

## **Becoming Unsafe Overnight: Managing Historic Buildings as Building Regulations and Standards Change**

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**Abstract** Building standards and regulations have been around for a long time, and most historic structures were built in accordance with whatever codes existed at the time. However, as codes have changed (often in response to natural or human-caused disasters) these buildings have become progressively less compliant, making their continued occupation and use difficult without extensive and often damaging alterations to their significant spaces and fabric. In Australia, there have been considerable changes to standards over the past two hundred years to deal with apparent deficiencies in the codes exposed as a result of bushfires, earthquakes, cyclones and rising sea levels. Building regulations have also changed so as to deal in ever more detail with health and safety matters, as well as issues such as equitable access and energy efficiency. These changes have had an impact on historic buildings and structures, in the most extreme cases leading to loss of the building where owners anxious to redevelop can convince the authorities that preservation and upgrading to meet current standards will impose unreasonable economic hardship. In other cases, the insensitive and sometimes over-cautious application of codes (often to reduce the risk of future litigation or loss of insurance) leads to almost as much damage to the historic building as the upgrading work is intended to avoid if a disaster occurs. Conserving historic buildings while keeping them safely in active use requires a flexible and innovative approach to the regulations, as exemplified in the work of the Heritage Council of New South Wales Fire Access and Services Advisory Panel, of which the author was a foundation member.

**Keywords:** Building regulation, historic building, performance requirement

### **Introduction**

Building regulations have been with us for a long time. The first recorded example is nearly 400 years old; it is part of the Code of King Hammurabi of Babylonia, written in cuneiform on a tablet now on display in the Louvre Museum in Paris. The Code includes the following requirement: Article 229: The builder has built a house for a man and his work is not strong and if the house he has built falls in and kills a householder, that builder shall be slain (Quoted in Gross 1996).

The first building regulation in Australia was probably an order issued in July 1788 (six months after the founding of the colony) by the first Colonial Governor, Arthur Phillip, banning the use of thatch as a roof covering for houses with chimneys (Cowan 1998). This was followed by the City of Sydney Building Act of 1837, under which the use of timber as an external building material was forbidden within the central town area (Fitzgerald 1992).

### **Building Regulation as Risk Management**

Most societies that have settled in towns or cities throughout the world have found it necessary to regulate building practices in one way or another. The purpose of such regulations is to control the actions of individuals for the public good (and sometimes even for the good of the individuals). In the past, building regulations have dealt mainly with health and safety matters such as fire safety and structural adequacy, and have sought to reduce (not to eliminate) the risks of personal injury or loss of life. More recently, regulations have ventured into other areas of equity and amenity such as access for people with disabilities, and acoustic privacy.

The concept of regulations as risk management tools is important for understanding how they are formulated and policed. As structural engineers know, it is probably impossible to make a structure capable of withstanding any unspecified load that could possibly be applied to it. It is, however, quite possible to make a structure to withstand specified loads, with the cost of the structure being directly proportional to the size and range of these loads, and also to the safety factors applied by the engineers. The question then becomes: what is a reasonable size and range of loads (with a reasonable safety factor) that society should require all structures to withstand? The cost to society (and its members) of compliance with these requirements must be balanced against the risk of failure and the consequences of that failure to society, and in every case there is an actual or implied risk assessment involved. In other words, even a building that complies with all current building regulations is only “safe” to the extent that the risk of its failure is within currently acceptable limits set by society.

### **Changes in Building Regulations**

Building regulations change and develop for a number of reasons. One is that society’s view changes over time about acceptable risks and an acceptable price to pay to reduce them. Another is that research identifies different, often better, ways of making buildings safe and healthy for their occupants, and the regulations change to take account of the latest knowledge. However, it must also be said that changes in regulations or standards often happen for less worthy reasons: natural or human-induced disasters may generate unduly harsh new regulations as governments seek to demonstrate a politically acceptable response (especially where the regulations are perceived to have been lax prior to the event), or special interest groups may be able to influence the setting of standards for their own commercial benefit (for example, insurance companies in relation to fire safety regulations, which in many cases were aimed at protecting property rather than lives).

When changes to buildings standards occur, buildings constructed to comply with a previous standard instantly become non-complying. Does this mean that they are inherently less safe or healthy than they were previously, or less capable of being occupied and used? Even the authorities will concede that of course they are not. There is no expectation that at any one time every building will comply with current building regulations – however, there is an expectation that as buildings are progressively replaced or upgraded, the general standard of health and safety will gradually rise towards that set by the current regulations.

In New South Wales (NSW), building regulations have until recently developed as a response to actual or perceived disasters: for example, the Theatres and Public Halls Act of 1908 which followed the disastrous fire in Her Majesty’s Theatre in 1902 (Phillips1995) . The Height of Buildings Act of 1912 (restricting buildings to a maximum height of 150 feet) followed the construction of Culwulla Chambers in 1911-12, which at 170 feet was then Australia’s tallest building (Heritage Branch 2005), barely within reach of the NSW Fire Brigade’s ladders.

The Newcastle earthquake of 1989 led to a significant upgrading of the standard for earthquake design; the 1979 standard was superseded by a completely new standard in 1993, which although intended mainly for new buildings included some recommendations for the upgrading of existing buildings. With memories of the earthquake fresh in their minds, authorities frequently required compliance with the new standard when existing buildings were being altered. The new code had such an adverse impact on many existing buildings (including historic buildings) that another new standard had to be issued in 1998, dealing specifically with existing buildings and adopting a more considered approach. In the meantime, however, a considerable amount of damage had been done to historic buildings. This was recognised in the new standard, which although stating that it made no special provisions for heritage buildings, acknowledged that the damage likely to arise from upgrading might induce owners and authorities to agree to “accept a lesser load capacity, with an implied greater degree of risk, to maintain the quality of the building” (Standards Australia 1998).

Similar reform of Australian standards and building regulations occurred after Cyclone Tracy devastated the city of Darwin in the Northern Territory on Christmas Eve in 1974, and will no doubt

follow the most recent Black Saturday bushfires in Victoria last year. Draft guidelines for coastal planning in New South Wales were published in October 2009 in response to predicted sea level rise and coastal erosion (NSW Department of Planning 2009).

### **Prescription and Performance**

With some notable exceptions, including the Hammurabic Code referred to above, until recently most building regulations have been formulated using prescriptive requirements that specify particular materials, sizes and construction methods to achieve their objectives. Although in some cases these prescriptions were the result of genuine scientific inquiry, in many others they were simply the codification of long-established building practices that had been found to serve their purpose. Ordinance 71, first published in 1921 under the NSW Local Government Act 1919, was still in use until 1974, and until the 1970s contained its own prescriptive requirements for timber sizes based on traditional construction from the 18<sup>th</sup> and 19<sup>th</sup> centuries (NSW Government 1960). Australian Standard CA38, the Light Timber Framing Code, published in 1971, was based on extensive research conducted into the strength and stiffness of building timbers, and identified instances of both over-design (in some timber sizes) and inadequacy (such as cross-bracing) in the existing codes. It was subsequently adopted by reference into the building regulations, but it too was largely a prescriptive code, with tables for each grade of timber specifying minimum member sizes and maximum spans.

Prescriptive building codes have the merit of being reasonably straightforward for designers to use and for regulators to check and enforce compliance, but the disadvantage of being ill-equipped to deal with buildings that have different designs, materials or construction methods from those assumed by the regulations. In addition, they do not allow the designer any flexibility or innovation in meeting the objective (usually unstated in prescriptive codes) of producing a safe and healthy building (Foliente 2000). For this reason, since the 1970s many countries have moved towards the adoption of performance-based building regulation, where the regulations specify the performance requirement to be achieved. In Australia, the Building Code of Australia (BCA) was first published in 1996, and adopted by all states and territories (each of which had until then developed its own building regulations) by 1998 (Australian Building Codes Board 2010). It is a performance code, with the addition of “deemed-to-satisfy” clauses (very similar to the former prescriptive clauses in state and territory regulations) that allow designers and regulators the simplicity and predictability of the old prescriptive regulations while also allowing alternative methods of satisfying the performance requirements.

### **Building Regulations and Historic Buildings**

Progressive changes to building regulations are something of a problem for historic buildings, because unlike other buildings they tend not to be replaced over time. Moreover, retaining the qualities that make them significant heritage places means that there may also be difficulties upgrading these buildings to meet current building regulations. As a result, historic buildings present special challenges to both their owners and the building regulators, and there is often a call for them to be treated as special cases under the regulations. This indeed happens in several places, for example in the United States (Listokin and Hattis 2004). In New South Wales, there are still no such provisions to treat historic buildings as special cases.

However, the need for special treatment for historic buildings has been greatly reduced by the introduction of performance-based building regulations. Now that the regulations only specify performance rather than prescribe construction, the opportunity exists for building owners to demonstrate that their buildings in fact meet the performance requirements, or can be upgraded to do so in ways that minimise adverse impact on their cultural significance. More advanced methods of structural analysis and fire engineering allow a much better understanding of the adequacy of existing structures to meet performance requirements for health and safety.

At the same time, some aspects of changing building regulations cannot be so adequately managed by resort to performance-based codes. One example is balustrades and handrails, the prescribed height of which has been increasing gradually over the last century. The main reason for this is that average humans (at least, in developed countries) are becoming taller and heavier, and their centre of gravity is therefore moving inexorably upwards. Consequently, modern humans are capable of falling over the top of a 19<sup>th</sup> century railing that would have been perfectly adequate in height to restrain their grandparents. Creative ways therefore need to be found to retain the old railings and yet provide reasonably adequate barriers to falling.

Another development in New South Wales, which has not been as beneficial for historic buildings as some first thought, is the introduction of private certification in 1997. The government of the day (with the active encouragement of the development industry) decided to allow appropriately qualified private consultants to certify compliance with building regulations, so as to avoid the alleged delays and intransigence of local authority building surveyors. In the event, many of these surveyors left their employment as public servants and became private certifiers. The difference was that, instead of being covered by the insurance of their public service employers, they had now to take out their own professional indemnity insurance, and were also at risk of being sued personally for any errors of judgement. This tended in many cases to make private certifiers even more cautious than their local authority counterparts to consider alternatives to the deemed-to-satisfy provisions of the building regulations.

### **The Origins of the Fire Advisory Panel**

In 1976, the New South Wales State Cabinet established an inter-departmental committee to look at ways of improving fire safety in existing buildings. Local Councils were asked to inspect existing buildings and where necessary issue notices ordering fire upgrading. These notices, issued under Section 317D of the then Local Government Act 1919, became notoriously known as "fire orders". The following year the Heritage Act was passed which established the Heritage Council of New South Wales. Shortly afterwards, the Local Government Act was amended so as to require local Councils to give notice to the Heritage Council before making a fire order relating to any building listed on the Register of the National Estate, at the time the only statutory list of heritage places. The intention of the amendment was to allow the Heritage Council to advise on methods for fire safety upgrading which would be least detrimental to the cultural significance of the building. In practice, the lack of fire safety expertise at the Heritage Council often meant that its advice lost out against the acknowledged expertise of the Board of Fire Commissioners. In a few cases, a satisfactory outcome was achieved only after long negotiations.

The Ghost Train fire at Luna Park (an amusement park on Sydney Harbour) in 1979 prompted the Department of Local Government to remind local Councils in 1980 of their responsibilities concerning the fire safety of existing buildings, which led to a substantial increase in the number of fire orders issued throughout NSW. In 1983 the Royal Australian Institute of Architects (RAIA) (NSW Chapter) Historic Buildings and Sites Committee organised a seminar on Fire Protection in Historic Buildings, which brought together representatives from those making and administering fire regulations, and those concerned with preserving historic buildings, together with architects who in the end have to satisfy both groups at a reasonable cost to their clients (Phillips 1983). The seminar identified a number of problems including rigid enforcement of inflexible regulations, conflicting requirements, lack of expertise among designers and inspectors, and a proliferation of fire orders. Nevertheless, there were also encouraging signs that all parties were willing to adopt a more flexible attitude despite their differing points of view (Phillips 1995).

The growing involvement of the Heritage Council in the fire safety upgrading of historic buildings led in 1984 to the formation of the Fire Advisory Panel, an advisory committee to the Council. Many of its original members had participated in the RAIAs seminar the previous year. They included representatives from the NSW Board of Fire Commissioners, the Theatres and Public Halls Branch of the NSW Public

Works Department, the NSW Department of Local Government, the Height of Buildings Advisory Committee, local Council building surveyors, the Heritage Council itself, the Royal Australian Institute of Architects, the National Trust, the Australian Institute of Building Surveyors, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the fire protection industry.

### **Operation of the Fire Advisory Panel**

At the time the Panel was established in 1984, New South Wales building regulations were still prescriptive, and the regulations governing new buildings were often used inflexibly by local authority building surveyors as the standard to assess existing buildings, especially in the period immediately following a serious fire. Owners of historic buildings, unwilling to incur the cost of challenging fire orders in the courts (the only available avenue of appeal), often took a commercial decision to accept the upgrading requirements, despite the serious adverse heritage impacts on their buildings. These included removal of timber panelled doors and linings, oversheeting or removal of decorative ceilings, enclosure of internal stairs and addition of external stairs. In some cases the outcome was the loss of the entire building, as some owners managed to persuade the heritage authorities that the cost of compliance made it uneconomic to preserve the building in any form.

The Fire Advisory Panel offered owners of heritage buildings an alternative to appealing to the courts: a cost-effective way to minimise the damage to the significance of their buildings and at the same time achieve a reasonable level of fire safety that would satisfy the authorities. Owners could approach the Panel for advice if they found themselves unable to negotiate a satisfactory outcome with the local authority. The Panel itself had no statutory place in the regulatory regime, and its recommendations were only advisory, but they were almost always followed by the authorities as they represented the opinions of senior representatives of a wide range of fire safety authorities, consultants and heritage experts.

The Panel's approach worked well for a number of reasons. Firstly, every problem was dealt with from first principles on its merits, taking into account the inherent fire resistance of traditional construction and the exact nature of the proposed occupancy. Secondly, the Panel had access through its members to the latest research and developments in fire safety. Thirdly, the Panel included representatives from most regulatory authorities, so that potentially conflicting requirements could be identified and discussed. Finally, a range of possible solutions was considered, in particular the use of active fire protection (automatic detection, alarm and extinguishing systems) as a substitute for the passive protection (fire-resisting construction) usually required by prescriptive building regulations. The Panel was thus able to suggest appropriate and cost-effective methods of fire protection which provided an acceptable level of fire safety with the minimum effect on the significant fabric of the building.

The Panel also instituted a research program to explore generic solutions to common problems encountered in the fire safety upgrading of heritage buildings. The first of these was to find an alternative to the common requirement in residential apartment and hotel buildings for the replacement of timber panelled doors by flush timber doors. This had a marked adverse impact on the traditional appearance of such buildings, particularly in public spaces such as hallways where the doors were the principal decorative elements. The Panel, with the aid of its consultant Fire Research Pty Ltd, developed a cost-effective method of upgrading the panelled doors from the room side (the assumed side of the fire source), and fire-tested an upgraded door together with a typical example of the flush doors commonly specified for replacing panelled doors (National Building Technology Centre 1986). Interestingly, the test showed that the flush door achieved less than half the performance of the upgraded door, and that it would have performed little better than a good example of the panelled door it would have replaced.

The advent of the performance-based Building Code of Australia in 1996, together with developing knowledge and expertise in the field of fire engineering, resulted in a reduction in the number of requests to the Panel for advice on fire safety upgrading. The Panel accordingly turned its attention to other aspects of the impact of regulations on historic buildings, such as requirements for barrier-free

non-discriminatory access to buildings, and related issues such as the appropriate installation of new building services. It was accordingly renamed the Fire, Access and Services Advisory Panel. In recent years, other issues have arisen for its attention, such as the requirements for all buildings (including historic buildings) to reduce energy consumption, and also the enhanced provisions of occupational health and safety legislation.

### The Future of Historic Buildings and Building Regulations

On the one hand, the future for historic buildings appears threatening, as the number and extent of the regulations governing building grows over time. Aspects of these regulations such as energy conservation present particular challenges. In the context of attempts by governments to reduce energy consumption to mitigate global climate change, some people have called for the wholesale replacement of many traditional buildings, including historic buildings. An example is the 40% House report in the UK, which recommended a fourfold increase in the rate of demolition of the “worst performing” housing stock in Britain (Environmental Change Institute 2005).

On the other hand, the availability of tools and research that can help historic buildings meet the challenges of building regulation is also increasing. There is for example a developing understanding of the concept of the embodied energy in an existing building, which needs to be taken into account in any decision about its environmental performance (Phillips, 2008). In addition, many historic buildings were constructed with the aid of a wealth of traditional knowledge about climate and energy, and some contain ingenious construction methods and devices for environmental comfort that have fallen into disuse through lack of awareness. Provided that a well-informed and consultative approach is taken to the management of historic buildings, they can continue to enrich our culture while remaining in active use.

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