In-building Telecommunications Pathways and Spaces: Outcomes of Analysis

Australian Building Codes Board March 2016

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SUMMARY OF TABLES

DEFINITIONS

ABCB	Australian Building Codes Board
BCA	Building Code of Australia
BMF	Building Ministers' Forum
Brownfield	Reference to land or premises that is located in an area previously subject to development
Building Administration	A State or Territory Authority or government department with statutory responsibility for the administration of Building Acts and Regulations empowering the NCC.
Carrier	The owner of a network unit used to supply carriage services - such as telephony or internet
COAG	Council of Australian Governments
DoCA	Department of Communications and the Arts
Fixed Line	A method of telecommunications (voice, data) that connects a premises via cabled connection to a carrier.
FTTP	Optical fibre-to-the-Premises
FTTN	Optical fibre-to-the-Node
Greenfield	Reference to land or premises that is located in an area not previously subject to development
HFC	Hybrid fibre-coaxial – a technology that delivers broadband using a combination of optical fibre and coaxial cable.
MDU	Multi-dwelling unit
NBN	National Broadband Network
NCC	National Construction Code
QS	Quantity surveyor
SDU	Single-dwelling unit
SOU	Sole-occupancy-unit
Wireless Network	A means of telecommunications which relies on fixed cabled connections to transmit data wirelessly over a fixed geographic location

Notes on nomenclature:

The NCC classification system broadly categorises buildings into 10 building Classes and uses this as a means of categorising occupant risk associated with a building's use. It is acknowledged that this classification system may be not be familiar to the telecommunications industry. Likewise, the term single-dwelling unit (SDU) is used by the telecommunications industry to describe a single detached dwelling, similar to a Class 1 building as defined by the NCC.

A residential building containing more than one 'dwelling' is termed 'Multiple-Dwelling Unit' or MDU by the telecommunications sector and is a reference to either horizontal or vertical multiple dwelling construction. For the purposes of the NCC, a horizontal MDU could equally be considered a Class 1 building where each dwelling was separated by a fire-resisting wall. However, where a residential vertical MDU contains one dwelling above another, or other common space, it could be considered a Class 2 or 3 building, or Class 4

part of a building under the NCC due to the nature of the risks associated with fire and amenity being managed.

In this document the term 'spaces' is used generically to refer to areas or storage rooms for telecommunications equipment set aside to service larger buildings and connect individual units to the outside telecommunications network. These spaces are generally located in basements, and small spaces are sometimes on additional floors (e.g. communications cupboards). The term 'pathways' refers to ducts and risers or similar forms of access of adequate dimension for the passage of cabling to deliver services through to the building occupant.

EXECUTIVE SUMMARY

At its meeting in 2014, the Building Ministers' Forum (BMF) considered a request from the Department of Communications (now Communications and the Arts (DoCA)) that the issue of requiring telecommunications pathways and spaces in buildings be investigated by the Australian Building Codes Board (ABCB), with a view to requirements being including in the NCC2016. The project was premised on inclusion of such requirements in the NCC depending on an extensive consultation process, cost-benefit analysis and regulation impact statement. This was consistent with the 2008 Council of Australian Governments (COAG) decision under a national seamless economy for the establishment of a National Construction Code (NCC) dealing with all on-site construction requirements via a single code, including, potentially, telecommunications requirements[1].

Following agreement by Building Ministers, the ABCB, with the assistance of the Commonwealth Department of Communications and the Arts, has undertaken targeted consultation with governments and the building and telecommunications sectors to examine the nature and extent of the problem specific to new buildings. With the assistance of a telecommunications working group a regulatory specification was also developed to quantify and describe adequate telecommunications pathways for SDU and MDU residential buildings (Class 1, 2, 3 and 9c buildings and Class 4 parts) and commercial offices and shops (Class 5 and 6 buildings) for further public review.

In accordance with COAG Best Practice Regulation Principles, a formal Impact Analysis commenced in parallel to meet the timeframes of NCC 2016.

[1] COAG Reform Council 2009, *National Partnership Agreement to Deliver a Seamless National Economy: Report on Performance 2008–09*, COAG Reform Council, Sydney. p. 135.

The Office of Best Practice Regulation (OBPR), in confirming the need for further analysis, also confirmed the obligations of the Australian Government's regulatory burden measure. These requirements, triggered where a Commonwealth agency partake in a regulation initiative, require regulatory offsets for all feasible options be identified regardless of whether the proposed regulation generates a net benefit in order for the analysis to progress to public consultation.

The problem put forward for examination was that there can be a lack of spaces and pathways for telecommunication facilities in residential buildings including houses, apartments, hotels, caretakers and aged care facilities. In concept, this is the result of consumer demand driving carrier investment in telecommunications infrastructure not being matched by design and building practices. This has been characterised as a behavioural failure by the OBPR.

Determining the extent of the problem in new buildings is complicated by a lack of verifiable data. However, residential buildings have been the focus of examples cited to date and information from the infrastructure provider of the National Broadband Network (NBN Co). The ABCB, the DoCA and the OBPR met on several occasions to develop a methodology for impact assessment testing two scenarios on the rate of market failure. Scenario 1 uses information from NBN Co of a 70 per cent market failure in Class 2 buildings and a 60 per cent failure in Class 1 buildings. Scenario 2 tests a nominal 1 per cent failure and this figure is used in all classes of building and as a central scenario for Class 3, 4, 5, 6 and 9c buildings (to reflect a nominal risk of non-provisioning).

To inform the analysis, a quantity surveyor was engaged to cost the impact of the proposed regulatory specification and provide an estimate of the cost to retrofit generic buildings within the target classifications of building. The quantity surveyor was also requested to provide an indication of current practice in representative buildings, as a means to assessing the incremental impacts. Though, importantly, the adequacy of current practice was not a component of the quantity

surveying exercise. Instead, a range of independent assumptions regarding the extent of pathways and spaces in buildings were applied to generic buildings.[2]

Analysis demonstrates there are significant costs associated with both the specification and retrofitting of commercial and residential buildings relative to assumed current practice.

In assessing the incremental impacts of the NCC 2016 draft specification compared to (assumed) current practice, the key benefits of the proposal are derived from the avoidance of retrofitting, which is the cost of providing a pathway assuming no provision has been made (in all cases).

Table 1– Impacts on Class 1, 2, 3, 5, 6, 9c buildings

Class of building	Annual Impact ($000)	NPV ($000)	Required regulatory offset ($000)
Class 1	+$1,586	+$11,922	$302
Class 2	-$366,147	-$2,751, 678	$374,474
Class 3	-$33,541	-$252,072	$34,287
Class 5	-$302,977	-$2,276,945	$313,788
Class 6	-$56,284	-$422, 990	$57,920
Class 9c	-$1,194	-$8,977	$1,457
Total	-$758,557	-$5,700,740	$782,228

This analysis indicates that the proposed technical specification would impose a net cost to all building classes with the exception of Class 1 buildings which generated a small net benefit based on the available information and a 1% market failure rate noting that Hedonic Pricing factors would affect this result[3]. The Department of Communications and the Arts did not consider it could support the specification on the basis of the costing information available to it and recommended

[2] Refer DCWC Report on the Cost Implications of Providing Pathways and Spaces in Buildings for Telecommunications Cabling and Equipment, 10 July 2015.

[3] This concept is discussed further in the impact analysis section.

that the matter should be discussed further with stakeholders. Given the significant net cost identified, the DoCA was not prepared to provide the offset required.

Alternatives were explored including narrowing the specification to residential buildings where a net benefit may be achieved[4], however, given differing stakeholder views on the feasibility of the specification, the issues preventing the release of a Consultation RIS including the costs involved, and the time constraints in finalising the revisions to the NCC, this was not seen as a practical option.

DoCA and ABCB agreed if revision of the specification was necessary, it would not be achievable in the timeframes of the NCC 2016 amendment.

On the basis of the quantity surveyors' assessment of the cost of the specification (the proposed amendments to the NCC), DoCA and ABCB consider the specification, while perhaps technically strong, is not cost effective. As such, the amendments in their current form are not supported.

This report provides a summary of the process and outcomes of the analysis to allow participants in the process and other interested stakeholders the opportunity to review the discussion, costs, technical feedback and economic analysis that led to no change being made in NCC 2016. The document is based on the draft RIS for the project.

The ABCB do not propose to undertake further work on telecommunications pathways and spaces, though note this information may be of interest to participants when considering alternatives, information needs and evidentiary requirements of the ABCB and the OBPR or in assessing alternatives to demonstrate the efficiency of any future solution proposed through the NCC.

[4] Class 2 buildings do not achieve a net benefit under central analysis. This result is sensitive to assumptions for demand for fixed line services and the rate of market failure. See discussion P.60.

BACKGROUND

The NCC comprises the Building Code of Australia (BCA) Volumes One and Two; and the Plumbing Code of Australia (PCA) as Volume Three. The NCC contains technical provisions for the design and construction of buildings and other structures and addresses the issues of safety, health, amenity and sustainability in the design, construction and performance of buildings. Currently, the NCC does not reflect a societal expectation for telecommunications spaces and pathways in new buildings to achieve a satisfactory level of amenity – as a described Goal of the NCC. Historically, telecommunications have been a design consideration at the discretion of the building owner or designer. Until 1991 network connections were generally provided to the copper network (primarily for telephony) by a single, monopoly provider (Telstra). However, since the introduction of partial competition in 1991 and full competition in 1997, supply has come to include a range of providers, new technologies and cost competitive and complementary services.

There is no regulation in place that requires an adequate minimum for the design and construction of telecommunications spaces and pathways. Instead, building practitioners consider occupant's telecommunications needs on a voluntary basis, typically at the design stage of construction or post construction prior to occupancy. This may or may not be effective in all circumstances.

Pathways for telecommunications in buildings have been the subject of representations from governments since 2004 and resulted in the development by the ABCB of a (non-regulatory) Digital Building Telecommunications Access Guideline (DBTAG), released in 2006.

A central premise of the COAG decision of July 2008 for the establishment of an NCC, to which these considerations accord, was to ensure all on-site construction requirements, including telecommunications were addressed via a single code. Though it was noted a combination of telecommunications and planning regulations address these issues in respect of pit and pipe infrastructure provided to the building boundary, any consideration to on-site (internal) building requirements are rightly seen as a matter for the NCC.

In May 2014, Commonwealth, State and Territory Building Ministers (Building Ministers' Forum) considered a proposal, along with a request from the Commonwealth Department of Communications and the Arts that the issue be investigated further. The project was premised on

inclusion of such requirements in the NCC depending on an extensive consultation process, cost-benefit analysis and regulation impact statement. The BMF supported the ABCB further investigating inclusion of telecommunications pathways and spaces in the NCC subject to a net benefit being achieved and further consideration by BMF.

The goals of the NCC are the achievement of nationally consistent minimum necessary standards that relate to life safety, health, amenity and sustainability. Amenity is described in the NCC to mean *an attribute that contributes to the health, physical independence, comfort and well-being of people.*

As the well-being of people is affected by their capacity to access telecommunication services consideration, the ABCB has been consulting with building and telecommunications stakeholders on:

- the nature and extent of this problem in new buildings
- how access to telecommunications pathways affects the amenity of occupants in new buildings
- options to address any identified market failure through adequate access to telecommunication services.

Existing Regulation

The ABCB is not aware of any State and Territory legislation nor Local Government requirements that require the consideration of in-building telecommunications needs of occupants at the design stage of construction. While a combination of telecommunications and planning regulations address external infrastructure issues such as pit and pipe infrastructure outside of the building boundary[5] to some extent, consideration of 'on-site' building requirements including in-building telecommunications pathways and spaces are seen as a matter for the NCC.

There is currently guidance material available for use by industry on installing appropriate telecommunications spaces and pathways. An ABCB Handbook[6] (2006) contains guidelines for practitioners to accommodate telecommunications equipment. This guideline contains general information to facilitate the management of arrangements for access to buildings by multiple telecommunications carriers, carriage service providers and others involved in the provision of telecommunications services to tenants in buildings. This guideline does not, however, consider the access for Class 1 buildings (SDU or MDU). Moreover, being almost ten years old, it does not reflect contemporary industry practice, including providing for the use of optical fibre in new buildings in new developments.

Another reference for industry is the Australian Standard AS/NZS 3084:2003: Telecommunications installations – Telecommunications pathways and spaces for commercial buildings. This Standard is a voluntary document that seeks to standardise the design and practices of pathways and spaces for commercial buildings. However, this Standard only covers commercial buildings, and is currently under review by Standards Australia in recognition of the changing telecommunications environment.

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[5] Under Part 20A of the *Telecommunications Act 1997* there are obligations on constitutional corporations, including developers, to provide pit and pipe infrastructure in some circumstances.

[6] ABCB 2006 Digital Building Telecommunications Access Guideline.

Carriers servicing buildings also produce a number of building specifications detailing conduit sizes, entry points and bend radii, to allow ready deployment of the technology for both residential and commercial developments. Some property owners, such as NSW Department of Education, provide guidance material to follow when designing buildings for their use.[7]

Notwithstanding this guidance material, information received indicates that a small number of new buildings are being designed and constructed without adequate telecommunications spaces and pathways.

[7] Department of Education, Training and Employment (2013) Network Infrastructure Procedures and Standards.

STAKEHOLDER ENGAGEMENT

The ABCB, with the assistance of Department of Communications and the Arts, has undertaken comprehensive early consultation to gain an understanding of the problem and the telecommunications sector's role and challenges in provisioning telecommunications. This has included:

- A Telecommunications Stakeholder Forum
- ABCB discussion paper
- Targeted questionnaires
- Technical engagement via a telecommunications working group and
- A period of public consultation seeking comment on draft NCC provisions[8]

A Stakeholder Forum was convened on 17 July 2014, including representatives from real estate, peak bodies representing residential and commercial construction, telecommunications carriers, installers, and building owners. Attendees met to discuss how the regulatory framework and current practices create barriers to the effective deployment of telecommunications in buildings and discuss available solutions. Presentations by telecommunications carriers reflected the need for a greater understanding of the implications of inadequate provision of space for telecommunications infrastructure in buildings for end users, and the ongoing effects on competition and policy objectives of governments. Contributors were conscious of the complications faced in existing buildings by owners and managers and the potential for disputes to arise with carriers seeking to deploy telecommunications infrastructure where capacity for additional cabling is reached, but tenants (customers) seek a particular service provider.

With respect to retrofitting, the forum identified that inadequate sealing of penetrations of fire rated elements, breaching of waterproofing and soundproofing measures and impacts on other building systems is occurring. In instances where adequate pathways have been overlooked by the

[8] Stakeholder feedback on the Specification is summarised in the Technical Specification section

designer, the building certifier may certify the building as compliant with the NCC only to have the telecommunications installation compromise critical elements.

If a carrier (or its agent) is undertaking the retrofitting, Commonwealth legislation[9] requires telecommunications carriers installing subscriber connection equipment in buildings to do as little damage as practicable in the course of installing its facilities. In undertaking this work, a carrier is also obligated to manage its activities in accordance with good engineering practice and relevant industry standards.

Carriers must take all reasonable steps to restore the building to a condition similar to before it commenced installation within 10 workings days after the installation of its equipment[10].

There is also an industry guideline[11] which specifies that the building must be reinstated to comply with the BCA within 10 business days of telecommunications installations. It is unknown to what extent this is a compliance issue. It should be noted that a carrier may not undertake retrofitting works (e.g. a body corporate or other parties may conduct these works) and these works would not be covered by the Commonwealth legislation.

A discussion paper, informed by the Forum was released in October 2014, providing context on the regulatory environment. Though no regulatory obligations exist for telecommunications pathways and spaces, the discussion paper acknowledged good design would be cognisant of telecommunications pathways as this would have the potential to avoid the problem of maintaining NCC compliance which is likely to go unreported. 14 formal submissions were received in response to 17 questions in the paper and provided further detail on the nature of the problem.

Targeted Questionnaires were used to seek specific data from the building industry, building designers and architects, and building management associations to provide their experience on

[9] Clause 8 and 9 of Schedule 3 to the Telecommunications Act 1997.

[10] Sections 2.3 – 2.5 and 2.7 of the Telecommunications Code of Practice 1997

[11] ACIF G571 (2002) Building Access Operations and Installation

what is current practice when considering telecommunications in new buildings. Responses from building industry bodies suggested new office buildings are being constructed having regard to the telecommunication needs of occupants over the life of the building. A building designer association suggested that currently, the small scale nature of single dwellings and the use of mobile devices would lead to less thought of telecommunication pathways at the design stage of construction. In summary, building stakeholders considered in-building telecommunications spaces and pathways are currently adequately governed by market forces in all classes of building. Experience and feedback from building designers suggested that the telecommunications needs of occupants are considered for the majority of new buildings at the time of building design.

NATURE AND EXTENT OF THE PROBLEM

Telecommunications stakeholders identified that currently some new Class 1, 2, 3, 4, 5, 6 and 9c buildings are being constructed with inadequate telecommunications spaces and pathways, which makes it difficult or impossible to install telecommunications equipment and cabling within the building, without retrofitting work. Either the owner or the eventual occupant in these situations may be faced with no access to telecommunications services – diminishing their amenity – and may have to respond to the situation by having to retrofit suitable infrastructure, or use wireless communications with lesser capacity and higher charges. Retrofitting can involve a wider range of solutions, including installing cabling external to the building, through to making alterations to the existing internal structure of the building. This problem could be leading to additional costs passed through to building owners and occupants in retrofitting cabling, inconvenience through delays in accessing telecommunications and damage to building elements designed for life safety and structural integrity. However, the extent of the problem was less certain and of those examples cited, the problem appeared to be most pronounced in existing MDU and SDU residential buildings.

Advice from NBN Co and the DoCA indicates that in some instances consideration is not given to spaces and pathways or those provided are not sufficient in size for telecommunications and are not fit for purpose. In new buildings, a design's suitability may be affected by building size and the prevailing method of deployment in the area (telecommunications technology e.g. fibre optic, copper), particularly where new infill development is undertaken in brownfield areas. One telecommunications provider restated their view that 12% of new Class 1 buildings constructed in greenfield areas have no suitable conduit from the property boundary to the dwelling. Furthermore, 60% of new Class 1 buildings constructed in brownfield areas have no suitable internal telecommunications pathway. In the case of new Class 2 buildings, 70% of constructed in brownfield areas have no suitable internal telecommunications pathways.

The telecommunications industry notes that this issue has a compounding effect over the life of the building where adequate spaces and pathways are not being considered at the design stage, prior to construction. The problem has also become more apparent with the growth in demand for telecommunications services used to access the internet and the transition of the building stock towards higher density construction in inner urban areas. One telecommunications expert considers that 80% of new buildings have some pathways included in the design, but less than 20%

are adequate for the medium term. This view was supported by a telecommunications industry group suggestion that only one per cent of single dwelling units are designed containing telecommunications pathways. For multi-dwelling units, it was suggested that the majority are not constructed having regard to the provision of fixed line telecommunications services.

Feedback suggests the problem would be most pronounced in new buildings where no consideration has been given to the telecommunications needs of occupants. Examples of new buildings that illustrate the problem of inadequate spaces and pathways are listed below.

Examples of new buildings constructed without dedicated telecommunications spaces and pathways:

Australian Capital Territory: New two storey, twelve unit apartment complex
No fibre ready in-building pathways installed. NBN Co had to fit exterior ducting which resulted in considerable delays in occupants receiving services and additional costs.

Western Australia: New four storey apartment complex
Copper cabling only installed. No fibre-ready in-building pathways. Provision of services will need to be managed at a later date as part of NBN Co's volume rollout.

New South Wales: New three storey apartment complex
Copper cabling only installed. No fibre-ready in-building pathways installed. Provision of fibre will need to be managed at a later date as part of NBN Co's volume rollout.

Queensland: New multi-apartment complex
No fibre ready in-building pathways installed. Lengthy delays in retrofitting cabling and additional costs.

Consequences of the Problem

The consequences of occupants' amenity of telecommunications services not being met may require a wide range of retrofitting solutions to accommodate carrier equipment and cabling, with many interim delays and retrofitting costs, substandard interim services, and potentially losses in efficiency from the final connection for the end user.

In this situation the cost of retrofitting may be more expensive than making the pathway available through the initial construction phase, for those occupants who choose to retrofit a fixed line pathway.

The degree of retrofitting and complexity may differ depending on the scale and use of the building and the number of its occupants. A building industry association suggests that "where a Class 1a

building (a SDU) does not have a pathway provided at the time of construction; the installation from the property boundary to the external wall of the building(s) can be readily fitted without 'deconstruction' or compromise of the building fabric". However, the process undertaken by the ABCB was more concerned about pathways into and within buildings, and associated spaces.

For larger buildings, the telecommunications industry considers that it is often difficult to subsequently identify and use suitable spaces and pathways in instances where telecommunications needs have not been considered early in the design or construction phases, in turn this causes downstream delays of about a year or longer[12], and additional costs. In these new buildings, demand from a larger base of occupants may require multiple telecommunications providers to offer services and hence sufficient space to accommodate more than one provider.

With the exception of those examples discussed above, much of the evidence received related to consumer choice and the effects of incumbency and were recognised as issues typical of existing buildings. Often problems in existing buildings are recognised as symptomatic of designs from an era that would not have readily foreseen the changing infrastructure and technology demands or the growth in business reliance on telecommunications such as those arising from competitive supply increasing data consumption and the deployment of optical fibre. Discussions regarding retrofitting solutions to existing buildings are explained in a manner to illustrate the problem. Proposed options to address the lack of spaces and pathways that can be identified in existing buildings are solely for the purpose of informing the discussion on illustrating the problem if new buildings did not have adequate spaces and pathways. The focus of this document is on new buildings being designed and built now and in the future.

[12]The DOCA advise this assumption represents the a typical delay and retrofitting period is based on contemporary apartment buildings examples.

THE CASE FOR REGULATION

The first principle of best practice regulation, contained in the COAG 2007 Guide, requires regulatory processes to establish a case for regulation before addressing a problem.

In the case of the problem of absent or inadequate telecommunications spaces and pathways in new buildings, the information to date indicates that this problem is most noticeable in Class 1 (NBN Co) and Class 2 buildings (NBN Co and examples). The occurrence of the problem in new commercial buildings is unknown, however, expected to be rare based on the advice from the building industry.

The Goal of the NCC is to achieve nationally consistent minimum necessary, particularly with a rigorously tested rationale for the regulation and that the regulation is effective and proportional to the issues being addressed. The issue is whether regulation on the basis of isolated and individual cases is consistent with this NCC Goal.

The DoCA suggests that a case for regulation can be made, focused on the end user. In the absence of any adequate spaces and pathways, the impact on end users would include both a retrofitting cost and delays in accessing fixed line communications. The telecommunications industry advises that the cost of retrofitting is much greater than providing adequate spaces and pathways at initial construction. Regulation to require spaces and pathways in the target building classifications would avoid these costs and delays and minimise the risk to future occupants.

The new housing stock in Australia has held relatively constant over the last decade despite significant cyclical fluctuations over the short term[13]. There is currently a 60/40 split between the number of new houses being constructed each year versus the number of new apartments. This trend is slowly increasing in favour of new apartments and it is expected that the composition of

[13] ABS (2013), Building Activity, Australia, 2014, category 8752, viewed 18 May 2015, http://www.abs.gov.au/ausstats/abs@.nsf/mf/8752.0

new residential buildings will see an increase in the number of apartments being constructed in the long term.

In future years, over the next decade or so, telecommunications technology can be expected to continue to advance and increase in value to commercial and residential users. The introduction of these advances is difficult to predict in terms of extent – the degree to which they are adopted by users – and timing. The ABCB view is these characteristics influence the impacts of future advances and are hard to predict from the perspective of the present.

The DoCA considers that telecommunications is generally regarded as an essential facility and new owners/occupants of a building without adequate telecommunications pathways may subsequently seek to retrofit the building at their cost and convenience. In addition, in coming years, the importance of telecommunications is expected to grow, including through the forecasted take-up of smart ICT technologies in smart buildings[14].

Establishing Market Efficiency

Regulation may be justified where a market failure can be demonstrated[15]. The use of telecommunications is an amenity issue. Amenity in buildings has historically been regulated for reasons of occupant comfort, building useability and its linkages to health benefits. For the purposes of the NCC, amenity relates to the comfort and psychological well-being of building occupants, as well as the pleasantness of the environment within a building. The well-being of occupants can be materially affected by their access to telecommunications, including telecommunications connectivity. Conversely, impediments to telecommunications services can reduce occupants' well-being and diminish their amenity of living and working.

[14] See Section: Additional views of the DoCA.

[15] COAG 2007 Best Practice Regulation Guide P.9.

Market failure may occur when new buildings are constructed without adequate spaces and pathways that are required for fixed line telecommunications equipment and cabling, which would be needed to support the level of telecommunications services demanded by occupants. In the OBPR's view, market failure could occur in two ways. First, prospective residents who value fixed line connectivity in new dwellings are unable to find it in the market for new dwellings. Second, prospective residents are unprepared to pay the premium market price required for a residential building with fixed line amenity. The evidence of this occurring is limited to those examples cited in this report and hence market failure is difficult to substantiate.

The evidence points to most new buildings currently being constructed with adequate spaces and pathways for telecommunications services, however there are some instances where the adequate spaces and pathways have been overlooked. For new residential buildings, particularly where infill occurs in brownfield areas, information from NBN Co suggests that the problem is much larger; though NBN Co has not provided further supporting information to verify its view of the problem – that the construction market is not operating efficiently in providing adequate spaces and pathways for telecommunications services.

Some instances, such as the one cited below, could better be described as behavioural failure. Behavioural failure would occur when prospective occupants of a new building require and expect fixed line telecommunications services to be available and hence do not consider their telecommunications amenity needs at the time of purchase or rental.

Queensland: Multi-dwelling apartment complex

An occupant had entered into a rental agreement in a recently constructed two storey apartment building. Upon moving in and approaching a telecommunications provider to install a fixed line telecommunications service they were advised that connection could not be obtained due to no suitable spaces and pathways within the building. They needed to wait several months after requesting that a suitable pathway be provided within the building. No current regulatory regime at any level of government exists that would prevent this problem.

The DoCA considers that most new buyers of buildings would expect that adequate space and pathways would be provided in design, and that as future owners or occupiers, would not expected to incur the cost and inconvenience of retrofitting the building.

The case for regulation and market failure has been considered for each building category and provides an assessment of the merits of regulation for each category in the impact analysis section.

TECHNICAL SPECIFICATION

The ABCB, with the assistance of a telecommunications working group comprised of representatives from Communications Alliance, Standards Australia Committee CT-001 an Independent Building Services Consultant and DoCA developed the proposed specification contained at **Appendix A** for telecommunications pathways and spaces for inclusion in the public comment draft of NCC 2016. The Volume One specification would include prescriptive solutions relating to providing adequate building entry points, equipment rooms, vertical risers and floor distributors used to house telecommunications equipment. The technical solution would meet a new Performance Requirement for telecommunications spaces and pathways in Class 2, 3, 4, 5, 6, and 9c buildings.

The NCC Volume Two requirements would apply from the property boundary to the internal wall of a single dwelling unit, row house or townhouse (Class 1 building).

For the purposes of the analysis, these building classes can be assigned to four building categories:

a) New Houses (Class 1)
b) New Apartments (Class 2)
c) New Commercial Buildings (Classes 3, 5 and 6)
d) New Aged Care Buildings (Class 9c)

A fixed line connection requires a pathway suitable for the technology used by the available network infrastructure. The extent of a pathway will vary depending on the classification of a building and method used to provide access to telecommunications.

The pathway described in the proposed amendments is technology agnostic, that is, the space is not intended to cater to one specific method of deployment. Fixed line telecommunications infrastructure may be provided over fibre optic, copper or hybrid fibre coaxial cable by a telecommunications carrier and could be the decision of the carrier or reflect an agreement a carrier may have with either a developer or builder.

While there is no way of accounting for future technologies, a number of technologies could be relied upon to deliver telecommunications services. Notwithstanding technology choices, advice from the telecommunications industry suggests that fixed line cabling will play a central role in meeting the demand for bandwidth in Australia.

The working group was cognisant of the need to reflect best practice regulation principles to ensure occupants can access telecommunications networks regardless of the technology used. As the choice of the technology is influenced by the carrier and the infrastructure in the local area, any solution must cater to the available range of the fixed line technology, whether it is comprised of copper, hybrid coaxial cable, or fibre cable; the Working Group adopted minimum bend radius as common fibre-ready specifications were considered sufficient for other technologies.

Technical Feedback

Comments on the technical viability of the proposed solution NCC amendments were sought from interested stakeholders during an eight week period ending 3 August 2015. Over forty comments that focused on the technical merits were provided in submissions from working group members, building and telecommunications industry practitioners and peak bodies, design professionals and State and Territory building Administrations.

Much of the feedback from industry generally reflected advice received via early engagement. A number of comments addressed minor and miscellaneous issues such as the size of pathways and spaces and the location of the internal network termination equipment. One submission cited damage arising from a failure to observe the recommended clearances around termination equipment, although it did not identify a specific regulatory change. The ABCB is not aware of other examples that would suggest the necessary clearances reflected in the proposed specification are not routinely being observed in practice. Although it has been acknowledged certification would ensure that clearances are considered at approval, the ongoing use of a building and risks arising from occupant behaviour are beyond the remit of the NCC.

Generally, the telecommunications industry comments were supportive and sought to amend administrative definitions comments by some building industry participants stated their opposition to the principle of inclusion of telecommunications spaces and pathways in the NCC. Constructive clarifications and quantification of pathways, grammatical and editorial suggestions along with several requests for more diagrammatic information were also received.

The discussion below focuses on important unresolved technical issues in light of their potential to affect the efficiency of any proposed solution, and the ABCB would be required to consider and consult on these matters further as part of any future proposal, should one be forthcoming.

Floor distributors

These spaces are used to house mechanical, electrical telecommunications termination equipment and cables for the distribution of telecommunications infrastructure throughout the storey they serve. Where used, these spaces are commonly associated with the vertical riser and used as a means of transition between building cabling and customer cabling or to house electro

technologies associated with the needs of the tenant or occupant. These are considered a necessary element of an adequate pathway by the telecommunications working group.

Design professionals and a building Administration provided feedback consistent with assumption of the quantity surveyor relating to the overprovision of floor distributors in Class 2 and 5 buildings and the utility they provide.[16]

An assessment by the quantity surveyor of representative Class 2 and Class 5 buildings indicated there would be a variety of approaches taken under current practice. The findings suggest that the number and location of telecommunications floor distributors in a Class 5 building would be influenced by the number and needs of separate tenants occupying each floor. Anecdotally, in Class 5 buildings, these spaces are often provided as part of a building fit-out after construction is complete and their size and location is tailored to the needs of the occupant. Due to this variability in approach, generalised assumptions of current practice is considered unfeasible.

Similarly in Class 2 buildings telecommunications cupboards are used to provide access to a riser via appropriately sized doors. However, dedicated floor space equivalent to that required by the specification is suggested as generally unfeasible and therefore not provided under current practice. Furthermore, two conduits provided to service each sole occupancy unit (SOU) where a building is located in the fixed line footprint were considered unlikely to be used. The function of a floor distributor is therefore assumed under current practice to be a more efficiently served by a telecommunications cupboard, and this more closely reflects a minimum necessary practice.

In light of this current practice, further analysis of the utility of floor distributors and justification as to their necessity, as a part of a minimum necessary specification, would be necessary, accounting for both the advantages of their current building specific provision and the potential to reduce net lettable area.

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[16] Inclusion of these spaces may have a significant impact on Net Lettable Area, for example, the average impact in the Class 2 buildings assessed using the specified minimum would be 84m^2.See DCWC Report for estimates on the number required.

The DoCA also queried the requirement for multiple conduit servicing SoUs in recognition of the quantity surveyors assessment of current practice and the ABCB agrees the number and dimension of conduit in horizontal pathways may warrant further examination.

Administrative matters and defined terms

Many comments related to the use of defined terms and administrative issues. Ascribing responsibly to a party for approval or designation of areas is an administrative function of State or Territory building Administrations who oversee the application of building law, or fulfilled by a 'relevant authority'. As a technical document, the NCC does not generally contain administrative matters, although at times definitions, such as the two discussed below, clarify the terms and the extent a provision or Part is applied and/or trigger may be relied upon to determine the need for compliance in some instances.

1. FIXED LINE FOOTPRINT

Feedback received from a telecommunications industry working group member advocated extending the application of the requirements outside of the '*fixed line footprint*' on the basis that the full extent of this area is yet to be known. The DoCA and a state building Administration raised concerns with defining this area noting, no single authority exists, and complications arising from the respective deployment techniques.

The draft specification proposed a reliance on the term *fixed line footprint* to intentionally limit:

- the need to install the horizontal pathways on each floor of a building to the Sole-Occupancy Unit in a Class 2, 3 or 9c building or a Class 4 part of a building in NCC Volume One; and
- the installation of an underground conduit from the external wall to the boundary of an allotment of a Class 1 building in NCC Volume Two;

to areas where a fixed line existed, in order to ensure the provisions were a targeted and efficient solution.

Defined terms are often used in the NCC provisions to ensure that the proposed NCC amendments only apply where specific conditions exist, as determined by the relevant authority at the time of approval (e.g. *flood hazard area*). Generally, these authorities are a single entity by virtue of having statutory authority. For telecommunications this authority was envisaged to be NBN Co, but in some circumstances it may be Telstra or another provider in the long term.

Though removing the term is the preference of some stakeholders, the ABCB considers that the extension of fixed line requirements to areas based on an uncertain future possibility to be precautionary justification. The intent of targeting the provision to buildings where a fixed line is available has the potential to deliver a more efficient solution than their blanket provision on a precautionary basis.

The definition of the fixed line footprint is relied upon in two scenarios where the extent of a telecommunications pathway is determined by the availability of a fixed line. The first scenario relates to where an external conduit is proposed to be provided in SDU (Class 1 buildings)[17], though, this element would not constitute a difficult prospect to retrofit according to one housing industry body. The second scenario is in a residential MDU, where a horizontal pathway is required to the point of connection within an SoU. In both scenarios, horizontal pathways otherwise need not be provided.

2. OPEN ACCESS TELECOMMUNICATIONS NETWORKS

The NCC Performance Requirements FP6 and P2.4.3 describe the need to safeguard amenity of occupants by providing access to 'open telecommunications networks'. These are wholesale networks over which multiple retail providers are able to provide voice or data services and are distinct from networks of integrated service providers seeking to deploy cabling or infrastructure for their own services or other needs of the occupants. Its inclusion stems from the need to define 'adequate' space. The DoCA noted that while there are various networks including open access,

[17] See Appendix A NCC Volume Two 3.8.3.4 (d).

there is scope for providers to operate other types of networks and all providers should have access to spaces and pathways. In particular, regulatory requirements for open access telecommunications primarily relate to new networks servicing residential customers not business customers. However, it is conceivable that the necessary dimensions of spaces and pathways for open access infrastructure could be less than those required for multiple providers duplicating infrastructure on a competitive basis.

Concerns that were raised regarding the inclusion of the term 'open access' from the telecommunications industry relate to the nature of the services using a space or pathway, including the reticulation of broadcasting services.

The notion of 'open access' was preferred by the ABCB telecommunications working group as this concept was considered consistent with a common regulatory requirement and supports the ABCB Goal to prescribe a minimum level of amenity to meet the needs of the occupants. To treat the uncertainty of the potential number of infrastructure providers by nominating the number accommodated in a minimum specification, may have undesirable impacts on space or competition. Therefore, the current specification relies on the concept of 'open access' (or an equivalent concept), to ensure effectiveness of the prescriptive dimensions and neutrality, noting the market may willingly exceed the dimensions in recognition of business needs or other market forces.

Despite the difficulties in applying an open access concept, especially to commercial buildings, these administrative obstacles may be a secondary concern to the need for regulation itself. A threshold issue relates to the market failure to provide a minimum level of amenity in Class 5 or 6 buildings first being established.

The NCC Performance Requirements must to the extent possible be quantifiable. Defining the nature of the services a space must serve would enable greater certainty and innovation in alternative designs. As prescriptive requirements are Deemed-to-Satisfy the Performance Requirement, the further definition of the number and nature of services, like removal of the term 'open access', would prompt the need for a reassessment of the adequacy of the specifications dimensions.

IMPACT ANALYSIS

Regulation impact analysis is the process of examining the likely impacts of a proposed regulation, compared with a range of alternative options that could meet government policy objectives. The purpose is to identify which option can deliver the highest net benefits to the community. The incremental impacts of all valid options are required to be measured against the status-quo (the default position) to assess their relative effectiveness of addressing a problem or achieving pre-determined Objectives. The following feasible options were analysed:

- The Status Quo - the status quo was regarded as a baseline from which the incremental impacts of the proposals and alternative options were assessed.
- Option 1 - to include into the NCC, mandatory Performance Requirements and prescriptive solutions for telecommunication spaces and pathways in new buildings in all the building classes nominated.
- Option 2 – to publish an up-to-date handbook for use by the construction industry.

Option 1 based its assessment on the specification developed by the telecommunications working group (See Appendix A), and as it was developed to reflect its advice on current practice that delivers adequate space, it would be considered effective in meeting the Objective of ensuring an adequate level of amenity is provided in new buildings. Option 2 would involve the ABCB developing an up-to-date non-regulatory handbook that would provide suitable guidance for the construction industry to incorporate telecommunications spaces and pathways in new buildings. The ABCB, in collaboration with the telecommunications and building industries, developed a set of technical building solutions that addressed the problem of inadequate spaces and pathways in new buildings. Under this option the current non-regulatory Guideline would be updated for use on a case-by-case basis by State, Territory and Local Governments and the building industry.

Methodology

Available evidence, which is limited, indicates the extent of the problem is not evenly distributed across the four building categories. Hence the impacts are assessed individually.

The nominated building classes are assigned to four broad categories:

a) New Houses (Class 1)

b) New Apartments (Class 2)

c) New Commercial Buildings (Classes 3, 5 and 6)

d) New Aged Care Buildings (Class 9c)

Costings were undertaken by quantity surveyors, Donald Cant Watts Corke who used 13 generic buildings within the target classifications to inform this analysis and test three scenarios:

1. The cost of current practice
2. The cost of retrofitting suitable spaces and pathways for telecommunications where no spaces and pathways are provided.
3. The cost of complying with the proposed specification (net impact of Option 1).

The estimates were used to determine the impacts of Option 1 for each Class under the alternative problem scenarios[18] derived using the below inputs:

Number of buildings benefited = number of buildings constructed in greenfield/brownfield x percentage under the problem scenario x demand for fixed line

Cost of current practice = QS estimate of current practice x number of buildings not affected under the problem scenario (i.e. the 1 per cent problem scenario assumes current practice in 99 per cent of buildings)

[18] Refer DCWC Report on the Cost Implications of Providing Pathways and Spaces in Buildings for Telecommunications Cabling and Equipment, 29 June 2015.

Gross cost of the Specification = QS estimate of the cost of the specification x the number of buildings approved per Class

Net Cost of the Specification = Gross cost of the specification – cost of current practice

Avoidance of retrofitting = Number of buildings benefited x QS estimate of cost of retrofitting

Avoidance of delay = Number of buildings benefited x estimate of cost of delay

Annual impact = Avoidance of retrofitting + avoidance of delay – Net cost of the specification

Summary of technical assumptions

Below is a summary of assumptions made by the quantity surveyor when undertaking its assessment of providing telecommunications pathways and spaces in the above scenarios based on a generic sample of the subject building classes. Further assumptions relating to the assessed Classifications can be found in the introduction to each sub-option of the DCWC report.

Current Practice:

- In Class 1 buildings (SDUs), the generic building designs assessed did not include a telecommunications pathway[19].
- All building vertical risers and telecommunications equipment rooms are assumed to consist of a maximum of three walls, the fourth wall being a requirement of the base building works.
- Telecommunications internal lead in conduit in office buildings are assumed not required due to the fact that they generally end at the riser. It is the tenant's responsibility to install conduit and/or cabling from the riser or equipment room to the tenancy on each floor (this is not a requirement of the specification in Class 5, 6 or 9c buildings).

[19] This issue is discussed in more detail under the impact analysis of option 1a current practice Class 1 buildings.

- In residential MDUs examples including Class 2, 3 storey apartment buildings and the Class 3, 2 storey Motel, current practice provided riser space sufficient to accommodate proposed specification in as specified scenarios.
- In the Class 9c aged care building, current practice for main switch rooms sufficiently accommodates the specified equipment room size of 19m^2.

Retrofitting:

- All building vertical risers and telecommunications equipment rooms are assumed to consist of a maximum of three walls, the fourth wall being a requirement of the base building works.
- Retrofitting to most buildings is carried out and installed internally and not via conduits fixed to the external face of the building. The exception being developments of low rise and lower quality where cabling would be installed via conduits external to the building.
- Most retrofitting projects are deemed to incur additional scopes of work, involving demolition to building fabric, creation of pathway and on completion, patch, reinstate and paint building fabric damaged during the works.
- Floor distributors have not been assumed as a component of retrofitting due to a lack of available floor space in Class 5 and 6 buildings.

Summary of quantity surveyors findings

The following findings are taken from the quantity surveyor's report assessing generic building designs and reflect the findings described by pathway element. Detailed findings can be found in the accompanying DCWC Report.

Telecommunications Entry Point

(i) Current practice in Class 3, 5, 6, 9 buildings is sufficient and the generic buildings made provisions for a telecommunications entry point.

(ii) Current practice in Class 1 and 2 buildings is generally insufficient and the generic buildings made no provisions for telecommunications entry point. Other pathway elements are provided in a building to different extents, there is generally no allowance for an entry point.

Telecommunications Equipment Rooms

(i) Current practice in Class 5, 6, 9 buildings is sufficient and the sample buildings made provisions for telecommunications equipment room, this is generally provided in the way of main switchboard room.

(ii) Current practice in Class 1 and Class 2 low rise examples is generally insufficient and the sample buildings made no provisions for telecommunications equipment room. However, in Class 2 and Class 3 examples over 3 storeys, sufficient provisions for equipment rooms were made.

Vertical Risers

(i) Current practice in Class 2, 3, 5, 6 and 9 buildings examples is sufficient and the sample buildings made provisions for sufficient sized risers.

(ii) Current practice in Class 1 and smaller Class 2 buildings (with a rise in storey of up to 3) is generally insufficient and the sample buildings provided very little or no riser space.

Telecommunications Space – Floor Distributors and Riser Cupboards

(i) The only building Class which currently provides this are Class 9c aged care, by way of a data room on each floor of approximately $9m^2$.[20]

(ii) The proposed requirement may be provided in Class 5 buildings where single tenant is in place, however where multiple tenancies are in place these would generally be provided through fitout (as needed).

(iii) Current practice in Class 2, 3 and 5 buildings provide a cupboard space associated with the riser which is generally accessed via appropriately sized doors.

(iv) Costs associated with meeting proposed specification provisions have been allowed for class 2 and 3 buildings.

[20] Inclusion of these spaces may have a significant impact on Net Lettable Area, See DCWC Report for estimates on the number of floor distributors required under each class.

(v) Retrofitting costs associated with meeting the proposed specification for floor distributors have not been allowed, as in most cases there is not sufficient floor space.

Telecommunications Internal Lead in Conduits

(i) The quantity surveyors review indicates in situations where there are multiple SoUs, dedicated internal lead-in conduits are generally not provided. However, general provision is via horizontal cable trays in corridors and common space.

(ii) In constructing to the proposed specification and retrofitting scenarios, the analysis includes costs for installing dedicated conduits into available cable trays.

Summary of quantity surveyor's approach to costing the specification

The costings associated with the proposed specification includes all construction costs imposed on each representative building as a result of implementing Option 1. Building costs are generally total costs relative to the section of the building being analysed and are inclusive of builder's preliminaries, overheads, and margin, together with project design and delivery costs. Rates where noted in the QS report are inclusive of the material supply, labour, and all sundries required for installation.

The quantity surveyor has also made assumptions about the estimated the loss of lettable area associated with implementing Option 1. Market rate square metre estimates for the loss of floor space differ based on building classification and have not been included, though estimates of the physical size of the loss have been estimated (See Accompanying DCWC report for the full QS report and quantified costings).

Where more than one building was representative of each building classification, an average of the buildings costs was taken. The distribution across representative buildings is unknown and so a simple average was used.

Option 1 addresses the nature of the problem as arises from behavioural failure. Specifically where owners or occupants of new buildings have a need for spaces and pathways to provide fixed line connectivity but this need is not top of mind at the time the new building was purchased or

occupied. Subsequently the owners or occupants discover this unmet need that reduces their amenity in cases where this occurs.

Where new buildings are constructed without adequate spaces and pathways a large proportion of the potential market - 73% of potential residential purchasers and 99% of potential commercial purchasers[21] - will be adversely affected. The market price for these new buildings will be lower reflecting the market assessment of this lack of amenity and the associated lower demand for these new buildings. The reduction in the market price is known as the hedonic pricing effect. There is a commercial incentive for builders to avoid the financial losses associated with this outcome, which becomes stronger as the new building becomes more valuable. Purchasers of these new buildings without spaces and pathways for fixed line connectivity who wish to retrofit would have available the extent of the lower market price for this purpose.

A US study tested whether a hedonic price effect could be determined empirically.[22] It posed the question: are people willing to pay more for real-estate located in areas where fibre broadband access is available than for equivalent properties that do not offer this amenity. The study assessed 20,521 houses in New York State. It found that the presence of fibre based broadband was associated with a positive effect on property values, with a mean increase in house prices of 5%. The study also noted limitations: of New York State not being representative of other states in the USA, of data being obtained from just one year, and the issue of potential endogeneity. (The ABCB notes that the mean estimate of a 5% price impact is similar to estimates of hedonic price impacts on another amenity issue – of traffic noise heard in apartments – of between 5% and 10%.[23])

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[21] ACMA Communications Report 2013-14 p14.

[22] Molnar G (2013) The Impact of High-speed Broadband Availability or Real Estate Values: Evidence from the United States Property Market p.10.

[23] Jon P. Nelson (2007) *Hedonic Property Value Studies of Transportation Noise: Aircraft and Road Traffic*, published in A. Baranzini et. al. (eds) *Hedonic Methods in Housing Market Economics*.

A hedonic price impact of 1 per cent would be sufficient to cover the costs of retrofitting new residential buildings without fixed line telecommunications services[24].

[24] For example, a $300,000 home subject to a 1% hedonic pricing effect would result in a market reduction of $3000.

Extent of the Problem

The costs and benefits are proportional to the extent and the nature of the problem. Where there is no information about the problem – for new commercial buildings and new aged care buildings – the benefits are assumed to accumulate to a nominal 1 per cent of new buildings, (to reflect a nominal risk of non-provisioning). For new houses and apartments the problem is indicated by a range of information plus further advice from NBN Co; the benefits have been evaluated through two scenarios: 1 per cent of new residential buildings and a scenario that reflects the advice from NBN Co.

Impacts of Option 1a – New Houses

The number of new houses approved each year in Australia is approximately 113,000[25]. These new houses are constructed in greenfield and brownfield areas, being new developments and infill developments in established urban areas. Occupants of a proportion of these developments demand fixed line telecommunications services while the remainder have no services or use only mobile services.

Class 1 Assumptions

- 80% of new houses are constructed in greenfield areas, 20% in brownfield areas.
- 73% of residential occupants demand fixed line telecommunications services[26].
- Two scenarios describe the incidence of market failure: 1 per cent (to reflect a nominal risk of non-provisioning); and 12 per cent in greenfield areas and 60 per cent in brownfield areas (as advised by NBN Co).

[25] Australian Bureau of Statistics (ABS), 8752.0 – Building Activity, Australia, Sep 2014, 'Table 37 – Number of Dwelling Unit Completions by Sector, Australia', accessed at www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/8752.0Sep%202014?OpenDocument

[26] ACMA Communications Report 2013-14 states that 27 per cent of the total adult population do not have a fixed line home phone (page 14) – therefore, 73 per cent have a fixed line home phone.

- Occupants, who need fixed line, where it is not included in the new building, will install a fixed line by retrofitting. These occupants will incur a cost associated with the lack of amenity in not having fixed line telecommunication services for the duration that fixed line is not available.
- Avoidance of delays is calculated by the number of new houses that are not constructed having adequate telecommunications spaces and pathways and where the owners or occupiers experience delays. Willingness to pay is used to calculate this.

These assumptions are combined to determine the number of new houses benefited by the proposals. For example, 80% x 73% x 1% x 113,000 = 660 new houses constructed in greenfield areas where market failure is assumed to be 1% (Scenario 1).

Class 1 current practice

The generic Class 1 buildings formally assessed by the quantity surveyor did not include a dedicated telecommunications pathway, therefore no cost was assigned to current practice in the DCWC report. Although this estimation is strictly consistent with the task required of the quantity surveyor, it presents a methodological issue. Firstly, as the impact analysis methodology assesses the impact of Option 1 by comparing the incremental cost the specification would impose over current practice or retrofitting, assigning no dollar value to providing a pathway under current practice has the equivalent effect of assuming a pathway will not be installed in all cases (a 100 per cent problem). Consequently, this would create an inconsistency with how the extent of the problem is measured in other classifications. Secondly, the extent of the problem would be inconsistent with stakeholder feedback used as the basis for Scenario 1 and Scenario 2. A housing industry association has advised that prospective owners of new houses are given the choice of fixed line connection at the design stage under current practice. This decision may involve market failure when a customer's need for pathways and spaces for fixed line connection is not top of mind (Behavioural Failure) yet is not thought to occur in all cases. Furthermore, NBN Co advice equally supports that the problem occurs at the rate of 12 per cent for greenfield areas and 60 per cent in brownfield areas, not 100 percent of cases.

Recognising these methodological issues, it has been necessary to assign a value to the cost of providing a simple pathway in recognition that this is provided under current practice. The value

adopted is equivalent to that used for the specification of $268 per new house and this was based on the advice of the quantity surveyor.

Cost of the specification for Class 1 buildings

The gross cost of the specification has been estimated on the basis that there are no designed telecommunications pathways and spaces in new houses. The net cost is the result of the incremental cost of the specification over and above current practice. The net cost of the specification has been formally estimated to be $268 per new house.

Cost of retrofitting Class 1 buildings

Occupants who require fixed line telecommunications services, and in their absence would undertake retrofitting, will benefit when the costs of retrofitting are avoided and fixed line services is included in the initial construction of the house. The cost of retrofitting has been formally estimated to be $2,111 per new house.

Cost of delay in Class 1

Where pathways for fixed line has not been installed in a new house there will be a delay to retrofit. The cost of delay has been estimated by occupants' willingness to pay for fixed line services adjusted by the typical duration of delay. This cost has been estimated to be $82 per new house[27] with an estimated average delay of one month.

[27] Willingness to pay estimate by DOCA based on confidential industry data.

Table 2 – Impact Estimates for Option 1a - New Houses (per year)

Scenarios	**Scenario 1: 1%**	**Scenario 2: 12% greenfield/60% brownfield**
Type of Building	3 Bedroom House	3 Bedroom House
Current Practice	$268	$268
Cost of the Specification	$268	$268
Retrofitting	$2,111	$2,111
Number of Class 1 buildings being built per year	113,000	113,000
Number of new Class 1 buildings benefited from the proposal	825	17,818
Cost of current practice	$30,062,900	$25,508,776
Gross cost of specification	$30,284,000	$30,284,000
Net cost of specification	$221,100	$4,775,224
Avoidance of retrofitting	$1,741,575	$37,613,798
Avoidance of delay	$66,000	$1,425,440
Annual Impact	**$1,586,475**	**$34,264,014**
Net Present Value	**11,922,728**	**257,502,023**

Impacts of Option 1b - New Apartments

For new apartment buildings, no national or state based statistics are collected on building approvals issued each year. In 2013 the ABCB sought statistics from the Victorian Building Authority (VBA) who had previously collected this information. It is known through ABS comparisons that Victoria accounts for approximately 25% of all building activity occurring

annually[28]. The number of new apartment buildings approved each year in Australia is approximately 2,500[29].

Class 2 assumptions

- 80% of new apartments are constructed in brownfield areas, 20% in greenfield areas.
- 73% of residential occupants demand fixed line telecommunications services[30].
- Two scenarios describe the incidence of market failure: 1% (to reflect a nominal risk of non-provisioning); and 70% in brownfield areas and 0% in greenfield areas (as advised by NBN Co).
- Occupants, who need fixed line, where it is not included in the new building, will install a fixed line by retrofitting. These occupants will incur a cost associated with the lack of amenity in not having fixed line telecommunication services for the duration that fixed line is not available.

These assumptions are combined to determine the number of new apartments affected by the proposals. For example, 80% x 73% x 1% x 2,500 = 15 new apartment buildings constructed in brownfield areas where market failure is assumed to be 1% (Scenario1).

Current practice in Class 2

The cost of current practice has been estimated by the quantity surveyor on the basis of three representative sample apartment buildings: 3, 7 and 15 storey buildings to represent the range of apartment buildings. The costing of current practice in making spaces and pathways available is an average of the 3 building samples and estimated to be $80,565 per new apartment building.

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[28] The value of non-residential work completed 2003-2013 account for 24.7% of all activity and the number of other residential units completed 2003-2013 account for 25.9% of all activity.

[29] Unpublished data sourced through specific data request to the Victorian Building Authority.

[30] ACMA Communications Report 2013-14 states that 27 per cent of the total adult population do not have a fixed line home phone (page 14) – therefore, 73 per cent have a fixed line home phone.

Assessment of representative Class 2 buildings indicates there would be a variety of approaches taken under current practice for the number and location of telecommunications floor distributors. For the purposes of this analysis, current practice assumes floor distributors in apartment buildings take the form of a telecommunications cupboards opening to the riser on each occupied floor and would be retrofitted with equivalent space.

Cost of the specification for Class 2 buildings

The cost of the specification has been estimated by the quantity surveyor on the basis of three representative sample apartment buildings: 3, 7 and 15 storey buildings to represent the range of apartment buildings. The gross cost of the specification to install fixed line telecommunications pathways and spaces is an average of installing the spaces in the three building samples and estimated to be $229,549 per new apartment building. The net cost of the specification is the gross cost of the specification less the cost of current practice as estimated by the quantity surveyor.

The specification requires the installation of floor distributors- rooms with a minimum size of 9m2 on all occupied floors to house additional electro technologies. The quantity surveyor's assessment of current practice determined these were not a necessary element in a Class 2 or 3 building under current practice. The inclusion of floor distributors alone represents an increase the cost of provisioning a telecommunications pathway by an average of 21 per cent for Class 2 buildings and 16 per cent in Class 3 buildings respectively.

Cost of retrofitting Class 2 buildings

Occupants who require fixed line telecommunications services, and in their absence would undertake retrofitting, will benefit when the costs of retrofitting are avoided and spaces and pathways for a fixed line service is included in the initial construction of the apartment building. The cost of retrofitting has been formally estimated to be an average of $377,438 per new apartment building. Noting the findings of the DCWC report, retrofitting would be unlikely to accommodate floor distributors of the size specified. If these were to be included during retrofitting in line with the specification, the retrofitting cost would be proportionately greater.

Cost of delay in Class 2 buildings

Where adequate spaces and pathways have not been included in a new dwelling there will be a delay to retrofit. The cost of delay has been estimated by occupants' willingness to pay for fixed line services adjusted by the typical duration of delay, estimated to be 12 months. This cost has been estimated to be $984 per new sole-occupancy unit or $35,424 per new apartment building[31].

Table 3 – Impact Estimates for Option 1b - New Apartment Buildings (per year)

Scenarios				**Scenario 1: 1%**	**Scenario 2:70%**
Type of Building	3 Storey Apartment	7 Storey Apartment	15 Storey Apartment	Average	Average
Current Practice	19,401	89,484	132,810	80,565	80,565
Cost of the Specification	65,094	194,413	429,140	229,549	229,549
Retrofitting	81,435	299,616	751,263	377,438	377,438
Number of Class 2 buildings being built per year				2,500	2,500
Number of new Class 2 buildings benefited from the proposal				19	1,022
Cost of current practice				$199,881,765	$119,075,070
Gross cost of specification				$573,872,500	$573,872,500
Net cost of specification				$373,990,735	$454,797,430
Avoidance of retrofitting				$7,171,322	$385,741,636
Avoidance of delay				$672,600	$36,178,800
Annual Impact				**-$366,146,813**	**-$32,876,994**
Net Present Value				**-2,751,678,337**	**-247,078,246**

[31] This per building cost is calculated using an average of 36 sole-occupancy units per new apartment building.

Testing the Effect of 100% Residential Demand for Fixed Line

The impacts for new houses and new apartments, above, were calculated on the basis of 73% of the residents demand fixed line telecommunications services. The following table shows the impacts where 100% of residents demand fixed line telecommunications services.

Table 4 – Impact Estimates with 100% residential demand for fixed line.

Scenarios	**Scenario 1 (1 %)**	**Scenario 2 (70%)**
New Houses	$2,692,200	$46,936,584
New Apartments	-$364,153,175	$92,722,200
Total Annual Residential Impacts	**-$361,460,975**	**$139,658,784**
New Houses	$20,232,508	$352,739,330
New Apartments	-$2,736,695,684	$696,828,868
Total Residential Net Present Value	**-$2,716,463,176**	**$1,049,568,197**

Impacts of Option 1c – New Commercial Buildings

New commercial buildings include Hotels/Motels (Class 3 buildings), Office buildings (Class 5 buildings) and retail and restaurant buildings (Class 6 buildings). Approval data is not collected for these buildings. However data from Victoria indicates the number of new building permits for commercial buildings each year.

Table 5: Approximate number of commercial buildings approved each year

Building Class	Number[32]
Class 3	181
Class 5	2,631
Class 6	1,473

Commercial building assumptions

- 99% of commercial occupants demand fixed line telecommunications services[33].
- There is no information on market failure. For the purposes of the impact analysis a nominal failure rate of 1% has been assumed, reflecting the potential risk of non-provisioning.
- Occupants, who need fixed line, where spaces and pathways are not included in the new building, will install a fixed line by retrofitting. There is a strong commercial incentive to ensure fixed line connectivity as part of the occupants' business model. These occupants will incur a cost associated with the lack of amenity/business service in not having fixed line telecommunication services for the duration that fixed line is not available.
- Any delay will affect the profitability of businesses so commercial occupants will seek to minimise any delay in retrofitting.

These assumptions are combined to determine the number of new commercial buildings affected by the proposals. For example, 99% x 1% x 181 = 2 new Class 3 buildings constructed where market failure is assumed to be 1%.

Current practice in commercial buildings

The cost of current practice has been estimated by the quantity surveyor on the basis of:

[32] Figures are approximates based on an average of recent historical data

[33] ACMA Communications Report 2013-14 states that 27 per cent of the total adult population do not have a fixed line home phone (page 14) – therefore, 73 per cent have a fixed line home phone.

- Three representative sample hotel/motel buildings: 3, 8 and 20 storey buildings to represent the range of accommodation buildings.
- Three representative sample office buildings: 2, 7 and 20 storey buildings to represent the range of office buildings.
- One representative sample shopping centre over four levels and one representative restaurant over 2 levels to represent the range of Class 6 buildings.

The cost of current practice to install fixed line telecommunications pathways and spaces has been undertaken independently for each building Class. Assessment of representative Class 5 buildings indicates there would be a variety of approaches taken under current practice for the number and location of telecommunications floor distributors. However, general assumptions about the extent floor distributors are currently provided could not be made as their need and number is driven by the number of building tenants occupying each floor and the nature of the business or services undertaken.

Due to the difference in stakeholder opinion on current practice and the methodology adopted by the quantity surveyor, the inclusion of floor distributors in the cost of the specification when compared to other scenarios would unevenly represent the utility provided under each scenario. Floor distributors have therefore been excluded to allow a comparison to be made between all scenarios for the remaining common pathway elements.

Cost of the specification for commercial buildings

The gross costs of the specification are averages based on a representative sample of buildings for each building Class.

Cost of retrofitting

Commercial occupants require fixed line telecommunications services, and in the absence of spaces and pathways to accommodate the required cabling and equipment, would undertake retrofitting. They will benefit when the costs of retrofitting are avoided and adequate space and pathways are included in the initial construction of the new building.

Cost of delay in commercial buildings

It is expected that any delay to install fixed line telecommunications services to a commercial building would have immediate and severe impacts on the profitability of business enterprises. Therefore instances of delay in commercial buildings would be rare and would not be tolerated.

Table 5 – Impact Estimates for Option 1c - New Commercial Buildings (per year)

Buildings	**Class 3**	**Class 5**	**Class 6**
Current Practice	93,952	132,888	40,883
Cost of the Specification	282,442	249,944	79,795
Retrofitting	414,969	324,733	111,675
Number of new buildings per year	181	2,631	1,473
Number of new buildings benefited from the proposal	2	26	15
Cost of current practice	16,836,900	346,166,139	59,624,474
Gross cost of specification	51,121,942	657,601,787	117,537,299
Net cost of specification	34,285,042	311,435,648	57,912,824
Avoidance of retrofitting	743,582	8,458,279	1,628,523
Annual Impact	**-33,541,460**	**-302,977,368**	**-56,284,301**
Annual Commercial Impact			**-392,803,129**
Net Present Value	**-$252,071,859**	**-$2,276,945,290**	**-$422,989,594**
Commercial Net Present Value			**-$2,952,006,743**

Impacts of Option 1d – New Aged Care Buildings

For aged care buildings, a report conducted in 2012 by the CH Group found that approximately 50 new aged care buildings are constructed each year nationally[34]. Assuming market failure in these buildings is 1%, the number of buildings benefited by implementing Option 1 would be 1 building per year.

Aged care building assumptions

- 99% of residential occupants demand fixed line telecommunications services[35].
- There is no information on market failure. For the purposes of the impact analysis a failure rate of 1% has been assumed, reflecting a nominal risk of non-provisioning.
- Occupants, who need fixed line, where it is not included in the new building, will install a fixed line by retrofitting. There is a strong commercial incentive to ensure fixed line connectivity as part of the occupants' business model. These occupants will incur a cost associated with the lack of amenity/business service in not having fixed line telecommunication services for the duration that fixed line is not available.
- Any delay will affect the profitability of businesses so commercial occupants will seek to minimise any delay in retrofitting.

These assumptions are combined to determine the number of new aged care buildings affected by the proposals. For example, 99% x 1% x 50 = 1 new aged care building constructed where market failure is assumed to be 1%.

[34] Unpublished data sourced through specific data request to the CH Group.

[35] ACMA Communications Report 2013-14 states that 27 per cent of the total adult population do not have a fixed line home phone (page 14) – therefore, 73 per cent have a fixed line home phone.

Current practice in aged care buildings

The costs of current practice are formally estimated to be $74,092.

Cost of the specification for aged care buildings

The cost of the specification is based on a representative aged care building. The gross cost of the specification does not take into account current practice: the net cost does take into account current practice.

Cost of retrofitting aged care buildings

Occupants who require fixed line telecommunications services, and in their absence would undertake retrofitting, will benefit when the costs of retrofitting are avoided and spaces and pathways are included in the initial construction of the aged care building. The cost of retrofitting has been formally estimated to be $299,616 per new aged care building.

Table 6 – Impact Estimates for Option 1d - New Aged Care Buildings (per year)

Type of Building	**Aged Care Facility**
Current Practice	74,092
Cost of Specification	102,492
Retrofitting	299,616
Number of Class 9c being built per year	50
Number of Class 9c buildings benefited from the proposal	1
Cost of current practice	$3,630,508
Gross cost of specification	$5,124,600
Net cost of specification	$1,494,092
Avoidance cost of retrofitting	$299,616
Annual Impact	**-$1,194,476**
Net Present Value	**-$8,976,764.56**

Total Impacts

The total annual impacts and the net present values of the proposals are shown in the following table.

Table 7 – Total Impacts

Annual Impacts and Net Present Values	Scenario 1	Scenario 2
New Houses	+$1,586,475	+$34,264,014
New Apartments	-$366,146,813	-$32,876,994
New Commercial Buildings	-392,803,129	-392,803,129
New Aged Care Buildings	-1,194,476	-1,194,476
Total Annual Impacts	**-$758,557,943**	**-$392,610,585**
New Houses	+$11,922,728	+$257,502,023
New Apartments	-$2,751,678,337	-$247,078,246
New Commercial Buildings	-$2,952,006,743	-$2,952,006,743
New Aged Care Buildings	-$8,976,765	-$8,976,765
Total Net Present Value	**-$5,700,739,117**	**-$2,950,559,730**

Overall the total impacts are a large net cost to society.

Sensitivity Analysis

This section examines the sensitivity of the quantitative analysis to variations in key assumptions underpinning the aggregate net impact analysis. The sensitivity analysis has been conducted on four areas noting:

- That the distribution of upper building costs and lower building costs is unknown and a midpoint has been used. The sensitivity analysis will test a ±10% variance in construction cost as a result of this uncertainty.
- A real discount rate of 7% has been used in the quantitative analysis, and sensitivity will be tested from a lower bound of 3% to an upper bound of 11%.
- The rate of approvals in greenfield and brownfield areas is not known. The sensitivity analysis will test a variance of ±10%.
- The demand for fixed line connection in the future is uncertain. The sensitivity analysis will test a scenario where all new buildings demand fixed line telecommunications services.

The outcomes of the sensitivity analysis are summarised in the table below, in present value terms, with the impact of each on the assessed level of quantitative costs and benefits provided.

Table 8 – Sensitivity Analysis

Annual Impacts	**Scenario 1**	**Scenario 2**
Baseline	-$758,557,943	-$392,610,585
Build Costs +10%	-$870,852,604	-$419,302,399
Build Costs -10%	-$712,515,767	-$343,065,599
Brownfield/Greenfield 90/10	-$759,333,662	-$353,980,777
Brownfield/Greenfield 70/30	-$760,330,481	-$421,692,136
Assume 100% demand for fixed line connectivity	-$755,458,580	-$254,338,821

Net Present Value	**Scenario 1**	**Scenario 2**
Baseline	-$5,700,739,117	-$2,950,559,730
Build Costs +10%	-$6,544,659,574	-$3,151,154,911
Build Costs -10%	-$5,354,721,470	-$2,578,217,653
Brownfield/Greenfield 90/10	-$5,706,568,825	-$2,660,247,752
Brownfield / Greenfield 70/30	-$5,714,060,151	-$3,169,114,340
Discount Rate (11%)	-$4,958,729,330	-$2,566,514,057
Discount Rate (3%)	-$6,664,772,712	-$3,449,519,365
Assume 100% demand for fixed line connectivity	-$5,677,446,684	-$1,911,415,311

Note: Scenario 1 is calculated with market failure of 1%. Scenario 2 is calculated with market failure of 1% for commercial and aged care buildings and as advised by NBN Co for residential buildings.

Impacts of Option 2

Option 2, a non-regulatory handbook providing guidance to industry on how to include adequate telecommunications spaces and pathways in new buildings, would be used in instances where it is helpful to designers and builders so designers and builders would not incur any costs in following helpful advice. There would be intangible benefits to industry where current practice is enhanced by the guidance material. Overall, a small net benefit to society.

Business Compliance Costs

Option 2 provides information that may be used by the building industry but in itself it does not impose any requirements on when or how this information should be used. That is a judgement for industry. Therefore Option 2 does not impose any compliance costs on business.

Consideration is given to any compliance burden imposed on business as a result of the adoption of Option 1.

Notification – Option 1 does not require businesses to report certain events.

Education – Industry will incur a once-off education cost to become aware of the proposed NCC provisions for telecommunications spaces and pathways, and to reflect how to respond to the requirements and their objectives. The ABCB seeks to effectively communicate changes to the NCC, and hence minimise education costs, by holding annual seminars in each jurisdiction to explain the changes. The building industry takes time and effort to become familiar with the changes each year, including through strong participation in the ABCB seminars. As an indication of the size of the once-off education costs, the incremental contribution of the new provisions for telecommunications spaces and pathways would be a small part of this annual education exercise, around 10 minutes in a half-day seminar.

Permission – Option 1 does not require any new permission to be obtained by business.

Purchase costs – Option 1 does impose purchase costs on business in materials and labour costs as described in the impact analysis.

Record keeping – Option 1 does not change the record keeping obligations of business.

Enforcement – Option 1 does not alter the inspection regimes of the jurisdictions and does not impose any costs of cooperating with inspections on business.

Procedural – Option 1 does not involve any new administrative costs.

Other – Option 1 does not involve any other costs.

Effects on Competition

Option 2 will not have any competition effects because the information contained in the handbook will be available to all building practitioners and telecommunication providers. Specifically Option 2 will not affect the number and range of suppliers nor change the ability of suppliers to compete nor alter suppliers' incentives to compete vigorously.

Under Option 1 the sub options 1a and 1d applying to new houses and new aged care buildings will not change the competitive environment as currently exists in the status quo. Specifically sub options 1a and 1d will not affect the number and range of suppliers nor change the ability of suppliers to compete nor alter suppliers' incentives to compete vigorously.

Under Option 1 the sub options 1b and 1c are designed to address competitive problems perceived by telecommunication providers in providing services to new apartments and commercial buildings by providing sufficient space for multiple providers. The problem in the status quo as identified by the providers is that the pathways in new buildings facilitate infrastructure by the first provider but these pathways are not always accessible to subsequent providers. This situation gives the first provider an advantage of incumbency and makes it both difficult and more expensive for subsequent providers to compete in providing telecommunications services to that building. The competitive advantage of incumbency enables the first supplier to increase the number of users of its service within the building. However the ABCB expects prices charged for services will be based on national competition and the first supplier will not be able to charge a monopoly price within the building.

Sub options 1b and 1c address this competitive problem in the status quo by requiring a sufficient volume of pathway to support four telecommunication providers. The telecommunications industry has advised that provision for four telecommunications providers in these buildings would satisfy their competition concerns. Sub options 1b and 1c have the potential to increase the number of suppliers in a new building, to enhance the ability of suppliers' to compete and support suppliers to compete vigorously.

REGULATORY BURDEN MEASUREMENT

The Inter-government agreement under which the ABCB operates describes the process to be followed by the ABCB when considering regulation, including that COAG Best Practice Principles be observed and ensure that, in determining the area of regulation and the level of the requirements:

- there is a rigorously tested rationale for the regulation;
- the regulations are effective and proportional to the issues being addressed such that the regulation will generate benefits to society greater than the costs (that is, net benefits);
- there is no regulatory or non-regulatory alternative (whether under the responsibility of the Board or not) that would generate higher net benefits; and
- the competitive effects of the regulation have been considered; and the regulation is no more restrictive than necessary in the public interest.

Office of Best Practice Regulation (OBPR) undertake an audit function assessing the adequacy of analysis against best practice regulation guidelines. Advice provided confirmed that the analysis met the 2007 COAG Best Practice Guidelines but did not meet the Commonwealth's Regulatory Burden Measurement (RBM) framework.

The principles of the Australian Government's guide to regulation requires all regulatory costs to be offset through other regulatory savings regardless of any net benefit that is derived from the new regulation. [36] The RBM also requires a regulatory offset to be provided for a measure to proceed to consultation or be identified as unfeasible. The costing for the proposed specification indicated in sum, this would not 'generate benefits to society greater than the costs' and on this basis the specification could not be supported. Given the significant net cost identified, the DoCA was not prepared to provide the offset required.

[36] http://cuttingredtape.gov.au/sites/default/files/documents/australian_government_guide_regulation.pdf

Identifying the specification as unfeasible was considered inappropriate in this instance, where the role of the consultation document was to seek feedback on assumptions and uncertainties.

Alternatives were explored including narrowing the specification to residential buildings where a net benefit may be achieved. Regulatory costs associated with Option 1 are shown in Table 9 and relate to administrative and substantive costs. These costs include the time it takes practitioners to understand and interpret the new requirements and the physical construction costs of complying with the proposed specification when considering current practice.

Table 9 – Regulatory costs (all Classes)

Type of Cost	Amount
Administrative costs	$1,204,280
Substantive costs	$782,228,665
Total annual regulatory costs	$783,432,945

Notes:

1. Administrative costs are calculated assuming the requirements will require 10 minutes for each practitioner to read and apply the new requirements based on 115,000 practitioners being impacted.
2. Regulatory costs are conservatively calculated using a nominal 1% behavioural failure rate. An increase in the problem would consequently increase the regulatory offset required.

Analysis suggests Class 1 buildings will deliver a small net benefit designing and building to the specification where it is assumed no pathway is provided at construction relative to the cost of retrofitting. This would require a regulatory offset of between $302, 000 and $18,000,000 depending on the market failure scenario.

Table 10 – Impacts on Class 1a buildings

Market Failure	Annual impact (000)	NPV (000)	Required regulatory offset (000)
Scenario 1 (1%)	+$1,586	+$11,922	$302
Scenario 2 (60%)	+$34,264	+$257,502	$18,170

1. Scenario 1 calculated using 0.01 x 113,000 x $268
2. Scenario 2 calculated using 0.6 x 113,000 x $268

Class 2 buildings do not achieve a net benefit under central analysis. This result is sensitive to assumptions for demand for fixed line services and the rate of market failure. Though a net benefit

is achievable using a higher rate of market failure (NBN's advice), the required regulatory offset also increases proportional to the number of buildings affected.

Table 11 – Impacts on Class 2 buildings

Demand	**73 %**	**100 %**	**73 %**	**100 %**	**Required regulatory offset (000)**
Market failure	**Annual impact (000)**		**NPV (000)**		
(1%) Scenario 1	-$366,147	-$364,153	-$2,751, 678	-$2,737,695	$374,474
(70%) Scenario 2	-$32,877	+$92,722	-$247, 078	+$696,829	$513,449

1. Scenario 1 calculated using (0.01 x 2500 x $229,549) + (0.99 x 2500 x ($229,549 – $80,565))
2. Scenario 2 calculated using (0.7 x 2500 x $229,549) + (0.3 x 2500 x ($229,549 – $80,565))

Given differing stakeholder views on the feasibility of the specification and the costs involved, and in recognition of the issues preventing the release of a Consultation RIS, the ABCB and DoCA agreed to release this report.

ADDITTIONAL VIEWS OF THE DOCA

Market Failure

The Department of Communications and Arts (DoCA) generally expects that buyers of properties, including Class 1 and 2 buildings, would not make conscious pre-purchase assessments or decisions in respect of spaces and pathways to accommodate telecommunications infrastructure. As with other utilities, it considers there is a general community perception that telecommunications in the form of fixed line phone and Internet connectivity will be readily available in a premises, particularly in urban areas, where most Australians live. It is taken as a given. This is largely because Telstra's Universal Service Obligation (USO) and its market dominance as a provider of telecommunications infrastructure has historically ensured that it would provide a connection to the building and the community expectation is that services are readily delivered, even though the provision of such services has depended on pathways being available where needed. Similar expectations exist with the rollout of the NBN and comparable competing infrastructure, on the basis such next-generation broadband infrastructure is to be available to all premises in Australia. Few, if any people, therefore are likely to stop and to ask whether there are pathways and spaces in a building to allow the ready connection of a fixed line service to them. Instead, they assume they will be there as a matter of course. Typically the examples raised with the DoCA are those where a person has moved into a new premises assuming they could be readily connected only to find they cannot be because of a lack of appropriate pathways. While it could be argued that people need to be educated to ask about pathways and conduits, most members of the community are likely to ask why they need to ask about something that is so basic to the provision of an everyday utility.

If anything, the take-up of mobile services may compound the problem. If a person generally uses a mobile phone service, they may they have even less reason to think about fixed line services and pathways. However, if it comes to a point where they need a higher capacity service and require a fixed line, if the appropriate pathways are not in place, they will face additional costs in remedying the situation, whether these be additional mobile costs, retrofitting costs, or moving costs.

In short, the DoCA considers that most new buyers of buildings would expect that adequate space and pathways would be provided for in design, and that as future owners or occupiers, would not expect to incur the cost and inconvenience of retrofitting the building to make adequate spaces and

pathways available. They would consider the absence of these pathways would be viewed by affected consumers to be a market failure – and a regulatory failure.

Future Perspective

The DoCA also considers that while, at June 2014, 27 per cent of Australian adults did not have an active fixed line telephone service, this does not mean new buildings in the future will have less need for adequate spaces and pathways for fixed line services, given building life is typically considered to be up to 50 years. As the data indicates, the majority of people still have fixed line services, and as indicated elsewhere in this report, it is generally accepted these are needed for cost-effective high speed, high volume internet usage, which is growing strongly. Spaces and pathways are not generally provided in a building on the basis that 73 per cent of occupants may make use of them and 27 per cent may not. In an MDU spaces and pathways are provided for all premises or for none. Generally they are provided for all premises because most people want the option of a fixed line service and, the DoCA considers, failure to provide pathways to allow this would affect sales if it became apparent it was an issue buyers needed to consider because it became a widespread practice. Moreover, over the life of a building, whether a SDU or in a MDU, the occupant of any particular unit, whether an owner or a tenant, may change several times. That is, while the first or second or third occupant may not require a fixed line, at some stage there is likely to be an occupant who does. As such, it is reasonable to expect that if a proportion of new buildings were constructed without adequate telecommunications pathways, they would subsequently be retrofitted at some point during the building's life by subsequent owners, at their cost and inconvenience. The ABCB notes this may be particularly pertinent for Class 1 buildings, which are also not covered by the existing Digital Building Telecommunications Access Guidelines[37], although the HIA noted that retrofitting the external element of a pathway in Class 1 buildings could be readily achieved and did not support the NCC amendments for Class 1 buildings.

[37] Available for download from the ABCB website

Given the importance of there being ready access to fixed line telecommunications and the need for appropriate spaces and pathways to enable this, the DoCA considers that a risk mitigation approach to the problem of the absence of appropriate spaces and pathways should be considered. This is reflected in the scenarios above that look at a nominal 1% non-provisioning rate. It is generally recognised that adequate (if not always optimal) spaces and pathways are generally provided. The problem is when this does not happen. Fortunately the problem is limited and probably driven by oversights in the design or building process (the small extent of the problem actually indicates the importance that is otherwise generally ascribed to providing spaces and pathways). However, when these are not provided, the cost of rectifying the situation by retrofitting far exceeds the cost of requiring their installation in the first place in the small percentage of buildings where it would not otherwise have happened (this is demonstrated by the quantity surveyor's assessment and the impact analysis above, which show significant retrofitting costs in all building classes). These costs include the actual cost of retrofitting, the costs of not having access to a fixed line service, the costs of arranging retrofitting, and potential damage to the fabric (e.g. impairing fire resistance) or aesthetics (e.g. surface mounted conduit) of a building caused by retrofitting. These are significant costs for an affected individual, even if the incidence of the problem nationally is low. The DoCA also considers that the cost-benefit of intervention on this basis should be considered, even though the reported incidence of the problem is low. That is, in most instances there is no problem because appropriate spaces and pathways are provided, but when it does happen it is a problem, and that risk should be mitigated by requiring appropriate spaces and pathways, in line with established and general practice, where this can be defined.

The DoCA considers that a future perspective of the fixed line service can be taken with some certainty. As is the case for water and electricity, telecommunications is widely regarded as an essential facility. In coming years, its importance is expected to grow, not diminish. This is reflected in society's increasing use of information and communications technologies for both work and

leisure which is reflected in high numbers of services in operation and exponential growth in data traffic[38].

Another factor that is expected to be important is the forecasted take-up of smart ICT technologies, generally referred to as the 'Internet of Things' (IoT)[39]. The IoT is the network of physical objects with connectivity that can collect and exchange data with each other and an operator. In this context, smart ICT can refer to connected vehicles, connected buildings and other connected infrastructure such as bridges, electrical grids or railways. It includes smart buildings. While the IoT will make extensive use of wireless technologies, it also makes use of wireline connections, whether to provide direct connections or to connect wireless transceivers. This infrastructure requires appropriate spaces and pathways as well, and the DoCA considers that is needs to be considered here, as well as by planners and designers when considering the benefits of smart buildings.

DoCA continues to consider there can be net savings in ensuring adequate spaces and pathways are included in buildings so as to avoid higher retrofitting costs, the key issues are what are the appropriate specifications and their costs.

Hedonic Pricing

The DoCA notes the ABCB's use of hedonic pricing data and its application to the problem examined here. While the DoCA acknowledges the role of hedonic pricing in regulatory analysis, it has expressed some concerns about the extrapolation of data in relation to the value of access to fibre-based broadband in New York State (p. 37) to the value of communications generally and the way the data has been applied to the current problem. It considers that if hedonic pricing is to be considered in an analysis like this, the matter needs to be considered more fully.

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[38] ACMA 2015 Communications Report 2014–15, p. 7, 48.

[39] See Communications Alliance 2015 Enabling the Internet of Things for Australia; International Telecommunications Union ITU-T SG20: IoT and its applications including smart cities and communities; OECD 2015 OECD Digital Economy Outlook 2015.

CONCLUSIONS

The telecommunications industry has identified that some new buildings are currently being constructed with no or inadequate telecommunications spaces and pathways, which makes it difficult or impossible to install telecommunications equipment and cabling within buildings. In these cases occupants who expect fixed line telecommunications services to be available will immediately lose this amenity and may seek to remedy the situation by retrofitting.

The telecommunications industry has provided examples of inadequate telecommunications spaces and pathways in new houses and new apartment buildings. NBN Co advises that 60% of new houses and 70% of new apartment buildings in brownfield areas are being constructed with inadequate telecommunications spaces and pathways. It has not been possible to substantiate NBN Co's advice with other information that would robustly verify the extent of the problem. It is possible that the problem is limited to occasional and isolated cases and statistical data underpinning the problem would assist future considerations.

Currently 73% of residences and 99% of businesses demand fixed line telecommunications services, so where pathways and spaces for fixed line are not available in new buildings a sizeable majority of prospective occupants would be affected by this lack of amenity. However from the supply side the evidence points to new buildings generally being constructed with adequate spaces and pathways for telecommunications cabling. The contrary information available indicates instances of the problem in some houses and low rise apartments, but not in new commercial buildings.

The specific objective of any amendment to the NCC is to ensure that occupants of new buildings can access fixed line telecommunications services if they demand it, which would be facilitated by adequate spaces and pathways in new buildings.

In assessing the need for regulation, analysis assessed three alternatives:

- The Status Quo – was regarded as a baseline to evaluate the incremental impacts of the alternative options.
- Option 1 – to mandate adequate telecommunication spaces and pathways in:
    a) New houses (Class 1)
    b) New apartment buildings (Class 2)

c) New commercial buildings Classes 3, 5 and 6)

d) New aged care buildings (Class 9c)

- Option 2 – to develop an up-to-date non-regulatory handbook for guidance to the construction industry.

The impacts of Option 1 are evaluated separately for each sub-option and under two Scenarios. The available information about inadequacies in new residential buildings has been quantified by assuming that a nominal 1 per cent of new buildings lack adequate spaces and pathways. This nominal 1 per cent assumption has also extended to commercial buildings and aged care buildings, although there is no information about inadequacies in these buildings. The nominal 1 per cent also reflects a risk mitigation approach. Scenario 2 adopts the advice of NBN Co for inadequacies in new houses and new apartment buildings and 1 per cent for the remaining building classes.

The impacts of both scenarios are based on the central case of 73 per cent of occupants in residential buildings and 99 per cent of occupants in commercial buildings demanding fixed line telecommunications services. The results are presented in the table below.

Table 12 – Total Impacts

Annual Impacts	**Scenario 1 (1 Percent)**	**Scenario 2 (NBN Co)**
New Houses	+$1,586,475	+$34,264,014
New Apartments	-$366,146,813	-$32,876,994
New Commercial Buildings	-392,803,129	-392,803,129
New Aged Care Buildings	-1,194,476	-1,194,476
Total Annual Impacts	**-$758,557,943**	**-$392,610,585**

Net Present Value	**Scenario 1 (1 Percent)**	**Scenario 2 (NBN Co)**
New Houses	+$11,922,728	+$257,502,023
New Apartments	-$2,751,678,337	-$247,078,246
New Commercial Buildings	-$2,952,006,743	-$2,952,006,743
New Aged Care Buildings	-$8,976,765	-$8,976,765
Total Net Present Value	**-$5,700,739,117**	**-$2,950,559,730**

The table shows that where 73% of residential and 99% of commercial occupants demand fixed line telecommunications services, Option 1 would result in net benefits for new houses and significant net costs for all other building categories. A sensitivity analysis was undertaken of the major parameters used in the impact analysis, including the case where 100% of residents expect fixed line telecommunications services. This sensitivity analysis shows net benefits for houses under both scenarios 1 and 2 and for apartment buildings under Scenario 2.

It should be noted that these estimates have been calculated without consideration of any hedonic price effect – where the lack of amenity influences the price of new buildings. If the lack of fixed line telecommunications services reduced the prices of new building by 1 per cent, then the market would be operating efficiently and cheaper prices would be sufficient to cover the costs of retrofitting. It has been excluded from the analysis on the basis that there are not any direct measurements of hedonic price effects relating to telecommunications in Australia. However, if hedonic price effects do occur in the market – Option 1 would not generate benefits.

The impacts of Option 2 involve an intangible benefit to the construction industry, where current practice of including telecommunications spaces and pathways in new buildings may be enhanced by guidance in a non-regulatory handbook. As a voluntary guideline, it could be adopted to the degree necessary, and in those instances where it is useful for a designer or builder, and therefore is assumed not to impose any costs. The benefits of Option 2 are intangible and less substantive than the quantified benefits of Option 1a.

On the basis of current information, the ABCB concludes the extent of the problem appears small and the impacts associated with the impost of the working group specification do not outweigh the available benefits in most cases. This view is shared by the DoCA, which on the basis of the quantity surveyor's assessment of the cost of the specification (the proposed amendments to the NCC), considers the specification, while perhaps technically strong, is not cost effective. As such, the amendments in their current form are not supported.

Consideration of Future Proposals

In recognition of the outcomes of this analysis, the ABCB is currently not undertaking any further work on amendments to the NCC for telecommunications pathways and spaces and therefore the status quo remains. The telecommunications industry, or the DoCA, may have an interest in undertaking further work, which if proposed would be given consideration by the ABCB in light of other priorities.

It is suggested any future proposal have regard both to this analysis, COAG best practice regulation principles and the ABCB Economic Impact Analysis Protocol, available from wwww.abcb.gov.au. Early engagement with the ABCB, and compliance with these guidelines will assist the ABCB in

meeting its obligations. In addition to the information presented in this report, the ABCB considers the following will further assist in objectively determining the merits of any future proposal:

- data to address uncertainties where identified in the analysis;
- evidence that supports key assumptions and inform the potential impacts of changes, including those arising from technical comments and the assessment of current practice in meeting occupant amenity; and
- evidence of the efficiency and effectiveness of amendments, including consideration of unintended consequences.

The ABCB notes that to fulfil obligations under the Inter-Governmental Agreement (IGA), ensure that in determining an area of regulation and the level of the requirements:

- there is a rigorously tested rationale for the regulation;
- the regulations are effective and proportional to the issues being addressed such that the regulation will generate benefits to society greater than the costs (that is, net benefits);
- there is no regulatory or non-regulatory alternative (whether under the responsibility of the Board or not) that would generate higher net benefits.

Further, the ABCB is obliged to follow the Commonwealth's RBM framework, which requires the identification of a corresponding regulatory offset for any regulatory burden arising from a change to the NCC and it would expect that the relevant Commonwealth agency would provide any such offset for changes it or the telecommunications industry proposes in relation to telecommunications.

Future consideration of NCC changes would depend on an extensive consultation process, cost-benefit analysis and regulation impact statement.

Fabric , for the purposes of **Part 2.6** and **Part 3.12**, means the basic building structural elements and components of a building including the roof, ceilings, walls and floors.

Fire-protective covering means—

(a) 13 mm fire-protective grade plasterboard; or

(b) 12 mm cellulose cement flat sheeting complying with AS/NZS 2908.2 or ISO 8336; or

(c) 12 mm fibrous plaster reinforced with 13 mm x 13 mm x 0.7 mm galvanised steel wire mesh located not more than 6 mm from the exposed face; or

(d) other material not less fire-protective than 13 mm fire-protective grade plasterboard, fixed in accordance with the normal trade practice for a *fire-protective covering*.

Fire-resistance level (FRL) means the grading periods in minutes determined in accordance with **Specification A2.3** of BCA Volume One, for—

(a) *structural adequacy*; and

(b) *integrity*; and

(c) *insulation*,

and expressed in that order.

Explanatory information:

A dash means there is no requirement for that criterion. For example, 90/–/– means there is no FRL for integrity and insulation.

Fire-resisting , applied to a *structural member* or other part of a building, means having the FRL *required* for that *structural member* or other part.

Finished ground level means the ground level adjacent to footing systems at the completion of construction and landscaping.

Fixed line footprint means the geographic area defined by the *appropriate authority* as being served by fixed telecommunications network infrastructure.

Flammability Index means the index number determined under AS 1530.2.

Flashing means a strip or sleeve of impervious material dressed, fitted or built-in to provide a barrier to moisture movement, or to divert the travel of moisture, or to cover a joint where water would otherwise penetrate to the interior of a building.

Flood hazard area means the *site* (whether or not mapped) encompassing land lower than the *flood hazard level* which has been determined by the *appropriate authority*.

STATE AND TERRITORY VARIATIONS

In Victoria the definition of flood hazard area is replaced as follows:

Flood hazard area means the *site* (whether or not mapped) encompassing land in an area liable to flooding within the meaning of Regulation 802 of the Building Regulations 2006.

Flood hazard level (FHL) means the flood level used to determine the height of floors in a building and represents the *defined flood level* plus the *freeboard* (see **Figure 1.1.5**).

Flight means that part of a stair that has a continuous series of *risers*, including *risers* of *winders*, not interrupted by a *landing* or floor (see **Figure 1.1.7**).

Explanatory information:

A *flight* is the area of a stair that has a continuous slope created by the nosing line of treads. The length of a *flight* is limited to restrict the distance a person could fall down a stair. Quarter *landings*, as shown in **Figure 1.1.7**, are considered sufficient to halt a person's fall and therefore are considered for the purposes of this document not to be part of the *flight*.

Piping means an assembly of pipes, with or without valves or other fittings, connected together for the conveyance of liquids.

Point of entry for telecommunications—

(a) in the *fixed line footprint*, means the point where the telecommunications network provider's starter pipe from a pit servicing the allotment passes the property boundary; or

(b) in other cases, means an *external wall* of the Class 1 or attached 10a building.

Prescriptive Solution means a method of satisfying the *Deemed-to-Satisfy Provisions*, deemed to comply with the *Performance Requirements*.

Pressure vessel means a vessel subject to internal or external pressure. It includes interconnected parts and components, valves, gauges and other fittings up to the first point of connection to connecting piping, and—

(a) includes fire heaters and gas cylinders; but—

(b) excludes any vessel that falls within the definition of a *boiler*.

Primary building element , for the purposes of **Part 3.1.3**, means a member of a building designed specifically to take part of the building loads and includes roof, ceiling, floor, stairway or ramp and wall framing members including bracing members designed for the specific purpose of acting as a brace to those members.

Explanatory information:

The loads to which a building may be subjected are dead, live, wind, snow and earthquake loads. Further information on building loads can be found in the 1170 series of Standards.

STATE AND TERRITORY VARIATIONS

In Queensland delete definition of primary building element and replace with the following:

(a) a member of a building designed specially to take part of the building loads and includes

Primary building element, for the purposes of **Part 3.1.3**, means—

roof, ceiling, floor, stairway or ramp and wall framing members including bracing members designed for the specific purpose of acting as a brace to those members; and

(b) door jambs, window frames and reveals, architraves and skirtings.

Private bushfire shelter means a structure associated with, but not attached to, or part of a Class 1a dwelling that may, as a last resort, provide shelter for occupants from immediate life threatening effects of a bushfire.

Private garage means—

(a) any garage associated with a Class 1 building; or

(b) any separate single storey garage associated with another building where such garage contains not more than 3 vehicle spaces.

Professional engineer means a person who is—

(a) if legislation is applicable — a registered *professional engineer* in the relevant discipline who has appropriate experience and competence in the relevant field; or

(b) if legislation is not applicable—

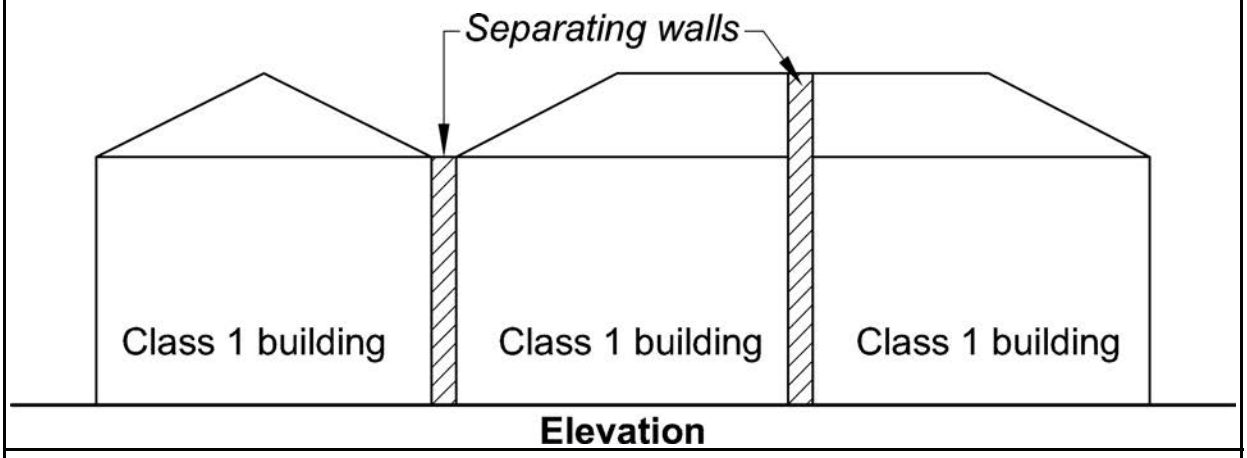
(i) a Corporate Member of the Institution of Engineers, Australia; or

(ii) eligible to become a Corporate Member of the Institution of Engineers, Australia, and has appropriate experience and competence in the relevant field.

R-Value (m^2.K/W) means the thermal resistance of a component calculated by dividing its thickness by its thermal conductivity.

Separating wall means a wall that is common to adjoining Class 1 buildings (see **Figure 1.1.3**).

Figure 1.1.3
SEPARATING WALL



Note: May also be known as a party wall and typically is *required* to be *fire-resisting* construction (see **Part 3.7.1**).

Shower area means the area affected by water from a shower, including a shower over a bath.

Single leaf masonry means outer walls constructed with a single thickness of masonry unit.

Site means the part of the allotment of land on which a building stands or is to be erected.

Sitework means work on or around a *site*, including earthworks, preparatory to or associated with the construction, *alteration*, demolition or removal of a building.

Smoke-Developed Index means the index number for smoke developed under AS/NZS 1530.3.

Spiral stairway means a stairway with a circular plan, winding around a central post with steps that radiate from a common centre or several radii (see **Figure 3.9.1.4**).

Spread-of-Flame Index means the index number for spread of flame under AS/NZS 1530.3.

Standard Fire Test means the Fire-resistance Test of Elements of Building Construction as described in AS 1530.4.

Structural adequacy , in relation to an FRL, means the ability to maintain stability and adequate *loadbearing* capacity under AS 1530.4.

Structural member means a component or part of an assembly which provides vertical or lateral support to a building or structure.

Surface water means all naturally occurring water, other than sub-surface water, which results from rainfall on or around the *site* or water flowing onto the *site*.

Swimming pool means any excavation or structure containing water and principally used, or designed, manufactured or adapted to be principally used for swimming, wading, paddling, or the like, including a bathing or wading pool, or spa.

Tapered tread means a stair tread with a walking area that grows smaller towards one end.

Telecommunications pathway means the pathway between the customer interface such as a network termination device, telephone point or similar, to the *point of entry*.

Total energy load means the sum of the *heating load* and *cooling load* divided by the conditioned *floor area* (MJ/m^2 conditioned *floor area*. annum).

Total R-Value means the sum of the *R-Values* of the individual component layers in a composite element including any building material, insulation material, airspace and associated surface resistances.

Total System Solar Heat Gain Coefficient (SHGC) means the fraction of incident irradiance on *glazing* or a *roof light* that adds heat to a building's space.

No.	Date	Title	BCA Clause(s)
AS 1288	2006	Glass in buildings—Selection and Installation Amdt 1 Amdt 2	**3.6.0**, **3.6.1**, **3.6.3**, **3.9.2.3**, **3.10.1.0**, **3.11.6**
AS 1289		Methods of testing soils for engineering purposes	
Method 6.3.3	1997	Determination of the penetration resistance of a soil — Perth sand penetrometer test Amdt 1	**3.2.2.2**
AS 1397	2011	Continuous hot dip metallic coated sheet steel and strip - coatings of zinc and zinc alloyed with aluminium and magnesium Amdt 1	**3.4.2.2**, **3.5.1.3**
AS 1477	2006	PVC pipes and fittings for pressure applications	**3.8.3.5**
AS 1530		Methods for fire tests on building materials, components and structures	
Part 1	1994	Combustibility test for materials	**1.1.1**
Part 2	1993	Test for flammability of materials Amdt 1	**1.1.1**
Part 4	2005	Fire-resistance test of elements of construction [**Note:** Subject to the note to AS 4072.1, reports relating to tests carried out under earlier editions of AS 1530 Parts 1 to 4 remain valid. Reports relating to tests carried out after the date of an amendment to a Standard must relate to the amended Standard]	**1.1.1**, **3.7.1.8**
AS/NZS 1530		Methods for fire tests on building materials, components and structures	
Part 3	1999	Simultaneous determination of ignitability, flame propagation, heat release and smoke release	**1.1.1**
AS 1562		Design and installation of sheet roof and wall cladding	**3.5.3.0**
Part 1	1992	Metal Amdt 1 Amdt 2 Amdt 3	**3.5.1.0**, **3.5.3.0**
AS/NZS 1562		Design and installation of sheet roof and wall cladding	
Part 2	1999	Corrugated fibre-reinforced cement	**3.5.1.0**
Part 3	1996	Plastics	**3.5.1.0**

PART 2.4 HEALTH AND AMENITY

Explanatory information:

OBJECTIVE

O2.4.1 Wet areas

The *Objective* is to safeguard the occupants from illness or injury and protect the building from damage caused by the accumulation of internal moisture arising from the use of *wet areas* in a building.

O2.4.2 Room heights

The *Objective* is to safeguard the occupants from injury or loss of amenity caused by inadequate height of a room or space.

O2.4.3 Facilities

The *Objective* is to—

(a) safeguard occupants from illness caused by infection; and

(b) safeguard occupants from loss of amenity arising from the absence of adequate personal hygiene facilities; and

(c) enable occupants to carry out laundering; and

(d) provide for facilities to enable food preparation; and

(e) enable unconscious occupants of *sanitary compartments* to be removed from the compartment; and

(f) safeguard occupants from loss of amenity, by ensuring a building facilitates access to telecommunications.

O2.4.4 Light

The *Objective* is to safeguard occupants from injury, illness or loss of amenity due to—

(a) isolation from natural light; and

(b) lack of adequate artificial lighting.

O2.4.5 Ventilation

The *Objective* is to safeguard occupants from illness or loss of amenity due to lack of air freshness.

O2.4.6 Sound insulation

The *Objective* is to safeguard occupants from illness or loss of amenity as a result of undue sound being transmitted between adjoining dwellings.

FUNCTIONAL STATEMENTS

F2.4.1 Wet areas

A building is to be constructed to avoid the likelihood of—

(a) the creation of any unhealthy or dangerous conditions; or

(b) damage to building elements,

caused by dampness or water overflow from bathrooms, laundries and the like.

F2.4.2 Room heights

A building is to be constructed to provide height in a room or space suitable for the intended use.

F2.4.3 Facilities

A building is to be provided with suitable—

(a) space and facilities for personal hygiene; and

(b) space or facilities for laundering; and

(c) space and facilities for the preparation and cooking of food; and

(d) space or other means to permit an unconscious occupant to be removed from a *sanitary compartment*; and

(e) means for the sanitary disposal of waste water.

(f) spaces and pathways to enable the deployment of telecommunication appropriate to the available public telecommunications network infrastructure.

Application:

F2.4.3 only applies to a Class 1 building.

F2.4.4 Light

(a) A *habitable room* within a building is to be provided with openings to admit adequate natural light consistent with its function or use; and

(b) A space within a building used by occupants is to be provided with artificial lighting consistent with its function or use which, when activated in the absence of suitable natural light, will enable safe movement.

F2.4.5 Ventilation

A space used by occupants within a building is to be provided with adequate ventilation consistent with its function or use.

F2.4.6 Sound insulation

A building element which separates dwellings is to be constructed to prevent undue sound transmission between those dwellings.

PERFORMANCE REQUIREMENTS

P2.4.1 Wet areas

To protect the structure of the building and to maintain the amenity of the occupants, water must be prevented from penetrating—

(a) behind fittings and linings; or

(b) into concealed spaces,

of sanitary facilities, bathrooms, laundries and the like.

P2.4.2 Room heights

A room or space must be of a height that does not unduly interfere with its intended function.

P2.4.3 Facilities

(a) Suitable sanitary facilities for personal hygiene must be provided in a convenient location within or associated with a building, appropriate to its function or use.

(b) * * * * *

This clause has been deliberately left blank.

(c) Laundering facilities or space for laundering facilities and the means for sanitary disposal of waste water must be provided in a convenient location within or associated with a building, appropriate to its function or use.

(d) A food preparation facility must be provided which includes—

(i) a means for food rinsing, utensil washing and the sanitary disposal of associated waste water; and

(ii) a means for cooking food; and

(iii) a space for food preparation.

(e) A *sanitary compartment* must be constructed with sufficient space or other means to enable an unconscious occupant to be removed from the compartment.

(f) Suitable spaces and pathways must be provided for a building, appropriate to the available public telecommunications infrastructure, to enable occupant access to open telecommunications networks.

Application:

P2.4.3 only applies to a Class 1 building.

Explanatory information:

For the purposes of **P2.4.3(c)**, waste water includes water that is soiled as a result of clothes washing, mopping floors and other domestic cleaning processes.

P2.4.4 Light

(a) A *habitable room* must be provided with *windows* so that natural light, when available, provides a level of *illuminance* appropriate to the function or use of that part of the building.

(b) Artificial lighting must be installed to provide a level of *illuminance* appropriate to the function or use of the building to enable safe movement by occupants.

PART 3.8.3 FACILITIES

3.8.3.4 Telecommunications pathways and spaces

A Class 1 building must be provided with a *telecommunications pathway*, and include—

(a) a point on an internal wall within the Class 1 or Class 10 building with clear space for termination equipment of 565 mm wide x 325 mm high x 100 mm deep; and

(b) a point on the face of the *external wall* of the Class 1 or attached Class 10a building between 300 mm and 1500 mm from the finished ground level and clear of any obstruction such as an internal corner of a building, balcony, window or another building service within a 450 mm radius; and

(c) a conduit to connect **(a)** and **(b)**; and

(d) where the building is located within the *fixed line footprint*, a pathway from the *point of entry* to the point on the face of the *external wall* must be not less than 100 mm and not more than 140 mm horizontally adjacent to the point in **(b)**.

Explanatory information:

The clear space required on the internal wall of the Class 1 or Class 10 building in **(a)** defines the internal boundary of the *required telecommunications pathway* and the transition point to any customer equipment or additional cabling.

Clearances listed in **(b)** are to ensure the safe and effective operation and installation of premises connection devices on the *external wall* used in fixed line networks. In a building not in the *fixed line footprint*, this point on the *external wall* is considered the building entry point and would define the pathway boundary.

Where a building is located in the *fixed line footprint*, the pathway in accordance with **(d)** provides a suitable pathway between the external premises connection device and the entry point on the allotment of the telecommunications infrastructure provider's pit and pipe used to service the allotment and defines the *telecommunications pathway* boundary.

Buildings located within and not within the *fixed line footprint*	
Diagram a	Building not located within the *fixed line footprint*

Buildings located within and not within the *fixed line footprint*

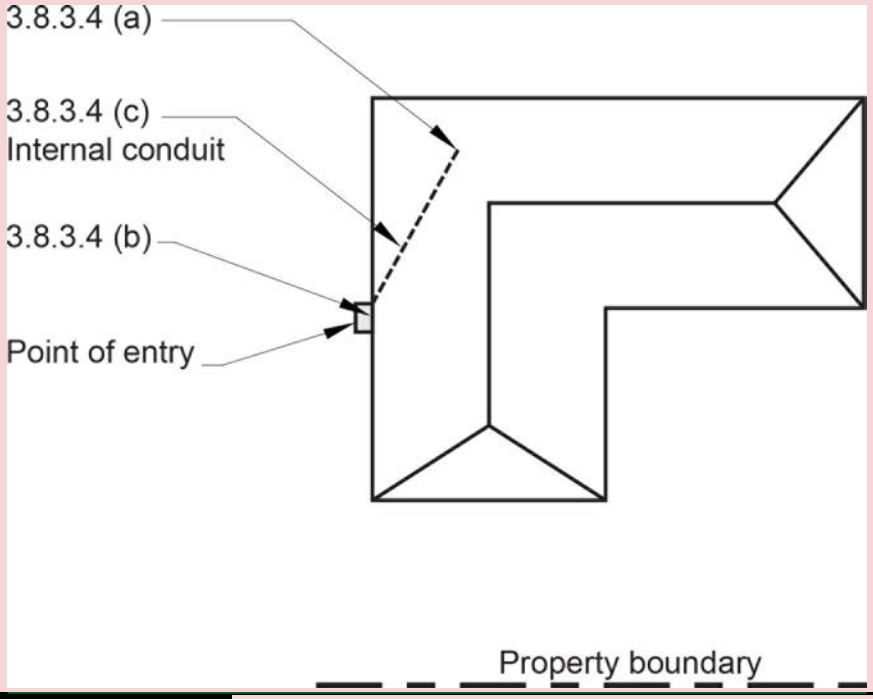
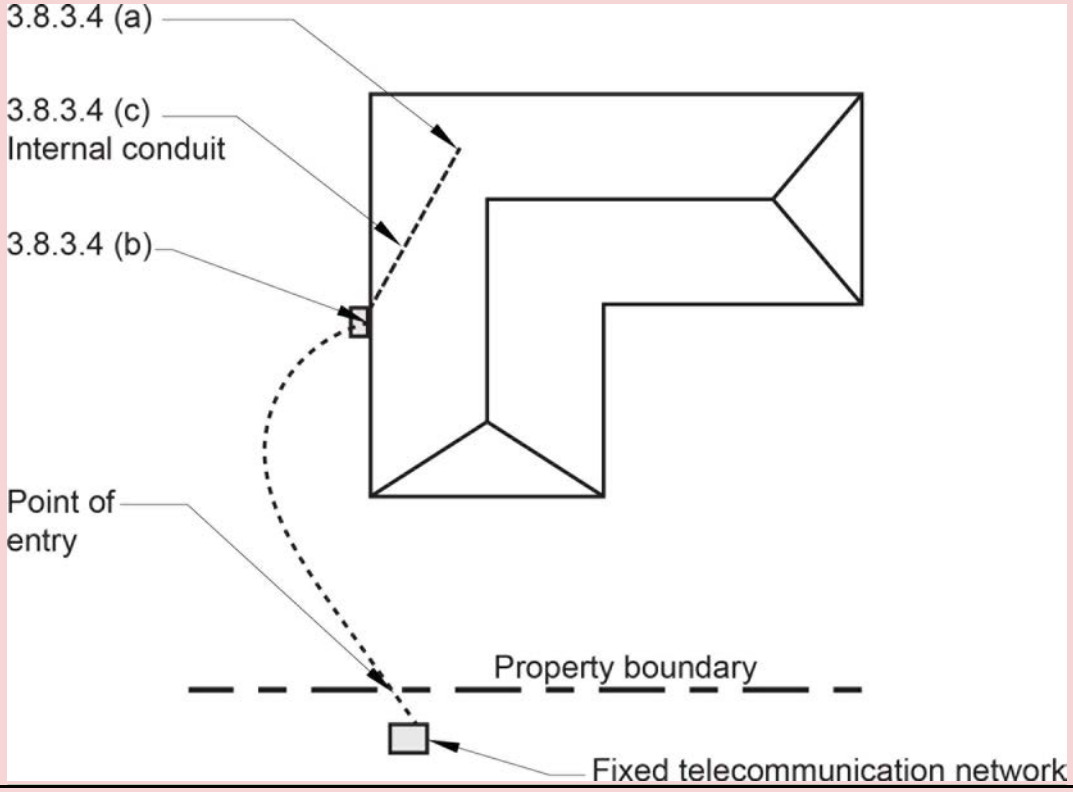


Diagram b Building located within the *fixed line footprint*



3.8.3.5 Installation requirements

A *telecommunications pathway* required by **3.8.3.4** must—

(a) be via white conduit complying with AS 1477 with an inside diameter of not less than 23 mm; and

(b) at changes in direction, use bends that are—

(i) individually not more than 90 degrees; and

(ii) cumulatively of not more than 270 degrees; and

(iii) if installed above ground, have a radius of not less than 100 mm; and

(iv) if installed below ground, have a radius of not less than 300 mm; and

(c) where located below ground—

(i) be installed with a depth of cover not less than 300 mm; and

(ii) where located below a driveway, be installed with a depth of cover not less than 450 mm of *controlled fill*; and

(iii) include provision for access to cables at intervals of not more than 50 m.

Fire-isolated stairway means a stairway within a *fire-resisting shaft* and includes the floor and roof or top enclosing structure.

Fire load means the sum of the net calorific values of the *combustible* contents which can reasonably be expected to burn within a *fire compartment*, including furnishings, built-in and removable materials, and building elements. The calorific values must be determined at the ambient moisture content or humidity. (The unit of measurement is MJ.)

Fire-protected timber means *fire-resisting* timber building elements that comply with **Specification A1.1**.

Fire-protective covering means—

(a) 13 mm fire-protective grade plasterboard; or

(b) 12 mm cellulose cement flat sheeting complying with AS/NZS 2908.2 or ISO 8336; or

(c) 12 mm fibrous plaster reinforced with 13 mm x 13 mm x 0.7 mm galvanised steel wire mesh located not more than 6 mm from the exposed face; or

(d) other material not less fire-protective than 13 mm fire-protective grade plasterboard,

fixed in accordance with the normal trade practice for a *fire-protective covering*.

Fire-resistance level (FRL) means the grading periods in minutes determined in accordance with **Specification A2.3**, for the following criteria—

(a) *structural adequacy*; and

(b) *integrity*; and

(c) *insulation*,

and expressed in that order.

Note: A dash means that there is no requirement for that criterion. For example, 90/–/– means there is no requirement for an FRL for integrity and insulation, and –/–/– means there is no requirement for an FRL.

Fire-resisting , applied to a building element, means having an FRL appropriate for that element.

Fire-resisting construction means one of the Types of construction referred to in **Part C1**.

Fire safety system means one or any combination of the methods used in a building to—

(a) warn people of an emergency; or

(b) provide for safe evacuation; or

(c) restrict the spread of fire; or

(d) extinguish a fire,

and includes both active and passive systems.

Fire-source feature means—

(a) the far boundary of a road, river, lake or the like adjoining the allotment; or

(b) a side or rear boundary of the allotment; or

(c) an *external wall* of another building on the allotment which is not a Class 10 building.

Fire wall means a wall with an appropriate resistance to the spread of fire that divides a *storey* or building into *fire compartments*.

Fixed line footprint means the geographic area defined by the *appropriate authority* as being served by fixed telecommunications network infrastructure.

Flashover , in relation to *fire hazard properties*, means a heat release rate of 1 MW.

Flammability Index means the index number as determined by AS 1530.2.

Flight means that part of a stairway that has a continuous series of risers, including risers of winders, not interrupted by a landing or floor.

(Vic, Flood hazard area)

Flood hazard area means the *site* (whether or not mapped) encompassing land lower than the *flood hazard level* which has been determined by the *appropriate authority*.

Open space means a space on the allotment, or a roof or similar part of a building adequately protected from fire, open to the sky and connected directly with a public road.

Open spectator stand means a tiered stand substantially open at the front.

Other property means all or any of the following—

(a) any building on the same or an adjoining allotment; and
(b) any adjoining allotment; and
(c) a road.

Outdoor air means air outside the building.

Outdoor air economy cycle is a mode of operation of an *air-conditioning* system that, when the outside air thermodynamic properties are favourable, increases the quantity of outside air used to condition the space.

Outfall means that part of the disposal system receiving *surface water* from the drainage system and may include a natural water course, kerb and channel, or soakage system.

Panel wall means a non-*loadbearing external wall*, in frame or similar construction, that is wholly supported at each *storey*.

Patient care area means a part of a *health-care building* normally used for the treatment, care, accommodation, recreation, dining and holding of patients including a *ward area* and *treatment area*.

Performance Requirement means a requirement which states the level of performance which a *Performance Solution* or *Prescriptive Solution* must meet.

Performance Solution means a method of complying with the *Performance Requirements* as outlined in **A0.4**.

Personal care services means any of the following:

(a) The provision of nursing care.
(b) Assistance or supervision in—
  (i) bathing, showering or personal hygiene; or
  (ii) toileting or continence management; or
  (iii) dressing or undressing; or
  (iv) consuming food.
(c) The provision of direct physical assistance to a person with mobility problems.
(d) The management of medication.
(e) The provision of substantial rehabilitative or development assistance.

Piping , for the purposes of **Section J**, means an assembly of pipes, with or without valves or other fittings, connected together for the conveyance of liquids and gases.

Point of connection for telecommunications means the point where the customer cabling meets the open telecommunications network boundary.

Prescriptive Solution means a method of satisfying the *Deemed-to-Satisfy Provisions*, deemed to comply with the *Performance Requirements*.

Pressure vessel means a vessel subject to internal or external pressure. It includes interconnected parts and components, valves, gauges and other fittings up to the first point of connection to connecting piping, and—

(a) includes fire heaters and gas cylinders; but
(b) excludes any vessel that falls within the definition of a *boiler*.

Primary building element means a member of a building designed specifically to take part of the loads specified in **B1.2** or **B1.3** and includes roof, ceiling, floor, stairway or ramp and wall framing members including bracing members designed for the specific purpose of acting as a brace to those members.

Smoke growth rate index (SMOGRA$_{RC}$) means the index number for smoke used in the regulation of *fire hazard properties* and applied to materials used as a finish, surface, lining or attachment to a wall or ceiling.

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 building, which includes sleeping facilities and any area for the exclusive use of a resident.

Spread-of-Flame Index means the index number for spread of flame as determined by AS/NZS 1530.3.

Stage means a floor or platform in a Class 9b building on which performances are presented before an audience.

Stairway platform lift means a power-operated device for raising or lowering people with limited mobility on a platform (with or without a chair) in the direction of a stairway.

Standard Fire Test means the Fire-resistance Tests of Elements of Building Construction as described in AS 1530.4.

Storey means a space within a building which is situated between one floor level and the floor level next above, or if there is no floor above, the ceiling or roof above, but not—

(a) a space that contains only—

(i) a lift *shaft*, stairway or meter room; or

(ii) a bathroom, shower room, laundry, water closet, or other *sanitary compartment*; or

(iii) accommodation intended for not more than 3 vehicles; or

(iv) a combination of the above; or

(b) a *mezzanine*.

Structural adequacy , in relation to an FRL, means the ability to maintain stability and adequate *loadbearing* capacity as determined by AS 1530.4.

Surface water means all naturally occurring water, other than sub-*surface water*, which results from rainfall on or around the *site* or water flowing onto the *site*.

Swimming pool means any excavation or structure containing water and principally used, or that is designed, manufactured or adapted to be principally used for swimming, wading, paddling, or the like, including a bathing or wading pool, or spa.

Telecommunications pathway means the pathway used by open telecommunications network infrastructure and includes—

(a) telecommunications entry points; and

(b) telecommunications equipment rooms or floor distributors; and

(c) vertical telecommunications risers between *storeys*; and

(d) in a Class 2, 3 or 9c building or a Class 4 part in the *fixed line footprint*, horizontal pathways used up to the *point of connection*.

Total R-Value means the sum of the *R-Values* of the individual component layers in a composite element including any building material, insulating material, airspace and associated surface resistances.

Total System Solar Heat Gain Coefficient (SHGC) means the fraction of incident irradiance on *glazing* or a *roof light* that adds heat to a building's space.

Total System U-Value (W/m^2.K) means the thermal transmittance of the composite element allowing for the effect of any airspaces and associated surface resistances.

PART F6 TELECOMMUNICATIONS

OBJECTIVE

FO6

The *Objective* of this Part is to safeguard occupants from a loss of amenity, within a building by facilitating access to open telecommunications networks.

FUNCTIONAL STATEMENTS

FF6.1

A building is to be provided with spaces and pathways for telecommunications to enable the deployment of telecommunications appropriate to the available public telecommunications network infrastructure.

PART F6 TELECOMMUNICATIONS

PERFORMANCE REQUIREMENTS

FP6.1

To allow occupant access to open telecommunications network, suitable spaces and pathways for telecommunications must be provided in a building, appropriate to—

(a) the function and use of the building; and

(b) the availability of the telecommunications network infrastructure.

Application:

FP6.1 only applies to a Class 2, 3, 5, 6 or 9c building or a Class 4 part of a building.

PART F6 TELECOMMUNICATIONS

Deemed-to-Satisfy Provisions

F6.0 Deemed-to-Satisfy Provisions

Performance Requirement **FP6.1** is satisfied by complying with **F6.1**.

F6.1 Telecommunication pathways and spaces

(a) In a Class 2, 3, 5, 6 or 9c building, space for a *telecommunications pathway* must be provided with—

(i) a telecommunications entry point; and

(ii) a telecommunications equipment room; and

(iii) telecommunication floor distributors or the like; and

(iv) vertical risers connecting telecommunication equipment rooms and floor distributors; and

(v) a telecommunications internal lead-in conduit where the building—

(A) is a Class 2 or 3 building; or

(B) contains a Class 4 part,

in accordance with **Specification F6.1**.

(b) The requirements of **(a)(iii)** and **(a)(iv)** need not apply to a building with a *rise in storeys* of not more than one.

SPECIFICATION F6.1 PATHWAYS AND SPACES FOR TELECOMMUNICATIONS

Deemed-to-Satisfy Provisions

1. Scope

This Specification describes the necessary elements for common *telecommunications pathways* in a building. **Clauses 2**, **3** and **5** relate to the pathway requirements and **Clauses 4** and **7** relate to telecommunications spaces.

2. Extent of telecommunications pathways

A *telecommunications pathway* must be provided to the *point of connection* with their number and dimension in accordance with—

(a) **Table 1** for a Class 2, 3 or 9c building; and

(b) **Table 2** for a Class 5 or 6 building,

for a building with a *rise in storeys* of two or more.

3. Telecommunications entry point

A telecommunications entry point in a *telecommunications pathway* must—

(a) be separated by a distance of not less than 20 m where more than one telecommunications entry points are *required*; and

(b) use a conduit or the like with a minimum internal diameter of 100 mm; and

(c) connect directly to a telecommunications equipment room.

4. Telecommunications equipment rooms

A telecommunications equipment room must—

(a) connect directly to the *required* vertical risers; and

(b) serve an aggregate *floor area* of all *storeys* of not more than 50 000 m^2.

5. Vertical risers

Where a duct, tray, conduit, or the like is used to carry telecommunications network infrastructure it must—

(a) limit cumulative changes in direction to not more than 180 degrees between access points; and

(b) have a minimum bend radius of not less than six times the internal conduit diameter where conduit is used; and

(c) have a minimum internal cross sectional dimension two times that of the total sum of the aggregate cable cross sectional area it encases; and

(d) be accessible from each *storey* via a space in accordance with **Clause 6**.

Deemed-to-Satisfy Provisions

6. Telecommunications spaces – Floor distributors and riser cupboards

(a) A floor distributor must have a minimum *floor area* of 9 m^2 and only serve—

(i) a *storey*—

(A) containing not more than 50 *sole-occupancy units*, in a Class 2, 3 or 9c building; and

(B) with a *floor area* less than 2 500 m^2 in a Class 5 or 6 building; or

(ii) a point on the *storey* less than 50 m from a riser or a point where access is provided to a riser via a telecommunications cupboard with a door of not less than 750 mm wide x 1980 mm high.

(b) The floor distributor space in **(a)** may be combined in a building equipment room in a—

(i) Class 2, 3 or 9c building containing not more than 20 *sole-occupancy units*; or

(ii) Class 5 or 6 building with a *floor area* of less than 2 000 m^2.

7. Telecommunications internal lead-in conduit

In a Class 2 or 3 or 4 building, the *fixed line footprint*, two white conduits, each with an internal diameter of not less than 23 mm must—

(a) connect a floor distributor, combined floor distributor and equipment room or telecommunications riser with—

(i) a device serving as the network boundary within the *sole-occupancy unit*; or

(ii) a point on the wall with clear space for termination equipment equivalent to 325 mm wide x 565 mm high x 100 mm deep; and

(b) comply with **Clause 5(a)** and **(b)**.

Table 1 TELECOMMUNICATIONS PATHWAYS AND SPACES FOR CLASS 2, 3 or 9c BUILDINGS

Number of *sole-occupancy units* in a building	Number of entry points	Minimum total *floor area* of equipment rooms (m^2)	Total area of vertical riser per *storey* (mm^2)	Number of vertical riser shafts
Less than 5	1	5	7 500 mm^2	1
5 to less than 50	1	10	20 000 mm^2	1
50 to less than 100	1	19	20 000 mm^2	1
100 to less than 250	1	23	40 000 mm^2	1
250 to less than 500	1	26	60 000 mm^2	1
500 to less than 1 000	2	31	60 000 mm^2	2
1 000 or more	2	add 5 per 250	80 000 mm^2	2

Table 2 TELECOMMUNICATIONS PATHWAYS AND SPACES FOR CLASS 5 AND 6 BUILDINGS

Building *floor area* (m^2)	Number of entry points	Minimum total *floor area* of equipment rooms (m^2)	Total area of vertical riser per *storey* (mm^2)	Number of vertical riser shafts
Less than 1 000	1	9	15 700 mm^2	1

Deemed-to-Satisfy Provisions

Building *floor area* (m^2)	**Number of entry points**	**Minimum total *floor area* of equipment rooms (m^2)**	**Total area of vertical riser per *storey* (mm^2)**	**Number of vertical riser shafts**
1 000 to less than 2 000	1	9	17 270 mm^2	1
2 000 to less than 4 000	1	14	20 410 mm^2	1
4 000 to less than 12 000	1	22	32 970 mm^2	1
12 000 to less than 25 000	1	35	53 380 mm^2	2
25 000 to less than 50 000	1	60	92 630 mm^2	2
50 000 to less than 75 000	2	85	131 880 mm^2	2
75 000 to less than 100 000	2	110	171 130 mm^2	3
100 000 or more	2	160	249 630 mm^2	3
Note: The vertical riser dimensions may be apportioned to diminish height increases, provided the sum of the total area provided is equal to the sum of the aggregate area *required* for all *storeys* when determined at the rate of 15 700 mm^2 plus 7 850 mm^2 per 5 000 m^2 of *floor area* or part thereof above.				