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Productivity Commission
PO Box 80
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ARUP

Dear Sir / Madam

**Reform of Building Regulation - Productivity Commission**

Arup Fire provided an initial submission as part of the study into the reform of Building Regulation and has received the Draft Research Report (August 2004). Arup Fire would now like to provide comment on the Draft Report and the recommendations developed within this Report.

The second submission from Arup Fire on the reform of Building Regulation is attached for your attention.

Yours sincerely

Barber

David Barber
Associate

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## 1. EDUCATION AND TRAINING FOR PRACTITIONERS

It is encouraging that "Overview" page XXXI indicates that many of the underlying problems that have been identified in the building industry are related to a lack of adequate education and training for practitioners, at all levels.

It is disappointing though that there is no general recommendation on development of education and training in the area of building regulations and codes, for Australia. Section 4.3 "Sources of Productivity Change" provides background to the process of regulatory reform undertaken in Australia and clearly states on page 52 that "…*performance based codes reinforce the need for a high level of skills and competency*....".

Many of the issues and problems identified within the Draft Report can be attributed to the lack of adequate education of practitioners and authorities, at all levels. As an example, Section 1.4 states under the sub-heading "Performance Requirements" that the broad nature of the performance requirements may lead to confusion. It is argued that a lack of understanding by practitioners as to the purpose of the Performance Requirements is to blame, rather than the Performance Requirements themselves.

Another example is within Section 2.6, sub heading "Scope of the BCA" whereby a query is raised regarding building classification (page 25). Again, the BCA is being blamed for an issue of buildings being classified incorrectly when in fact it is up to the Authorities involved with the building to determine the class; the BCA simply sets the criteria for the decision.

A further example is Section 5.2 "Are These Objectives Appropriate" sub-heading "Plain Language" implies that the BCA is too technical. This would appear to be inappropriate given that the BCA is the National Building Code and hence should be a high level technical document. Whilst the document must always be understandable and clearly written, there would and should not be any need to make the document simpler. This is an indication that it may be more appropriate to raise the level of education of the users in how to read and understand the BCA.

Performance Based codes are not easy documents to understand and differ greatly in their scope and purpose from prescriptive codes. The aspect of further education, training and increasing skills for practitioners appears to have not been emphasised within the study to date. Better education and training on the use of the BCA may resolve many of these types of issues in the future.

To ensure the outcomes and benefits of education is to enshrine it in licensing and accreditation of practitioners and Continuing Professional Development (CPD). We strongly recommend the adoption of that part of the report.

## 2. DRAFT RECOMMENDATION 6.8 - ASSET PROTECTION

"Overview" page XXXIII and Draft Recommendation 6.8 indicate that the ABCB or its replacement body needs to address the issue of property protection and protection against business interruption.

It is recommended that any approach related to property protection must be clearly based on defining the different types of protection. "Asset Protection" must be clearly defined. Asset protection could include for business continuity or it could be for building fabric / structure only. Fire protection for business continuity is a significantly higher level of fire protection than is currently regulated and would incur a high cost to all society. A lesser cost and a lesser level of protection would be fire protection to protect the building fabric or building structure. Countries such as Singapore, Hong Kong, Japan and the USA provide for fire protection to protect the structure or building fabric. Business continuity protection is not regulated in these countries.

## 2.1 Discussion Related to Cost

A fundamental concept that has been developed within the present BCA is that the wider society should not be expected to pay for a building and its assets to be protected from fire. If a building owner or operator requires protection from fire, then the building owner or operator must choose whether to pay for this level of protection. This protection is not regulated at present and building owners and their insurers can determine the level of protection that is desirable. It is considered that for a change to occur to this fundamental aspect, a significant study of the costs and benefits must be undertaken to justify the change.

Any change that provides fire safety measures for asset protection and business continuity will result in increased building capital costs and on-going maintenance costs than are presently incurred by the wider society. To be able to provide commercial buildings with a level of property, asset and business protection will require a significant increase in the present level of prescribed fire safety provisions with the need for sophisticated fire protection systems of detection and suppression. There are also required to be controls on hazards, fire risks and programmes of on-going management of fire hazards. It should be noted that sophisticated fire protection systems require significant levels of maintenance over the life of the building and there will need to be significant increases in fire safety management.

The cost of installation, fire safety management and on-going maintenance would be passed on to consumers and hence it is expected that this increased level of asset and property protection would be a cost that all society would have to pay for.

Figure 1 below indicates the cost per person of property lost through fire in Australia (Productivity Commission Report[1]). This clearly indicates that present cost per person is in the order of $25 to $35 per person in Australia. It is therefore questionable, based on this information alone, as to whether there is actually a problem with property loss through fire in Australia at the present time.

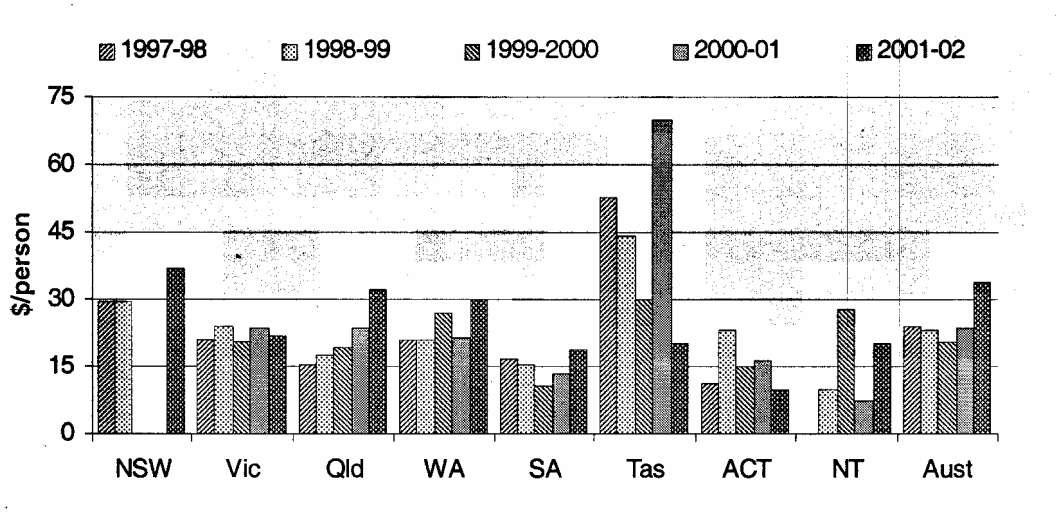


**Figure 1 – Productivity Commission: Cost of Fire Within Australia (2003)**

There will be advantages if these changes occur. If commercial buildings were provided with early detection and suppression systems, then the risk of a fire would be considerably reduced over a building without the systems. In fact the likelihood of a major fire would be reduced to be at an

[1] "Chapter 8 - Emergency Management" Report on Government Services, Productivity Commission, 2003 (www.pc.gov.au)

insignificant level within commercial buildings, given the present fire risk. It would be expected that benefits would be passed on to owners in that insurance premiums would be significantly reduced. Also, as the likelihood of a fire would be reduced considerably, there would be little need for the fire fighting resources presently available (this is the experience in other countries / states where changes to property protection have been introduced). There could potentially be a reduction in the number of fire fighters and certainly in stations and equipment. Residential fires would be the major operating target for fire fighters.

It is questionable though whether the reduction in insurance premiums and the reduction in fire fighting resources would offset the overall cost of the new fire safety provisions that would be required to meet the objectives of asset protection and the on-going maintenance.

It is considered that to develop Draft Recommendation 6.8 further, an in-depth and comprehensive cost-benefit analysis should be undertaken. The questions that need to be addressed quantitatively are:

- Is there a problem with fire in Australia to justify significantly increasing the level of property and asset protection within commercial type buildings ?
- Do the losses in property and indirect costs justify the increased spending in fire protection, given the very low likelihood of a major fire ?
- Are the benefits in protecting buildings and their assets from fires going to outweigh the costs ?
- Can Australia afford to spend money on fire protection to protect buildings and assets when these funds could be spent on other issues of public safety such as infectious diseases, heart disease, cancer etc that may have a higher incurred cost to society ?
- If there are regulated requirements for fire safety measures to protect buildings and assets will this result in significantly reduced insurance premiums from insurance companies ?
- If there are regulated requirements for fire safety measures to protect buildings and assets will this result in significantly reduced numbers of fire fighting personnel and equipment, given that the buildings will be highly protected from fire, therefore replacing the need for many fire service operations ?

## 2.2 Further Discussion

Section 6.9 “Asset Protection” has many interesting conclusions and statements. Whilst the AFAC statements indicate a desire for property and asset protection, there is also a desire for fire fighter safety. It is questionable as to whether the BCA should also provide regulations that crossover and detail fire protection measures to determine aspects of work place occupational heath and safety. This aspect may need further investigation.

It is also considered that the ABCB has potentially already carried out a study regarding asset protection and the BCA 1996 reflects the outcome of this study, in that a building constructed to meet the BCA Deemed-to-Satisfy provisions may have little or no fire safety provisions for property protection and no fire protection measures specified for business interruption. It is recommended that one of the first steps in the process of reviewing the need for asset protection is to review the decisions and process that was carried out to develop BCA 1996.

A change to introduce fire safety measures for business continuity to commercial buildings would leave Australia as one of the few (and potentially the only western country) with regulated fire protection for business continuity. This cost must be considered in detail before a decision is determined.

## 3. DRAFT RECOMMENDATION 5.2 - QUANTIFIABLE PERFORMANCE CRITERIA

This recommendation specifies that greater emphasis should be placed on providing quantifiable criteria to aid in judging compliance. This aspect must be approached with caution as providing specific numeric values within performance requirements may lead to a process of "prescriptive – performance" design, whereby a design is based on the set criteria, which may be conservative for some use classifications, but may not be conservative for others. Quantifying performance criteria within a fire safety context may lead to more problems in design than currently exists and so the process must be developed and tested rigorously.

A good example is tenability criteria. An average bulk smoke temperature of 100$^{o}$C may be tolerable for most able-bodied occupants, provided there is a short exposure. This temperature though may be too high for persons who are more vulnerable, such as residents of an elderly persons home or hospital, where an average temperature of 50 or 60$^{o}$C may be more appropriate for short exposures. Another example is audibility of alarms – 65dBa is an appropriate alarm level for most office buildings, but this should be closer to 75dBa for occupants who are asleep, and should be over 80dBa in retail centres, but should not be over about 105dBa so as to not cause hearing damage. Also, in many industrial facilities, audibility levels may inappropriate to consider due to many staff using ear protectors, in which case strobe lights or other alarm measures may be more effective.

The advantages performance based design without quantification is that the designer and authorities are able to consider all aspects without set limitations or criteria. In lieu of "dumbing down" the performance criteria, potential increasing the level of education training for practitioners may be of more long-term benefit.

## 4. DOMESTIC FIRE SAFETY

Section 6.9 "Asset Protection", sub heading "Stand alone buildings" has some interesting conclusions. Given that approximately 80 to 90% of all fires, injuries and fatalities involving structural fires within Australia occur in the home, little information or conclusions are drawn on improving domestic fire safety (see information from NSW Fire Incident Statistics[2], which are indicative for all States and Territories).

The BCA specifies all requirements for domestic dwellings and therefore a review of regulatory control would be expected to provide considerably greater coverage to the problems of domestic fire safety.

The Draft Report indicates that it would not be cost effective to improve fire safety in the home. The study concludes that there is little benefit in providing greater protection to homes. It would appear that without any form of quantification, the study has determined that there is no benefit in providing homes in Australia with increased protection, but has drawn a conclusion that there may be benefit in protecting commercial business (again with no quantification).

Significant work has been developed in the area of domestic fire safety and attention should be drawn to the New Zealand study into domestic sprinklers[3] (and the Building Commission work also carried out).

[2] NSWFB "Incidents and Response: A Ten Year Review" – NSWFB Annual Statistical Report 2001 / 2002 (www.nswfb.nsw.gov.au)

[3] See Building Research Association of New Zealand (www.branz.co.nz) and also Building Commission (http://www.buildingcommission.com.au/www/default.asp?casid=3381)

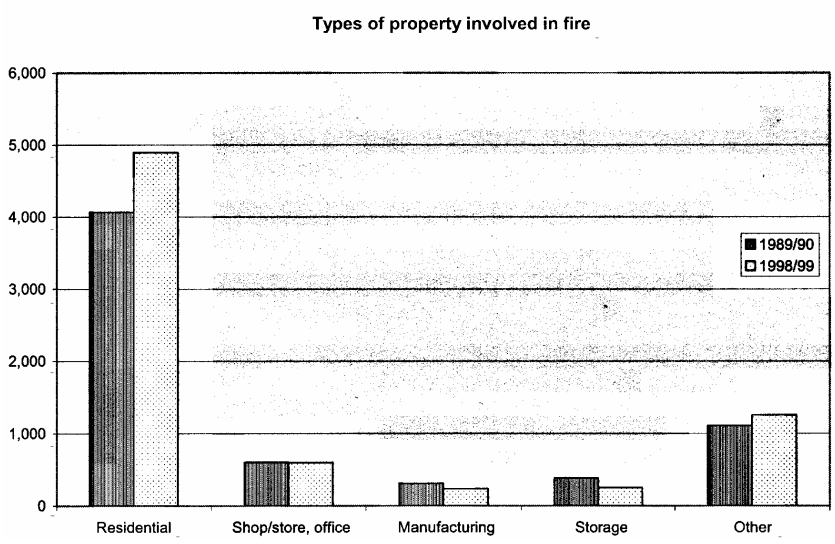


**Figure 2 – NSW Fire Incident Statistics (10 year review)**

It is considered that as part of the overall study into asset protection for commercial property, that the Productivity Commission study should also look further into the very cost effective domestic sprinkler system that has been developed by the Building Research Association of New Zealand. This sprinkler system has been shown through cost benefit analysis to be of benefit to the wider society, due to its low cost and overall efficiency.

Any cost benefit study on asset protection in Australia must include domestic dwellings as it is expected that there may be real benefits in improving fire safety in the home in Australia, benefits that may certainly outweigh those of protecting commercial buildings.

It should also be noted that Productivity Commission[4] and ABS figures indicate that about 2 million homes may not have smoke detectors installed, within Australia (approximately 75% do). Given that smoke detectors cost about $30 to purchase and install, it would appear that to improve fire safety within Australia and reduce significantly the number of fire incidents, injuries and fatalities, the first $60 million in funds available for fire protection should be spent on the most effective and proven fire safety device – a smoke detector for the home.

## 5. MAINTENANCE

Maintenance costs are outlined as a concern, especially under the change from a prescriptive to a performance based environment. This conclusion is considered to be potentially incorrect, as maintenance of fire safety provisions has always been required by building regulations. It is considered there are two parts to the maintenance issue:

- The impact of performance based design in that active measures such as sprinklers are being utilised in building fire design more than passive measures such as fire compartment walls; and
- The recognition under a performance based environment that maintenance is critical to the building design working in the future.

[4] "Chapter 8 - Emergency Management" Report on Government Services, Productivity Commission, 2003 (www.pc.gov.au)

## 5.1 Active and Passive Fire Safety Measures

Previous State and national Codes prior to BCA 1996 were based on a fire safety strategy of fire containment and passive fire protection to prevent major fires. Along with this code developed strategy, there has always been a perception that passive fire safety measures, such as walls, doors and floors do not require significant on-going maintenance and that the cost may be minor, when compared to active systems such as alarms, sprinklers, mechanical smoke venting. This is a misconception as many concrete fire walls have penetrations that render the fire walls ineffective and there are many examples of fires that have occurred in commercial buildings that have higher than expected levels of damage, due to penetrated fire walls, inoperable fire doors and services penetrations between floors not adequately sealed. Passive fire safety measures are just as vulnerable to failure as are active fire safety measures, given the ease by which a fire door can be held open or a penetration can be sawed into a concrete wall.

Under the BCA 1996, the fire strategy developed by the Deemed-to-Satisfy provisions is one of utilising traditional passive fire safety measures for low-rise and smaller buildings, but greater use of active fire safety measures for larger or more hazardous buildings, to meet with the now stated objectives of life safety and prevention of fire spread. Buildings constructed under the 1996 Deemed-to-Satisfy provisions have therefore had a greater level of sprinkler and active systems installed. Also, fire safety engineers have utilised active systems as a means by which to develop innovative fire safety strategies, utilising the early warning of detection and the suppression of sprinklers.

Thus, under BCA 1996 there has been a change in the overall principle of fire safety strategy development, from the more traditional passive fire safety containment, to a strategy of utilising active measures to ensure life safety and to allow the building to have other innovative aspects. Authorities are also requesting a greater use of active fire safety measures such as detection and sprinklers. This is similar to the changes that occurred in New Zealand when the performance based New Zealand Building Code was introduced in 1993, in that the prescriptive part of the Code encouraged the use of alarms and sprinklers in buildings and performance based designs were often based around strategies of active, rather than passive, fire safety provisions.

Section 4.4 “Impact on Economic Efficiency” sub section “Building Owners” states that maintenance costs have increased due to issues such as access. This would appear to be an inappropriate statement given that access difficulties have always existed for maintenance of equipment for as long as buildings have been constructed.

In light of the change from passive strategies to active strategies due to the introduction of the BCA 1996, one of the “side effects” is that maintenance costs should increase, given the change in overall strategy from passive based strategies to active based strategies. A building with a predominance of active fire safety measures will typically have a higher maintenance cost than a building with passive fire safety measures, due to the number of inspections required and the complexity of the inspections. Whilst this is a cost to the owner, there is also an increase in the overall occupant level of safety in that occupants would typically be safer in a building with a working detection and alarm system. Because of the change in emphasis from passive to active fire safety strategies as part of the BCA 1996 change, there is expected to be a greater cost in maintenance.

## 5.2 Emphasis on Maintenance

The introduction of the performance based BCA 1996 also introduced more fire safety engineers involved in building design. Fire safety engineers are concerned with the design of a building for fire safety and also how a building operates. The introduction of the performance based code has resulted in fire safety engineers determining fire safety strategies that are based on systems approaches for the life of the building, which includes maintenance for all fire safety measures.

The input of fire safety engineers has raised the importance of maintenance and hence building owners are now being requested as part of their approval process to have appropriate management systems in place to ensure maintenance occurs through the life of the building. A typical fire safety strategy for a building will place emphasis on the process of on-going maintenance, for all passive and active fire safety measures.

As an example, a elderly persons home Arup Fire were engaged to audit had compliant fire safety measures, but it was evident that fire doors within a fire wall were critical to the life safety of the occupants, given the limited mobility of the occupants. Arup Fire requested that the facility managers carried out greatly increased maintenance and management than would be required under the BCA Deemed-to-Satisfy provisions to ensure the fire doors were not held open inappropriately, due to the high reliance for life safety for these fire safety doors. Whilst this could be argued as an undue maintenance cost and above the expected level of the BCA, it would be considered by most fire safety engineers as a prudent request to ensure that all persons involved are aware of the hazards and risks associated with not completing adequate maintenance and management for fire safety.

Private building certification has also introduced greater emphasis on building fire safety maintenance with building certifiers / surveyors requesting building owners or operators to have processes in place to manage their maintenance requirements.

Another aspect for discussion is the State based introduction of Essential Services legislation that requires mandatory maintenance. Victoria's system of maintenance requires a greater understanding by building owners of their fire safety maintenance requirements. One of the reasons for increased cost for maintenance has been the change at a State level of the legislation governing maintenance and management. This aspect does not appear to have been discussed within the Draft Report as a reason for increased awareness and cost of maintenance.

Another aspect that has changed the perception regarding fire safety maintenance is the litigious environment in Australia whereby building owners and operators recognise that unless maintenance is carried out to the required standards and systems are in place to record maintenance activities that the owner or operator could be liable for damages in a fire event. This aspect is certainly relevant to many building owners. As an example, a property manager working for a major retailer commented to Arup Fire that in the 20 years he was involved with property management, maintenance of fire safety measures has really only been a concern for them in the last 5 years. In previous years, fire safety maintenance occurred, but was not clearly documented or costs traced. In the last 5 years, there has been greater emphasis placed on building owners to document and trace all fire safety maintenance due to the potential legal implications of not completing this task. Organisations are clearly aware of their risks and incidents such as the Longford gas fire have brought the implications to the forefront of many organisations.

In conclusion, the information provided on pages 99 to 103 stating that the introduction of a performance based code has increased maintenance costs, should not really come as a surprise. Maintenance is a life-cycle cost for a building. A builder cannot provide a building that is free of maintenance costs and maintenance costs have always been required to be provided by the building owner or operator. The change in fire strategies from passive based systems to active based systems will mean greater life-cycle costs to building owners and operators. The Draft Report implies that this cost on building owners and operators may not be an appropriate cost, when in fact maintenance and management are key components of fire safety and the discussion should be used as a further basis for development of national and mandatory approach to building fire safety maintenance.

Draft Recommendations 5.4 and 5.5 on maintenance are considered to be appropriate and supported.