



Cost Study

*The cost impact of complying with
proposed 2022 changes to section G of NCC Volume One
in
Non-residential Class 9 Buildings*

31 May 2021



Contents

Contents.....	1
Introduction	2
Executive Summary.....	4
Table 1 – Cost increase required to achieve NCC 2022 draft revisions.....	4
Major Cost Increases.....	5
Schools	5
Childcare.....	5
Aged Care	5
Hospital	5
Commentary	6
Appendix A - ‘Example’ buildings	7
Table 3 - ‘Example’ Buildings.....	7
Appendix B - Design requirements the proposed changes to the Bushfire Provisions for Non-Residential Buildings on ‘typical’ Class 9 buildings	8

Introduction

This report indicates the likely design and cost implications of complying with the revised section G of NCC Volume One on a range of 'example' buildings.

The report refers to the proposed changes noted in Specification 44 for the following Class 9 building types.

- Primary Schools
- Childcare Centres
- Aged Care
- Hospitals

It is not intended to provide specific advice to building designers nor is it intended to cover all possible scenarios.

Several assumptions have been made in this report regarding the 'example' buildings used to establish the cost models, and these assumptions are identified within this report.

The design and cost implications of complying with the revised section G of NCC Volume One may vary considerably depending upon:

- The location of the building on the site
- The size and shape of the building
- The construction materials used
- The design options adopted to address the BAL rating requirements

The methodology used in preparing this report was as follows:

- The report identifies the proposed design requirements (refer to Appendix B). The table in Appendix B is a summary only of the design implications of complying and it is not a complete list of all the design requirements or options.
- From the various design options, the report identifies typical design solution for each 'example' building (refer to Appendix B). This forms the basis of the additional construction cost estimates included in the report. Note: Appendix B only lists the additional design requirements that are not otherwise required by other building regulations, licensing standards and common practice.
- The report identifies the 'example' building size, shape and construction type, for each building type (Refer to Appendix A). These are used to calculate overall building costs and additional construction costs for each 'example' building type.

The various 'example' buildings as based on the following assumed construction:

- All new construction
- Single storey
- Masonry clad
- Concrete slab
- Concrete verandahs
- Steel framed metal deck roof
- Aluminum windows

This is typical of these types of buildings and requires the least changes to meet the proposed design requirements.

This building type has been adopted to indicate the range of cost which may be incurred.

Variations to the 'example' building materials will likely increase the cost required to achieve the proposed design requirements.

Executive Summary

The cost impact of complying with proposed NCC 2022 draft revisions for the designated 'example' buildings is as shown below:

Table 1 – Cost increase required to achieve NCC 2022 draft revisions

Using the typical design solutions and the “example” buildings for each building type (from Appendix A), estimates of the cost implications on each building type were calculated (refer below).

	Estimated Total Building Construction Cost	Additional Costs	% increase	\$/m ² increase
School	\$8,820,000	\$1,315,913	15%	\$439
Child Care	\$1,890,000	\$333,349	17.6%	\$556
Aged Care	\$22,050,000	\$347,533	1.6%	\$58
Hospitals	\$23,630,000	\$393,525	1.7%	\$79

The Anticipated Costs is the cost of building works only (labour and materials) in Melbourne and excludes:

- External works and external services
- Consultant fees (including redesign fees)
- Furniture and equipment
- Locality allowance
- Cost escalation after May 2021
- GST

Major Cost Increases

The causes of the additional costs vary with each building type. The following is a summary of the major drivers for each building type.

Schools

S44C9 Internal tenability - \$900,000

S44C11 Supply of water for firefighting - \$90,000

S44C12 Emergency power supply - \$150,000

Childcare

S44C9 Internal tenability - \$180,000

S44C11 Supply of water for firefighting - \$18,000

S44C12 Emergency power supply - \$75,000

Aged Care

S44C6 Non-combustible path around building- \$139,500

S44C11 Supply of water for firefighting - \$180,000

Hospital

S44C9 Internal tenability - \$111,775

S44C11 Supply of water for firefighting - \$150,000

The costs represent the anticipated additional cost incurred for the various 'example' building types due to the proposed additional requirements.

Refer to the attached appendices for further information on the methodology and assumptions made.

Commentary

1. The % cost impact varies depending on the type of building. For example, a school building has a lower \$/m² building cost rate than a hospital, therefore the same design requirement on a school and hospital of the same size would result in a higher % increase for the school.
2. The % cost impact varies depending on the size of building. For example, whereas in the “example” building assumes a hydrant is already covered under current design and statutory requirements, a childcare (or other building) with a smaller footprint or more than 50km from a fire brigade would not. Therefore, the additional costs of a static water supply are provided to be indicative of the costs of compliance with this measure.
3. Aged Care and Hospital buildings already include a larger number of the proposed design already incorporated into building regulations, licensing requirements or common practice. For example, the expected changes to the air-handling systems are already likely to be included in Aged Care and Hospital buildings.
4. Smaller buildings such as Childcare tend to have a higher external wall to floor area ratios than large buildings. Therefore, as most of the additional costs associated with external walls and windows, smaller buildings like kindergartens incur a higher % increase than other larger buildings.
5. It is assumed S44C10 (Building Envelope) provisions will be required by all buildings, even if the location and separation requirements of S44C3, S44C4 and S44C5 requirements are met. S44C10 costs included for upgrades to roofs, walls, windows, glazing and screens as required to meet BAL-19
6. Typical building construction materials for Class 9A, 9B and 9C buildings usually include concrete floor slabs, masonry walls, metal roofs and aluminum windows. These meet most of the requirements of a BAL-19.
7. On most sites for Class 9 buildings there is some opportunity to relocate the building on the site to meet the proposed requirements. However, it should be noted that in many cases, a combination of the constraints of the site dimensions, topography, vegetation, site access, site services, adjacency to public roads, etc make it either impossible or impractical to relocate the building sufficiently.
8. Due to the wide variability of potential or existing sites, it is not possible to quantify what proportion of sites may allow for this, or what the anticipated cost might be.

Appendix A - 'Example' buildings

The design and cost implications will vary considerably depending upon the building design, this report has been based upon a series of 'example' buildings that are indicative of the likely common building types in each category.

These 'typical' buildings are as follows:

Table 3 - 'Example' Buildings

	School	Child Care	Aged Care	Hospitals
Internal floor area (FECA)	3000m ²	600m ²	6000m ²	5000m ²
External covered areas (UCA)	150m ²	30m ²	300m ²	250m ²
External wall perimeter	330m	145m	465m	425m
External wall area	1155m ²	365m ²	1090m ²	1594m ²
Window area	495m ²	244m ²	537m ²	531m ²
Roof area	3308m ²	662m ²	6615m ²	5516m ²

The various 'example' buildings as based on the following assumed construction:

- All new construction
- Single storey
- Masonry clad
- Concrete slab
- Concrete verandahs
- Steel framed metal deck roof
- Aluminum windows

Appendix B - Design requirements the proposed changes to the Bushfire Provisions for Non-Residential Buildings on 'typical' Class 9 buildings

Appendix B identifies the proposed design requirements and is a summary only. It is not a complete list of all of the design requirements.

From the various proposed design requirements, Appendix B identifies typical design solution for each 'example' building. This forms the basis of the additional construction cost estimates included in this appendix. Note: Appendix B only lists the additional design requirements which are not otherwise required by other building regulations or common practice.

Specification 44 - Bushfire protection for certain Class 9 buildings				Additional cost for complying			
Clause	Construction Requirements	Proposal already incorporated into building regulations, licensing requirements or common practice	Additional design requirements	School	Childcare	Aged care	Hospital
S44C2	Separation from classified vegetation (1) The building must be separated from classified vegetation - (a) by not less than the minimum distances specified in Table S44C2; or (b) such that radiant heat flux on exposed building elements will not exceed 10kW/m ² . (2) For the purposes of (1), the term classified vegetation has the meaning that it has in AS 3959.	n/a	For the purpose of this assessment, it is expected that this requirement can be met without any additional building design requirements through relocation of building on site or clearing of site	0	0	0	0
S44C3	Separation between buildings (1)The building must be located not less than 12 m from any other building. (2)The separation distance required by (1) need not be complied with if the external walls and roof of the building are constructed - (a) with an FRL of not less than 60/60/60 when tested from the outside, with any openings protected in accordance with AS 3959 for BAL-19 or greater; or (b) using a material of system that satisfies the test criteria of AS 1530.8.1 for a radiant heat flux of 10 kW/m ² .	n/a	Item (1) - For the purpose of this assessment, it is expected that this requirement can be met without any additional building design requirements through relocation of building on site or clearing of site Item (2) - Yes (see S44C10 for costs)	0	0	0	0
S44C4	Separation from allotment boundaries and carparking areas (1) The building must be located not less than 10 m from any allotment boundary or carparking area. (2) The separation distance required by (1) need not be complied with if the external walls and roof of the building are constructed - (a) with an FRL of not less than 60/60/60 when tested from the outside, with any openings protected in accordance with AS 3959 for BAL-19 or greater; or (b) using a material of system that satisfies the test criteria of AS 1530.8.1 for a radiant heat flux of 10 kW/m ² .	n/a	Item (1) - For the purpose of this assessment, it is expected that this requirement can be met without any additional building design requirements through relocation of building on site or clearing of site Item (2) - Yes (see S44C10 for costs)	0	0	0	0
S44C5	Separation from hazards The external walls and roof of the building must be protected from potential hazards on the site such as gas bottles, fuel storage, storage of combustible materials, waste bins, vehicles, machinery, and the like, by - (a) a separation distance of not less than 10m; or (b) where within the 10m separation distance described in (a), construction with an FRL of not less than 60/60/60 when tested from the outside, with any openings protected in accordance with AS 3959 for BAL-19 or greater; or (c) construction using a material of system that satisfies the test criteria of AS 1530.8.1 for a radiant heat flux of 10 kW/m ² .	n/a	Item (a) - For the purpose of this assessment, it is expected that this requirement can be met without any additional building design requirements through relocation of building on site or clearing of site Item (b) and (c) - Yes (see S44C10 for costs)	0	0	0	0
S44C6	Non-combustible path around building A non-combustible pathway not less than 1.5 m wide must be provided around the perimeter of the building.	n/a	Yes - concrete or similar path to perimeter of building	99,000	43,500	139,500	127,500
S44C7	Access pathways (1) Access pathways that lead to a road or open space must - (a) be readily identifiable; and (b) have an even surface; and (c) have a minimum clear width of not less than 1 m. (2)If the access pathway is an accessway that is required to comply with Part D4, the requirements of Part D4 override (1) to the extent of any inconsistency.	Yes	Nil	0	0	0	0
S44C8	Exposed external areas For any external area designed to hold people unable to be safely accommodated within the building, that may be exposed to radiant heat flux from a fire front during a bushfire event, the maximum incident radiant heat flux from the fire front must not exceed 1 kW/m ² above background solar radiant heat flux.	n/a	For the purpose of this assessment, it is expected that this requirement can be met without any additional building design requirements	0	0	0	0
S44C9	Internal tenability To maintain internal tenability throughout the duration of occupancy during a bushfire event, the building must comply with the following: (a) An air handling system must be provided that is capable of - (i) being adjusted for full recycling of internal air for limited periods to avoid the introduction of smoke into the building; and (ii) maintaining an internal air temperature of not greater than 25°C. (b) The building envelope must be designed such that if an air handling system required by (a) fails, then - (i) internal air temperatures can be maintained below 39°C; and (ii) internal surface temperatures can be maintained below 60°C. (c) If the building is divided into separate compartments then, for the purposes of (a), each compartment must have a separate air handling system. (d) Each air handling system required by(a) must be designed to account for the activation of smoke detectors from low concentrations of smoke from external sources, so as to ensure that air conditioning and other essential systems remain operational.	Partial - it is expected that Items (a), (c) and (d) provisions are already included in Aged Care and Hospital buildings	Yes Item (a) - upgrade mechanical system and controls designed to meet requirement Item (b) - Yes (see S44C10 for costs)	900,000	180,000	0	0
S44C10	Building envelope The external walls and roof of the building must be - (a) non-combustible, except for materials listed in C2D10(4) or (5); and (b) constructed in accordance with AS 3959 for BAL-19 or greater.	n/a	"Example" building walls are assumed to have non-combustible masonry clad external walls and metal deck roofs. Additional costs required to seal and screen all gaps and penetrations to roofs and walls and upgrade windows, glazed doors and flyscreens to meet current BAL-19 specification	73,613	15,399	23,383	111,775
S44C11	Supply of water for firefighting Water for fire-fighting purposes must be available and consist of - (a) a fire hydrant system complying with E1D3, or (b) a static water supply consisting of tanks, swimming pools, dams or the like, or a combination of these, together with suitable pumps, hoses and fittings, capable of providing the required flow rate for a period of 4 hours, determined in consultation with the relevant fire brigade.	Partial - it is expected that provision (a) is already	Static water supply - tanks - pumps, hoses and fittings - connections to hydrant system	90,000	18,000	180,000	150,000

Specification 44 - Bushfire protection for certain Class 9 buildings				Additional cost for complying				
Clause	Construction Requirements	Proposal already incorporated into building regulations, licensing requirements or common practice	Additional design requirements	School	Childcare	Aged care	Hospital	
				S44C12	Emergency power supply Emergency power must be provided to support, for not less than 4 hours before and 2 hours after the passing of the fire front during a bushfire event, the ongoing operation of - (a) air handling systems to maintain internal tenability; and (b) any pumps for fire-fighting; and (c) any emergency lighting, exit signs, and (d) any other emergency equipment listed in C3D14(6) and required to be provided.	Partial - it is typical that this provision is already included in Aged Care and Hospital buildings	Emergency power generator and association works	150,000
S44C13	Signage Signage must be provided to warn building occupants against storing combustible materials under or adjacent to the building.	n/a	Additional signage - assumed every 25m to perimeter of building	3,300	1,450	4,650	4,250	
S44C14	Vehicular access Vehicular access to the building must be provided in accordance C3D5(2), as if the building were a large isolated building for the purposes of C3D5.	Yes	It is typical that vehicle access is provided to all "example" buildings within current common design practices and any changes required to meet C3D5(2) can be met with zero or minimal cost	0	0	0	0	
				Total	1,315,913	333,349	347,533	393,525
				% of building cost	14.9%	17.6%	1.6%	1.7%

\$439 \$556 \$58 \$79