CONSULTANTS REPORT

REPORT FOR THE AUSTRALIAN BUILDING CODES BOARD

CLASS 2 AND 3 EVALUATION OF OPTIONS PROJECT

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1. Executive Summary

This report has been prepared for the Australian Building Codes Board (ABCB) by Philip Chun and Associates. The purpose of the report is to examine and analyse issues related to the classification and use of Class 2 and Class 3 buildings as defined by the Building Code of Australia (BCA).

The report is based on a defined set of assumptions and proposes two case study building types with cost plans to analyse the economic impact of any options resulting from a change to the building code. Preparation of a cost plan has been carried out by North Projects, and the economic analysis has been carried out by Deloitte Access Economics.

The ABCB has been considering issues related to the use of Class 2 and Class 3 buildings for a number of years including concerns about the classification and use of Class 2 and 3 buildings,. Stakeholder consultation was carried out to collect detailed information and to collect stakeholder's suggestions and solutions.

The key matters of concern related to the use of Class 2 and Class 3 buildings including

a) Differences in building code requirements
b) Issues with building management and use, and
c) Issues with commercial investment interests and strategies.

As a result of stakeholder consultation the following reform options were considered:

- No change
- Have only one class (combining Class 2 and 3 buildings)
- Include short stay serviced apartment living as a Class 2 building
- Include short stay serviced apartment living as a Class 3 building
- Create new Class 2b Classification for Short Stay Serviced Apartment buildings

In order to provide some quantitative evidence in relation to the impacts of the potential reform options, the analysis considered:

(c) The technical parameters affecting changes to the BCA including a literature review and thorough qualitative discussion in relation to the risk of occupants to fire life safety, and
(d) The economic parameters based on a stylised modeling exercise that simulates the effect of change.

Changes analysed identified the impact on regulations for new and existing buildings including fire life safety, accessibility, health, amenity and energy efficiency, and on the economic impact to sectors of the economy, including effects on housing supply, affordability and the impact on existing buildings.

Whilst changing the classification or changing the definitions related to residential living in the BCA is one method to address the issue, it is considered that specific micro changes to BCA requirements or utilizing the power and controls of associated Acts, regulations, schemes and rules, which come into effect prior and post construction, should also be investigated.

Planning or Development schemes and Owners Corporation rules are able to enforce accommodation management and rental conditions or restrictions and can prescribe amenity and housekeeping matters in consultation with building owners. These vehicles could address key concerns of residents occupying residential Class 2 buildings on a long term or permanent basis.

The economic impact of the various options has identified varying levels of impact, pending the nature and vehicle for change.

The contents of this report provide a basis for the ABCB to respond to stakeholder and to develop a way forward to resolve the concerns identified by industry.

PART A

1. Introduction

This report has been prepared for the Australian Building Codes Board (ABCB) by Philip Chun and Associates. The purpose of the report is to examine and analyse issues related to the classification and use of Class 2 and Class 3 buildings as defined by the Building Code of Australia (BCA).

The ABCB has commissioned this report in response to concerns from industry and occupants of residential buildings that residential buildings or parts of residential buildings are increasingly being used for short stay, short term letting and/or serviced apartment style accommodation. It is contended that short stay serviced apartment type accommodation is against or in contravention of the intended or expected use as prescribed by the building code and respective statutory approvals or permits.

This report examines issues associated with the building classification and evaluates options for change based on recent ABCB commissioned stakeholder consultation and respective qualitative and quantitative analysis into the differences between Class 2 and Class 3 buildings.

This report will be based on a defined set of assumptions and propose two case study building types with cost plans to analyse the economic impact of any options resulting from a change to the building code. Preparation of a cost plan has been carried out by North Projects, and the economic analysis has been carried out by Deloitte Access Economics.

2. Methodology

The approach and methodology proposed to complete this evaluation project is as follows:

j. Review the existing ABCB office research and recent stakeholder consultation including an assessment of questionnaires and responses from various individuals and industry groups,

k. Consider the historical development of the BCA and the prescriptive building construction requirements for Class 2 and Class 3 buildings,

l. Identify the codes technical provisions including requirements for buildings to include minimum fire and life safety, access, egress, health, amenity and energy efficiency provisions,

m. Identify the issues and concerns raised by individuals and industry related to the use of existing Class 2 buildings for short stay serviced style apartment living,

n. Consider the impact of other Acts, regulations, guidelines and standards on the design, construction and occupancy of Class 2 and Class 3 buildings,

o. Develop project case study buildings and cost plans to analyse current and proposed construction, maintenance and operational cost differences,

p. Undertake qualitative and quantitative analysis of the differences in BCA requirements between Class 2 and Class 3 buildings,

q. Collate available data on the number of buildings in Australian states and territories with Class 2 and Class 3 classifications including the average investment yield of the building types,

r. Identify the potential economic impact of all options against;

   i. Impact on investment in the relevant sector
   ii. Impact on housing supply
   iii. Impact on housing affordability
   iv. Impact on existing buildings

s. Consider change options identified following the ABCB stakeholder consultation process,

t. Deliver Class 2 and Class 3 Evaluation Report.

3. Background

3.1 The Building Code of Australia

The BCA outlines the classification of buildings and has three specific categories for residential type buildings.

The three categories of residential building can be described as follows:

Class 1 a single house or dwelling,

Class 2 multiple dwellings typically attached and constructed over more than one level, and

Class 3 a residential building other than a Class 1 or 2 used by a transient population such as hotels, motels, lodging houses and the like, or particular or distinctive uses such as accommodation associated with schools, hospitals, etc. Class 3 occupancy buildings are commonly operated on a commercial basis or arrangement.

These three categories outline broad definitions for the expected residential use of buildings which are based on historic fire life safety risk and amenity provisions. These in turn, are based on the occupants, activities of the occupants and the fire loads of the buildings. More recently additional building code provisions have included requirements for acoustic separation, accessibility and energy efficiency measures in Class 2 and Class 3 buildings.

Building codes have been around for over 50 years and are administered and enforced in Australian states and territories via various regulatory frameworks. Introduction of codes and standards were initially administered through local Council by laws, however are today administered through individual Acts, regulations and rules on a state by state, territory by territory basis. Building control is administered via regulatory frameworks and includes the participation of public and private sector practitioners.

In 1986, following the formation of the Australian Uniform Building Regulation Coordinating Council (AUBRCC), a national building code for Australia was developed. The Building Code of Australia was the first building code to be adopted by all states and territories combining all technical provisions to create a single consistent method of classifying buildings and prescribing minimum construction standards to meet government policy objectives and community expectations.

The BCA has been the subject of various amendments since its first introduction in 1988, however there have been no changes to the description of Class 2 and 3 buildings since 2003.

Whilst changes to the description of classification of buildings in the BCA has occurred over time, the lifestyle, management, ownership and investment in residential buildings have also changed, yet not in alignment with changes to BCA classifications.

3.2 Class 2 Building Occupancy

Class 2 residential buildings were originally constructed predominantly as owner occupier or long term tenant rental buildings, typically accommodating individuals or families who would purchase or rent a residence pending their financial or personal circumstances. The occupants of Class 2 buildings could be assumed to be permanent or long term stay occupants.

The requirements of the BCA prescribe the minimum level of fire life safety, egress and health and amenity provisions intended to facilitate permanent or long term stay occupation of the building. The provisions would require features such as kitchens, sanitary facilities and laundries in typically a range of one to three bedroom homes, designed to afford the usual comforts of a home environment.

It is noted that Class 1 building whilst typically separate free standing dwellings were also prescribed with a similar fire life safety and health and amenity provision, as a Class 2, to afford a similar minimum community accepted home environment standard.

It is recognised that owners of buildings and long term tenants of Class 2 buildings would be residents who are aware of a buildings geometry, and who are likely to be responsible for payment and use of energy consuming services.

3.3 Class 3 Building Occupancy

Class 3 buildings were originally intended to cover two further accommodation types being:

a) Accommodation for transient or short term occupants such as hotels and motels, and
b) Accommodation buildings associated with other classes such as schools, health care buildings and the like.

The nature of occupants in Class 2 buildings are typically people residing for long term occupation such that their familiarity and affiliation with the buildings features and geometry was well known. The nature of occupants in Class 3 buildings are typically unfamiliar with building features and geometry or were residents with particular mental or physical impairments and / or in need of assistance with activities of daily living. e.g. elderly or people with disabilities, such that enhanced safety installations were considered necessary.

In addition, features such as kitchens and laundries were not deemed necessary in Class 3 buildings and it was recognised that occupants of Class 3 buildings would not generally be responsible for payment, use or consideration of energy consuming services.

3.4 Building Ownership, Investment and Management

The BCA is a technical code which prescribes specific building features, systems and services which afford a building the minimum condition for fire life safety, access, egress, health and amenity and energy efficiency.

The BCA does not consider specifically the ownership, operational management or commercial investment interests and strategies of building owners and / or operators.

Consequently it is conceivable that a particular ownership structure, investment or management strategy of a building, post occupancy, may not accord strictly with the original approved class or use, and therefore may attract additional fire life safety or amenity provisions. It is not uncommon to have changes in use, within the same class, to attract additional building code provisions.

For example a Class 2 building which accommodates an elderly resident, ageing in place, may require additional fire life safety or amenity provisions deemed necessary for the characteristics of an aged occupant, as prescribed for a Class 3 use.

Equally, in other classes of occupancy, the change of tenant from a Class 6 retail clothing store to a Class 6 café / coffee shop may require additional features, characteristic of a building which accommodates eating and drinking occupants.

It is common for owners of Class 1 and Class 2 buildings to be owner occupiers however it is also common for owners of Class 1 and 2 building to rent or let their buildings as investment properties for financial gain and security.

Owners of investment properties often utilise the management resources of real estate agents to manage their investment on their behalf. This type of arrangement is usually for long term rental agreements to secure income for owners whilst recognising that this category of investor is generally not in the business of providing accommodation.

The owners of Class 3 buildings i.e. typically hotels, motels, guest houses and the like, are in the business of providing accommodation or lifestyle apartment living as a core business and for financial return. Typically these accommodation buildings are owned and operated by the same entity or chain. e.g. Hilton Hotel, Choice Hotels,

In recent years there has been an increasing number of accommodation management and rental companies providing strategic commercial investment opportunities for owners of Class 2 investment properties (dwellings and apartments). These accommodation management companies are in the business of providing serviced and lifestyle accommodation / utilising privately owned dwellings and apartments effectively competing with the Class 3 hotel / motel marketplace.

It is the emergence of these types of accommodation management companies and the occupancy of Class 2 buildings on a short term, short stay basis that has resulted in suggestions of illegal occupation and /or conflict between the actual, or intended use of, Class 2 buildings and Class 3 buildings in the rental or serviced accommodation marketplace.

It is recognised that in popular tourist or holiday destinations the provision of holiday letting with broader amenity has been practiced for over 30 years. Where a typical Class 3 hotel or motel suite provides adequate accommodation for business, commercial and some holiday makers, holidaying families have increasingly sought accommodation with broader amenity typically contained in buildings constructed as Class 2.

4. ABCB Stakeholder Consultation Process

4.1 Stakeholder Consultation

The ABCB has been considering issues related to the use of Class 2 and Class 3 buildings for a number of years including a consultation and review process in 2007. In 2010, the Productivity Commission released its 'Annual Review of Regulatory Burdens on Business' report, which raised concerns about the classification and use of Class 2 and 3 buildings, specifically concerns raised by the hotels industry.

The ABCB developed a questionnaire to obtain detailed information regarding the issues and requested stakeholders to respond to several questions.

4.2 Stakeholder Questionnaire

Stakeholder consultation carried out by the ABCB had two main objectives. To collect detailed information regarding issues, and to collect stakeholder's suggestions and solutions with the aim to resolve any issues identified.

The following questions were asked of stakeholders:

Question 1 – Do you believe that the definitions provided for Class 2 and 3 buildings in the Building Code of Australia (BCA) require clarification?
Question 2 – Do you believe the issue is leading to widespread misclassification of buildings?
Question 3 – What do you think should be done to resolve the issue?

4.3 Stakeholder Responses

In response to ABCB Question 1 and Question 2, a majority of stakeholders believed that the definition of Class 2 and 3 buildings required clarification however there was no consistency in identifying wording which would resolve the issue or in fact if there was any widespread misclassification at design or approval stage.

The following is a brief example response from individuals who believe there is an issue:

> *"'Sole-occupancy unit' and 'residential' needs specific clarification as both seem to be open to interpretation. This has meant that there are no restrictions for apartments on how long an occupant can reside meaning they are not limited to residential accommodation and can pursue short-term or overnight accommodation".*

> *"As there is no clear definition of a dwelling, or whether the concept of a dwelling is for short-term as well as long-term; or what is meant by short-term, the advocate of using Class 2 buildings for pseudo hotels is being promoted and continues to occur unless clarified at a national level".*

"The entire definition of Class 2 is open to interpretation. It hasn't been reviewed for over 35 years and fails to take into consideration usage patterns within buildings since the Gold Coast boom in the 1980's.

'2 or more sole-occupancy units each being a separate dwelling'… (requires clarification). All units in tourist areas are capable of being used as a separate dwelling in accordance with town planning, (BCA requirements) F2.1 and Table F2.1".

"While it is clear in the BCA that hotels are to be built to Class 3 standards, the requirement for serviced apartment operations is unclear and there is no defined class of building to which a serviced apartment has to adhere, i.e. serviced apartments are not specifically mentioned in the A3.2 Classification section of the BCA".

"The problem seems to be the difference between a 'home' and a place of short or medium term accommodation as inferred in the building classifications. The classification of a Class 3 should be changed to include 'serviced apartments' and the term 'serviced apartments' should be defined so that it clearly relates to a use that is not considered a 'home'. A definition of 'home' should also be included in the BCA".

Conversely the following are examples of views expressed by stakeholders who do not believe that there is a problem with the classification of Class 2 and Class 3 buildings:

"There is a clear distinction between Class 1, 2 and 3 types of buildings. Just as Class 2 buildings are differentiated from Class 1 (single unit residential as opposed to multi unit residential) there is then a distinction between multi-unit residential and hotels, motels, backpackers etc as buildings. The differentiation is quite clearly set out in the BCA. There is no confusion. A hotel, motel, backpackers or aged care type facility does not provide a full residential unit as does a Class 2 building which is a cluster of apartments normally connected by a central foyer to lifts and stairwells.

Class 2 building provision in the Code set out the construction needs for a Class 2 type building and separately the construction needs for a Class 3 type building. They are sufficiently differentiated in their descriptions".

"There is no clear restriction on a Class 2 building being used for temporary or transient living, thereby allowing a Class 2 to be used for short-term accommodation".

"In my view, the use of a serviced apartment for short-term rental is not an issue because the buildings are designed for a certain number of occupants in any case. Also serviced apartments are generally (but not exclusively) rented by the week, and usually contain a number of permanent residents and that combination leads to a significant number being familiar with the building at any one time".

"In the definition of Class 3 building, "other than a building of Class 1 or 2" excludes all SOU's that have facilities to be a single dwelling regardless of the use or the length of stay. This includes serviced apartments and hotel rooms with a kitchenette and access to a shared laundry".

*"*** believes there are no issues with the classification of Class 2 and 3 buildings as presently set-out in the BCA. As previously stated, this is an argument between two parties that has become political. We believe that too many people see the BCA as a panacea for all things unrelated to building. Ironically, when local governments want to introduce regulations contrary to the BCA they place it in their planning regulations, but when an issue such as this can't find a resolution there, placing it into the BCA seems to be the easiest means to solve the problem.*

*We disagree with this approach. Similarly we should be opposed to using political pressure to amend technical requirements in order to achieve an outcome that is merely to 'appease the noisy wheel'. The subject of Class 2 and 3 building classifications was brought to the attention of the BCC some time ago and they decided at that time, it was a post-construction matter and therefore beyond the BCA's scope. *** agreed with this position then and still does. If anything it MAY be a planning matter. The building is approved for construction to a given classification and then constructed accordingly. It is then certified as being compliant or otherwise with that classification at the completion of the construction process.*

The argument that changing a classification of Class 2 will solve this debate is an overstatement of the facts, because the perceived problems are happening post the issue of a final occupancy certificate".

In response to ABCB Question 3 the following reflects some of the suggested solutions to resolve the issue. There were some common themes to resolve the issue, one of those being to create a new classification for buildings used for short-term use or as tourist accommodation:

"Creating a Class 2b classification for buildings intended for <u>both</u> tourism and residential use. This new class of building would be most suitable for serviced apartments and would recognise the differences of this style of operation".

"Consideration could be given to the introduction of a new building code classification that would cover 'tourist accommodation'. However, in considering any such change, the Board should limit its deliberations to the building, fire safety and occupant amenity standards relevant to the use of the building".

"Consideration could be given to the introduction of a new BCA classification for 'tourist accommodation' including serviced and non-serviced apartments. However the BCA consideration should be limited to building, fire safety and occupant amenity relevant to the use of the building, rather than the objectives and concerns of other organisations".

"Introduce new Class 2a and Class 2b. Class 2a includes apartment buildings used for permanent residents and long-term leases as defined by the States/Territories residential act/s. Class 2b includes mixed use apartment buildings uses from permanent residents, long-term rental leases and short-term accommodation. Examples include apartment building in tourist destinations, serviced apartments or the like".

Another commonly suggested solution proposed by some stakeholders was to introduce greater guidance/explanation in the BCA through the introduction of more defined terms and examples of uses to the Class 2 and Class 3 definitions. For example

"'Serviced apartments' are not included in either definition of Class 2 or Class 3 buildings, so this needs to be debated as to whether they should be a Class 2 or Class 3 building. Furthermore, any debate needs to be based on technical issues rather than degenerate into an emotive argument".

"Define 'short-term accommodation' and 'long-term accommodation'".

"Amend the Class 2 definition to include examples like the Class 3 definition".

"Define 'dwelling' and clearly state that Class 2 is not intended for short-term accommodation".

"Include a definition of 'serviced apartment'".

"Include 'which are not used for short-term or transient accommodation' at the end of the Class 2 definition".

"We suggested the proposed change be implemented, namely change the word 'dwelling' to read 'dwelling, whether of a short-term or long-term nature'".

"As clarified in BCA 2011, short-term accommodation can be Class 1b. There should be recognition of short-term accommodation in the definition for Class 3 buildings.
There also needs to be more examples of what Class 2 buildings are, just like examples given for most other classifications".

4.4 Key Points

The ABCB office has summarised the consultation process in the following key points

a) There are mixed and polarised views amongst respondents about the issue, with no clear way forward proposed.

b) There is an expectation that the ABCB will resolve this issue at a national level.

c) No evidence was provided to suggest that the use of serviced apartments in Class 2 buildings is leading to a reduced level of safety to building occupants. The main concerns identified included :

   i. long-term residents of Class 2 buildings with serviced apartments are provided with a reduced level of amenity than would typically be expected in a Class 2 building used solely by long-term residents; and
   ii. higher construction costs are applied to hotels, which is leading to reduced investment in hotels and making it difficult for hotels to compete with serviced apartments in the short-term accommodation market.

d) Noting the evidence provided, the issue appears primarily to be focused around amenity and commercial interests, and not fire life safety.

e) There is a common view among stakeholders that the issue is not occurring at the design, construction and approval stage, but post-construction.

f) Any proposed solution should be limited to those that specifically relate to the issue regarding the use of serviced apartments. Any proposal that impacts on the construction of standard apartments is considered to be unjustified.

4.5 ABCB Questionnaire Summary and Analysis

Noting the mixed opinions presented, stakeholders do not propose a clear way forward which they believe can resolve the issue. The solutions suggested however, could be summarised under a number of broader headings which include:

a) Amend BCA Part A3.2 of the BCA, i.e. introduce a Class 2b classification for tourist accommodation, combine the Class 2 and 3 classifications to create one class, etc;

b) Amend the individual Class 2 and 3 definitions, i.e. include more examples of Class 2 and 3 uses, define terms used in the Class 2 and 3 definitions, include additional wording in the Class 2 and 3 definitions, etc;

c) Provide specific clarification, i.e. a press release that clarifies which classification should be applied to a building with serviced apartments.

5. Issues

5.1 Identification of Issues

In recent years Class 2 apartment living has become more popular. Investment in Class 2 apartment buildings has also increased in particular, in regional and coastal areas such that the flexibility afforded by ownership of private apartments, has led to an increase in offering of apartments for short or long term accommodation.

Class 2 buildings were traditionally intended for long term residents as owner occupiers on long term rentals. The BCA prescribed the relevant fire life safety, health, amenity and more recently acoustic, accessibility and energy efficiency requirements for typically this type of use.

Class 3 buildings were intended for short term transient occupants needing minimal facilities due to the nature and length of stay. It was common for the owner or operator of the Class 3 accommodation building to provide room service and / or in house cooking and laundering services to cater for the transient or short stay occupancy.

The amenity, flexibility and affordability offered by Class 2 buildings has become more attractive to the transient businessperson and holidaying tourist, particularly in popular holiday locations, not limited to the CBD and coastal areas.

Objectors and advocates of the use of traditionally constructed Class 2 buildings for broader occupancy use has been well debated and documented with one side arguing and emphasising the need for a “level playing field” within the business and tourist accommodation marketplace.

It is clear from the ABCB consultation process that a majority of stakeholders believe the definitions provided for Class 2 and 3 buildings in the BCA require clarification. However, whilst noting this conclusion, stakeholders did not consistently identify specific wording in the BCA which they believe is causing the issue. Some stakeholders even argue that the issue has nothing to do with what is included in the BCA, but rather what is not included in the BCA.

The consultation process identified that there are disputes amongst stakeholders, objectors and advocates, when determining the most appropriate classification to apply to buildings used for short stay serviced style apartment living. Notwithstanding, it was clear that the issue was not due to widespread misclassification of buildings.

Consequently, with the increase of the short stay serviced style occupancy of Class 2 buildings, three key areas of concern were evident which may be categorised as follows:

a) Differences in building code requirements
b) Issues with building management and use, and
c) Issues with commercial investment interests and strategies.

5.2 Building Code Requirements

The key issues related to building code requirements include the differences in technical provisions for Class 2 and Class 3 buildings. These are:

a) Fire life safety features such as
    i. Smoke detection systems
    ii. Fire isolation / separation of stairways,
    iii. Fire alarm connections,
b) Accessibility for people with disabilities,
c) Sanitary and other facilities for people with disabilities
d) Sanitary, cooking and other amenities, and
e) Energy efficiency measures and method of assessment,

Whilst there are differing requirements for different classes, BCA technical requirements of a building will also vary pending the specific design of a building. These include criteria such as the building area, number of stories (including rise of stories) and the requirements for engineering systems and services such as automatic sprinkler systems, detection systems, and the like.

The administration and enforcement of building code provisions are at the design and approval stage of a development (prior to construction) and are based on the proposed or intended use nominated by the owner and or the owners agent / design team.

Class 3 buildings are commonly designed specifically for a known owner or operator however buildings designed as Class 2 may be speculative and pending market demands, may inadvertently be acquired and operated / occupied not as originally intended by the requirements of the BCA. This is evident, post construction where a Class 2 building or part is managed by an accommodation management company with a use more akin to a Class 3.

Evidently, where the use of a Class 2 building aligns itself more with transient or short stay occupancy, the technical requirements of a Class 3 building should apply. This would ensure the minimum occupancy risks and standards associated with the use of the building are maintained.

However it is recognised that the BCA does not limit the duration of stay in Class 2 buildings which is where the issue, industry debate and concerns emanate.

5.3 Building Management

The concerns of residents and body corporate or owner's corporation entities related to the management and use of Class 2 buildings, used as short stay serviced style accommodation and include:

a) Increase in building wear and tear,
b) Increase in occupant room numbers,
c) Increased elevator waiting times,
d) Higher demands on resident facilities such as gym, pool and the like,
e) Car parking rule violation,
f) Excessive noise and behavior from one night residents,
g) Overloading of recycling and rubbish facilities, and

h) Increase in body corporate or owners corporation fees, levies and the like

It is expected that the design of a Class 3 buildings would include design features, systems and facilities to minimise or eliminate the issues identified above acknowledging the transient nature and occupant behaviour in a Class 3 hotel building.

It is common for Class 2 buildings to be under the control of a body corporate or Owners Corporation and typically a Committee of Management to deal with issues related to common property, building maintenance, housekeeping levies, fees and the like, as identified above.

The BCA does not consider these operational management or housekeeping issues and only deals with the maintenance of “Essential Fire Safety Measures” associated with buildings. Rubbish collection, wear and tear and other such matters are not regulated by the building code.

5.4 Commercial Investment, Interest and Strategies

The concern of industry associations such as the hotels association is where Class 2 buildings are competing in the Class 3 marketplace. The issues of concern include:

a) Higher cost of construction and maintenance of hotel buildings,
b) Increased planning requirements and costs associated with different zoning,
c) Different requirements related to liquor licensing,
d) Different insurance requirements,
e) Different taxation obligations,
f) Different provision of services and facilities such as catering of food and beverage, and
g) Reduction of investment in hotel and motel buildings.

The investment strategies of commercial accommodation businesses are clearly determined by the economic viability and profitability of constructing, operating and managing hotels, motels in the business and tourism sector.

It is conceivable that with a diminishing occupancy rate in the traditional hotel and motel accommodation sector, those owners and operators of Class 3 buildings would be considering the economic viability of future investment, and / or development in this sector. The hotels association specifically has identified that there is not a level playing field due to differing requirements and standards.

Whilst it is considered that:

a) the economic viability of owning and / or operating a business in the tourism accommodation marketplace, and
b) dealing with issues associated with building management, day to day operation and housekeeping,

may be dictated by market forces, it is considered that minimum building code requirements, in particular related to fire life safety, health and accessibility, should be based on a measured occupancy risk and minimum community expected standard, not market forces.

5.5 Overview of Options

The following is an overview of the potential change options based on the above discussion of issues. The options are:

A. No change

B. Have only one class (combining Class 2 and 3 buildings)

C. Include short stay serviced apartment living as a Class 2 building

D. Include short stay serviced apartment living as a Class 3 building

E. Create new Class 2b Classification for Short Stay Serviced Apartment buildings

PART B

1. Building Code of Australia

1.1 Classification and Definitions

The BCA defines and classifies buildings and building terms. The classification of buildings is determined by a measure of the risk associated with the occupation and fire loads of the building. The minimum construction requirements of building are generally determined by buildings area, volume, number of stories and the provision of specific building systems and services, such as fire separation, automatic sprinkler protection, and smoke detection systems

Sole Occupancy Unit is the only relevant definitions outlined in the BCA related to the classification of Class 2 and Class 3 buildings.

Definitions

Sole-occupancy unit:

means a room or other part of a building for occupation by one or joint owner, lessee, tenant, or other occupier to the exclusion of any other owner, lessee, tenant, or other occupier and includes—

- *(a) a dwelling; or*
- *(b) a room or suite of rooms in a Class 3 building which includes sleeping facilities; or*
- *(c) a room or suite of associated rooms in a Class 5, 6, 7, 8 or 9 building; or*
- *(d) a room or suite of associated rooms in a Class 9c aged care building, which includes sleeping facilities and any area for the exclusive use of a resident.*

Classifications

BCA 2011 classifies Class 2 and Class 3 buildings as follows:

Class 2:

a building containing 2 or more sole-occupancy units each being a separate dwelling.

Class 3: a residential building, other than a building of Class 1 or 2, which is a common place of long term or transient living for a number of unrelated persons, including—

- *(a) a boarding house, guest house, hostel, lodging house or backpackers accommodation; or*
- *(b) a residential part of a hotel or motel; or*
- *(c) a residential part of a school; or*
- *(d) accommodation for the aged, children or people with disabilities; or*
- *(e) a residential part of a health-care building which accommodates members of staff; or*
- *(f) a residential part of a detention centre.*

Since the introduction of the BCA in 1988, there have been various amendments to the code. The following is a chronology of BCA requirements for Class 2 and Class 3 since the BCA 1988

BCA 1988 classified both Class 2 and Class 3 buildings as follows:

Class 2: *a building containing 2 or more sole-occupancy units, each being a separate dwelling, other than a building of Class 1.*

Class 3: *a residential building, other than a building of Class 1 or 2, which is a common place of living for a number of unrelated persons, including:*

(a) *a boarding-house, guest house, hostel, or lodging-house;*
(b) *a residential part of a hotel or motel;*
(c) *a residential part of a school;*
(d) *accommodation for the aged, disabled or children; and*
(e) *a residential part of a health-care* building which accommodates members of staff.

BCA 1990 Amendment 0, a Class 2 building was defined as:

"a building containing 2 or more sole-occupancy units each being a separate dwelling, excluding buildings of Class 1"

BCA 1990 Amendment 0 a Class 3 building was defined as:

A residential building, other than a building of Class 1 or Class 2, which is a common place of living for a number of unrelated persons, including:

(a) *a boarding house, guest house, hostel, or lodging house;*
(b) *a residential part of a hotel or motel;*
(c) *a residential part of a school;*
(d) *accommodation for the aged, disabled or children; and*
(e) *a residential part of a health-care building which accommodates members of staff.*

BCA 1990 Amendment 5 (July 1993) the definition of Class 2 and Class 3 buildings were changed to:

Class 2: *a building containing 2 or more sole-occupancy units, each being a separate dwelling.*

Class 3: *a residential building, other than a building of Class 1 or 2, which is a common place of long term or transient living for a number of unrelated persons including:*

(a) *a boarding house, guest house, hostel, or lodging house;*
(b) *a residential part of a hotel or motel;*
(c) *a residential part of a school;*
(d) *accommodation for the aged, disabled or children; and*

(e) *a residential part of a health-care building which accommodates members of staff.*

It was in July 1993 that the words “long term” and “transient” living included in the definition of Class 3 to clarify the nature of occupant use. It is noted that Class 2 was not accordingly amended to limit occupancy to long term or permanent occupancy.

BCA 1996 Amendment 3 (July 1998) an amendment was made to Class 3 buildings to include a new sub-clause:

(f) *a residential part of a detention centre.*

BCA 1996 Amendment11 (January 2003) The BCA was amended to align the provisions for residential buildings used for the accommodation of the aged to align with the Commonwealth Aged Care Act, 1997.

BCA 2003 classified both Class 2 and Class 3 buildings as follows:

Class 2: *a building containing 2 or more sole-occupancy units each being a separate dwelling.*

Class 3: *a residential building, other than a building of Class 1 or 2, which is a common place of long term or transient living for a number of unrelated persons, including—*

(a) *a boarding house, guest house, hostel, lodging house or backpackers accommodation; or*
(b) *a residential part of a hotel or motel; or*
(c) *a residential part of a school; or*
(d) *accommodation for the aged, children or people with disabilities; or*
(e) *a residential part of a health-care building which accommodates members of staff; or*
(f) *a residential part of a detention centre.*

1.2 Technical provisions – Class 2 and Class 3 buildings

Technical building construction requirements are outlined in the BCA and vary for different classes. The following outlines a summary of the key differences in Class 2 – residential apartment buildings and Class 3 – hotel type accommodation based on BCA 2011

a) Fire Resistance

Fire resistant construction is generally 90 minutes throughout to both classes of building

b) Access and Egress

In low rise Class 3 buildings, stairways must be fire isolated when connecting more than 2 stories. A Class 2 building is permitted to have 3 stories connected before fire separation of the stairway is required.

c) Access for people with disabilities

Class 2 and 3 buildings require access for people with disabilities to all common areas and to not less than one of each unique facility. This includes recreation and conference facilities, function rooms and commercial spaces within Class 3 buildings, and may include refuse areas and common laundries within a Class 2 building.

Furthermore, Class 3 buildings require specific sole occupancy units for use by people with disabilities, in addition to provision for car parking.

Braille and tactile signage and provision for hearing augmentation may be required within both building classifications, depending upon the unique facilities provided within, however typically these provisions relate only to Class 3 buildings.

d) Service and Equipment

Engineering services such as mechanical, electrical and plumbing installations are required to both buildings with a concession is afforded to Class 2 buildings in relation to the installation of smoke alarms and connection to the local fire station or brigade.

e) Lift Installations

Lift Installations and the accessibility provisions for lifts to all levels are require to both building classes.

f) Emergency Lighting Exit Signs and warning systems

Emergency Lighting, Exit Signs and warning systems are required to both classes with Class 3 buildings requiring a slightly higher dBA sound rating for the occupant warning system.

g) Sanitary and other facilities

Sanitary facilities are required to both Class 2 and Class 3 buildings including provision for a bath or shower, closet pan (WC) and washbasin within Sole occupancy units. Class 2 buildings, due to the expected duration of occupancy, require the installation of a kitchen sink and cooking facilities in addition to laundering facilities such as the space for a washing machine and clothes dryer or clothes line.

Class 3 buildings require provision of the above facilities with a dedicated number of identified accessible hotel or motel suites / sole occupancy units. Class 3 building require provision for sanitary and other facilities for employees

h) Energy Efficiency.

Class 2 buildings are required to achieve an energy star rating based on recognized energy rating tools. These requirements relate specifically to the building fabric and orientation and are essentially assessed on an apartment by apartment basis.

Class 3 building are required to meet energy efficiency criteria which includes building fabric, glazing, shading, and engineering services associated with the building. The additional requirements for Class 3 buildings include assessment for solar heat gain, automation of shading and various mechanical (fresh air, air-conditioning, cooling and heating) and electrical (lighting and power) requirements and controls.

A detailed comparison of the BCA requirements for Class 2 and Class 3 buildings is in Appendix A.

2. Other relevant Acts, Reports and Codes

2.1 Productivity Commission Report

In August 2010, the Productivity Commission released its 'Annual Review of Regulatory Burdens on Business' report, which raised concerns about the classification and use of Class 2 and 3 buildings; specifically concerns from the point of view of the hotels industry.

The key point identified by the Commission in regards to Class 2 and Class 3 occupancy was:

> *"Serviced apartments are increasingly competing with hotels in the short-stay tourist accommodation market, but are classified differently within the BCA and are therefore subject to different standards, for example in relation to disabled access and fire safety. The Australian Building Codes Board should consider whether the current variation in standards is appropriate where the buildings are used for similar (especially tourist accommodation) purposes."*

In particular the Australian Hotels Association (AHA) expressed concern that serviced apartments, which are increasingly competing with hotels in the short stay tourist accommodation market, are classified differently within the BCA and are therefore subject to different standards, for example in relation to disabled access and fire safety.

The AHA outlined to the Commission that because there is not a 'level playing field', in terms of the BCA standards, hotels face significantly higher construction and ongoing costs than serviced apartments and that this is discouraging investment in hotels.

The Tourism & Transport Forum (TTF) suggest that a separate new class be created in the BCA for serviced apartments, which includes appropriate building standards for this use, and that residential apartments that do not comply with these standards would not be permitted to be used on the short term accommodation market.

2.2 Disability Discrimination Act

The Commonwealth Disability Discrimination Act 1992 (DDA) requires certain new buildings, and existing buildings undergoing building work, must comply with the Disability *(Access to Premises – Buildings)* Standards 2010 (Premises Standards).

The purpose of the Premises Standards is:

a) To ensure that dignified, equitable, cost-effective and reasonably achievable access to buildings, and facilities and services within buildings, is provided for people with disabilities; and
b) To give certainty to building developers, building managers and authorities that, if access to buildings is provided in accordance with the Standards, the provision of that access, to the extent covered by the Standards, will not be unlawful under the Act.

With the implementation of the Premises Standards, the ABCB made a commitment to achieve harmony between the requirements of the BCA and the DDA, in relation to access provision,

through the incorporation of the Access Code into the BCA. The Access Code forms Schedule 1 of the Premises Standards and contains its technical requirements.

The implementation of the Premises Standards, and corresponding changes to the BCA, is a significant step towards achieving equal access to premises and is crucial to justice and social inclusion for people with disabilities. Inadequate access to buildings has repercussions for employment, participation and social inclusion. Conversely, improvements to the accessibility of all new and upgraded buildings will have a pervasive impact on the interaction of people with disabilities, facilitating full participation in the economic, cultural, social and political aspects of life.

It is noted that the Premises Standards are limited in scope, covering aspects of building compliance applicable under the BCA however it is acknowledged there are features which fall beyond the scope of the Standards which may be subject to the general complaints provisions of the DDA.

The technical requirements of the Premises Standards have been adopted into the BCA however there is a difference in the Class 2 definition and application of requirements for access for people with a disability. The Premises Standards specifically identifies Class 2 short term accommodation and state that access within these buildings only must be provided to:

'Common areas in buildings where one or more sole-occupancy units are made available for short-term rent'

The Premises Standards has considered that some Class 2 buildings may be used for short term accommodation however stops short of specifying a proportion of sole occupancy units being accessible (as required for Class 3).

Despite the Productivity Commission Report also recognizing the disparity in requirements to provide accessible rooms to hotel and serviced apartment accommodation, the matter has not been addressed in absolute terms therefore leaving the provision for access and facilities for people with disabilities open for complaints under the DDA.

2.3 Planning / Development Schemes

Planning or Development Schemes set out policies and provisions for the use, development and protection of land. Planning schemes are administered by the responsible authorities such as the local council and are an Act of State or Territory Governments e.g. Planning and Environment Act 1987 – Victoria, Environment Planning and Assessment Act 1979 – New South Wales

Local Councils will issue Planning Permits or Development Approval in accordance with state legislation however may also create local plans e.g. Sydney Local Environment Plan 2005 which provides a vehicle to address the use of buildings relevant to a particular area or zone.

Since the increase of short stay accommodation in residential buildings, various local authorities have included restriction and or mandated binding covenants on buildings regarding their permitted use.

An example of a restriction on residential use and or condition of use in a Planning Permit or Development Approval may read as follows:

a) the accommodation portion of the building must be used as permanent residential accommodation only and not for the purpose of a hotel, motel, serviced apartments, private hotel, boarding house, tourist accommodation or the like,

b) If a unit contains tenants, it must be subject to a residential tenancy agreement for a term of at least three months.

c) An owner, tenant or Owners Corporation shall not permit a Building Manager or agent to advertise or organize for short term accommodation or share accommodation in the building.

The advent and nature of these types of conditions and covenants may conflict with uses intended by the BCA at Building Permit or Construction Certificate stage and therefore clarification on the uses is paramount.

Notwithstanding planning authorities attempting to address the amenity concerns of residents in residential buildings through clear and concise conditions on use, these types of conditions are not considered to address the issue holistically, omitting the broader objectives of the BCA including fire life safety, accessibility and energy efficiency.

2.4 Owners Corporations and Body Corporate Rules

Owners Corporations and / or Body Corporate Management Committees are established in residential buildings to administer and enforce laws and rules applicable to the day to day occupancy and use of the building.

These rules are typically contained in legislation such as the Residential Tenancies Act 1994 – QLD, Strata Schemes Management Act 1996 – NSW and Owners Corporation Act 2006 – Victoria.

The rules outline responsibilities of apartment owners and administering body and may be broad in scope as determined and agreed on establishment of the corporation or body. Laws or rules generally include for:

a) Fees and charges
b) Insurance and liability
c) Appearance of apartments
d) Permits, approvals and consents
e) Noise and behavior
f) Common property
g) Garbage disposal
h) Car parking
i) Pets
j) Storage of goods, etc

Whilst the above rules relate to the day to day use of a building, the scope of the rules relate directly to the amenity afforded to residents and occupants. These rules are generally established after the building is constructed and suitable for occupancy, allowing for all owners to be included in the establishment of the rules. The rules typically would not prevent or restrict occupancy as outlined in some planning and development schemes as established prior to construction or occupancy of the building.

2.5 International Codes and Standards

The International Building Code (IBC) issued by the International Code Council (ICC) is a recognized code adopted by the majority of states in the USA. The IBC includes a section on Use and Occupancy Classification consistent with other codes around the world. Section 310 of the IBC identifies Residential Groups for buildings or structures used for sleeping.

Residential occupancies in the Code are prescribed as follows:

310.1 Residential Group R.

Residential Group R includes, among others, the use of a building or structure, or a portion thereof, for sleeping purposes when not classified as an Institutional Group I or when not regulated by the *International Residential Code* in accordance with Section 101.2. Residential occupancies shall include the following:

R-1 Residential occupancies containing sleeping units where the occupants are primarily transient in nature, including:

Boarding houses (transient)
Hotels (transient)
Motels (transient)

R-2 Residential occupancies containing sleeping units or more than two dwelling units where the occupants are primarily permanent in nature, including:

Apartment houses
Boarding houses (not transient)
Convents
Dormitories
Fraternities and sororities
Hotels (non transient)
Monasteries
Motels (non transient)
Vacation timeshare properties

Congregate living facilities with 16 or fewer occupants are permitted to comply with the construction requirements for Group R-3.

R-3 Residential occupancies where the occupants are primarily permanent in nature and not classified as Group R-1, R-2, R-4 or I including:

Buildings that do not contain more than two dwelling units.

Adult care facilities that provide accommodations for five or fewer persons of any age for less than 24 hours.

Child care facilities that provide accommodations for five or fewer persons of any age for less than 24 hours.

Congregate living facilities with 16 or fewer persons.

Adult and child care facilities that are within a single-family home are permitted to comply with the *International Residential Code*.

R-4 Residential occupancies shall include buildings arranged for occupancy as residential care/assisted living facilities including more than five but not more than 16 occupants, excluding staff.

Group R-4 occupancies shall meet the requirements for construction as defined for Group R-3, except as otherwise provided for in this code, or shall comply with the *International Residential Code*.

The IBC also separately defines “boarding house” “congregate living facilities” “dormitory” “personal care service” residential care “assisted living facilities” and “transient” to assist with the classification of buildings.

It is noted specifically that the definition of boarding houses, hotels and motels are separately defined in R1 and R2 as “transient” and “non transient” respectively.

The effect of separately classifying “transient” and “non transient” apartment buildings, hotels and motels is to ensure the two occupant characteristics and profiles of apartment type living are appropriately regulated.

The definition of “transient” in the IBC is occupancy for a period of not more than 30 days.

The IBC has recognized the two types of living styles and addressed these by identifying them in separate residential occupancy groups

PART C

1. Project Case Study buildings

1.1 Building Case studies

In this section we outline two case study buildings developed to allow for analysis of the differences in the construction of a Class 2 residential building and a Class 3 hotel in accordance with the current requirements of the BCA.

The case study buildings are generic and provide a platform for a comparative cost plan, technical and economic impact analysis. Where the case study building may vary from a particular sector, so too will the outcomes or conclusions drawn from the cost plan. The case study buildings and cost plan will allow for derivation to determine costs associated with:

a) Construction of the buildings,
b) Maintenance of the buildings, and
c) Upgrade of the buildings.

These costs and estimated refurbishment costs associated with the life of the building will be considered in the economic analysis.

The first case study proposes the construction of a high rise building typically located in the CBD of a capital city or in major coastal tourist areas such as the Gold Coast. The second case study proposes the construction of a low rise building typically located in the suburban area of capital city or regional tourist areas around the country.

1.2 High Rise Case Study

Table C1 and C2 below describes the proposed high rise case study building

Table C1 - High Rise Class 2 Case Study Building

High Rise - Residential apartment building - Class 2
• 26 storeys • 20 residential storeys • 6 levels of car parking (above ground) 250 cars • 210 Apartments - 90 x 1bed - 102 x 2 bed - 18 x 3 bed • Facilities will include associated mail, garbage and security entry • Lift to all levels • Building area 35,000 m2 approx - Residential area 22,000m2 - Car parking 8,000m2 - Ancillary uses 5,000m2

Table C2 – High Rise Class 3 Case Study Building

High Rise - Hotel Building – Class 3
• 26 storeys • 24 residential hotel storeys (e.g. Hilton Hotel) • 2 levels of car parking (above ground) 120 cars including # 5 accessible car parking spaces • 280 hotel suites including # 11 accessible suites • Facilities include - Function / Conference / Ball room 1000m2 - 2 x restaurants (20 seats and 60 seats) with kitchens - Office area - Laundry area • Lift to all levels • Building area 35,000m2 - Hotel area 20,000m2 - Car parking 4,000m2 - Ancillary 11,000m2

1.3 Low Rise Case Study

Table C3 and C4 below describes the proposed low rise case study building

Table C3 - Low Rise Class 2 Case Study Building

Low Rise - Residential apartment building - Class 2
• 3 storeys • 3 residential storeys • 1 level of car parking (on grade) 60 cars adjacent to building • 60 Apartments - 20 x 1bed - 34 x 2 bed - 6 x 3 bed • Facilities will include associated mail, garbage and security entry • Lift to all levels - No communication stairs • No automatic sprinkler protection • Building area 3,500 m2 approx - Residential area 3,000m2 - Ancillary 500m2 - Car park on grade 500m2

Table C4 - Low Rise Class 3 Case Study Building

Low Rise - Hotel Building – Class 3
• 3 storeys • 3 residential hotel storeys (e.g. Flag Inn) • 1 level of car parking (on grade) 40 cars adjacent to building including # 2 accessible car parking spaces • 40 hotel suites including # 5 accessible suites • Facilities include - Conference room 500m2 - 2 x restaurants (10 seats and 20 seats) with kitchens - Office area - Laundry area - Concierge reception area • Lift to all levels - 1 communication / feature stair • No automatic sprinkler protection • Building area 3,500m2 - Hotel area 2,500m2 - Ancillary 1,000m2 - Car park on grade 500m2

2. Class 2 and Class 3 Case Study Cost Plan

2.1 Basis of Cost Plan

The cost plan has been based on the total area of the two (2) case study buildings including the proposed building and car parking use. Some assumptions have been made on the functionality split of some of the areas in the building however these are relative and not considered to affect the outcome of the cost plan.

The cost plan has been based on the following star rating standard for each classification:

High Rise

Class 3 Hotel	5.0 star
Class 2 Residential	4.0 star

Low Rise

Class 3 Hotel	3.5 star
Class 2 Residential	3.0 star

The above star ratings are equivalent in terms of the nature of accommodation and quality fittings fixtures and the like. The star ratings afforded to the hotels are higher only as a result of the additional services provided by hotel operators and therefore for the purposes of this analysis the star ratings will reflect an equivalent comparison.

The cost plan includes allowance for professional design fees, design and construction contingency, FF&E allowance for the Class 3 hotel only however excludes any escalation costs, operating and recurring costs, demolition, dewatering, GST costs etc.

2.2 Construction Cost

The construction cost estimates for the proposed case study buildings are as follows:

High Rise

The total estimated development cost of a 20 storey Class 3 hotel accommodation building is $182,792,000. The total estimated development cost of a 20 storey Class 2 residential accommodation building is $146,313,000

Table C5 below identifies the cost and percentage difference of construction:

Table C5 - Construction Cost difference High Rise Class 2 and Class 3

Building	Construction Cost	Cost Difference	Percentage difference
High Rise Class 3	$182,792,000		
High Rise Class 2	$146,313,000	**$36,479,000**	**24.9%**

Based on the above construction cost comparison of the high rise case study buildings the increased cost to construct a high rise Class 3 compared to a high rise Class 2 is 24.9%.

Low Rise

The total estimated development cost of a 3 storey Class 3 hotel accommodation building is $14,814,000. The total estimated development cost of a 3 storey Class 2 residential accommodation building is $12,409,000

Table C5 below identifies the cost and percentage difference of construction:

Table C6 - Construction Cost difference Low Rise Class 2 and Class 3

Building	Construction Cost	Cost Difference	Percentage difference
Low Rise Class 3	$14,814,000		
Low Rise Class 2	$12,409,000	**$2,405,000**	**19.4%**

Based on the above construction cost comparison of the low rise case study buildings the increased cost to construct a low rise Class 3 compared to a low rise Class 2 is 19.4%

2.3 Maintenance Cost

The maintenance cost estimates for the proposed case study buildings are determined by the typical day to day, repair and maintenance costs and are calculated based on the following rate range. Assumptions have been made based on average rates for each case study:

High Rise

Class 3 Hotel	$9.00/m2 - $12.00/m2
Class 2 Residential	$7.50/m2 - $9.00/m2

Low Rise

Class 3 Hotel	$5.50/m2 - $7.50/m2
Class 2 Residential	$4.50/m2 - $6.00/m2

Table C7 below identifies the estimated maintenance costs (p.a.) for the case study buildings

Table C7 - Maintenance cost High Rise Class 2 and Class 3

	Use	Area (m2)	Rate ($/m2)	Cost ($) p.a.
High Rise Class 3	Residential	20,000	$12.00	$240,000
	Car park	4,000	$3.50	$14,000
	Ancillary	11,000	$9.00	$99,000
				$353,000
	Use	Area (m2)	Rate ($/m2)	Cost ($) p.a.
High Rise Class 2	Residential	22,000	$9.00	$198,000
	Car park	4,000	$3.50	$28,000
	Ancillary	11,000	$7.50	$37,500
				$263,500

Table C8 below identifies the maintenance cost and percentage difference:

Table C8 - Maintenance Cost difference High Rise Class 2 and Class 3

Building	Maintenance Cost	Cost Difference	Percentage difference
High Rise Class 3	$353,000		
High Rise Class 2	$263,500	**$89,500**	**33.0%**

Based on the above maintenance cost comparison the difference in the annual maintenance cost for the high rise case study building is $89,500 or 33% more for Class 3 hotel buildings

Table C9 below identifies the estimated maintenance costs (p.a.) for the case study buildings

Table C9 - Maintenance cost Low Rise Class 2 and Class 3

	Use	Area (m2)	Rate ($/m2)	Cost ($) p.a.
Low Rise Class 3	Residential	2,500	$7.50	$18,750
	Car park	1,000	$2.00	$2,000
	Ancillary	500	$5.50	$2,750
				$23,500
	Use	Area (m2)	Rate ($/m2)	Cost ($) p.a.
Low Rise Class 2	Residential	3,000	$6.00	$18,000
	Car park	500	$2.00	$1,000
	Ancillary	500	$4.50	$2,250
				$21,250

Table C10 below identifies the maintenance cost and percentage difference.

Table C10 - Maintenance Cost difference Low Rise Class 2 and Class 3

Building	Maintenance Cost	Cost Difference	Percentage difference
Low Rise Class 3	$23,500		
Low Rise Class 2	$21,250	**$2,250**	**10.5%**

Based on the above maintenance cost comparison the difference in the annual maintenance cost for the low rise case study building is $2,000 or 10.5% more for Class 3 hotel buildings

2.4 Capital Upgrade Cost

Estimated capital upgrade costs have been calculated based on a general building life expectancy of 50 years. For the purposes of the case study a refurbishment period and a cost rate range has been applied to estimate likely upgrade costs per class.

High Rise

Class 3 Hotel	Full refurbishment upgrade every 10 years to maintain 5 star rating $1,700/m2 - $2,100/m2
Class 2 Residential	Full refurbishment upgrade every 15 – 20 years $1,300/m2 - $1,800/m2

Low Rise

Class 3 Hotel	Full refurbishment upgrade every 10 years to maintain 5 star rating $1,700/m2 - $2,100/m2
Class 2 Residential	Full refurbishment upgrade every 15 – 20 years $1,300/m2 - $1,800/m2

2.5 Capital Cost Upgrade Class 2 to Class 3

Based on the above criteria and assumptions, the cost associated with the upgrade of a Class 2 residential building to a Class 3 hotel and for the purposes of this assessment can be divided into the following two categories:

a) Costs associated with BCA requirements, e.g. fire alarm system, accessible suites, energy efficiency provisions, and

b) Costs associated with the facilities, services and building features typically associated with a hotel, e.g. conference, commercial kitchens, concierge etc.

The division of costs between a) and b) above is estimated at approximately 25% and 75% respectively. Table C11 below identifies the estimated cost to upgrade an existing building from Class 2 to Class 3

Table C11 – Upgrade cost Class 2 to Class 3

Building	Cost Difference	Estimated BCA component %	Estimated cost BCA component
High Rise	$36,479,000	25%	$9,119,000
Low Rise	$2,405,000	25%	$601,250

Full details of the cost plan are included in Appendix B and details of estimated refurbishment cost are included in Appendix C

3. Class 2b Case Study Cost Plan

3.1 Proposed Class 2b Serviced Apartment building

In this section we outline the parameters for a new Class 2b classification for a serviced apartment building. The case study option will allow for analysis of the differences in the construction of a Class 2 residential building and a new Class 2b classification in accordance with the current requirements of the BCA.

Table C12 and C13 below describe the proposed new classification case study building for both low and high rise scenarios.

Table C12 – High Rise Class 2b Case Study Building

High Rise – Serviced Apartment building - Class 2b
4. 26 storeys 5. 20 residential storeys 6. 6 levels of car parking (above ground) 250 cars including # 2 accessible car parking spaces 7. 210 Apartments including # 6 accessible suites - 90 x 1bed - 102 x 2 bed - 18 x 3 bed. • Facilities will include associated mail, garbage and security entry • Lift to all levels • Building area 35,000 m2 approx - Residential area 22,000m2 - Car parking 8,000m2 - Ancillary uses 5,000m2

Table C13 - Low Rise Class 2b Case Study Building

Low Rise – Serviced Apartment building - Class 2b	
8. 3 storeys	
9. 3 residential storeys	
10. 1 level of car parking (on grade) 60 cars adjacent to building cars including # 1 accessible car parking spaces	
11. 60 Apartments # 3 accessible suites	
- 20 x 1bed	
- 34 x 2 bed	
- 6 x 3 bed.	
• Facilities will include associated mail, garbage and security entry	
• Lift to all levels - No communication stairs	
• No automatic sprinkler protection	
• Building area 3,500 m2 approx	
- Residential area	3,000m2
- Ancillary	500m2
- Car park on grade	500m2

A detailed comparison of the BCA requirements for Class 2 and proposed Class 2b building is in Appendix D.

3.2 Basis of Cost Plan

The cost plan has been based on the following star rating standard for Class 2b classification:

High Rise
Class 2b Serviced apartment 4.0 star
Low Rise
Class 2b Serviced apartment 3.0 star

3.3 Construction Cost

The construction cost estimates for the proposed Class 2b building is as follows:

High Rise

The total estimated development cost of a 20 storey Class 2b residential accommodation building is $152,059,000

Table C14 and C15 below identifies the cost and percentage difference of construction:

Table C14 - Construction Cost difference High Rise Class 2 and Class 2b

Building	Construction Cost	Cost Difference	Percentage difference
High Rise Class 2b	$152,059,000		
High Rise Class 2	$146,313,000	**$5,746,000**	**3.9%**

Based on the above cost comparison of the high rise case study buildings the increased cost to construct a high rise Class 2b compared to a high rise Class 2 is 3.9%

Low Rise

The total estimated development cost of a 3 storey Class 2b residential accommodation building is $13,224,000

Table C15 - Construction Cost difference Low Rise Class 2 and Class 2b

Building	Construction Cost	Cost Difference	Percentage difference
Low Rise Class 2b	$13,224,000		
Low Rise Class 2	$12,409,000	**$815,000**	**6.5%**

Based on the above cost comparison of the low rise case study buildings the increased cost to construct a low rise Class 2b compared to a low rise Class 2 is 6.5%

3.4 Maintenance Cost

The maintenance cost estimates for the proposed Class 2b building determined by the typical day to day, repair and maintenance costs and are calculated based on the following rate range. Assumptions have been made based on average rates for each case study:

High Rise

Class 2b Serviced apartment $10.50/m2 - $8.25/m2

Low Rise

Class 2b Serviced apartment $6.75/m2 - $5.00/m2

Table C16 below identifies the estimated maintenance costs for the Class 2b building

Table C16 - Maintenance cost High Rise Class 2b

	Use	Area (m2)	Rate ($/m2)	Cost ($) p.a.
High Rise Class 2b	Residential	20,000	$10.50	$210,000
	Car park	4,000	$3.50	$14,000
	Ancillary	11,000	$8.25	$90,750
				$314,750

Table C17 below identifies the maintenance cost and percentage difference.

Table C17 - Maintenance Cost difference High Rise Class 2 and Class 2b

Building	Maintenance Cost	Cost Difference	Percentage difference
High Rise Class 2	$263,500		
High Rise Class 2b	$314,750	**$51,250**	**19.4%**

Based on the above maintenance cost table the difference in the annual maintenance cost for the high rise case study building is $51,250 or 19.4% more for Class 2b Serviced apartment compared to a Class 2 residential building from Table C7

Table C18 below identifies the estimated maintenance costs for the Class 2b building

Table C18 – Maintenance cost Low Rise Class 2b

	Use	Area (m2)	Rate ($/m2)	Cost ($) p.a.
Low Rise Class 2b	Residential	2,500	$6.75	$16,875
	Car park	1,000	$2.00	$2,000
	Ancillary	500	$5,00	$2,500
				$21,375

Table C19 below identifies the maintenance cost and percentage difference.

Table C19 - Maintenance Cost difference Low Rise Class 2 and Class 2b

Building	Maintenance Cost	Cost Difference	Percentage difference
Low Rise Class 2	$21,250		
Low Rise Class 2b	$21,375	**$125**	**0.5%**

Based on the above maintenance cost table the difference in the annual maintenance cost for the low rise case study building is $125 or 0.5% more for Class 2b Serviced apartment compared to a Class 2 residential building from Table C9

3.5 Capital Upgrade Cost

The capital upgrade cost has been based on a general life expectancy of buildings being 50 years and therefore for the purposes of the Class 2b study building the following criteria and capital upgrade cost rate range has been applied

High Rise

Class 2b Serviced apartment — Full refurbishment upgrade every 15 years
$1,400/m2 - $1,900/m2

Low Rise

Class 2b Serviced apartment — Full refurbishment upgrade every 15 years
$1,400/m2 - $1,900/m2

3.6 Capital Cost Upgrade Class 2 to Class 2b

Based on the above criteria and assumptions, the cost associated with the upgrade of a Class 2 residential building to a Class 2b apartment building and for the purposes of this assessment can be divided into the following two categories:

a) Costs associated with BCA requirements, e.g. fire alarm system, accessible suites, energy efficiency provisions, and

b) Costs associated with the facilities, services and building features typically associated with a hotel, e.g. conference, commercial kitchens, concierge etc.

In this scenario the cost component estimated for

a) is 100% and that the provision of services outlined, and in
b) are deemed not required for a Class 2 b building.

Table C16 below identifies the estimated cost to upgrade an existing building from Class 2 to Class 2b

Table C16 – Upgrade cost Class 2 to Class 2b

Building	Cost Difference	Estimated BCA component %	Estimated cost BCA component
High Rise	$5,746,000	100%	$5,746,000
Low Rise	$815,000	100%	$815,000

Full details of the cost plan are included in Appendix E and details of estimated refurbishment cost are included in Appendix F

PART D

1. Reform options

The following are the reform options identified by the ABCB consultation process including the option to create a new Class or sub Class to cater for the particular short stay services apartment use. The options are:

A. No change

B. Have only one class (combining Class 2 and 3 buildings)

C. Include short stay serviced apartment living as a Class 2 building

D. Include short stay serviced apartment living as a Class 3 building

E. Create new Class 2b Classification for Short Stay Serviced Apartment buildings

2. Overview of Analysis

In order to provide some quantitative evidence in relation to the impacts of the potential change options, this analysis considers:

a) The technical parameters affecting changes to the BCA including a literature review and thorough qualitative discussion in relation to the risk of occupants to fire life safety, and
b) The economic parameters based on a stylised modeling exercise that simulates the effect of the each of the above changes.

It is recognized that many social objectives such as provision of equity and amenity in buildings cannot be measured quantitatively and therefore it is considered reasonable to adopt a qualitative approach to assess the need for such facilities, services or systems. In particular historical research and opinion surveys can be used to determine the appropriate or community expected level of access to buildings for people with disabilities, sanitary facilities, cooking facilities and energy efficiency provisions in buildings.

Part B of this report outlines the provisions of the Premise Standard established under the DDA. The provisions of the Premises Standard determine the basis for the provision of services for persons with disabilities.

Recent introduction of energy efficiency provisions in the BCA determine the basis for provision of energy efficient rating and construction

Fire life safety and the fire risk to occupants in the different classes can be quantified based on assessments, statistics and case studies and sound qualitative discussion. A detailed technical analysis related to the fire life safety is included in this Part.

As Part C describes, the modeling is undertaken with reference to two case studies: a high-rise building and a low-rise building. Compared with a modeling exercise that takes a more comprehensive view of the sector, the findings of the quantitative analysis presented here are limited by their case-study nature. That is, to the extent that the characteristics of the case studies are inconsistent with the sector more broadly, so too will the findings of the analysis be.

Nevertheless, the two case studies provide a systematic basis for exploring the impacts of the options under consideration and two quite different sets of conditions. In parameterising the case studies, the approach taken has been to draw on publicly available data and previous research and to leverage this with the commercial expertise and industry knowledge as outlines in body of this report.

Part E of this report will describe the nature of the potential economic impacts, the data and assumptions that underpin the modeling and the modeling results.

3. Technical Review

3.1 Technical impact

Any changes to technical provisions of the BCA to resolve the issue of short stay serviced accommodation relies on a review of the risk profile inherent with the current classification, followed by discussion on the impact resulting from any change.

It is recognized that any changes to the BCA for a particular class may impact on other parts and classes. Discussion in this area is included in Part E of this report.

In terms of fire risk to occupants the following parameters outline relevant aspects of fire life safety in buildings to the case study buildings.

3.2 Fire Risk

Occupant Characteristics

On examination of a typical occupant profile, it is expected that Class 2 occupants will have a higher level of familiarity with a buildings geometry and therefore not requiring a considerable amount of time for way finding, compared to occupants in Class 3 hotel buildings. Class 2 occupants are also expected to feel more responsibility towards alarm signals outside their sole occupancy unit compared to occupants in a Class 3 hotel building and may therefore be more likely to investigate and act upon such signals. These arguments support a lower risk for Class 2 occupants compared to a Class 3 building occupants in hotels.

Class 3 hotel occupants are likely to be less committed to activities within their sole occupancy unit and therefore more likely to respond to alarm signals. It is also more likely that few or no social affiliation exists with other occupants within Class 3 hotel buildings (with the exception of other occupants within their sole occupancy unit) which may reduce the time before evacuation commences.

By applying the minimum BCA requirements for both Class 2 and Class 3 buildings in terms of occupancy type and classification of alarm system, the complexity and management of the building to the method specified in British Standards Published Document 7974-6, pre-movement time distributions for occupants may be derived. The results suggest that pre-movement times are similar for both building classes regardless of number of storeys or effective height.

Evacuating occupants in Class 2 buildings are expected to have good knowledge of locations of exits and therefore not likely to need any considerable time for way finding. A study of way finding in hotels showed that occupants did not perceive hotels as complex buildings. The study did however show that 1 out of 5 occupants changed direction of travel while evacuating. This suggests that Class 3 hotel occupants may need some additional time for way finding which is expected to be order of seconds. The time spent way finding is however considered less likely to have an impact on the occupant risk as the pre-movement times is expected to be between approximately 20 to 40 minutes or more for occupants in both buildings.

It is important to recognise that the general definition of Class 3 relates to a broad class of transient and unrelated occupants. i.e. including backpackers, aged and occupants with special needs. This case study considers the profile of occupants in hotel buildings. It is considered that the different, and in most cases the more enhanced prescriptive requirements for Class 3 buildings relate to the broad range of likely occupants described.

For example the requirements for fire isolation of stairways in low rise buildings, enhanced detection system and alarm connection are considered necessesary particularly for the category of Class 3 occupants who are aged or with special needs and requiring early warning, protected escape routes and assistance to evacuate.

The purposes of this case study, it is considered that there is no measurable increase in fire risks related to occupant characteristics Class 2 residential and Class 3 hotel buildings.

Fire Hazards

Design guides and research into fire loads in buildings show that there is a significant difference between Class 2 and Class 3 buildings, where the latter normally contains a lower fire load. As both building classes are provided with identical provisions for fire resistance levels, there is a lower probability of the building elements in a Class 3 building failing in a complete compartment burn out compared to a Class 2.

U.S statistics show that the number one ignition source related deaths is smoking in both Class 2 and Class 3 buildings. The majority of deaths in Class 3 occupancies occurs in bedrooms and in most the first item ignited was in mattress or bedding materials. This suggests that occupants are intimately involved in the fire. In Class 2 buildings the fire related deaths are associated with a much wider range of ignition sources. It is theorized that a detailed statistical analysis could show that the proportion of preventable (i.e. where occupants are not intimately involved in the fire) fires is larger in Class 2 buildings compared to Class 3.

Fire Statistics

Based on data with limited certainty, it is suggested that the ignition frequency in hotel buildings are approximately a factor of 10 more frequent in Class 3 buildings compared to Class 2 buildings per square meter floor area.

Given that a fire has occurred, data from NSW Fire Brigades between 2003 and 2007 suggest that the probability of becoming fatality in a fire is

- 1 in every 172 fires for Class 2 buildings; and
- 1 in every 155 fires for Class 3 buildings (caution should be given to these figures as the number of fires recorded was limited).

U.S statistic between 2003 and 2007 suggest that the probability of becoming fatality in a fire is

- 1 in every 202 fires for Class 2 buildings; and
- 1 in every 361 fires for Class 3 buildings.

While both data sources seem to be associated with similar fatality risk per fire for Class 2 buildings, large differences are suggested for Class 3 buildings. The NSW data for Class 3 comes with some uncertainty due to relatively few data entries. Disregarding this, the statistics from Class 3 buildings in the U.S suggest that the probability of a fatality due to fire is lower compared to Class 2 buildings.

U.S statistics show that the provision of automatic sprinkler systems is an effective method of reducing occupant risks. As the BCA requirements are identical for Class 2 and Class 3 buildings in terms of sprinklers (buildings greater than 25m in effective height), the risk reduction is expected to be similar for both classes. Only limited effective data is available for other fire safety systems.

3.3 Technical differences between Class 2 and Class 3 buildings

BCA Specification C1.1 (Fire Resistance Levels or FRL) has identical requirements for Class 2 and Class 3 buildings. However, due to the significant differences in fire load (see Appendix F), the risk of compartmentation failure is higher for Class 2 buildings compared to Class 3 (assuming identical openings and compartment linings). The difference in risk could be quantified using a probabilistic equivalent fire severity method.

BCA Clause D1.3 requires fire-isolated stairs in Class 3 buildings where the stair connects more than 2 storeys, however allows 3 storeys in a Class 2 building. Open stairs provide no protection to escaping occupants and may serve as a path for smoke migration between levels.

The likelihood of smoke migration occurring is considered to be higher in Class 2 buildings due to the number of permitted storeys connected. As discussed the requirements for Class 3 relate to a broad range of occupants. Findings suggest that occupants in Class 3 hotel buildings are not considered to be associated with significant differences in evacuation time compared to a Class 2 residential buildings, therefore for the purposes of this case study it is considered that the consequence of smoke migration in Class 2 residential and Class 3 hotel buildings is comparable. It is considered however that the consequence of smoke migration would not be acceptable in the broader Class 3 range where occupants need assistance to evacuate.

The requirements for smoke alarm and detection systems differ slightly between the building classes. For Class 2 buildings, smoke alarms are sufficient in the sole occupancy unit. Smoke alarms connected to the building occupant warning system in public areas are necessary if the building is less than 25m in effective height.

In buildings over 25m in effective height, sprinklers are required which also deletes the requirement for any smoke alarm or detection system in the public areas. Class 3 buildings require a smoke detection system throughout the building, except for public spaces in buildings over 25m. This is due to the mandatory provision of sprinklers. As such, it is expected that occupants are likely to be notified earlier of a fire hazard due to the interconnected smoke detection system. No studies of differences in effectiveness of smoke detection systems versus smoke alarms have been found.

In a Class 2 building any alarm signal intended for occupants of common areas will be slightly delayed due to the location of alarms within the sole occupancy units only. For fires occurring in common places or evacuation routes, the detection and warning is considered to be similar in both classes.

All Class 2 and Class 3 buildings need to be provided with an occupant warning system. In a Class 2 building, the delivered sound pressure must be no less than 85 dB at the door providing access to the sole occupancy unit. For Class 3 buildings, 100 dB sound pressure at the sole occupancy unit door is required. The Guide to the BCA does not provide a background to the differences in required sound pressure levels however it is theorized that the increased requirements reflect the broad range of occupant types in Class 3 (hotel, motel, occupants with disabilities, school accommodation, aged residents, etc.) where for example aged generally may require a higher sound pressure to be warned.

Furthermore, Clause E4.9 requires that in a Class 3 building used as for aged care needs to have the system arranged so that warning is provided for occupants, suggesting that this might be specific to the type of occupants accommodated. As the acoustic requirements are demanding for decreasing levels of noise to be transmitted between sole occupancy units and public areas in conjunction with recent research on the effectiveness of alarm signals delivered (Thomas & Bruck, 2010), uncertainty exists on which sound pressure needs to be delivered to adequately warn occupants. Despite the uncertainty, 100 dB is considered more likely to warn occupants compared to 85 dB. It is theorized that the 100 dB requirement for Class 3 intends to provide warning signal to an occupant profile with lower probability of perceiving warning signals at 85 dB.

Class 3 buildings are also required to have an automatic direct alarm connection to the local Fire Service which is not required for Class 2 buildings. This is considered to provide additional safety as Fire Brigade intervention including search and rescue operations are likely to occur at an earlier time in a fire scenario. In the broader Class 3 category where occupants may need assistance, direct alarm notification is essential. In Class 3 hotel buildings based on the occupant profile direct connection is not considered essential.

Sprinkler requirements are identical for both buildings and similar risk reduction effectiveness is expected for both buildings.

4. Economic Review

4.1 Economic impact

The economic impacts of the proposed changes to the building code manifest in changes to the cost of constructing and operating short- or long-term accommodation developments. The additional costs incurred in the construction and operation of a building with a greater number of attributes – as in a Class 3 building – are potentially significant in affecting investment decisions and prices in downstream markets (i.e. the cost of housing or short-term accommodation). In this respect, downstream markets can be affected through two channels:

- In the short term, downstream markets may be impacted directly if changes to construction costs are passed through to end-users. For example, housing rents will be affected if investors bear additional costs throughout the building phase and recoup these costs by increasing rents once the development is complete.

- In the longer term, downstream markets may be indirectly impacted via changes to investment incentives. To the extent that investment levels change in response to changes to the building code, so too will the stock of, for example, serviced apartments and, depending on the balance between supply and demand at a given point in time; so too will prices (room rates).

In relation to the former of these impacts, the outcome for the sector hinges on where ultimate incidence falls. Where changes to the cost of construction are borne entirely by the investor, the full impact will fall on the investment decision (with flow-ons to the housing stock etc). To the extent that impact on the investment's expected rate of return shifts it above or below the investor's threshold rate, the investment decision will be impacted and, over time, so will the stock capital (i.e. housing or short term accommodation). Conversely, where changes to the cost of construction are passed entirely through to end-users, the full impact will fall on room rates/rents. The issue of where the incidence ultimately falls is explored in the discussion below.

4.2 Economic Incidence

In the case of building construction, it is the economic incidence rather than the legal incidence which ultimately determines who will bear the impact of costs such as changes to construction costs. That is, it is the dynamics of relevant markets, rather than the parameters of the relevant legislation, which determine where the impacts fall.

Economic incidence is a function of the characteristics of the market in question – in this case the property market. The economic concepts of the elasticity of supply and demand affect the ability of costs to be passed on, with the less elastic side of the market bearing a greater proportion of the incidence.

For example, if the developer has a higher elasticity of supply than the owner's elasticity of demand (that is, the owner is more indifferent to an increase in price than the developer), then the owner will bear a greater share of the incidence. This will therefore have an effect on housing affordability by increasing the price of the property or the rents paid.

However, if the converse is true, the owner will be relatively sensitive to an increase in the price of the property and may not make the purchase. In this case, the developer will bear a higher

proportion of the increase in building costs. This is likely to flow on to the investment decision of the developer and have an impact on overall housing supply.

While there is a paucity of empirical research into the specific issue of the incidence of building costs, the related area of developer charges has increasingly faced policy scrutiny over recent years and can provide insights into the actual incidence of building costs.

Developer charges are typically levied where additional supporting infrastructure is required for a development. For example, a block of apartments could increase both the population and density of a region, necessitating the addition of basic utilities, roads, parks and shopping centres. While the local government may bear a share of costs, developers are often required to contribute to these additional costs through planning or developer charges.

The literature is broadly consistent in suggesting that the "economic incidence of developer charges is ultimately borne by the final home purchaser" (Access Economics, 2003, cited in Master Builders Australia, 2009). However, this is likely to be nuanced depending on the particular circumstances in the market. In some cases the end market for properties may be more elastic than the supply from developers, with the incidence falling back more heavily on developers/investors.

Further, the ultimate burden of charges tends to fall more heavily on the buyer when the development is in a metropolitan or established area. Such urban land tends to have few other alternative uses, whereas purchasers in new release areas have greater scope for potential substitution as they can theoretically purchase elsewhere (Applied Economics, 2003).

As developer charges are similar in concept to additional building costs required to meet BCA Class requirements, it can be inferred that, at least in the case of residential investments, building costs are also likely to be passed through to end-markets (i.e. home owners/renters).

However, the hotel accommodation market is also nuanced as the characteristics of hotel users vary. In particular, people requiring accommodation for business as opposed to leisure will respond differently to facing additional costs (that is, the elasticity of demand will vary).

Business travel tends to be relatively inelastic in terms of the location and timing of the accommodation required. As such, a hotel constructed primarily for a business market could expect to have greater capacity to pass on any additional costs of construction or maintenance to its customers. On the other hand, people travelling for leisure are able to substitute locations and timings of holidays in response to higher prices, and thus are likely to have a higher elasticity of demand. Accommodation catering mainly for this market would have much less scope to pass on additional building costs as room tariffs.

Hence, the incidence of building costs associated with the BCA Class of building depends on the relative elasticities of supply and demand in the market. These are influenced by the location of the development, the market to which the development caters, as well as individual characteristics of the developers and purchasers/tenants. While there is little empirical research on the incidence of building costs, they are anecdotally borne predominantly by the purchaser, in line with the findings of literature on the incidence of developer charges.

However, given these uncertainties and in light of the fact that the economic incidence of changes to the BCA are likely to vary across different circumstances, the modelling presented below tests a number of pass through assumptions.

4.3 Investment decisions

As noted above, whether the cost impacts stemming from changes to the building code impact the investment decisions hinges on the extent to which the expected rate of return changes relative to the investor's required – or hurdle – rate. The hurdle rate of return is typically the minimum rate of return required for an investor to proceed with a project. If the expected rate of return on capital does not exceed this threshold, investors are likely to pursue other projects.

In the case of the accommodation market, there is no 'rule of thumb' rate of return (hurdle rates tend to have some degree of subjectivity), but it would need to take into account the alternate rates of return for not investing, or investing in another project, as well as the risk involved in developing accommodation for the tourist sector versus developing accommodation for long term residency. Industry sources suggest that the required rate of return for hotel developments, or hurdle rate, is around 8%-12% per annum real. Conversely, since the risks relating to long term residency developments are lower than short stay accommodation developments (which are exposed to tourism sector or economic downturns, seasonal fluctuations etc.), the required rate of return on capital is around 6% to 9% per annum real.

The hurdle rates presented in the financial case study analysis below take into account all cash flows, including upfront capital costs, over the assumed economic life time of each development (50 years). Hotels and other accommodation developments with the highest construction costs and build issues will face the greatest challenges in achieving acceptable rates of return. As a result, hotels at the luxury end of the market typically provide a lower return on investment than those further down the chain. As an example, Table D1 compares the construction cost estimates per room of each of the case studies.

Table D1 - Comparative construction costs

	Class 3 – high rise	Class 2 – high rise	Class 3 – low rise	Class 2 – low rise
Capital costs ($/room)	$652,828	$692,728	$370,350	$206,81

Note: The above cost comparison is based on the total construction cost of the building divided by the number of rooms.
The construction costs include the additional assets and facilities provided in a Class 3 building.
The above figures relate to 2010-11 values drawn from data presented in Section 4.4.

However, hotels and motels at all levels have a number of avenues through which to influence returns and to successfully differentiate themselves from their competitors such as additional services and facilities and site location. In this way, the Class 3 high rise and low rise case studies have further assets to leverage off – such as restaurants and conference rooms – which may differentiate them from Class 2 accommodation hotel-style offerings. There are a number of variables that can influence the hurdle rate outcome. It is common practice to perform a sensitivity analysis to investigate the impact that changes in any given variable will have on baseline return calculations.

Sensitivity testing on accommodation investment is usually geared towards assessing downside risks since developers tend to be more concerned with potential losses than potential gains. In this analysis, a central case estimate is presented along with a likely range – positive and negative – of cash flow outcomes.

4.4 Key Data sources

The following summarises the key data sources used to inform the financial modeling of the case studies:

- Data for short stay accommodation in Australia and each of the states was sourced from the rent-a-home website, which provides prices for holiday rentals and corporate accommodation by number of bedrooms. For each region, an approximate average of the available rates was used to estimate the respective room tariffs and rents.
    - The resultant parameters were benchmarked against ABS Survey of Tourist Accommodation mean room tariff data for hotels and serviced apartments.

- Mean long stay weekly rents were sourced from ABS census data by state and capital city versus rest of state, 2005-06. The figures were inflated to 2010-11 dollars using the ABS Consumer Price Index values for housing.

- Short stay occupancy rate assumptions were sourced from the ABS Survey of Tourist Accommodation. The parameters were specified based on the type of accommodation, that is:
    - Hotel and resort occupancy rates were used to inform Class 3 high rise occupancy assumptions;
    - Serviced apartment occupancy rates were used to inform Class 2 high rise occupancy assumptions; and
    - Motel and guest house occupancy rates were used to inform low rise occupancy assumptions.

- There was no relevant data available to inform long stay occupancy rates. A broad assumption of 90% was assumed across all case studies.

In all cases, capital city figures were assumed to best reflect assumptions informing the high rise case studies, while 'rest of state' data was used to estimate low rise case study assumptions.

PART E

1. Analysis of options

1.1 Option A - No change

BCA technical impact analysis

Adopting no change to the BCA would not resolve the current disparity, in particular, in relation to requirements for access for people with disabilities and the provisions for energy efficiency measures in new and existing buildings.

The Premises Standard identifies the need to consider the provision for access and facilities in short stay serviced accommodation, for people with disabilities. Not addressing this issue in absolute terms may cause for complaints under the DDA.

Equally the environmental measures introduced into the BCA to minimize the use of energy in buildings accommodating transient occupants would not be achieved without addressing the current Class 2 use permitting short stay accommodation. For example, measures which serve to minimize energy consumption, such as air conditioning temperature and controls, individual light switching and controls, and occupant motion detectors are not required in Class 2 buildings, however are required in Class 3 buildings.

The life safety of occupants is not considered to be adversely affected by Option A. The requirement of fire safety systems is similar between the two classes. Short-term residents may lack knowledge of the building environment but the complexity of a Class 2 building is generally considered to be lower, suggesting a shorter time for way finding.

Short-term residents are also less likely to have any social bonds to other occupants in the building (other than in the SOU) which indicates less likelihood of gathering and therefore quicker evacuation time. No significant difference in pre-movement time has been determined for the building classes. Overall, evacuation times are considered to be similar for Class 2 and Class 3 hotel buildings.

This would not resolve current concern and the increasing voice of individuals and industry seeking clarification on the design, approval and construction requirements for Class 2 and Class 3 buildings would continue.

Economic Impact Analysis

Under the existing situation, short stay occupancy is assumed to account for 50% of all Class 2 accommodation and 100% of Class 3 accommodation. As shown in Table E1 net revenues per annum in high rise buildings range from approximately $7.6 million for Class 2, to $13.4 million in Class 3 buildings. For low rise buildings, Class 2 buildings return approximately $1.5 million per annum, compared to $1.1 million for Class 3 buildings.

In high rise buildings, Class 3 accommodation has a rate of return on capital of 7.1%, greater than the 4.6% anticipated for Class 2 accommodation. This reflects the relative risk-return profile of the

two types of property developments. That is, the Class 2 case study is assumed to have 50% of rooms acting as long stay residencies, providing a lower return, but at less risk than hotel-style accommodation.

Class 2 accommodation in low rise buildings provides a rate of return of 11.8%, compared to Class 3 accommodation in similar buildings with a rate of return of 7.5%. The higher rates of return relative to their high rise counterparts reflects the significant impact that higher capital costs can have on investment returns.

Table E1 - Option A

	Class 2 – high rise	Class 3 – high rise	Class 2 – low rise	Class 3 – low rise
Net revenues ($/p.a.)	$7,581,302	$13,449,793	$1,467,683	$1,144,711
Payback period (years)	19	14	8	13
Net revenues per room ($)	$36,101	$48,035	$24,461	$28,618
Net revenues per m^2	$217	$384	$367	$286
Rate of return on capital	4.6%	7.1%	11.8%	7.5%
Rate of return confidence interval	*3.1% -6.8%*	*5.0% -10.1%*	*8.9% -16.0%*	*5.4% -10.6%*

Note: The rate of return confidence interval is based on the impact of ±20% on capital costs and ±10% on room tariffs concurrently.
The above figures relate to 2010-11 values drawn from data presented in Section 4.4.

Under the current environment, there is concern among industry that the incidence of Class 2 buildings offering short stay accommodation is on the rise. This is particularly the case in tourism 'hot-spot' regions such as the Gold Coast.

While this trend may be viewed as a positive move to a higher return profile for the owners of Class 2 buildings, there are flow-on effects, particularly to the long stay residential market, worthy of consideration. That is, the reduction in long stay accommodation supply may negatively impact housing affordability and locality.

In terms of new investment, stakeholders may opt to build a lower cost, Class 2, building but operate primarily as a short stay accommodation facility. Certainly, the ability to attract Class 3 returns (or, at least returns superior to Class 2), without incurring the additional costs of construction that accompany Class 3 would continue to incentivise this approach. However, since the move to short stay accommodation is largely concentrated in high tourism areas, there would still be expected to be residential accommodation available in outlying areas.

1.2 Option B - Have only one class (combining Class 2 and 3 buildings)

BCA technical impact analysis

Combining the current two classifications and requirements would result in a simplified classification system and would provide the tourism sector with level playing field.

The result of applying the minimum or higher technical provisions of both Class 2 and Class 3 buildings, to the one building, would increase the fire life safety provisions accessibility, health, amenity and energy efficiency provisions such that the building would be "over provided" or "over regulated" with building code requirements.

Notwithstanding the potential increase in costs, the BCA objectives related to accessibility and energy efficiency would be met.

Economic Impact Analysis

Combining Class 2 and 3 buildings into the one class provides the tourism sector with a level playing field competitively, and consumers with a higher confidence in the standard of accommodation facilities. In this scenario, costs would increase for the fit-out of existing Class 2 apartments that wish to act as short-stay accommodation and would similarly increase for new investments.

The results reflect a Class 2 property development that upgrades at the start of its economic life. That is, the revised revenue profile is earned for the full duration of the assumed economic life of this type of building and reflects a 'best case' scenario for an existing Class 2 building as well as the expected outcomes for a new investment. Expected returns would decrease with the age of an existing building (i.e. the higher revenues associated with the upgrade would be earned for a shorter amount of time).

Based on the BCA technical requirements, the upgrade of existing Class 2 high rise building to a Class 3 building would cost approximately $9.1 million (and $0.6 million for the low rise Class 2 building) under the stylised example modelled here – or 25% of the gap between total capital outlay for a Class 2 versus Class 3 high rise building. These upgrade costs do not cover non-essential services, facilities and building features such as conference rooms, restaurant and laundering services which are commonly provided in a Class 3 hotel.

It is assumed new investments would incur the same amount of additional capital costs to meet the revised building standards required to operate as a hotel. In this way, the results for the 'Class 2' buildings reflect new investments in lower cost hotel/mixed residency developments.

While there are no changes to revenues for Class 3 buildings, there is a marginal decrease in the expected return to Class 2 buildings. The rate of return on capital for Class 2 high rise (low rise) apartments decreases from 4.6% (11.8%) per annum to 4.4% (11.3%) per annum in the central case, attributable to the increased capital costs to meet the new building standards.

Table E2 - Option B

	Class 2 – high rise	Class 3 – high rise	Class 2 – low rise	Class 3 – low rise
Net revenues ($/p.a.)	$7,763,697	$13,449,793	$1,479,708	$1,144,711
Payback period (years)	19	14	8	13
Net revenues per room ($)	$36,970	$48,035	$24,662	$28,618
Net revenues per m^2	$222	$384	$370	$286
Rate of return on capital	4.4%	7.1%	11.3%	7.5%
Rate of return confidence interval	*2.9% -6.4%*	*5.0% -10.1%*	*8.6% -15.3%*	*5.4% -10.6%*

Note: The rate of return confidence interval is based on the impact of ±20% on capital costs and ±10% on room tariffs concurrently.
The above figures relate to 2010-11 values drawn from data presented in Section 4.4.

The increased capital costs associated with upgrading a Class 2 building to a Class 3 hotel may be expected, at least in part, to flow on to consumers through higher accommodation prices. The modelling outcomes above are based on a 100% pass through of additional capital costs to consumers (or $5 per room night in the high rise case study and $1 per room night in the low rise case study).

Depending on the proportion of existing Class 2 buildings that choose to upgrade to a Class 3 hotel-style accommodation facility, housing affordability and supply may be affected (noting that this impact is in addition to any longer term impacts stemming from the changes to investment incentives discussed above). However, given the relatively low capital injection required to make the upgrade, this impact is not expected to be significant, as Class 2 buildings opt to continue operating as a mixed residency facility.

New investment in Class 2 buildings, however, will be lower given the restriction to long stay only residential use guidelines. These restrictions significantly reduce expected returns on Class 2 buildings, as is reflected by the difference between Option D versus Option A investment profiles for Class 2 buildings. Investors are likely to instead opt to invest in low end Class 3 facilities and operate as a mixed residential facility. This would improve the overall standard of residential housing, whilst still maintaining an adequate level of supply.

With this reduction in expected rate of return, the incentive for new investment would fall and, with it, the growth in the stock of housing. The adverse impact on investment could be offset by increasing the share of short stay occupancy in the Class 2 buildings (that is, by increasing the revenue profile of the new investment), though of course any move in this direction would restrict residential housing supply in the short term (relative to Option A).

Overall, the market would be expected to return to a natural equilibrium over the longer term as the clear distinction between accommodation standards and building types will see investors choosing the risk-return profile and development option that best suits their needs.

1.3 Option C - Include short stay serviced apartment living as a Class 2 building

BCA technical impact analysis

Amending the classification of Class 2 building to clearly identify the permitted use for short stay serviced apartment living would clarify the approval process. The current technical provisions of the BCA would leave hotel operators at a competitive disadvantage however without change, equitable and dignified access and energy efficiency objectives of the BCA would not be achieved.

In this regard this option is similar to no change as outlined in Option A

In terms of fire life safety, this option is also similar to Option A. Short-term residents may lack knowledge of the building environment but the complexity of a Class 2 building is generally considered to be lower, suggesting a shorter time for way finding.

Short-term residents are also less likely to have any social bonds to other occupants in the building which indicates less likelihood of gathering and therefore quicker evacuation time. Overall, the evacuation time is considered similar for Class 2 and Class 3 hotel buildings.

This suggests that Option C is not associated with a significant difference in fire life safety to occupants.

Selection of Option C would require the following changes to the provisions in the BCA.

a) Classification and Definitions

The definition of Class 2 would require amendment to clarify the permitted use as long or short term, owner occupier or rental accommodation.

For example

Class 2: a building containing 2 or more sole-occupancy units each being a separate dwelling and which is a common place of long or short term living for owner occupiers or rental accommodation

b) Fire Resistance

Fire resistant construction will remain as 90 minutes throughout as there is not consider to be any increase in measurable risk to the class. Consequently there would not be any change to the current provisions as prescribed in Part C of the BCA

c) Access and Egress

In low rise Class 3 buildings, stairways must be fire isolated when connecting more than 2 stories. A Class 2 building is permitted to have 3 stories connected before fire separation of the stairway is required.

Based on an analysis of the typical occupant characteristics, fire hazards, fire statistics and the technical differences between Class 2 and Class 3 buildings, it is considered that a change to the current provisions as prescribed in Part D of the BCA would not be required.

d) Access for people with disabilities

Class 3 buildings require access and facilities, including specific sole occupancy units for use by people with disabilities. Class 2 buildings require access to common areas only.

The Premises Standard identifies the need to consider the provision for access and facilities in short stay serviced accommodation, for people with disabilities. Not addressing this issue in absolute terms may cause for complaints under the DDA.

Equally the environmental measures introduced into the BCA to minimize the use of energy in buildings accommodating transient occupants would not be achieved without addressing the current Class 2 use.

It is considered that the provision for access and facilities for people with disabilities must be addressed in this option and if appropriate applied on a pro rata basis.

Consequently there should be a change to the current provisions as prescribed in Part D3 of the BCA prescribing similar provisions and ratio of facilities as required for Class 3 buildings

e) Service and Equipment

Engineering services such as mechanical, electrical and plumbing installations present no discernible difference between Class 2 and Class 3 buildings however a concession is afforded to Class 2 buildings with the permitted installation of smoke alarms.

A Class 2 building will have the option for smoke alarms (in lieu of a smoke detection and alarm system) and do not require the installation to be connected to the local fire station or brigade. There is no evidence to suggest based on our research that the occupancy of a Class 2 building on a short term services accommodation style basis has resulted in an increase in fire related deaths or injuries. Therefore it is considered that the detection and alarm system prescribed for a Class 2 building is appropriate also for occupation of Class 2 sole occupancy units on a short stay basis.

Consequently it is considered that there is no necessity to change the provision for engineering services as currently prescribed in Part E1 of the BCA

f) Lift Installations

Lift Installations and the accessibility provisions for lifts to all levels present little or no discernable difference between Class 2 and Class 3 buildings. Consequently there would not be any change to the current provisions as prescribed in Part E2 of the BCA

g) Emergency Lighting Exit Signs and warning systems

Emergency lighting exit signs and warning systems present little or no discernable difference between Class 2 and Class 3 buildings except Class 3 buildings require a slightly higher dBA sound rating for the occupant warning system.

It is considered that 100 dBA rating for Class 3 buildings would be appropriate for Class 2 buildings with short stay occupants therefore requiring a minor change to the BCA.

h) Sanitary and other facilities

Sanitary facilities are required to both Class 2 and Class 3 buildings including provision for a bath or shower, closet pan (WC) and washbasin. Class 2 buildings, due to the expected duration of occupancy, require the installation of a kitchen sink and cooking facilities in addition to laundering facilities such as the space for a washing machine and clothes dryer or clothes line.

The market has dictated the need for enhanced facilities and services in Class 2 and Class 3 buildings including short stay serviced apartment living. Whilst the provision of additional services may be driven by market forces, no additional facilities are considered necessary for Class 2 buildings as currently prescribed.

i) Energy Efficiency.

Class 2 buildings are required to achieve an energy star rating based on recognized energy rating tools. These requirements relate specifically to the building fabric and orientation and are essentially assessed on an apartment by apartment basis.

Class 3 building are required to meet further enhanced energy efficiency criteria which includes building fabric, glazing, shading, and engineering services associated with the building. The additional requirements for Class 3 buildings include assessment for solar heat gain, automation of shading and various mechanical (fresh air, air-conditioning, cooling and heating) and electrical (lighting and power) requirements and controls.

In order to meet the BCA objectives for the transient type use, it is considered that the provision for energy efficiency and / or and energy star rating for a Class 2 building should be based on a combination of current provisions for Class 2 and Class 3 buildings.

Class 2 provisions should be upgraded to include

A. an energy star rating determined on an apartment by apartment basis, and
B. further enhanced provisions to include for the various mechanical (fresh air, air-conditioning, cooling and heating) and electrical (lighting and power) requirements and controls.

Economic Impact Analysis

The inclusion of short stay accommodation as a Class 2 building would simplify the approval process but disadvantage the hotels sector as they would be competing against lower cost buildings which would provide an investor with a higher return and/or greater capacity to compete on room rates. There would also be implications for long term residents of Class 2 accommodation through the potential disruptions of tourist movements and the negative impact on housing supply and affordability in such a building.

Under this Option, existing Class 2 accommodation would not face an increase in construction costs, but still earns the high rate of return associated with short stay accommodation. The modelled assumption is that 50% of the Class 2 case study rooms will be offered as short stay accommodation (consistent with current conditions). In reality, the market may see a rise in the share of short stay accommodation in Class 2 buildings, however the consistency in assumptions allows a more transparent comparison of options.

Compared to the business as usual case (Option A), there is no change to the expected return for Class 2 accommodation under Option C (Table E3).

Table E3 - Option C

	Class 2 – high rise	Class 3 – high rise	Class 2 – low rise	Class 3 – low rise
Net revenues ($/p.a.)	$7,581,302	$13,449,793	$1,467,683	$1,144,711
Payback period (years)	19	14	8	13
Net revenues per room ($)	$36,101	$48,035	$24,461	$28,618
Net revenues per m^2	$217	$384	$367	$286
Rate of return on capital	4.6%	7.1%	11.8%	7.5%
Rate of return confidence interval	*3.1% -6.8%*	*5.0% -10.1%*	*8.9% -16.0%*	*5.4% -10.6%*

Note: The rate of return confidence interval is based on the impact of ±20% on capital costs and ±10% on room tariffs concurrently.
The above figures relate to 2010-11 values drawn from data presented in Section 4.4.

Option C has potentially material implications for the residential market. In the short term, there could be expected to be a significant move from Class 2 buildings towards short stay accommodation offerings (subject to demand constraints), affecting housing supply and affordability. Class 3 hotels competing against these buildings would need to differentiate themselves by focussing on the additional, high-end facilities and services they can offer to remain competitive.

The outcome in terms of housing investment and supply is unclear as investors may opt to invest in Class 2 building types more frequently than current trends. In this case, while the share of short stay accommodation in these buildings may rise, there will be more of these types of buildings

available to maintain an adequate level of residential housing supply. That is, the incentives for investment in Class 2 buildings are likely to increase, but so too are the incentives to utilise Class 2 buildings as short stay accommodation.

However, given the leniency in the guidelines, the overall standard of short stay accommodation, locality and services will decline.

1.4 Option D - Include short stay serviced apartment living as a Class 3 building

BCA technical impact analysis

Amending the classification of Class 3 building to clearly identify the permitted use for short stay serviced apartment living would simplify the approval process by omitting any short stay type accommodation from Class 2 buildings.

The result of applying the minimum technical provisions of Class 3 buildings to all short stay serviced apartment type living would satisfy the BCA objectives in terms of accessibility, health, amenity and energy efficiency provisions however may have an impact otherwise on the short term accommodation market.

In terms of fire life safety, it has been determined that short-term occupants are not exposed to a higher or increased risk in a Class 2 building, it follows that the level of fire life safety will be sufficient in a Class 3 buildings (as generally higher requirements apply for this class).

Selection of Option D would require the following changes to the provisions in the BCA.

a) Classification and Definitions

The definition of Class 2 would require amendment to exclude the use of short term, owner occupier or rental accommodation.

For example

Class 2: a building containing 2 or more sole-occupancy units each being a separate dwelling and which is a common place of long term living for owner occupiers or long term rental accommodation and excludes any short term, short stay serviced apartment style living

It is considered a time period for “short term” would also require definition. 30 days is proposed which consistent with the equivalent time specified in the International Building Code.

For example

Short Term:
A period of less than 30 days

b) Fire Resistance

Fire resistant construction will remain as 90 minutes throughout as there is not consider to be any increase in measurable risk to the class. Consequently there would not be any change to the current provisions as prescribed in Part C of the BCA

c) Access and Egress

In low rise Class 3 buildings, stairways must be fire isolated when connecting more than 2 stories as identified previously and based on an analysis of the typical occupant characteristics, fire hazards, fire statistics and the technical differences between Class 2 and Class 3 buildings. New and existing Class 2 buildings used as services apartments will require open stairways to be fire isolated consistent with the Class 3 provisions however otherwise it is considered that a change to the current provisions as prescribed in Part D of the BCA would not be required

d) Access for people with disabilities

Class 3 buildings require access and facilities, including specific sole occupancy units for use by people with disabilities. It is considered that the provisions are adequate and that no changes are required to the current Class 3 requirements

e) Service and Equipment

Engineering services such as mechanical, electrical and plumbing installations present no discernible difference between Class 2 and Class 3 buildings notwithstanding a concession afforded to Class 2 buildings with the permitted installation of smoke alarms.

The current requirements for Class 3 buildings are considered appropriate for the permitted use including a transient population and therefore based on our analysis there would not be any change to the current provisions as prescribed in Part E1 of the BCA

f) Lift Installations

Lift Installations and the accessibility provisions for lifts to all levels present little or no discernable difference between Class 2 and Class 3 buildings. Consequently there would not be any change to the current provisions as prescribed in Part E2 of the BCA

g) Emergency Lighting Exit Signs and warning systems

Emergency lighting exit signs and warning systems present little or no discernable difference between Class 2 and Class 3 buildings except Class 3 buildings require a slightly higher dBA sound rating for the occupant warning system.

It is considered that 100 dBA rating for Class 3 buildings is appropriate therefore requiring no change to the BCA.

h) Sanitary and other facilities

Sanitary facilities are required to both Class 2 and Class 3 buildings including provision for a bath or shower, closet pan (WC) and washbasin. Current Class 3 buildings provisions are

considered adequate for transient occupants however it is considered that the market would dictate the need for further enhanced facilities, evident of market demands in recent years.

Consequently there would not be any change to the current provisions as prescribed in Part F of the BCA

i) Energy Efficiency.

Class 3 building are required to meet enhanced energy efficiency criteria which includes building fabric, glazing, shading, and engineering services associated with the building. The additional requirements for Class 3 buildings include assessment for solar heat gain, automation of shading and various mechanical (fresh air, air-conditioning, cooling and heating) and electrical (lighting and power) requirements and controls.

These requirements meet the objectives of the BCA and therefore no change to the current requirements for Class 3 buildings is required.

Economic Impact Analysis

If all short term accommodation were classified as Class 3 buildings, there would be implications for investment in Class 2 buildings, due to the reduction of use options. Existing Class 2 buildings would not be permitted to provide short term accommodation, hence they would only be able to target the longer term residential market. In the short term, there would be an increase in the availability of Class 2 apartments for rent, likely leading to a fall (or at least slower growth) in rents. However, given the relatively low capital injection required to make the upgrade, this impact is not expected to be significant as Class 2 buildings opt to continue operating as a mixed residency facility.

New investment in Class 2 buildings, however, will be lower given the restricted to long stay only residential use guidelines. That is, given reduced ability to achieve Class 3 returns at Class 2 costs. These restrictions significantly reduce expected returns on Class 2 buildings. Investors would instead opt to invest in low end Class 3 facilities and operate as a mixed residential facility. This would improve the overall standard of residential housing, whilst still maintaining an adequate level of supply.

For Option D, net revenues for Class 2 high rise buildings would fall to $2.7 million per annum, resulting in a payback period of 53 years. With a rate of return on capital of negative 0.3%, the investment would in fact be making a loss. For low rise buildings, the rate of return on Class 2 accommodation falls to 4.2%, and net revenues to $601,000 per annum (Table E4).

Table E4 – Option D

	Class 2 – high rise	Class 3 – high rise	Class 2 – low rise	Class 3 – low rise
Net revenues ($/p.a.)	$2,742,859	$12,557,503	$601,551	$1,027,692
Payback period (years)	53	15	21	14
Net revenues per room ($)	$13,061	$44,848	$10,026	$25,692
Net revenues per m^2	$78	$359	$150	$257
Rate of return on capital	-0.3%	6.6%	4.2%	6.7%
Rate of return confidence interval	*(-0.9%) -0.6%*	*5.0% -10.1%*	*3.2% -5.7%*	*5.4% -10.6%*

Note: The rate of return confidence interval is based on the impact of ±20% on capital costs and ±10% on room tariffs concurrently.
The above figures relate to 2010-11 values drawn from data presented in Section 4.4.

1.5 Option E - Create new Class 2b Classification for Short Stay Serviced Apartment buildings

BCA technical impact analysis

Creating a new sub classification will provide a clear difference in the classification of Class 2 residential accommodation buildings based on traditional uses and risks associated with such use.

A new sub classification would clarify the classification system and long-term residents of Class 2 buildings would not be disadvantaged.

Provision for access and facilities for short stay serviced apartment buildings and respective requirements for energy efficiency provisions would meet the objectives of the BCA.

It is considered that the fire load and occupant profile of occupants in Class 2b would not be significantly different to the occupant profile of Class 2 buildings hence the equivalent provisions for a Class 2 building would apply to both Class 2a and Class 2b.

It is considered that the change would provide the tourism sector with level playing field.

Selection of Option E would require the following changes to the provisions in the BCA.

a) Classification and Definitions

The definition of Class 2 would need to be amended to be described as Class 2a and to exclude the use of short term, owner occupier or rental accommodation which would form the basis of a Class 2b definition.

For example

Class 2a:

a building containing 2 or more *sole-occupancy units* each being a separate dwelling which is a common place of accommodation for owner occupiers, permanent or long term tenant rental and un serviced holiday letting.

Class 2b:

a building containing 2 or more *sole-occupancy units* which is a common place for serviced long or short term tenant rental accommodation or transient living including –

(a) Serviced apartment style accommodation; or
(b) Self contained short stay living apartments; or
(c) Serviced holiday apartments

It is considered a time period for "short term" would also require definition. 30 days is proposed which consistent with the equivalent time specified in the International Building Code.

For example

Short Term:

A period of less than 30 days

A definition of "serviced" is required.

For example

Serviced:

means the provision of a property management, apartment letting, cleaning, laundering services and the like to 2 or more Sole Occupancy Units

The above definition aims to include services provided by accommodation management companies and the like however exclude "mum and dad" type investors offering rental accommodation on personal investment properties.

b) Fire Resistance

Fire resistant construction will remain as 90 minutes throughout as there is not consider to be any increase in measurable risk to the class. Consequently there would not be any change to the current provisions as prescribed in Part C of the BCA

c) Access and Egress

In low rise Class 3 buildings, stairways must be fire isolated when connecting more than 2 stories. A Class 2 building is permitted to have 3 stories connected before fire separation of the stairway is required.

Based on an analysis of the typical occupant characteristics, fire hazards, fire statistics and the technical differences between Class 2 and Class 3 buildings, it is considered that a change to the current provisions as prescribed in Part D of the BCA would not be required.

d) Access for people with disabilities

Class 3 buildings require access and facilities, including specific sole occupancy units for use by people with disabilities. Class 2 buildings require access to common areas only.

It is considered that the provision for access and facilities for people with disabilities is comparable with the occupancy requirements of a Class 3 building and therefore the equivalent provisions for a Class 3 building would apply. Class 2b provisions could be applied pro rata based on the number of Class 2b apartments.

e) Service and Equipment

Engineering services such as mechanical, electrical and plumbing installations present no discernible difference between Class 2 and Class 3 buildings however a concession is afforded to Class 2 buildings with the permitted installation of smoke alarms.

A Class 2 building will have the option smoke alarms (in lieu of a smoke detection and alarm system) which do not require the installation to be connected to the local fire station or brigade.

There is no evidence to suggest based on our research that the occupancy of a Class 2 building on a short term services accommodation style basis has resulted in an increase in fire related deaths or injuries. Therefore it is considered that the detection and alarm system currently prescribed for a Class 2 building is also appropriate for Class 2b occupancy.

In buildings less than 25m in effective height, it is considered that the alarm system in the building is interconnected to the common areas on each floor.
This will require a change the provision for engineering services as currently prescribed in Part E1 of the BCA

f) Lift Installations

Lift Installations and the accessibility provisions for lifts to all levels present little or no discernable difference between Class 2 and Class 3 buildings. Consequently there would not be any change to the current provisions as prescribed in Part E2 of the BCA

g) Emergency Lighting Exit Signs and warning systems

Emergency lighting exit signs and warning systems present little or no discernable difference between Class 2 and Class 3 buildings except Class 3 buildings require a slightly higher dBA sound rating for the occupant warning system.

It is considered that 100 dBA rating for Class 3 buildings would be appropriate for Class 2b building, also recommended for Class 2 in order to achieve consistency in the BCA.

h) Sanitary and other facilities

Sanitary facilities are required to both Class 2 and Class 3 buildings including provision for a bath or shower, closet pan (WC) and washbasin. Class 2 buildings, due to the expected duration of occupancy, require the installation of a kitchen sink and cooking facilities in addition to laundering facilities such as the space for a washing machine and clothes dryer or clothes line.

Class 3 buildings require provision of the above facilities with a dedicated number of identified accessible hotel or motel suites / sole occupancy units. Class 3 buildings require provision for sanitary and other facilities for employees.

It is considered that the provision for sanitary and other facilities is comparable with the occupancy requirements of a Class 2 building (based on market demands) and therefore the provisions for Class 2 buildings would apply to Class 2b buildings. There are no changes required to the Class 2 or Class 3 requirements

i) Energy Efficiency.

Class 2 buildings are required to achieve an energy star rating based on recognized energy rating tools. These requirements relate specifically to the building fabric and orientation and are essentially assessed on an apartment by apartment basis.

Class 3 building are required to meet further enhanced energy efficiency criteria which includes building fabric, glazing, shading, and engineering services associated with the building. The additional requirements for Class 3 buildings include assessment for solar heat gain, automation of shading and various mechanical (fresh air, air-conditioning, cooling and heating) and electrical (lighting and power) requirements and controls.

In order to meet the BCA objectives for the transient type use, it is considered that the provision for energy efficiency and / or and energy star rating for a Class 2b building should be based on a combination of current provisions for Class 2 and Class 3 buildings.

Class 2b provisions should include

A. an energy star rating determined on an apartment by apartment basis, and
B. further enhanced provisions to include for the various mechanical (fresh air, air-conditioning, cooling and heating) and electrical (lighting and power) requirements and controls.

Economic Impact Analysis

Option E clarifies the classification system by creating a new Class 2b for short stay serviced apartment buildings within the original Class 2 category. This would result in buildings dedicated to short stay accommodation, reducing the impact on longer term residents of Class 2 buildings. The 2b class would be intermediate between Class 2 and Class 3, with the expected cost of upgrading from Class 2 to Class 2b being $5.7 million for the high rise case study and $0.8 million for the low rise case study.

The upgrade is modelled as being implemented at the commencement of the Class 2 buildings' economic lives, or a 'best case' scenario in terms of achievable revenues for existing buildings, as well as reflective of expected returns on new investments in Class 2b buildings.

As shown in Table E5, the introduction of a new class would stabilise net revenues for Class 2b buildings at about the same level as in current conditions for Class 2 buildings. This is a low impact option for change to the standards while still ensuring an adequate level of quality and safety for short stay accommodation offerings.

Table E5 – Option E

	Class 2b – high rise	Class 3 – high rise	Class 2b – low rise	Class 3 – low rise
Net revenues ($/p.a.)	$7,696,222	$13,449,793	$1,483,983	$1,144,711
Payback period (years)	19	14	8	13
Net revenues per room ($)	$36,649	$48,035	$24,733	$28,618
Net revenues per m^2	$220	$384	$371	$286
Rate of return on capital	4.5%	7.1%	11.2%	7.5%
Rate of return confidence interval	*3.0% -6.5%*	*5.0% -10.1%*	*8.5% -15.1%*	*5.4% -10.6%*

Note: The rate of return confidence interval is based on the impact of ±20% on capital costs and ±10% on room tariffs concurrently.
The above figures relate to 2010-11 values drawn from data presented in Section 4.4.

The clear distinction between building classifications would stimulate new investment in Class 2b buildings as a lower-end hotel offering compared to the Class 3 buildings. The separation in the target markets for each of the Class 2b and Class 3 hotels will stabilise the competitive features of the accommodation market. The impact on traditional Class 2 buildings is more difficult to determine given the changed nature of a Class 2 investment. With these investors no longer able to achieve the premium rate of return that short stay accommodation attracts, investment decisions fall solely on the expected rate of return on residential accommodation (rather than being a hybrid driven by mixed use).

In this sense, the incentives for investment in traditional Class 2 accommodation are, all else the same, likely to fall, with potential flow-ons to housing supply and affordability. Of course these impacts will be most acute where investment decision was traditionally driven heavily by the return achievable on short stay accommodation. In areas less frequented by tourists, therefore, these impacts are likely to be marginal. From an amenity perspective, Class 2 buildings will be dedicated to longer term residents, avoiding the undesirable results from mixed long stay and short stay accommodation buildings.

2. Comparison of Options

The tables below provide a summary of building cost comparisons and the outcomes of each of the options for change to the standards relative to the business as usual scenario. The options again are:

A. No change

B. Have only one class (Class 2 moves to Class 3 building for short stay accommodation and incurs a small capital cost to upgrade)

C. Class 2 buildings are allowed to freely operate as short stay accommodation (no additional upgrade costs incurred)

D. Class 3 buildings only act as short stay accommodation – no upgrade to Class 2 buildings

E. Create new Class 2b Classification for Short Stay Serviced Apartment buildings (Class 2 building incur upgrade costs to move to a Class 2b standard)

Table E6 – Construction Cost comparison

Low rise	Class 2	Class 3	Class 2b
Construction Cost ($)	$12,409,000	$14,814,000	$13,224,000
Maintenance Cost ($ p.a.)	$21,250	$23,500	$21,375
Upgrade ($)(from Class 2)	-	$2,405,000	$815,000
	Class 2	Class 3	Class 2b
Construction Cost ($)	$182,792,000	$146,313,000	$152,059,000
Maintenance Cost ($p.a.))	$263,500	$353,000	$314,750
Upgrade ($)(from Class 2)	-	$36,479,000	$5,746,000

The key assumptions to consider when reviewing these results are:

- The short stay share of accommodation remains unchanged across options except in the case of Option D where Class 2 buildings cannot operate as short stay accommodation facilities. That is, Class 2 short stay share of accommodation remains at 50% regardless of whether funds are committed to upgrade to a short stay accommodation suitable facility. This approach is taken for transparency in the comparison of options and will not necessarily reflect actual outcomes.

- 100% pass through to customers of additional upgrade costs is assumed. These costs are relatively small and would not make a difference to overall outcomes.

Table E7 – Movement of expected returns relative to business as usual

	Class 2 – high rise	Class 3 – high rise	Class 2 – low rise	Class 3 – low rise
Existing Buildings				
Option A: Rate of return on capital	4.6%	7.1%	11.8%	7.5%
Option B	Small negative	-	Small negative	-
	No Change	-	No change	-
Option D	Large negative	-	Large negative	-
Option E	Small negative	-	Small negative	-
New investments				
Option B	Large negative	Positive	Large negative	Positive
	Positive	Negative	Positive	Negative
Option D	Large negative	Positive	Large negative	Positive
	Negative	Negative	Negative	Negative

The implications of the comparison of Options are:

- Option B: New investment in Class 2 buildings will be dampened by low expected returns (as acting partially as short stay accommodation is no longer an option).
    - Investors are likely to instead opt to invest in low end Class 3 facilities (i.e. excluding non-essential services and in less central locations) and operate as a mixed residency facility. This would improve the overall building standard of residential buildings.
    - Class 3 buildings would need to distinguish their offering through their higher end facilities and locality to ensure ongoing competitiveness.

- Option C: Constrained only by demand, existing and new investment in Class 2 buildings will expect to receive higher returns on lower cost capital in line with any growth in the proportion of rooms offered as short stay accommodation.
    - The outcome in terms of housing investment and supply is unclear as investors may opt to invest in Class 2 building types more frequently than current trends. In this case, while the share of short stay accommodation in these buildings may rise, there will be more of these types of buildings available to maintain an adequate level of residential housing supply.

- Class 3 buildings would need to distinguish their offering through their higher end facilities and locality to ensure ongoing competitiveness.

- Option D: In the short term the availability of residential housing will increase as Class 2 buildings cease to offer rooms out for short stay accommodation. Conversely, in the long term, given poor investment prospects for Class 2 buildings residential housing investment and supply will be restricted.

- Option E: In the short term the availability of residential housing will be restricted as many Class 2 buildings will opt to move to a Class 2b options.

    - However the extent of this impact is expected to be minimal as Class 2b buildings would continue operating as a mixed residency facility.
    - Over time, given the relatively low difference in capital costs, investment in Class 2 buildings may be replaced by Class 2b buildings. This would improve the overall standard of residential buildings.
    - Class 3 buildings would need to distinguish their offering through their higher end facilities and locality to ensure ongoing competitiveness.

Table E8 – Long term impact on investment, housing supply and affordability (all else the same)

	Rate of investment	Housing supply	Housing affordability
Option B	↓	↓	↓
Option C	↑	↑	↑
Option D	↓	↓	↓
Option E	↓	↓	↓

PART F

1. Summary Conclusion

This report has examined and analysed issues relating to the classification and use of Class 2 and Class 3 buildings as defined by the BCA.

The report has considered the requirements of the BCA, resident issues and industry concerns, stakeholder responses and has analysed the regulatory and economic impact resulting from a change to classifications of either or both Class 2 and Class 3 as currently prescribed in the BCA.

Changes analysed identify the impact on regulations for new and existing buildings including fire life safety, accessibility, health, amenity and energy efficiency, and on the economic impact to sectors of the economy, including effects on housing supply, affordability and the impact on existing buildings.

The report has also considered other Acts, regulations, schemes and rules associated with the construction and occupancy of Class 2 and Class 3 buildings, recognising that there are various mechanisms or mediums to address the broader issue of short stay serviced accommodation.

The following table summarises the outcome of change options analysed.

Table F1 - Impact and Outcomes Summary

Option		Residents Objectives	BCA Objectives			Economic Impacts				
						Expected returns		Rate of investment	Housing supply	Housing Affordability
		Amenity	Fire life safety	Access	Energy Efficiency	Class 2	Class 3	Class 2	Class 2	Class 2
A		No change	Yes	No	No	No change	No change	No change	No change	No change
B		Negative	Yes	Yes	Yes	Large negative	Positive	Reduction	Reduction	Reduction
C		Negative	Yes	No	No	Positive	Negative	Increase	Increase	Increase
D		Positive	Yes	Yes	Yes	Large negative	Positive	Reduction	Reduction	Reduction
E		Positive	Yes	Yes	Yes	Negative	Negative	Reduction	Reduction	Reduction

Whilst changing the classification or changing the definitions related to residential living in the BCA is one method to address the issue (as can be seen in the International Building Code example), it is considered that specific micro changes to BCA requirements or utilising the power and controls of associated Acts, regulations, schemes and rules, which come into effect prior and post construction, should also be investigated.

Where access to new and existing Class 2 buildings offering short stay serviced or managed accommodation does not provide equitable and dignified access and facilities, a change to Part D of the BCA may be considered.

Where energy efficiency objectives are not achieved in new and existing Class 2 buildings offering short stay serviced or managed accommodation, changes to Part J may be considered.

Planning or Development schemes and Owners Corporation rules are able to enforce accommodation management and rental conditions or restrictions and can prescribe amenity and housekeeping matters in consultation with building owners. These vehicles could address key concerns of residents occupying residential Class 2 buildings on a long term or permanent basis.

The economic impact of the various options have identified varying levels of impact, pending the nature and vehicle for change.

The contents of this report provides a basis for the ABCB to respond to stakeholders and develop a way forward to resolve the concerns identified by industry.

PART G

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2. Appendices

A. BCA comparison of Class 2 and Class 3 building

B. Cost comparison of Class 2 and Class 3 case study buildings

C. Refurbishment cost analysis for Class 2 and Class 3 buildings

D. BCA comparison of Class 2 and Class 2b building

E. Cost comparison of Class 2 and Class 2b case study buildings

F. Refurbishment cost analysis for Class 2 and Class 2b buildings

G. Fire statistics data

APPENDIX A

COMPARISON OF CLASS 2 AND CLASS 3 BUIDING REQUIREMENTS

BCA Clause	Class 2 Requirement	Class 3 Requirement	Difference in requirements
Section C – Fire Resistance			
Spec C1.1 Table 3 Fire Resisting Construction	Fire resistance levels for Class 2 are generally 90 minute as per Table 3 of Spec C1.1. Fire isolated stairways for Class 2 occupancy must have FRL 90/90/90.	Fire resistance levels for Class 3 are generally 90 minute as per Table 3 of Spec C1.1. Fire isolated stairways for Class 3 occupancy must have FRL 90/90/90.	No difference for the case study buildings.
Section D – Access and Egress			
D1.3 Fire Isolated exits	A stairway that connects more than 3 stories in a Class 2 building must be fire isolated.	A stairway that connects more than 2 stories in a Class 3 building must be fire isolated.	Additional requirements for Class 3 building is that all stairways must be fire isolated in lieu of open stairs permitted in Class 2low rise building
D1.13 Number of people accommodated	There is no requirement for maximum number of people for a Class 2 use.	Table D1.13 – A ratio of 15sqm per person applies to Hostel, Hotel, Motel, and guest house type uses.	No difference for the case study buildings
Part D3 – Access for People with Disabilities			
D3.1 General building access requirements	Access for people with disabilities is required to Class 2 buildings to all common areas	Access for people with disabilities is required to Class 3 buildings to all common areas and a proportion of SOU's	Additional requirements for Class 3 building is provision of accessible SOU's – see details below
D3.2 Access to buildings	Access is to be provided from boundary and any adjacent building on the same allotment to the main entry points of the building.	Access is to be provided from boundary, accessible car parking and any adjacent building on the same allotment to the main entry points of the building.	Additional requirements for Class 3 building is that access is required from car parking to the main entry points – see details below
D3.1 General	Access is to be provided to all areas of the building available to residents	Access is to be provided to all areas of the building available to residents being	Additional requirements for Class 3 building

building access requirements	being the principal entrance, lift lobby, accessible carspace, and the like. For any retail/commercial levels access is required from accessible car parking space and common areas in accordance with AS1428.1. In addition, public corridors to the rooms are to meet the minimum requirement for circulation spaces to unit entry doors (accessible units only) and also include suitable turning spaces and passing spaces within the corridor of 1800 W x 2000 D passing spaces every 20m and 1540 x 2000 turning spaces at each end of the corridors. Not less than 1 of each unique facilities provided for the Class 2 residents e.g. gym, retail or the like, must also be fully accessible to AS 1428.1 – 2009. Where a swimming pool is provided and the pool edge has a total perimeter of 40m or more then access into that pool is to be provided as per BCA D3.10 such as a hoist.	the principal entrance, lift lobby, accessible carspace, accessible SOU's and the like. For any retail/commercial levels access is required from accessible car parking space and common areas in accordance with AS1428.1. The design of the required number of SOU's and the internal features (door circulation, toilet etc) are to comply with AS1428.1. Circulation spaces to and within the accessible SOU's (hotel rooms) must meet AS1428.1. Summary BCA Table D3.1 – Number of Class 3 accessible units. 1- 10 SOU's = 1 accessible 11 - 40 SOU's = 2 accessible 41 - 60 SOU's = 3 accessible 61 - 80 SOU's = 4 accessible 81 - 100 SOU's = 5 accessible 101 - 200 SOU's = 5 + 1 per 25 201 - 500 SOU's = 9 + 1 per 50 In addition, public corridors to the rooms are to meet the minimum requirement for circulation spaces to unit entry doors (accessible units only) and also include suitable turning spaces and passing spaces within the corridor of 1800 W x	Case study A • The high rise hotel requires access and circulation space to the retail and commercial spaces, function rooms, restaurants etc • # 11 accessible hotel suites (including associated facilities) are required – see details below Case study B • The low rise hotel requires access and circulation space to the retail and commercial spaces, function rooms, restaurants etc • # 2 accessible hotel suites (including associated facilities) are required – see details below

		2000 D passing spaces every 20m and 1540 x 2000 turning spaces at each end of the corridors. Not less than 1 of each unique facilities provided for the Class 3 residents e.g. gym, retail or the like, must also be fully accessible to AS 1428.1 – 2009. Where a swimming pool is provided and the pool edge has a total perimeter of 40m or more then access into that pool is to be provided as per BCA D3.10 such as a hoist.	
D3.3 Parts of buildings to be accessible	Access and circulation is required to above areas served by a ramp, lift including provision for passing spaces.	Access and circulation is required to above areas served by a ramp, lift including provision for passing spaces.	No difference for the case study buildings
D3.5 Accessible Carparking	Not applicable to Class 2 buildings	Accessible car parking spaces are to be provided at a ratio based on the total number of Class 3 car parking spaces provided. Where carparking is provided for Class 3 residents the number of accessible carspaces is calculated by multiplying the total number of Class 3 carspaces by the % of accessible SOU's to the total number of Class 3 SOU's. The nature and layout of the accessible carspaces are to be as per AS 2890.6-2009.	Additional requirements for Class 3 building Case study A • The high rise hotel requires # 5 number of accessible carspaces Case study B • The low rise hotel requires # 2 number of accessible carspaces

D3.6 Signage	Not applicable to the Class 2 case study buildings	Braille and tactile signage is to be provided to identify accessible features in accordance with AS1428.1.	Additional requirements for Class 3 building • The hotel requires braille and tactile signage to all public sanitary facilities, function spaces and the like throughout the building
D3.7 Hearing Augmentation	Not applicable to the Class 2 case study buildings	Hearing Augmentation is required to function rooms and conference spaces	Additional requirements for Class 3 building • The hotel requires hearing augmentation to the function rooms and conference spaces throughout the building
D3.8 Tactile Indicators	Not applicable to the Class 2 case study buildings	Tactile indicators are require to stairways and ramps used by public excluding fire isolated stairs.	Additional requirements for Class 3 building • The hotel requires tactile indicators to all communication stairs throughout the building
PART E – Services and Equipment			
E1.5 Sprinklers	Sprinkler system required to buildings with effective height greater than 25m.	Sprinkler system required to buildings with effective height greater than 25m.	No difference for the case study buildings
E2.2a Smoke Hazard Management	Smoke detection system to be provided throughout building. Class 2 has concession (option) of providing AS3786 smoke alarms to SOU's and common areas connected to a building occupant warning system in buildings less than 25m effective height A building occupant warning system is to achieve 85dBA at SOU door.	Smoke detection system to be provided throughout building. Class 3 building to have an AS1670.1 detection system installed throughout A building occupant warning system is to achieve 100dBA at SOU door. A Smoke Detection and Alarm System must be connected to the local Fire Brigade or Service	Additional requirements for Class 3 building • The hotel requires a smoke detection and alarm system in accordance with AS 1670 throughout. There is no option for a smoke alarm system in accordance with AS 3786 combined with the occupant warning system • The hotel requires an occupant warning

			system with 15dBA more than a Class 2 • The hotel requires a direct alarm connection to the local Fire Service
PART E3 – Lift Installations			
E3.6 Passenger Lifts	Class 2 where a lift is provided access to all levels is required Where serving a building over 12m effective height the lift shaft serving the Class 3 part of the building will be required to meet requirements of BCA E3.6 and AS1735.12. Lift car requires a minimum size of 1400mm x 1600mm with 900mm clear door width. Sensor heights, call buttons and grab rails are to be in accordance with AS1735.12.	Class 3 buildings requires access to all parts of the building. Where serving a building over 12m effective height the lift shaft serving the Class 3 part of the building will be required to meet requirements of BCA E3.6 and AS1735.12. Lift car requires a minimum size of 1400mm x 1600mm with 900mm clear door width. Sensor heights, call buttons and grab rails are to be in accordance with AS1735.12.	No difference for the case study buildings
PART E4 – Emergency Lighting, Exit Signs and Warning Systems			
E4.9 Sound systems and intercom systems for emergency purposes	Building with effective height greater than 25m requires a sound and intercom system for emergency purposes in accordance with AS1670.4.	Building with effective height greater than 25m requires a sound and intercom system for emergency purposes in accordance with AS1670.4.	No difference for the case study buildings

PART F2 – Sanitary and Other Facilities			
F2.1 F2.4 Sanitary and other facilities	Sanitary and other facilities are required to SOU's and include: • Kitchen sink and cooking facilities • Bath or shower • Closet pan and washbasin • Laundry facilities including space for washing machine, wash tub and dryer	Residents Sanitary and other facilities are required in a Class 3 building for residents • Bath or shower • Closet pan and washbasin Employees Sanitary and other facilities are required in a Class 3 building for employees • Closet pan and washbasin Accessible SOU's require a closet pan, washbasin, shower and a shelf	Additional requirements for Class 2 building • Apartment buildings require a kitchen sink, cooking facilities and laundry facilities including space for a washing machine, wash tub and dryer (This comparison does not consider communal facilities) Additional requirements for Class 3 building • The hotel requires accessible and ambulant facilities for persons with disabilities – employees and the public (not required in a Class 2 building) • Each accessible SOU / hotel suite (refer D1.3 above) requires an accessible closet pan, washbasin, shower and a shelf
F4.1	Natural Light to all habitable rooms	Natural light to all bedrooms	Additional requirements for Class 2 building • Apartment buildings require natural light to all habitable rooms in lieu of just bedrooms for a hotel suite
PART J – Energy Efficiency			
J1 Building Fabric	A Class 2 building is to meet the performance provisions of the BCA through a star rating energy assessment.	A Class 3 building must meet the deem to satisfy provisions of the BCA Part J1 for insulation. Class 3 "conditioned space" to be insulated to the deem to satisfy provisions of BCA Part J1.	Additional requirements for Class 3 building • Insulation to" conditioned spaces" including inparticular the retail, commercial, restaurant areas and the like

J2.4 Glazing	A Class 2 building is to meet the performance provisions of the BCA through a star rating energy assessment.	A Class 3 building must meet the deem to satisfy provisions of the BCA Part J2 for glazing type, selection and performance. Class 3 glazing to meet the requirements of BCA Clause J2.4 for solar heat gain, etc	Additional requirements for Class 3 building • Glazing type, to be assessed for solar heat gain
J2.5 Shading	Where adjustable shading is installed to meet Part J2.3 or J2.4, a Class 2 building is to have manual, electrical or mechanical operation of shading device.	Where adjustable shading is installed to meet Part J2.3 or J2.4, a Class 3 building is to have automatic operation of shading device in response to level of solar radiation.	Additional requirements for Class 3 building • Shading - automatic operation of shading device in response to level of solar radiation in lieu of manual for Class 2.
J5.2 Air-conditioning and ventilation systems	Air-conditioning systems within a SOU must be capable of being inactive when the SOU is not being occupied.	Air-conditioning systems within a SOU must be capable of being inactive when the SOU is not being occupied. Additionally, a Class 3 SOU must be capable of controlling the temperature at a different temp during sleeping periods than during other periods and must not operate when any external door is open for more than 1 minute.	Additional requirements for Class 3 building • Air-conditioning systems must be capable of being inactive when the SOU is not being occupied and must be capable of controlling the temperature at a different temp during sleeping periods than during other periods. • Air-conditioning unit must not operate when any external door is open for more than 1 minute. •
J6.2 Artificial Lighting	Not applicable within a SOU in Class 2 building.	Class 3 SOU's must have artificial lighting in accordance with Table J6.2a. That is, have max Lamp power density (W/m2) of 10.	Additional requirements for Class 3 building • Artificial lighting is restricted to a max Lamp power density of 10
J6.3(a) Interior artificial lighting and power control	Not applicable within a SOU in a Class 2 building.	Artificial lighting of a room or space within Class 3 building (including SOU's) must be individually operated by a switch or other control device. Each room to have its own switch for control of lighting.	Additional requirements for Class 3 building • Artificial lighting must be individually operated by a switch or other control device. • Each room to have its own switch for control of lighting.

J6.3(b) Interior artificial lighting and power control	Not applicable within a SOU in a Class 2 building.	An occupant activated device (motion detector or like) must be provided in a SOU to cut power to artificial lighting, air-conditioner, local exhaust fans and bathroom heater when SOU is not occupied.	Additional requirements for Class 3 building • An occupant activated device (motion detector or like) must be provided to cut power to artificial lighting, air-conditioner, local exhaust fans and bathroom heater when hotel suite is not occupied.
J8.1 Access for maintenance and facilities for monitoring	Not applicable within a SOU in a Class 2 building.	Access for maintenance is to be provided throughout the Class 3 part of the building. Sole Occupancy Units within Class 3 need to achieve compliance with this clause for access for service maintenance and fault monitoring.	Additional requirements for Class 3 building • access for service maintenance and fault monitoring.

APPENDIX B

Class 3 High Rise

Item	Area	Cost/ m2 on GFA	Unit	Quantity	Rate $	Cost $
	Building Works					
	Carparking					
1	Above ground		m2	4,000	1,200	4,800,000
	Hotel Entry					
2	Arrival court		Item			250,000
3	Main entry lobby		m2	360	4,500	1,620,000
4	Reception		m2	240	5,000	1,200,000
5	Reception retail		m2	200	3,000	600,000
6	Concierge/bag store		m2	100	3,000	300,000
7	Retail		m2	100	3,000	300,000
8	Administration		m2	600	4,000	2,400,000
	Accommodation					
	Hotel Rooms					
9	Standard		m2	18,520	4,000	74,080,000
10	Executive suites		m2	1,000	4,500	4,500,000
11	DDA		m2	480	4,000	1,920,000
12	Linen stores		m2	300	2,300	690,000
13	F&B		m2	300	3,200	960,000
14	House keeping		m2	450	2,500	1,125,000
15	Commercial		m2	200	2,600	520,000
16	Kitchen		m2	600	5,000	3,000,000
17	Storage support to kitchen		m2	550	3,200	1,760,000
18	Laundry		m2	200	2,500	500,000
	Public Spaces					
19	Visitors lounge		m2	300	4,000	1,200,000
20	Executive lounge		m2	200	4,500	900,000
21	Restaurant		m2	600	3,500	2,100,000
22	Café		m2	200	3,000	600,000
23	Multipurpose		m2	500	3,200	1,600,000
24	Function areas		m2	1,500	4,000	6,000,000
	Recreation					
25	Reception		m2	100		
26	Amenities		m2	400	3,600	1,440,000
27	Gym		m2	600	2,600	1,560,000
28	Exercise rooms		m2	400	2,600	1,040,000
	Conference					
29	Confreance rooms/breakout areas		m2	2,000	3,500	7,000,000
30	Lift		no	6	730,000	4,380,000
	External Works					
31	Site works/clearance		m2	3,000	25	75,000
32	Allowance for forming building platforms		m2	2,000	50	100,000
33	Swimming pools		Item			500,000
34	Tennis courts (2 number)		no	2	60,000	120,000
35	Allowance for new footpaths		Item			25,000
36	Roads		Item			75,000
37	Boundary fencing		Item			100,000
38	Entry gates/statements		Item			50,000
39	Allowance for internal fencing		Item			25,000
40	Retaining Walls		Item			Excl
41	Allowance for minor landscaping works		Item			150,000
42	External electrical services (lighting to carparks)		Item			75,000
43	New sub-station					150,000
44	External gas services					75,000
45	External water services		Item			75,000
46	External fire services (including booster pump and tanks)					750,000
47	External sewer services		Item			125,000
48	Environmental septic system		Item			Excl
49	External stormwater services		Item			100,000
50	Allowance for rainwater tanks and services upgrade		Item			250,000
	Gross Floor Area (GFA)	35,000				
	Sub-Total for Trade Works	**3,748**				**131,165,000**
51	Add staging costs					Excl
52	Add escalation					Excl
	Sub-Toal for Construction Costs	**3,748**				**131,165,000**
53	Add Design Contingency @ 10%					13,116,500
54	Add Construction Contigency @ 5%					7,214,075
55	Add Professional Fees @ 12%					18,179,469
56	Upgrading Infrastructure Services					Excl
57	Excavtion in rock					Excl
58	FF&E		10%			13,116,500
59	AV		4%			Excl
60	IT		4%			Excl
61	Decanting					Excl
62	Financing costs					Excl
63	GST					Excl
	Total Development Costs	**5,223**				**182,792,000**

Class 2 High Rise

Item	Area	Cost/ m2 on GFA	Unit	Quantity	Rate $	Cost $
	Building Works					
1	Above ground carparking		m2	8,000	1,200	9,600,000
2	Main entry lobby		m2	300	4,000	1,200,000
3	Apartments		m2	22,000	3,800	83,600,000
4	Ancillary areas (common/lift lobies)		m2	4,250	2,800	11,900,000
5	Back of house		m2	400	2,600	1,040,000
6	Gym (including equipment)		m2	50	3,500	175,000
7	Administration		m2	-	-	-
8	Lift		no	4	730,000	2,920,000
	External Works					
9	Site works/clearance		m2	3,000	25	75,000
10	Allowance for forming building platforms		m2	2,000	50	100,000
11	Swimming pools		Item			350,000
12	Tennis courts (2 number)		no	2	60,000	120,000
13	Allowance for new footpaths		Item			25,000
14	Roads		Item			75,000
15	Boundary fencing		Item			100,000
16	Entry gates/statements		Item			50,000
17	Allowance for internal fencing		Item			25,000
18	Retaining Walls		Item		Excl	
19	Allowance for minor landscaping works		Item			150,000
20	External electrical services		Item			75,000
21	New sub-station					150,000
22	External gas services					75,000
23	External water services		Item			75,000
24	External fire services (including boaster pump and tanks)					750,000
25	External sewer services		Item			125,000
26	Environmental septic system		Item		Excl	
27	External stormwater services		Item			100,000
28	Allowance for rainwater tanks and services upgrade		Item			250,000
	Gross Floor Area (GFA)	35,000				
	Sub-Total for Trade Works	**3,232**				**113,105,00€**
29	Add staging costs				Excl	
30	Add escalation				Excl	
	Sub-Toal for Construction Costs	**3,232**				**113,105,00€**
31	Add Design Contingency @ 10%					11,310,500
32	Add Construction Contigency @ 5%					6,220,775
33	Add Professional Fees @ 12%					15,676,353
34	Upgrading Infrastructure Services				Excl	
35	Excavtion in rock				Excl	
36	FF&E		10%		Excl	
37	AV		4%		Excl	
38	IT		4%		Excl	
39	Decanting				Excl	
40	Financing costs				Excl	
41	GST				Excl	
	Total Development Costs	**4,180**				**146,313,00€**

Class 3 Low rise

Item	Area	Cost/ m2 on GFA	Unit	Quantity	Rate $	Cost $
	Building Works					
	Carparking					
1	On grade carparking		m2	500	150	75,000
	Hotel Entry					
2	Reception		m2	50	2,500	125,000
3	Administration		m2	100	2,300	230,000
	Accommodation					
	Hotel Rooms					
4	Standard		m2	2,400	2,800	6,720,000
5	Executive suites		m2			Excl
6	DDA		m2	100	2,300	230,000
7	Linen stores		m2	100	2,300	230,000
8	F&B		m2	75	2,300	172,500
9	House keeping		m2	100	2,300	230,000
10	Kitchen		m2	150	3,500	525,000
11	Storage support to kitchen		m2	75	3,000	225,000
12	Laundry		m2	100	2,500	250,000
	Public Spaces					
13	Restaurant		m2	250	3,200	800,000
14	Lift		no	2	90,000	180,000
	External Works					
15	Site works/clearance		m2	1,500	25	37,500
16	Allowance for forming building platforms		m2	1,000	50	50,000
17	Swimming pools		Item			120,000
18	Tennis courts (2 number)		no			Excl
19	Allowance for new footpaths		Item			15,000
20	Roads		Item			25,000
21	Boundary fencing		Item			25,000
22	Entry gates/statements		Item			20,000
23	Allowance for internal fencing		Item			10,000
24	Retaining Walls		Item			Excl
25	Allowance for minor landscaping works		Item			75,000
26	External electrical services (lighting to carparks)		Item			35,000
27	New sub-station					Excl
28	External gas services					20,000
29	External water services		Item			25,000
30	External fire services (including booster pump and tanks)					50,000
31	External sewer services		Item			45,000
32	Environmental septic system		Item			Excl
33	External stormwater services		Item			35,000
34	Allowance for rainwater tanks and services upgrade		Item			50,000
	Gross Floor Area (GFA)	3,500				
	Sub-Total for Trade Works	**2,656**				**10,630,000**
35	Add staging costs					Excl
36	Add escalation					Excl
	Sub-Toal for Construction Costs	**2,656**				**10,630,000**
37	Add Design Contingency @ 10%					1,063,000
38	Add Construction Contigency @ 5%					584,650
39	Add Professional Fees @ 12%					1,473,318
40	Upgrading Infrastructure Services					Excl
41	Excavtion in rock					Excl
42	FF&E		10%			1,063,000
43	AV		4%			Excl
44	IT		4%			Excl
45	Decanting					Excl
46	Financing costs					Excl
47	GST					Excl
	Total Development Costs	**3,702**				**14,814,000**

Class 2 low rise

Item	Area	Cost/ m2 on GFA	Unit	Quantity	Rate $	Cost $
	Building Works					
1	On grade carparking		m2	500	150	75,000
2	Main entry lobby		m2			-
3	Apartments		m2	3,000	2,600	7,800,000
4	Ancillary areas (common/lift lobies)		m2	500	1,800	900,000
5	Lift		No	2	90,000	180,000
	External Works					
6	Site works/clearance		m2	1,500	25	37,500
7	Allowance for forming building platforms		m2	1,000	50	50,000
8	Swimming pools		Item			120,000
9	Tennis courts (2 number)		no		Excl	
10	Allowance for new footpaths		Item			15,000
11	Roads		Item			25,000
12	Boundary fencing		Item			25,000
13	Entry gates/statements		Item			20,000
14	Allowance for internal fencing		Item			10,000
15	Retaining Walls		Item		Excl	
16	Allowance for minor landscaping works		Item			75,000
17	External electrical services		Item			35,000
18	New sub-station				Excl	
19	External gas services					20,000
20	External water services		Item			25,000
21	External fire services (including boaster pump but excluding tanks)					50,000
22	External sewer services		Item			45,000
23	Environmental septic system		Item		Excl	
24	External stormwater services		Item			35,000
25	Allowance for rainwater tanks and services upgrade		Item			50,000
	Gross Floor Area (GFA)	3,500				
	Sub-Total for Trade Works	**2,397**				**9,592,500**
26	Add staging costs				Excl	
27	Add escalation				Excl	
	Sub-Toal for Construction Costs	**2,397**				**9,592,500**
28	Add Design Contingency @ 10%					959,250
29	Add Construction Contigency @ 5%					527,588
30	Add Professional Fees @ 12%					1,329,521
31	Upgrading Infrastructure Services				Excl	
32	Excavtion in rock				Excl	
33	FF&E		10%		Excl	
34	AV		4%		Excl	
35	IT		4%		Excl	
36	Decanting				Excl	
37	Financing costs				Excl	
38	GST				Excl	
	Total Development Costs	**3,101**				**12,409,000**

APPENDIX C

CAPITAL UPGRADE COST

Class 3 - Based on upgrade every 10 years

					plus 20 year refurbishment		plus 30 year refurbishment	
High Rise	**Use**	**Area (m2)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**
Class 3	Residential	20000	$1,700.00	$34,000,000.00	$1,900.00	$38,000,000.00	$2,100.00	$42,000,000.00
	Carpark	4000	$500.00	$2,000,000.00	$600.00	$2,400,000.00	$750.00	$3,000,000.00
	Ancillary	11000	$1,700.00	$18,700,000.00	$1,900.00	$20,900,000.00	$2,100.00	$23,100,000.00
				$54,700,000.00		**$61,300,000.00**		**$68,100,000.00**

					plus 20 year refurbishment		plus 30 year refurbishment	
Low Rise	**Use**	**Area (m2)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**
Class 3	Residential	2500	$1,700.00	$4,250,000.00	$1,900.00	$4,750,000.00	$2,100.00	$5,250,000.00
	Carpark	1000	$500.00	$500,000.00	$600.00	$600,000.00	$750.00	$750,000.00
	Ancillary	500	$1,700.00	$850,000.00	$1,900.00	$950,000.00	$2,100.00	$1,050,000.00
				$5,600,000.00		**$6,300,000.00**		**$7,050,000.00**

Class 2 – Based on full upgrade every 15 years

					plus 30 year refurbishment		plus 45 year refurbishment	
High Rise	**Use**	**Area (m2)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**
Class 2	Residential	22000	$1,300.00	$28,600,000.00	$1,550.00	$34,100,000.00	$1,800.00	$39,600,000.00
	Carpark	8000	$500.00	$4,000,000.00	$600.00	$4,800,000.00	$750.00	$6,000,000.00
	Ancillary	5000	$1,300.00	$6,500,000.00	$1,550.00	$7,750,000.00	$1,800.00	$9,000,000.00
				$39,100,000.00		**$46,650,000.00**		**$54,600,000.00**

					plus 30 year refurbishment		plus 45 year refurbishment	
Low Rise	**Use**	**Area (m2)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**
Class 2	Residential	3000	$1,300.00	$3,900,000.00	$1,550.00	$4,650,000.00	$1,800.00	$5,400,000.00
	Carpark	500	$500.00	$250,000.00	$600.00	$300,000.00	$750.00	$375,000.00
	Ancillary	500	$1,300.00	$650,000.00	$1,550.00	$775,000.00	$1,800.00	$900,000.00
				$4,800,000.00		**$5,725,000.00**		**$6,675,000.00**

APPENDIX D

COMPARISON OF CLASS 2 AND PROPOSED CLASS 2b REQUIREMENTS

BCA Clause	Class 2 Requirement	Class 2b Requirement	Difference in requirements
Section C – Fire Resistance			
Spec C1.1 Table 2 Fire Resisting Construction	Fire resistance levels for Class 2 are generally 90 minute as per Table 2 of Spec C1.1. Fire isolated stairways for Class 2 occupancy must have FRL 90/90/90.	Fire resistance levels for Class 2b to be same as Class 2 generally 90 minute as per Table 2 of Spec C1.1. Fire isolated stairways for Class 2b occupancy must have FRL 90/90/90.	No difference for the case study buildings.
Section D – Access and Egress			
D1.3 Fire Isolated exits	A stairway that connects more than 2 stories in a Class 2 building must be fire isolated.	Class 2b same requirement as Class 2.	No Additional requirements for Class 2b building open stairs to be permitted as per Class 2 low rise building
D1.13 Number of people accommodated	There is no requirement for maximum number of people for a Class 2 use.	Class 2b same requirement as Class 2.	No difference for the case study buildings
Part D3 – Access for people with Disabilities			
D3.1 General building access requirements	Access for people with disabilities is required to Class 2 buildings to all common areas	Access for people with disabilities is required to Class 2b buildings to all common areas and a proportion of SOU's	Additional requirements for Class 2b building is provision of accessible SOU's – see details below
D3.2 Access to buildings	Access is to be provided from boundary and any adjacent building on the same allotment to the main entry points of the building.	Access is to be provided from boundary, accessible car parking and any adjacent building on the same allotment to the main entry points of the building.	Additional requirements for Class 2b building is that access is required from car parking to the main entry points – see details below

D3.1 General building access requirements	Access is to be provided to all areas of the building available to residents being the principal entrance, lift lobby, accessible carspace, and the like. For any retail/commercial levels access is required from accessible car parking space and common areas in accordance with AS1428.1. The design of the required number of SOU's and the internal features (door circulation, toilet etc) are to comply with AS1428.1. Circulation spaces to and within the accessible SOU's (hotel rooms) must meet AS1428.1. In addition, public corridors to the rooms are to meet the minimum requirement for circulation spaces to unit entry doors (accessible units only) and also include suitable turning spaces and passing spaces within the corridor of 1800 W x 2000 D passing spaces every 20m and 1540 x 2000 turning spaces at each end of the corridors. Not less than 1 of each unique facilities provided for the Class 3 residents e.g. gym, retail or the like,	Access is to be provided to all areas of the building available to residents being the principal entrance, lift lobby, accessible carspace, accessible SOU's and the like. For any retail/commercial levels access is required from accessible car parking space and common areas in accordance with AS1428.1. The design of the required number of SOU's and the internal features (door circulation, toilet etc) are to comply with AS1428.1. Circulation spaces to and within the accessible SOU's (hotel rooms) must meet AS1428.1. Summary BCA Table D3.1 – Number of Class 3 accessible units. 1- 10 SOU's = 1 accessible 11 - 40 SOU's = 2 accessible 41 - 60 SOU's = 3 accessible 61 - 80 SOU's = 4 accessible 81 - 100 SOU's = 5 accessible 101 - 200 SOU's = 5 + 1 per 25 201 - 500 SOU's = 9 + 1 per 50 The Class 3 provisions should be applied pro rata based on the number of Class 2b occupancies.	Additional requirements for Class 2b building based on 50% use as Class 2 and 50% use as Class 2b Case study A • The high rise serviced apartment building requires access and circulation space to the retail and commercial spaces, function rooms, restaurants etc • # 6 accessible serviced apartments (including associated facilities) are required – see details below Case study B • The low rise serviced apartment building requires access and circulation space to the retail and commercial spaces, function rooms, restaurants etc • # 3 accessible serviced apartments (including associated facilities) are required – see details below

	must also be fully accessible to AS 1428.1 – 2009. Where a swimming pool is provided and the pool edge has a total perimeter of 40m or more then access into that pool is to be provided as per BCA D3.10 such as a hoist.	In addition, public corridors to the rooms are to meet the minimum requirement for circulation spaces to unit entry doors (accessible units only) and also include suitable turning spaces and passing spaces within the corridor of 1800 W x 2000 D passing spaces every 20m and 1540 x 2000 turning spaces at each end of the corridors. Not less than 1 of each unique facilities provided for the Class 3 residents e.g. gym, retail or the like, must also be fully accessible to AS 1428.1 – 2009. Where a swimming pool is provided and the pool edge has a total perimeter of 40m or more then access into that pool is to be provided as per BCA D3.10 such as a hoist.	
D3.3 Parts of buildings to be accessible	Access and circulation is required to above areas served by a ramp, lift including provision for passing spaces.	Access and circulation is required to above areas served by a ramp, lift including provision for passing spaces.	No difference for the case study buildings
D3.5 Accessible Carparking	Not applicable to Class 2 buildings	Accessible car parking spaces are to be provided at a ratio based on the total number of Class 2b car parking spaces provided. Where carparking is provided for Class 2b residents the number of accessible carspaces is calculated by multiplying the total number of Class 2b carspaces by	Additional requirements for Class 2b building Case study A • The high rise serviced apartment building requires # 3 number of accessible carspaces Case study B

		the % of accessible SOU's to the total number of Class 2b SOU's. The nature and layout of the accessible carspaces are to be as per AS 2890.6-2009.	• The low rise serviced apartment building requires # 1 number of accessible carspaces
D3.6 Signage	Not applicable to the Class 2 case study buildings	Class 2b same requirement as Class 2.	No difference for the case study buildings
D3.7 Hearing Augmentation	Not applicable to the Class 2 case study buildings	Class 2b same requirement as Class 2.	No difference for the case study buildings
D3.8 Tactile Indicators	Not applicable to the Class 2 case study buildings	Tactile indicators are require to stairways and ramps used by public excluding fire isolated stairs.	Additional requirements for Class 2b building • The serviced apartment building requires tactile indicators to all communication stairs throughout the building
PART E – Services and Equipment			
E1.5 Sprinklers	Sprinkler system required to buildings with effective height greater than 25m.	Sprinkler system required to buildings with effective height greater than 25m.	No difference for the case study buildings
E2.2a Smoke Hazard Management	Smoke detection system to be provided throughout building. Class 2 has concession (option) of providing AS3786 smoke alarms to SOU's and common areas connected to a building occupant warning system in buildings less than 25m effective height A building occupant warning system is to achieve 85dBA at SOU door.	Class 2b same requirement as Class 2.	No difference for the case study buildings

PART E3 – Lift Installations			
E3.6 Passenger Lifts	Class 2 where a lift is provided access to all levels is required Where serving a building over 12m effective height the lift shaft serving the Class 2 part of the building will be required to meet requirements of BCA E3.6 and AS1735.12. Lift car requires a minimum size of 1400mm x 1600mm with 900mm clear door width. Sensor heights, call buttons and grab rails are to be in accordance with AS1735.12.	Class 2b buildings requires access to all parts of the building. Where serving a building over 12m effective height the lift shaft serving the Class 2b part of the building will be required to meet requirements of BCA E3.6 and AS1735.12. Lift car requires a minimum size of 1400mm x 1600mm with 900mm clear door width. Sensor heights, call buttons and grab rails are to be in accordance with AS1735.12.	No difference for the case study buildings
PART E4 – Emergency Lighting, Exit Signs and Warning Systems			
E4.9 Sound systems and intercom systems for emergency purposes	Building with effective height greater than 25m requires a sound and intercom system for emergency purposes in accordance with AS1670.4.	Building with effective height greater than 25m requires a sound and intercom system for emergency purposes in accordance with AS1670.4.	No difference for the case study buildings
PART F2 – Sanitary and other Facilities			
F2.1 F2.4 Sanitary and other facilities	Sanitary and other facilities are required to SOU's and include: • Kitchen sink and cooking	Class 2b same requirement as Class 2.	No difference for the case study buildings

	facilities • Bath or shower • Closet pan and washbasin • Laundry facilities including space for washing machine, wash tub and dryer		
F4.1	Natural Light to all habitable rooms	Class 2b same requirement as Class 2.	No difference for the case study buildings
PART J – Energy Efficiency			
J1 Building Fabric	A Class 2 building is to meet the performance provisions of the BCA through a star rating energy assessment.	Class 2b same requirement as Class 2.	No difference for the case study buildings
J2.4 Glazing	A Class 2 building is to meet the performance provisions of the BCA through a star rating energy assessment.	Class 2b same requirement as Class 2.	No difference for the case study buildings
J2.5 Shading	Where adjustable shading is installed to meet Part J2.2 or J2.4, a Class 2 building is to have manual, electrical or mechanical operation of shading device.	Class 2b same requirement as Class 2.	No difference for the case study buildings
J5.2 Air-conditioning and ventilation systems	Air-conditioning systems within a SOU must be capable of being inactive when the SOU is not being occupied.	Air-conditioning systems within a SOU must be capable of being inactive when the SOU is not being occupied. Additionally, a Class 2b SOU must be capable of controlling the temperature at a different temp during sleeping periods	Additional requirements for Class 2b building • Air-conditioning systems must be capable of being inactive when the SOU is not being occupied and must be capable of controlling the temperature at a different temp during sleeping periods than during other periods.

		than during other periods and must not operate when any external door is open for more than 1 minute.	• Air-conditioning unit must not operate when any external door is open for more than 1 minute.
J6.2 Artificial Lighting	Not applicable within a SOU in Class 2 building.	Class 2b SOU's must have artificial lighting in accordance with Table J6.2a. That is, have max Lamp power density (W/m2) of 10.	Additional requirements for Class 2b building • Artificial lighting is restricted to a max Lamp power density of 10
J6.2a(a) Interior artificial lighting and power control	Not applicable within a SOU in a Class 2 building.	Artificial lighting of a room or space within Class 2b building (including SOU's) must be individually operated by a switch or other control device. Each room to have its own switch for control of lighting.	Additional requirements for Class 2b building • Artificial lighting must be individually operated by a switch or other control device. • Each room to have its own switch for control of lighting.
J6.2a(b) Interior artificial lighting and power control	Not applicable within a SOU in a Class 2 building.	An occupant activated device (motion detector or like) must be provided in a SOU to cut power to artificial lighting, air-conditioner, local exhaust fans and bathroom heater when SOU is not occupied.	Additional requirements for Class 2b building • An occupant activated device (motion detector or like) must be provided to cut power to artificial lighting, air-conditioner, local exhaust fans and bathroom heater when hotel suite is not occupied.
J8.1 Access for maintenance and facilities for monitoring	Not applicable within a SOU in a Class 2 building.	Access for maintenance is to be provided throughout the Class 2b part of the building. Sole Occupancy Units within Class 2b need to achieve compliance with this clause for access for service maintenance and fault monitoring.	Additional requirements for Class 2b building • access for service maintenance and fault monitoring.

APPENDIX E

Class 2a High Rise

Item	Area	Cost/ m2 on GFA	Unit	Quantity	Rate $	Cost $
	Building Works					
1	Above ground carparking		m2	8,000	1,200	9,600,000
2	Main entry lobby		m2	300	4,000	1,200,000
3	Apartments		m2	21,790	4,000	87,160,000
4	DDA Apartments		m2	210	4,200	882,000
5	Ancillary areas (common/lift lobies)		m2	4,250	2,800	11,900,000
6	Back of house		m2	400	2,600	1,040,000
7	Gym (including equipment)		m2	50	3,500	175,000
8	Administration		m2	-	-	-
9	Lift		no	4	730,000	2,920,000
	External Works					
10	Site works/clearance		m2	3,000	25	75,000
11	Allowance for forming building platforms		m2	2,000	50	100,000
12	Swimming pools		Item			350,000
13	Tennis courts (2 number)		no	2	60,000	120,000
14	Allowance for new footpaths		Item			25,000
15	Roads		Item			75,000
16	Boundary fencing		Item			100,000
17	Entry gates/statements		Item			50,000
18	Allowance for internal fencing		Item			25,000
19	Retaining Walls		Item			Excl
20	Allowance for minor landscaping works		Item			150,000
21	External electrical services		Item			75,000
22	New sub-station					150,000
23	External gas services					75,000
24	External water services		Item			75,000
25	External fire services (including boaster pump and tanks)					750,000
26	External sewer services		Item			125,000
27	Environmental septic system		Item			Excl
28	External stormwater services		Item			100,000
29	Allowance for rainwater tanks and services upgrade		Item			250,000
	Gross Floor Area (GFA)	35,000				
	Sub-Total for Trade Works	**3,358**				**117,547,000**
30	Add staging costs					Excl
31	Add escalation					Excl
	Sub-Toal for Construction Costs	**3,358**				**117,547,000**
32	Add Design Contingency @ 10%					11,754,700
33	Add Construction Contigency @ 5%					6,465,085
34	Add Professional Fees @ 12%					16,292,014
35	Upgrading Infrastructure Services					Excl
36	Excavtion in rock					Excl
37	FF&E		10%			Excl
38	AV		4%			Excl
39	IT		4%			Excl
40	Decanting					Excl
41	Financing costs					Excl
42	GST					Excl
	Total Development Costs	**4,345**				**152,059,000**

Class 2a Low rise

Item	Area	Cost/ m2 on GFA	Unit	Quantity	Rate $	Cost $
	Building Works					
1	On grade carparking		m2	500	150	75,000
2	Main entry lobby		m2			-
3	Apartments		m2	2,850	2,800	7,980,000
4	DDA Apartments		m2	150	3,000	450,000
5	Ancillary areas (common/lift lobies)		m2	500	1,800	900,000
6	Lift		No	2	90,000	180,000
	External Works					
7	Site works/clearance		m2	1,500	25	37,500
8	Allowance for forming building platforms		m2	1,000	50	50,000
9	Swimming pools		Item			120,000
10	Tennis courts (2 number)		no			Excl
11	Allowance for new footpaths		Item			15,000
12	Roads		Item			25,000
13	Boundary fencing		Item			25,000
14	Entry gates/statements		Item			20,000
15	Allowance for internal fencing		Item			10,000
16	Retaining Walls		Item			Excl
17	Allowance for minor landscaping works		Item			75,000
18	External electrical services		Item			35,000
19	New sub-station					Excl
20	External gas services					20,000
21	External water services		Item			25,000
22	External fire services (including boaster pump but excluding tanks)					50,000
23	External sewer services		Item			45,000
24	Environmental septic system		Item			Excl
25	External stormwater services		Item			35,000
26	Allowance for rainwater tanks and services upgrade		Item			50,000
	Gross Floor Area (GFA)	3,500				
	Sub-Total for Trade Works	**2,554**				**10,222,500**
27	Add staging costs					Excl
28	Add escalation					Excl
	Sub-Toal for Construction Costs	**2,554**				**10,222,500**
29	Add Design Contingency @ 10%					1,022,250
30	Add Construction Contigency @ 5%					562,238
31	Add Professional Fees @ 12%					1,416,839
32	Upgrading Infrastructure Services					Excl
33	Excavtion in rock					Excl
34	FF&E		10%			Excl
35	AV		4%			Excl
36	IT		4%			Excl
37	Decanting					Excl
38	Financing costs					Excl
39	GST					Excl
	Total Development Costs	**3,304**				**13,224,000**

APPENDIX F

CAPITAL UPGRADE COST Class 2 – Based on full upgrade every 15 years

					plus 30 year refurbishment		plus 45 year refurbishment	
High Rise	**Use**	**Area (m2)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**
Class 2a	Residential	22000	$1,400.00	$30,800,000.00	$1,650.00	$36,300,000.00	$1,900.00	$41,800,000.00
	Carpark	8000	$500.00	$4,000,000.00	$600.00	$4,800,000.00	$750.00	$6,000,000.00
	Ancillary	5000	$1,400.00	$7,000,000.00	$1,650.00	$8,250,000.00	$1,900.00	$9,500,000.00
				$41,800,000.00		**$49,350,000.00**		**$57,300,000.00**

					plus 30 year refurbishment		plus 45 year refurbishment	
Low Rise	**Use**	**Area (m2)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**	**Rate ($/m2)**	**Cost ($)**
Class 2a	Residential	3000	$1,400.00	$4,200,000.00	$1,650.00	$4,950,000.00	$1,900.00	$5,700,000.00
	Carpark	500	$500.00	$250,000.00	$600.00	$300,000.00	$750.00	$375,000.00
	Ancillary	500	$1,400.00	$700,000.00	$1,650.00	$825,000.00	$1,900.00	$950,000.00
				$5,150,000.00		**$6,075,000.00**		**$7,025,000.00**

APPENDIX G

1. Fire Risk Assessment

This appendix aims to identify, if any, differences between the characteristics of Class 2 and Class 3 buildings in terms of fire life safety. The characteristics considered relevant in relation to fire risk are, but not limited to, as follows:

- Occupant characteristics
  - behaviour in fire emergencies;
  - way finding;
  - response and pre-movement times in evacuation scenarios;
- Fire hazards characteristics;
  - Fire loads;
  - Ignition sources;
- Fire statistics
  - ignition frequency;
  - deaths and injuries from fires;
  - effectiveness of fire safety systems

4.5 Occupant Characteristics

This section contains general descriptions of occupants' characteristics and associated behaviour related to fire emergencies.

a) Occupant Profile

The responses expected and resulting actions taken in the event of a fire is a complex network of events. Response is commonly referring to the stage of evacuation occurring after one or several fire cues have made an occupant aware of the danger (BSI, 2004). Studies have shown a large variation in actions taken upon receiving a cue of the fire hazard (Bryan, 2008). Proulx lists some occupant characteristics that have shown to affect the evacuation time (Proulx, 2008):

Familiarity. Occupants who are familiar with a building, have been exposed to evacuation drills and have knowledge of evacuation procedures are more likely to start evacuation early.

Responsibility. Where occupants are responsible for the alarm signal (e.g. in a sole occupancy unit) these have shown to respond more quickly compared to buildings where others are responsible for them where a behaviour of awaiting further instructions is more likely.

Social affiliation. Occupants with emotional ties (e.g. families) tend to evacuate together. Gathering others (e.g. family members) before evacuating may increase the response time until evacuation is commenced.

Commitment. Occupants who are committed to an activity are less inclined to respond readily to alarm signals. However, if the activity is disrupted, occupants have shown very responsive to alarm signals.

Alertness and limitation. Occupants in a lower state of consciousness, such as sleeping, will have an increased response time. Occupants with disabilities or on medication or drugs may be associated with an increased delay before evacuation is commenced.

Staff or warden. Presence of trained staff or wardens may dramatically reduce the delay time as occupants respond to their status.

	Class 2	Class 3
Familiarity	As the building is expected to be occupied by long-term residents, these are expected to have good knowledge of building layout and evacuation routes. Although expected to be rare for apartment buildings, occupants may be trained in evacuation or emergency procedures.	Occupants are not expected to have any previous knowledge of the building layout or egress routes. Occupants are not expected to have any emergency training. Knowledge of evacuation routes may be acquired through mandatory evacuation plans (fire orders). Uncertainty exists in how many occupants self-educate during stays in these types of occupancies.
Responsibility	Occupants are expected to have a perceived responsibility for alarm signals generated within their dwelling and some responsibility of signals within the remainder of the building.	Occupants expected to act on alarm signals generated within their sole occupancy unit. However, they may be less inclined to act on other alarm signals within the building due to the presence of staff and perceived responsibility.
Social affiliation	Long-term residencies are associated with places of residents having emotional ties between them (e.g. families, friends, neighbours). As such, it can be expected that occupants will try to gather others before evacuating.	If several occupants are located within a sole occupancy unit in a Class 3 building, it is likely that these are families or groups of friends. Unless a party is occupying several sole occupancy units throughout the building, no social affiliation is expected to the remainder of the occupants. An exception may be hostels or similar housing where occupants may share room although not being socially affiliated. This type of occupancy is also more difficult to classify in terms of social affiliation as it is not uncommon that friends or families are spread over several sole occupancy units. It is also generally a more social accommodation with occupants with no previous social affiliation may form such bonds.
Commitment	As it is a place of residence, occupants may be involved in a wide range of activities. In terms of	Occupants may be committed to activities such as watching TV, reading, etc. However, the range of activities is

	commitment, it is not unlikely that occupants may be distracted by activities undertaken.	expected to be smaller than a place of usual residence. It is also expected that residing in a Class 3 building is commonly associated with activities outside the building (e.g. holidays, work-related stays, etc.).
Alertness and limitation	Occupants may be awake or asleep or under the influence of alcohol/drugs. Occupants with physical/intellectual disability may be present in building.	Occupants may be awake or asleep or under the influence of alcohol/drugs. Occupants with physical/intellectual disability may be present in building.
Staff or warden	No requirements in the BCA.	No requirements in the BCA. It is considered more likely that Class 3 occupancies, especially hotels, have some type of emergency procedure and staff training in place.

It is considered that Class 3 occupants may be less familiar with the environment and perceive alarm signals other than generated within their sole occupancy unit as not being their responsibility. This may result in occupants being less inclined to take action and/or being warned if a fire actually has occurred.

The Class 3 occupants on the other hand are expected to be less committed to any activities undertaken in their sole occupancy units and less likely to have social affiliation with others in the building (especially outside their sole occupancy unit), the response time upon recognition of the danger may be less compared to a Class 2 building.

b) Pre-movement Time

The pre-movement time is the combined length of occupant recognition and response time, i.e. the time an occupant needs to recognize an alarm signal or cue and all actions taken before evacuation is commenced.

The pre-movement time is strongly correlated to occupant and building characteristics and the presence of any fire safety management. The type of warning system and building complexity has also been shown to have some dependence on the pre-movement time. (BSI, 2004)

Published Document 7974-6 contains a method to suggest pre-movement times of occupants based on the level of awareness, the type of alarm system provided, building complexity and fire safety management organization (BSI, 2004). The method was derived using data from studies on occupant evacuation times. Below follows an explanation of the different factors used to derive a suggested pre-movement time for different design scenarios in accordance with this method. Figure 1 provides a guide to classify the occupancy based on awareness, familiarity, occupant density and building complexity.

Category	Occupant alertness	Occupant familiarity	Occupant density	Enclosures/ complexity	Examples of Occupancy types
A	Awake	Familiar	Low	One or many	Office or industrial
B1	Awake	Unfamiliar	High	One or few	Shop, restaurant, circulation space
B2	Awake	Unfamiliar	High	One with focal point	Cinema, theatre
	Asleep	Familiar	Low	Few	Dwelling
Ci	Long term: individual occupancy.				Without 24 h on site management.
Cii	Managed occupancy:				Serviced flats, halls of residence, etc.
Ciii	Asleep	Unfamiliar	Low	Many	Hotel, hostel
D	Medical care	Unfamiliar	Low	Many	Residential (institutional)
E	Transportation	Unfamiliar	High	Many	Railway station/Airport

Figure 1: Occupancy classification using PD7974-6 method (BSI, 2004)

A1 to A3, in Figure 2, is used for different alarm systems, where

- A1 is an automatic detection system throughout the building, activating an immediate general alarm to occupants of all affected parts of the building. If a voice alarm system is used, the time taken for the message to be spoken twice should be added to the alarm time.

- A2 is an automatic detection system throughout the building providing a pre-alarm to management or security, with a manually activated general warning system sounding throughout affected occupied areas and a general alarm after a fixed delay if the pre-alarm is not cancelled. If a voice alarm system is used, the time taken for the message to be spoken twice should be added to the alarm time.

- A3 is a local automatic detection and alarm only near the location of the fire or no automatic detection, with a manually activated general warning system sounding throughout all affected occupied areas.

B1 to B3, in Figure 2, is used to classify building complexity, where

- B1 represents a simple rectangular single storey building, with one or few enclosures and a simple layout with good visual access, prescriptively designed with short travel distances, and a good level of exit provision with exits leading directly to the outside of the building. Example: simple supermarket.

- B2 represents a simple multi-enclosure (usually multi-storey) building, with most features prescriptively designed and simple internal layouts. Example: simple multi-storey office block.

- B3 represents a large complex building. This includes large building complexes with integration of a number of existing buildings on the same site, common with old hotel or department stores, also large modern complexes such as leisure centres, shopping centres and airports. Important features are that internal layout and enclosures involve often large and complex spaces so that occupants may be presented with way finding difficulties during an evacuation and the management of an evacuation therefore presents particular challenges.

M1 to M3, in Figure 2, are used to classify the level of fire safety management on site, where

- M1 represents a situation where the normal occupants (staff or residents) should be trained to a high level of fire safety management with good fire prevention and maintenance practice, floor wardens, a well-developed emergency plan and regular drills. For “awake and unfamiliar” there should be a high ratio of trained staff to visitors. The system and procedures are subject to independent certification, including a regular audit with monitored evacuations for which the performance must match the assumed design performance. Security videotapes from any accidents or unwanted alarms are made available for audit under the certification scheme. This level would usually also imply a well designed building with obvious and easy to use escape routes (to level B1 or at least B2), with automatic detection and alarm systems to a high level provision (level A1). If used by the public, a voice alarm system should be provided.

- M2 is similar to M1, but have a lower staff ratio and floor wardens may not always be present. There may be no independent audit. Building features may be level B2 or B3 and alarm system A2. The design escape and evacuation times will be more conservative than for a level M1 system.

- M3 represents standard facilities with basic minimum fire safety management. There is no independent audit. The building may be level B3 and alarm system A3. This is not suitable for a fire-engineered design unless other measures are taken to ensure safety, such as restrictions on fire performance on contents, high levels of passive protection and/or active systems.

The suggested pre-movement times for occupants can be estimated from Figure 2 after classifying the building to the above described factors.

Scenario category and modifier	First occupants $\Delta t_{pre\ (1st\ percentile)}$	Occupant distribution $\Delta t_{pre\ (99th\ percentile)}$[a]
A: awake and familiar		
M1 B1 – B2 A1 – A2	0.5	1.0
M2 B1 – B2 A1 – A2	1	2
M3 B1 – B2 A1 – A3	*>15*	*>15*
For B3, add 0.5 for wayfinding		
M1 would normally require voice alarm/PA if unfamiliar visitors likely to be present		
B: awake and unfamiliar		
M1 B1 A1 – A2	0.5	2
M2 B1 A1 – A2	1.0	3
M3 B1 A1 – A3	*>15*	*>15*
For B2 add 0.5 for wayfinding		
For B3 add 1.0 for wayfinding		
M1 would normally require voice alarm/PA		
Ci: sleeping and familiar		
(e.g. dwellings – individual occupancy)		
M2 B1 A1	*5*	*5*
M3 B1 A3	*10*	*>20*
For other units in a block assume one hour		
Cii: managed occupancy		
(e.g. serviced apartments, hall of residence)		
M1 B2 A1 – A2	*10*	*20*
M2 B2 A1 – A2	*15*	*25*
M3 B2 A1 – A3	*>20*	*>20*
Ciii sleeping and unfamiliar		
(e.g. hotel, boarding house)		
M1 B2 A1 – A2	*15*	*15*
M2 B2 A1 – A2	*20*	*20*
M3 B2 A1 – A3	*>20*	*>20*
For B3, add 1.0 for wayfinding		
M1 would normally require voice alarm/PA		
D: medical care		
Awake and unfamiliar (e.g. day centre, clinic, surgery, dentist)		
M1 B1 A1 – A2	0.5	2
M2 B1 A1 – A2	1.0	3
M3 B1 A1 – A3	*>15*	*>15*
For B2 add 0.5 for wayfinding		
For B3 add 1.0 for wayfinding		
M1 would normally require voice alarm/PA		
Sleeping and unfamiliar (e.g. hospital ward, nursing home, old peoples' home)		
M1 B2 A1 – A2	5[b]	10[b]
M2 B2 A1 – A2	10[b]	20[b]
M3 B2 A1 – A3	*>10*[b]	*>20*[b]
For B3 add 1.0 for wayfinding		
M1 would normally require voice alarm/PA		
E: transportation (e.g. railway, bus station or airport)		
Awake and unfamiliar		
M1 B3 A1 – A2	1.5	4
M2 B3 A1 – A2	2.0	5
M3 B3 A1 – A3	*>15*	*>15*
M1 and M2 would normally require voice alarm/PA		

Figure 2: Pre-movement times using PD7974-6 occupant and building factors (BSI, 2004)

Class 2

The BCA requires a Class 2 building to have an automatic smoke detection and alarm system in accordance with Specification E2.2a. For Class 2 buildings, the minimum requirements in accordance with Specification E2.2a are generally as follows:

- Buildings 25 m or less effective height: Smoke alarms in accordance with AS3786 powered from mains source, other alarms suitable in accordance with AS1670.1 in areas where spurious signals are expected (e.g. kitchens), AS3786 smoke alarms in public spaces located in accordance with requirements for smoke detectors to AS1670.1 and connected to activate a building occupant warning system

- Buildings over 25 m effective height: Smoke alarms in accordance with AS3786 powered from mains source, sprinklers throughout need to be provided

A Class 2 building over 25 m effective height must also be provided with a sound system and intercom system for emergency purposes where applicable with AS1670.4.

A Class 2 building is required to provide at least one exit per storey for buildings less than 25 m effective height, which if exceeded, increases the minimum requirement to two exits.

The BCA does not require for a warden or emergency personnel in a Class 2 building.

Table 1: PD7974-6 method classification of minimum requirements for Class 2 buildings

Effective height	Storeys	Classification	Alarm	Complexity	Management
< 25 m	Any	Cii	A3	B2	M3
> 25 m	Any	Cii	A2	B2	M3

Using the above determined classification and alarm, complexity and management category, the BSI PD7974-6 method as per suggests a pre-movement time of 20 minutes (uncertain figure) for the 1st percentile of occupants and 40 minutes (uncertain figure) for 99th percentile occupant for buildings below 25 m effective height. For buildings over 25 m effective height, the method suggests a similar pre-movement time despite the increase in occupant warning system.

Class 3

The BCA requires a Class 3 building to have an automatic smoke detection and alarm system in accordance with Specification E2.2a. For Class 3 buildings, the minimum requirements in accordance with Specification E2.2a are perceived as follows:

- Buildings with two or less storeys or accommodating less than 20 residents for aged, children or people with disabilities purposes, and 25 m or less effective height: Smoke alarms in accordance with AS3786 powered from mains source, other alarms suitable in accordance with AS1670.1 in areas where spurious signals are expected (e.g. kitchens), AS3786 smoke alarms in public spaces located in accordance with requirements for smoke detectors to AS1670.1 and connected to activate a building occupant warning system

- Buildings with three or more storeys or accommodating 20 or more residents for aged, children or people with disabilities purposes, and 25 m or less effective height: Automatic smoke detection system to comply with AS1670.1 with detectors located within sole occupancy units and public spaces and activate the building occupant warning system, other alarms suitable in accordance with AS1670.1 in areas where spurious signals are expected (e.g. kitchens),

- Buildings over 25 m effective height: Automatic smoke detection system to comply with AS1670.1 with detectors located within sole occupancy units and activate the building occupant warning system, sprinklers throughout need to be provided

For Class 3, a sound system and intercom system for emergency purposes where applicable with AS1670.4 must be installed:

- in buildings over 25 m effective height

- in buildings having a rise in storeys of more than 2 and being used as a residential part of a school or accommodation for aged, children or people with disabilities

- in buildings used as residential aged care building, except that the system must be arranged to provide a warning for occupants, and in areas used by residents, may have its alarm adjusted in volume and content to minimise trauma consistent with the type and condition of residents

A Class 3 building is required to provide at least one exit per storey for buildings less than 25 m effective height, which if exceeded, increases the minimum requirement to two exits.

The BCA does not require for a warden or emergency personnel in a Class 3 building.

Table 2: PD7974-6 method classification of minimum requirements for Class 3 buildings

Effective height	Storeys	Classification	Alarm	Complexity	Management
< 25 m	< 3	Ciii	A3	B3	M3
< 25 m	≥ 3	Ciii	A2	B3	M3
> 25 m	Any	Ciii	A2	B3	M3

Table 2 suggests a pre-movement time of 21 minutes (uncertain value) for the 1st percentile occupants and 42 minutes (uncertain value) for the 99th percentile occupants in Class 3 buildings, regardless of number of storeys or height.

c) Way finding

Once an occupant or a group of occupants have responded to the hazard (which may include a large range of activities), this is the start of the movement phase. The movement phase constitutes of the occupant(s) trying to reach a place of safety. In apartment buildings and hotels, this is likely to involve travel through corridors and stairs in order to reach exits. In situations where the occupant is unfamiliar with the building environment or when necessary to travel through environments with obscured visibility, way finding (i.e. how people orientate themselves) may play an important role to the time to travel to a safe place.

Occupants familiar with the building will affect the necessary way finding in the event of a fire. As such, familiarity is associated with shorter travel times once an occupant has decided to evacuate (Rasbash et al., 2004).

Way finding in a building is also related to the complexity of the geometrical layout and the provision of safety systems such as exit signage and audible guidance signals. Certain layouts and spatial connections have been shown to be confusing to occupants (Kobes et al., 2010).

	Class 2	Class 3
Knowledge of building layout and location of fire exits	Expected to have good knowledge of at least one exit route as it is commonly used to enter building. This may not be the case for buildings with increasing height as it is expected that travel by elevators is more common to reach place of residence.	Expected that knowledge is limited to short exposure to building layout. In case travel to sole occupancy unit is commonly by elevator, occupants may have no or very limited knowledge of location of fire exits.
Perception of building complexity		Expected to be dependent on the individual layout. In a study, occupants did not perceive the hotel layout as complex (Kobes et al., 2010). However, the study showed that approximately 20% of occupants changed direction of travel.
Way finding	Minimal way finding in non obscured conditions is expected.	As occupants are expected to have little or no knowledge of location of exits, some way finding is expected. A quicker evacuation is expected when occupants have gathered knowledge of a fire exit (Kobes et al., 2010). An interesting find in the same study was that encountering smoke in the corridor yielded more rapid escape and shorter escape travel distances.

In un obscured escape conditions, way finding for Class 2 occupants is not considered necessary as they will most likely escape via the point of entrance. In smoke logged conditions, occupants may need longer times for way finding, however, they are expected to have knowledge of secondary exit routes.

In Class 3 buildings, the knowledge of locations of fire exits is expected to be dependent on the building layout and exposure to evacuation routes by normal means of access (e.g. if normally a stair is used for access which is also a fire exit). This is expected to be correlated to height of building where increased height of buildings may reduce the familiarity of exit locations as they have an increased likelihood of being served by lifts.

4.6 Fire Hazards

a) Fire Loads

Fire loads relates to the amount and energy content of combustibles throughout the building. A building with a high fire load may be associated with higher likelihood of fire start (as the presence of combustibles is more likely to be near ignition sources), a greater proportion of fire scenarios leading to flashover, longer fire duration, etc. compared to a building with a lower fuel load.

The fire load of a building is commonly measured in MJ per m^2, i.e. combustible energy content per unit area.

Class 2

Being long-term residencies for occupants, Class 2 buildings are commonly associated from fully furnished rooms and storage of personal belongings. The IFEG provides guidance of fire loads in different occupancies, however, no clear definition of the different occupancies is provided (ABCB, 2005). “Flats” have a suggested fire load of 300 MJ/m2 while “Homes” are given a fire load of 500 MJ/m2. “Homes for aged” is placed in between “Flats” and “Homes” with a fire load of 400 MJ/m2. These values all represent the average value of the occupancy category. The IFEG suggests that fire load densities in well defined occupancies, and dwellings being an example of such occupancies, have an associated coefficient of variation equal to 30 – 50 % of the average value.

Eurocode 1 part 1-2 ‘Actions on structures exposed to fire’ contains fire loads which are based on Gumbel distributions (CEN, 2002). The average fire load for “dwellings” is prescribed as 780 MJ/m2 with the 80% fractile value at 948 MJ/m2.

A detailed study of the energy contents of residential buildings was carried out in the city of Kanpur, India (Kumar & Rao, 1995). The buildings were one to four storeys tall with the majority of the occupancies containing four or less number of rooms. The overall average fire load was estimated to 487 MJ/m2 (116.5 Mcal/m2) with a standard deviation of 255 MJ/m2 (61 Mcal/m2).

A Canadian study of fire loads utilized a web-based distribution of survey forms to collect data of combustible contents in different types of dwellings (Bwalya et al., 2004). The average fire load density for apartment units was estimated to 550 MJ/m2, although the sample size was low (6 entries).

The Swedish National Board of Housing, Building and Planning publishes fire load data in a guidance document (Boverket, 2008). Dwellings, given as a single category, have a suggested 80% percentile value of 800 MJ/m2 variable fire load. The variable fire load is defined as the content introduced by furnishing and movable objects.

Class 3

The IFEG suggests a fire load of 300 MJ/m2 for hotels. Hotels are, similarly to dwellings, classified as “well-defined occupancies” and therefore have a coefficient of variation of 30 – 50 % of the average value.

Eurocode part 1-2 provides a suggested average fire load of 310 MJ/m2 for “hotel rooms” with the 80% fractile at 377 MJ/m2.

A recent study of fire loads in Switzerland and France resulted in a considerably sized data set (Thauvoye et al., 2009). For hotel occupancies, they analysed 6 receptions, 6 laundries and 10 guest rooms. The study included differentiating the combustibles into a fixed (e.g. doors, window frames) and non-fixed (e.g. bed, chair) categories. The statistical data is presented below in Error! Reference source not found..

Table 3: Fire loads in hotels (Thauvoye et al., 2009)

	Fire load density [MJ/m^2]		Total fire load density [MJ/m^2]	
	Mean	Stddev	Mean	Stddev
Reception	412	384	551	399
Room	297	114	562	138
Laundry	1279	763	1379	821

Data from the Swedish National Board of Housing, Building and Planning suggest an 80% percentile variable fire load of 400 MJ/m2 for hotel rooms (Boverket, 2008).

b) Ignition Sources

By analysing statistics on the leading causes of ignition, it is possible to determine where fires are most likely to occur and which types of fires are associated with occupants getting harmed.

Class 2

Based on U.S statistics, the leading cause of fires in apartments are cooking equipment which accounts for 61% of all fires (Ahrens, 2010). However, smoking constitutes by far the greatest risk to occupants as it constitutes 34% of all fire related deaths but only 7% of the total number of fires. Table 4 reproduces the data on leading causes of ignition between 2003 and 2007 for apartment buildings.

Table 4: Leading causes of ignition in U.S apartments, annual averages 2003 – 2007 (Ahrens, 2010)

Cause	Fires	Deaths	Injuries
Cooking equipment	68,600	130 (29%)	1,840 (47%)
Heating equipment	10,400	40 (10%)	300 (29%)
Smoking materials	7,500	150 (34%)	490 (13%)
Intentional	6,900	50 (11%)	310 (8%)
Candle	3,400	30 (7%)	340 (9%)
Electrical distribution and lighting equipment	2,700	30 (6%)	160 (4%)
Exposure fire	2,300	10 (2%)	20 (0%)[1]
Clothes dryer or washer	2,200	0 (0%)	80 (2%)
Playing with heat source	1,900	20 (4%)	230 (6%)

[1] Percentage noted as 2% in reference which seems to be an error

Class 3

U.S statistics on leading causes of ignition is presented in Table 5. below (Flynn, 2010). While the leading cause of ignition is cooking equipment, which is similar to the Class 2 (apartment) buildings, there are no associated fatalities with those fires. Fires from smoking materials constitute an even larger percentage of the deaths in hotels and motels with an average of 62%.

Table 5: Leading causes of ignition in U.S hotels and motels, annual averages 2003 – 2007 (Flynn, 2010)

Cause	Fires	Deaths	Injuries
Cooking equipment	1,590	0 (0%)	28 (18%)
Clothes dryer or washer	380	0 (0%)	14 (9%)
Heating equipment	320	0 (0%)	5 (3%)
Contained trash or rubbish fires	290	0 (0%)	2 (1%)
Electrical distribution and lighting equipment	240	0 (0%)	9 (6%)
Smoking materials	230	8 (62%)[1]	35 (23%)
Intentional	210	4 (31%)[1]	18 (12%)
Candle	100	1 (8%)[1]	8 (5%)

[1] Percentage noted in reference seems to be an error

Comparison

Figure 3, Figure 4 and Figure 5 contain comparisons between Class 2 and Class 3 buildings related to ignition sources. Figure 3 shows the distribution of leading causes of ignition in both building types. The majority of the fires are associated with cooking in both cases.

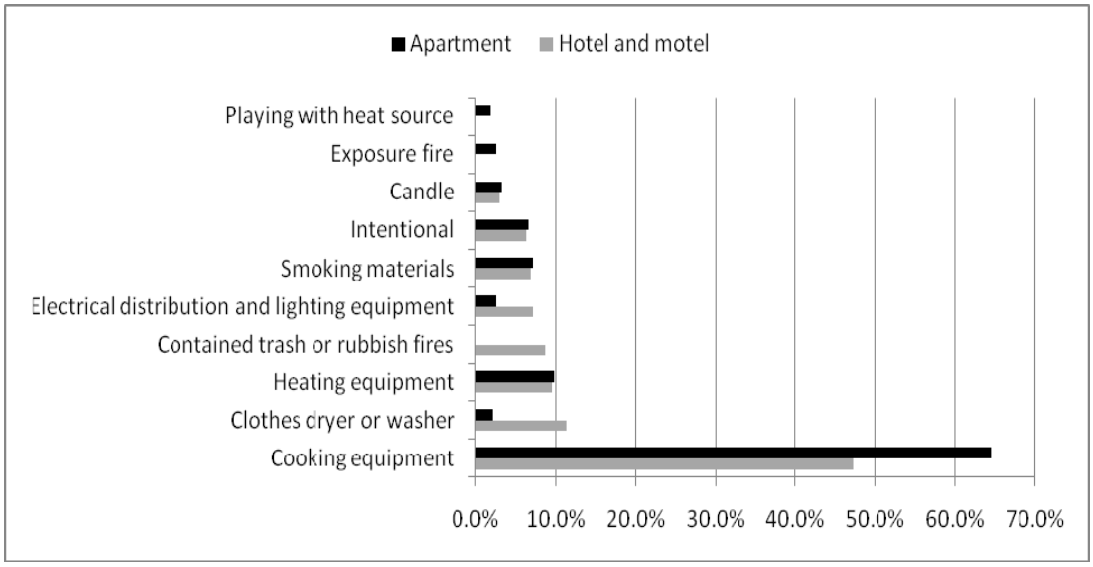

Figure 3: Comparison of leading cause of ignition between apartment and hotel/motel buildings

Figure 4 compares deaths by cause of ignition. In both building classes, smoking is the leading cause of death. It is interesting to note that although the majority of the fires in a Class 3 building are associated with cooking, no deaths were recorded for fires starting this way between years 2003 and 2007. It is theorized that in many hotels or motels, kitchen facilities are not provided within the sole occupancy units and therefore being associated with less deaths.

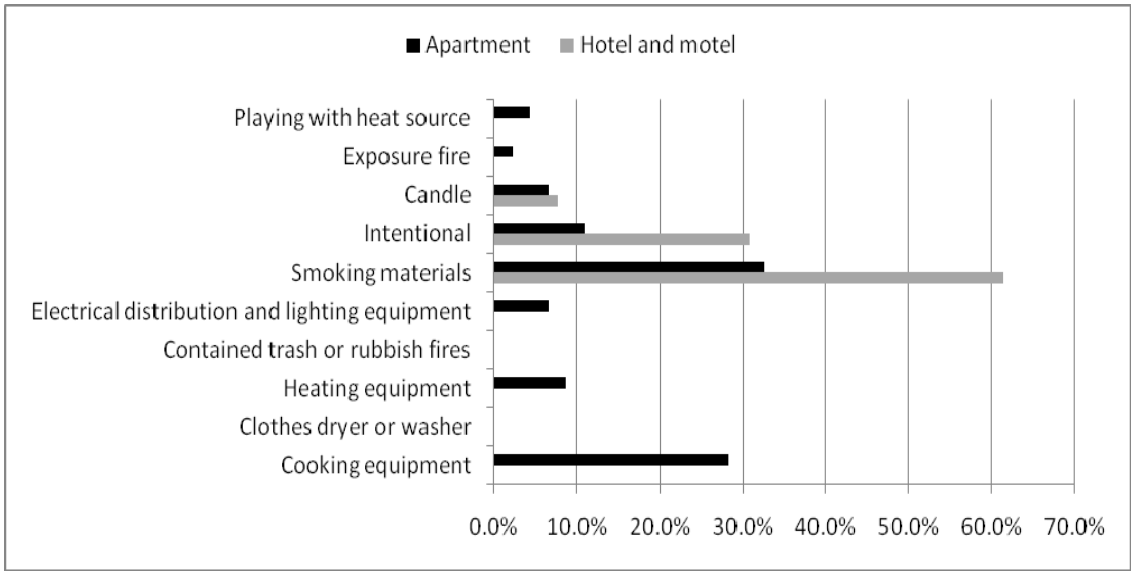

Figure 4: Comparison of deaths by cause of ignition between apartment and hotel/motel buildings

Figure 5 compares injuries by cause of ignition. Cooking constitutes nearly 50% of the fire related injuries in Class 2 buildings while the leading cause is smoking closely followed by cooking in Class 3 buildings.

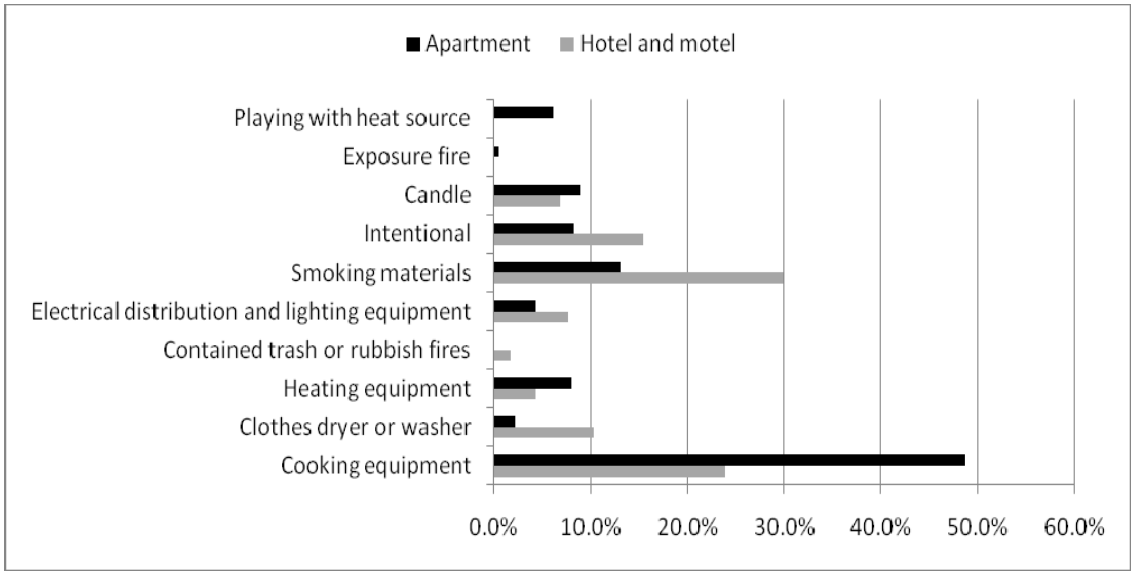

Figure 5: Comparison of injuries by cause of ignition between apartment and hotel/motel buildings

4.7 Fire Statistics

a) Ignition frequency

Available fire statistics associated with the different building classes are provided in the below section.

The frequency of unwanted events is a key figure in determining risk in quantitative terms. Traditionally, frequency of an unwanted event multiplied by the consequence is expressed as risk.

Frequency of ignition (or fire start) has been shown to be correlated to building floor area and type of occupancy. Below follows simple estimates of the ignition frequency in Class 2 and Class 3 buildings.

Class 2

The number of available data sources on ignition frequencies in apartment buildings are limited as apartment buildings are commonly included in more generalized categories such as 'dwellings' (BSI, 2003) or 'homes'.

Using data collected from fire events in Finland, estimates for different building types were derived (Tillander, 2004). For apartment buildings, a sample of 477 buildings generated an average ignition frequency of 6.1 x 10-6 per m2 and year.

Class 3

British Standards Published Document 7974-7 contains an expression for estimating the frequency of ignition as follows (BSI, 2003):

$$F = a \cdot A^b$$

Where

F ignition frequency [per year]

a,b occupancy characteristic constants [-]

A total floor area of building [m2]

The guidance documents suggest occupancy characteristic constants for "hotels, etc." as follows:

a = 0.00008

b = 1.0

Comparison

The correlation for both Class 2 and Class 3 are linearly proportional to the floor area of the building. The estimated ignition frequencies suggest that a fire occurring in a Class 3 building is approximately 13 times more likely than in a Class 2 building, assuming both buildings have the same total floor area.

It should be noted that the data used for the correlations in PD 7974-7 is considered a bit dated (Johansson, 1999). Both the data sources should be used with caution as they are not derived from Australian statistics.

A note on uncertainty

The above correlations have been derived from two different countries and in one case with data that may be dated. As the building, occupant behaviour and ignition sources profile is expected to vary between the countries for the derived correlations these might be biased as the correlation for hotels utilizes UK data while apartment building data is taken from Finland. Furthermore, it is also expected that the fire frequency in Australia for Class 2 and Class 3 buildings will differ from both of these countries.

Although the International Fire Engineering Guidelines references the UK and Finnish data referenced in this report, this introduces large uncertainties into any estimated risk measure (ABCB, 2005). Australian data on fire frequencies would be desirable as it would provide a more accurate estimate.

b) Fire related injuries and deaths

Detailed data on fire related deaths and injuries in Australia are not readily available to the public. Some statistics exists for fires in New South Wales, however, the detail of the statistics made publically available is very limited. The relatively low numbers of fires recorded indicate that the figures should be used with caution. Therefore, this report has aimed to find detailed data to compare with the prescriptive provisions for the different building classes of interest.

The U.S has a more developed fire incident data collection system (NFIRS). The National Fire Protection Association regularly releases reports summarizing these fire statistics for different types of buildings in the U.S. Although the prescriptive provisions are not identical for Australian and U.S building codes, the statistics can be useful to determine trends, which to a degree is related to non regulatory factors such as human behaviour and building complexity.

Class 2

Limited statistical data is available from the Fire & Rescue New South Wales (formerly New South Wales Fire Brigade) annual reports between 2003 and 2007 (NSW Fire Brigades, 2007). The data for injuries and fatalities is reproduced in Table 6 below.

Table 6: Fire related deaths and injuries in NSW apartment buildings between 2003 and 2007

Year	Fires	Deaths	Injuries
2003/2004	1285	3 (1 in 428)	160 (1 in 8)
2004/2005	1185	11 (1 in 107)	142 (1 in 8)
2005/2006	1262	9 (1 in 140)	181 (1 in 7)
2006/2007	1242	6 (1 in 207)	137 (1 in 9)
Total	4974	29 (1 in 172)	620 (1 in 8)

Statistics on fires reported in U.S apartment buildings between 2003 and 2007 are summarized in Table 7 (Ahrens, 2010). The statistics show that given that a fire has started, there is an average of 3.7% and 0.5% of the fires resulting in an injury and death, respectively.

Table 7: Fire related deaths and injuries in U.S apartment buildings between 2003 and 2007 (Ahrens, 2010)

Year	Fires	Deaths	Injuries
2003	91,500	410 (1 in 223)	3,650 (1 in 25)
2004	94,000	510 (1 in 184)	3,200 (1 in 29)
2005	94,000	460 (1 in 204)	3,000 (1 in 31)
2006	91,500	425 (1 in 215)	3,700 (1 in 25)
2007	98,500	515 (1 in 191)	3,950 (1 in 25)
Total	469,500	2320 (1 in 202)	17500 (1 in 27)

The above statistics cover all types of apartment buildings. Separate statistics are available for non high-rise and high-rise apartment buildings between 2005 and 2009 which are reproduced in Table 8 (Hall, 2011). High-rise buildings are defined as having 7 or more storeys.

Table 8: Average number of deaths and injuries by number of storeys of building between 2005 and 2009

Storeys	Fires	Deaths	Injuries
1	17,000	77 (1 in 221)	435 (1 in 39)
2	47,350	204 (1 in 232)	1,849 (1 in 26)
3	25,880	90 (1 in 290)	1,025 (1 in 25)
4	5,190	16 (1 in 324)	171 (1 in 30)
5	2,170	12 (1 in 180)	80 (1 in 27)
6	1,940	9 (1 in 215)	120 (1 in 16)
Total 1 – 6	99,520	409 (1 in 243)	3,680 (1 in 27)
7	1,130	7 (1 in 161)	35 (1 in 32)
8	870	3 (1 in 290)	20 (1 in 44)
9	550	2 (1 in 225)	25 (1 in 22)
10	1,650	3 (1 in 550)	40 (1 in 41)
11	430	1 (1 in 430)	23 (1 in 19)
12	790	1 (1 in 790)	22 (1 in 36)
13 or more	1,490	11 (1 in 135)	150 (1 in 10)
Total 7 or more	6,910	29 (1 in 238)	315 (1 in 22)
Total	106,430	438 (1 in 243)	3995 (1 in 27)

The statistics does not demonstrate any significant differences in risk of death or injury for high-rise and non high-rise buildings.

Class 3

Limited statistical data on deaths and injuries in Class 3 buildings in New South Wales are reproduced below.

Table 9: Fire related deaths and injuries in NSW Class 3 buildings between 2003 and 2007

Year	Fires	Deaths	Injuries
2003/2004	200	2 (1 in 100)	22 (1 in 9)
2004/2005	178	1 (1 in 178)	24 (1 in 7)
2005/2006	209	1 (1 in 209)	14 (1 in 15)
2006/2007	189	1 (1 in 189)	10 (1 in 19)
Total	776	5 (1 in 155)	70 (1 in 11)

NFPA statistics on fire related deaths and injuries are summarized in Table 10 below for years 2003 - 2007. The statistics show that given that a fire has started, there is an average of 3.8% and 0.3% of the fires resulting in an injury and death, respectively.

Table 10: Fire related deaths and injuries in Hotels and Motels between 2003 and 2007 (Flynn, 2010)

Year	Fires	Deaths	Injuries
2003	3,770	N/A	130 (1 in 29)
2004	3,940	N/A	167 (1 in 24)
2005	4,050	N/A	145 (1 in 28)
2006	4,070	N/A	153 (1 in 27)
2007	4,040	N/A	162 (1 in 25)
Total	19,870	55 (1 in 361)	757 (1 in 26)

Comparison

The estimated average death and injury rate per is graphed in Figure 6 below for the NSWFB data. The average rate of deaths per fires are similar for both Class 2 and Class 3 buildings from these statics while the injury rate is significantly larger for Class 2 buildings compared to Class 3.

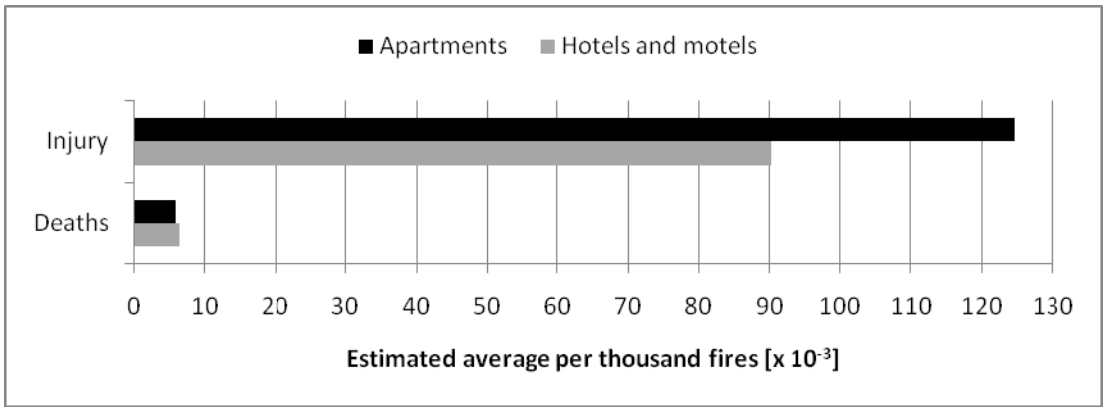

Figure 6: Comparison of estimated deaths and injuries per thousand fires, NSW data

Figure 7 below compares the estimated frequency of deaths and injuries in apartment and hotel/ motel buildings as presented in the above sections of U.S statistics. The figure shows that the average rate of deaths is lower for hotel/motel buildings compared to apartment buildings while injuries seem to be similar between the two building classes.

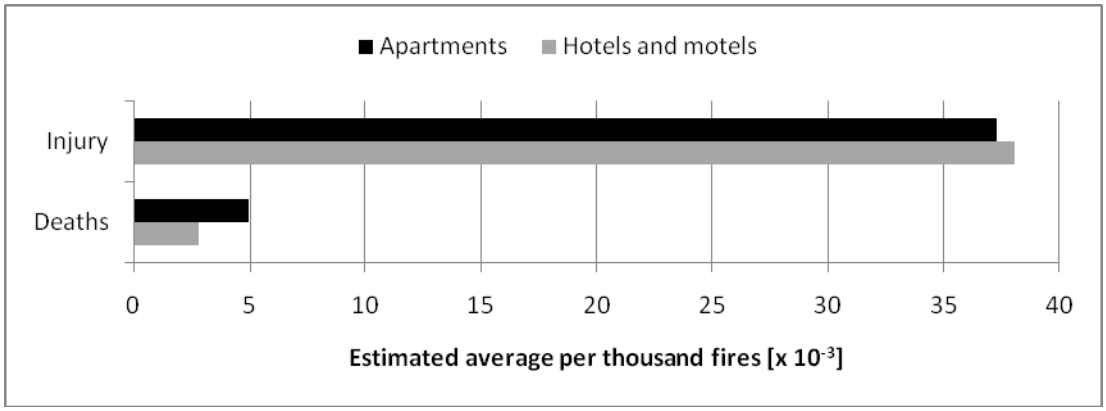

Figure 7: Comparison of estimated deaths and injuries per thousand fires, U.S data

A comparison between NSW and U.S data is performed in Figure 8 and Figure 9.This indicates a comparable average rate of deaths in Class 2 buildings while Class 3 buildings in the U.S have a significantly lower rate.
Overall the average estimated rate of injuries is significantly higher in NSW compared to the U.S. For Class 2 buildings, the indicative statics show more than a factor of 3 in difference.

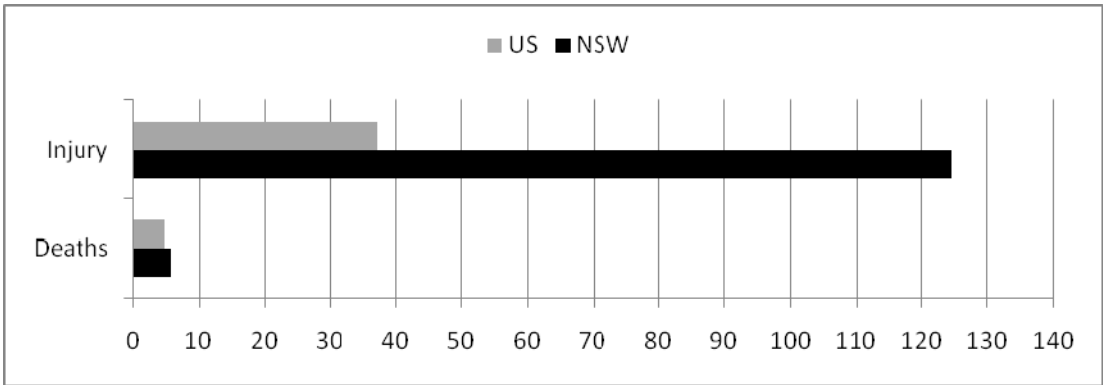

Figure 8: Comparison of estimated average of deaths and injuries for NSW and U.S data, Class 2 buildings

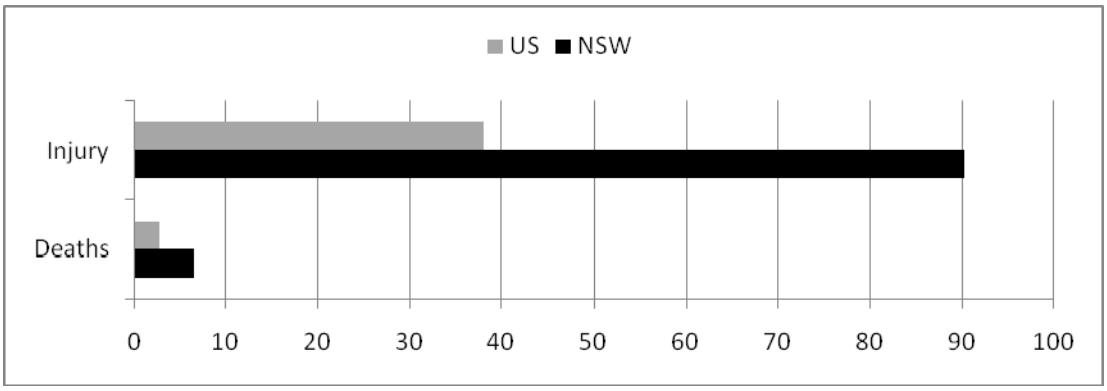

Figure 9: Comparison of estimated average of deaths and injuries for NSW and U.S data, Class 3 buildings

c) Effectiveness of fire safety systems

The fatality and injury risk can be greatly reduced by introduction fire safety measures such as smoke detection and sprinkler systems. The statistics presented in section above are average values for the entire stock of the building class. The stock will include both new and old buildings as well as buildings with high level of fire safety measures and others with very few fire safety measures.

It is particular interest to determine how the occupant risk is affected by particular fire safety measures in different types of occupancies.

Class 2

NFPA 101 Life Safety Code prescribes that all new apartment buildings need to be fitted with an automatic sprinkler system. If the building is 4 storeys or less, it is allowed to be fitted with a residential sprinkler system. Existing buildings are not required to install a compliant automatic sprinkler, unless already fitted with one or the building being classified as a high-rise building.

Statistics on the reduction in deaths with wet pipe sprinkler systems have been collated by NFPA (Hall, 2010). In homes, which indicated by the name is not exclusively apartment buildings, the estimated deaths per thousand fires is 7.8 and 1.3 without and with wet pipe sprinkler system, respectively. This constitutes a reduction equal to 83% in fatality risk.

Class 3

The requirements from the NFPA 101 Life Safety Code prescribes that all buildings need to be provided with an automatic sprinkler system, except for buildings where all guest sleeping rooms or guest suites have a door opening directly to either

Outside at the street or the finished ground level; or

Exterior exit access arranged as in accordance with 7.5.3 (Exterior Ways of Exit Access) in buildings three or fewer storeys in heights

For existing buildings, only high-rise structures are required to be fitted with an automatic sprinkler system.

The estimated deaths per thousand fires are 4.3 and 0.9 without and with wet pipe automatic sprinkler system, respectively (Hall, 2010). This constitutes a reduction of 79% in fatality risk.

On Australian data and other systems

Australian data on risk reduction from fire safety systems has been compiled by Marryatt but are rather dated, which is evident when the number of fires recorded where sprinklers were present for apartments, hotels and motels are 33, 106 and 2 respectively (Marryatt, 1988). An updated study of the years not covered by Marryatt is desirable.

Furthermore, detailed data on risk reduction from smoke alarm/detection systems and passive fire protection measures exist (Thomas, 2002). In the study NFIRS data between 1983 and 1995 was utilized which may also be considered to be out of date. Furthermore, the data collection coverage of the NFIRS has increased significantly since the data was collected and it may be questioned how representative this data is.