GOVERNMENT OF WESTERN AUSTRALIA

Building and Energy Western Australia

Decision Regulatory Impact Statement

Building Better: Reforms to WA's Building Regulatory Framework

Volume 2

Produced by:

The Department of Mines, Industry Regulation and Safety

Building and Energy Division

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2023

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This Decision Regulatory Impact Statement (DRIS) has been prepared in compliance with the WA Department of Treasury's Better Regulation Program.

The purpose of this DRIS is to recommend reforms to building regulation to ensure safe and high quality housing and commercial building in WA.

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Important Note on Volumes:

This DRIS comprises of two volumes. This document is Volume 2 which contains a number of important Attachments that support the recommendations in Volume 1.

The Attachments in Volume 2 should (where appropriate) be read in conjunction with the relevant sections in Volume 1.

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CIE final report WA building approvals and registration reforms CBA.

FINAL REPORT

Reforms to building approvals process and registration of building practitioners in Western Australia

Cost-benefit analysis

Prepared for
Western Australia Department of Mines, Industry Regulation and Safety

16 June 2022

THE CENTRE FOR INTERNATIONAL ECONOMICS
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Summary

The Centre for International Economics (CIE) was commissioned by the Western Australian Department of Mines, Industry Regulation and Safety – Building and Energy Division (Building and Energy) to conduct a cost-benefit analysis (CBA) of the proposed reforms in the building approvals process and registration of building practitioners.

The CIE, in partnership with quantity surveyors RLB, estimated the size of the problems that the proposed reforms aim to address and the likely costs and benefits to implement the reforms through household and building industry practitioner surveys, stakeholder consultations and desktop analysis.

Proposed reforms

The proposed reforms to the building approvals process and registration are comprehensive, and can be summarised as follows:

- mandatory inspections for all new BCA Class 1 to 9 buildings at prescribed notifiable stages;
- increasing requirements for design documentation;
- clarifying the role of the FES Commissioner in the fire safety design process for BCA Class 2-9 buildings;
- requiring building manuals for all new Class 2-9 buildings;
- improving process to document and approve variations;
- independent third-party review of high-risk structural and fire safety designs for BCA Class 2 buildings above 25m in effective height;
- documentation of maintenance or occupancy conditions for performance solutions on certificates of design and construction compliance and occupancy permit.
- requirements for building surveyors' engagement, including Code of Conduct;
- requiring building permits for prescribed high-risk structures including retaining walls of certain dimensions;
- requiring new Class 1b buildings to obtain both certificates of construction compliance and occupancy permits;
- requirement for permit authority to respond to Building and Energy notice;
- various administrative and enforcement reforms;
- a two-tiered model of registration for builders
  - Tier 1: Open builder class, any BCA classification and any size
  - Tier 2: Low rise buildings – restricted to

- Class 1 and 10 buildings of any size
- Class 2-9 buildings that are type C, with GFA not more than 2,000m²;
- mandatory Continued Professional Development for registered builders and building surveyors on the NCC
  - 3 hours annually for builders
  - 7 hours annually for building surveyors; and
- extending builder registration requirements to remote and regional areas of Western Australia, where registration is not currently required.

In addition, there was a proposal to register project managers on large commercial buildings (Class 2-9) to ensure individuals and entities are competent in their field and have a strong understanding of the NCC and their supervision obligations. This proposal is not included in the central case of the cost-benefit analysis (CBA). Rather it is subject to a sensitivity analysis of the CBA.

Size of the problems that proposed reforms aim to address

The problems that the proposed reforms aim to address are non-compliant works during construction that result in defects and damages. Rectifying defects after completion can impose significant financial and time costs to impacted households or building owners, as well as other costs such as evacuation costs, lost value in property or business, and so on.

It is estimated that the size of the problem could be in the order of $435 million a year in Western Australia (table 1).

1 Total size of the problem (annual)

Type of cost	Total size of problem (Annually)
	$m
Class 1 buildings	
Rectification cost	204.8
Other cost	11.2
Time cost	21.8
Fatalities / insurance claims	2.8
Mental health cost	17.6
Sub-total cost	**258.2**
Class 2 buildings	
Rectification cost	41.7
Other cost	5.7
Time cost	4.6
Fatalities / insurance claims	0.4
Mental health cost	3.4
Sub-total cost	**56.0**

Type of cost	Total size of problem (Annually)
	$m
Class 3-9 buildings	
Rectification, other, time costs	119.5
Insurance claims	1.5
Sub-total cost	**121.0**
All costs	**435.2**

Note: costs for year 2022

Source: CIE estimates

Over 80 per cent of the costs are rectification costs, with the remaining being time cost, fatalities, stress and other costs.

Potential costs to implement the reforms

It is estimated that annual on-going cost to implement the proposed reforms could be in the order of $153.8 million (table 2). In addition, an initial, one-off cost of about $1 million will be required mainly for the Government to set up relevant systems to implement the reforms.

2 Estimated cost to implement the proposed reforms

	Class 1	Class 2	Class 3-9	All new buildings
	$m	$m	$m	$m
On-going costs				
Inspection cost				
Initial inspection	29.44	11.75	20.45	61.64
Reinspection	2.67	0.85	1.08	4.60
Audit and independent review cost				
Audit	0.67	0.27	0.46	1.40
Third part review	n.a	0.24	n.a	0.24
Construction cost	19.77	3.99	11.59	30.67
Documentation cost				
Design	15.84	0.84	7.21	23.93
Variation	4.42	1.56	4.37	10.32
Building manual		0.35	5.25	6.54
Cost of delay	5.96	5.96	5.96	8.47

	Class 1	Class 2	Class 3-9	All new buildings
	$m	$m	$m	$m
Permit and other procedural requirements				
Role of FES Commissioner	n.a.	0.07	2.48	2.55
Permit fee	0.07	n.a.	n.a.	0.05
Engagement of building surveyors	0.19	0.00	0.03	0.22
Permit authority response to Building and Energy notices	0.10	0.02	0.01	0.13
Registration				
Expansion to regional areas				0.30
CPD				2.76
Administrative	Included in other categories			
Total on-going cost [a]	**79.53**	**25.91**	**58.90**	**153.84**
Initial one-off costs				
Building manual guidelines etc				0.31
Notification system of building surveyor engagement				0.38
Set-up for 2-tier registration system				0.20
CPD IT system set-up				0.19
Total [a]				**1.07**

[a] costs for registration, CPD and one-off cost are not distributed to sector of building

Note: costs for year 2022; n.a. – not applicable

Source: CIE estimates

Additional inspection cost is the most significant cost, at slightly more than $66.2 million a year in total. Following this, documentation costs are estimated to be slightly under $40 million a year. This includes reforms that enhance design requirements, documenting variations and preparing building manuals. Additional construction cost to fix the detected defects / non-compliance during construction is the third largest item at about $31 million per year. Cost of delay due to inspections and variation documents is also significant, being about $8.5 million a year.

The annual cost of the reforms are expected to fall over time. For example, the reforms may induce 'cultural changes' to the industry where the defects could be avoided from the beginning (rather than requiring rectification following an inspection) and better scheduling of construction works could avoid the delay.

If the previously proposed registration of project managers were to be implemented, the cost would increase further. It will be $4.1 million more in the first year including an initial set-up cost of $150 000, and in ongoing years the cost will fluctuate between $1.1 - $2.7 million depending on if a majority of project managers re-register (occurring every third year). This previously proposed reform will be subject to the sensitivity analysis.

Potential benefits of the reforms

The benefits of the proposed reform packages could be achieved through reduced non-compliance and defects after the implementation of the reforms and the associated reduction in the 'size of the problem'. CIE's survey of building industry participants indicated that current non-compliance and defects could be halved through implementing the proposed reforms.

It is estimated that annual benefits of the reforms could be in the order of $217 million (table 3).

3 Estimated indicative annual benefits

	Size of the problems due to non-compliance	Reduction	Benefit
	$m	%	$m
Class 1	258.2	51.7	133.50
Class 2	56.0	45.1	25.23
Classes 3-9	121.0	48.3	58.50
Total	**435.2**		**217.24**

Note: for the year of 2022

Source: CIE estimates

Cost-benefit analysis results

The proposed reforms are estimated to bring a net benefit to Western Australian society. Table 4 summarises the CBA results for the central case.

4 Summary of cost-benefit analysis in central case

	Class 1	Class 2	Class 3-9	All new buildings
Benefit ($m)				
Avoided rectification cost	844	161	419	1 424
Other benefits	73	12	5	90
Total benefit	**916**	**173**	**424**	**1 514**
Cost ($m)				
Inspection	220	86	161	468
Documentation	139	19	139	297
Construction	111	20	74	206
Delay	25	3	9	36
Other	23	7	24	54
Total cost	**519**	**135**	**408**	**1 061**
Net benefit ($m)	**398**	**39**	**17**	**453**

Benefit Cost Ratio (ratio)	**1.77**	**1.29**	**1.04**	**1.43**

Note :Present value over a 10-year period from 2025 to 2034 with 7 per cent discount rate.
Source: CIE analysis

The present value of total benefits is $1.51 billion over a period of 10 years, while total cost is $1.06 billion, leading to a net benefit of $453 million. The benefit-cost ratio is 1.43.

It is also shown from the table that reforms applied to new Class 1 buildings are expected to have the highest benefit-cost-ratio because the sector has proportionately lower costs, particularly for inspections.

Table 5 reports the sensitivity analysis results. It can be seen from the table that the results are robust – there will be net positive benefits (a benefit-cost ratio greater than 1) to society under all scenarios considered.

5 Sensitivity analysis results

	Net benefits	Benefit-Cost Ratio
	$m	Ratio
Central case	453	1.43
3 per cent discount rate	552	1.43
10 per cent discount rate	395	1.42
30 year appraisal period	786	1.45
Slower cultural change	372	1.33
Increase inspection hourly rates	398	1.36
Decrease inspection hourly rates	711	1.89
Higher rectification cost	368	1.32
Delay take longer to reduce	441	1.41
Lower baseline inspection rate	148	1.11
100% don’t satisfy document design	234	1.18
Fewer defects are reduced	113	1.11
Include project managers	479	1.45

Source: CIE estimates

The reform of project manager registration has been included as a sensitivity. The estimates of costs to implement this reform have been discussed in the cost chapter. For benefits, they are estimated using answers from the practitioner survey, where respondents ranked reforms from 'most important' to 'not important'. Registration of project managers was regarded as having slightly higher rank over the average of other reforms in reducing the non-compliance. As a result, including this reform would see the net benefit increase from $453 million to $679 million and the benefit-cost ratio from 1.43 to 1.45.

The discount rate does not change the benefit-cost ratio due to the implementation of reforms not having a comparatively large upfront cost (i.e. the benefits and costs will occur at the same time).

The effectiveness of the proposed reforms in reducing defects has the most significant impact on the benefit-cost ratio. With significantly reduced effectiveness assumptions, from around 52 per cent in the central case to less than 40 per cent, the proposed reforms will still pay off, but the net benefit of the reforms will reduce to only $113 million, or a benefit-cost ratio of 1.15.

Another important, but less significant factor is the baseline assumptions for inspections and the proportion of design documents that satisfy the new requirement.

- Lowering the baseline inspection rate by 30 per cent would see the benefit-cost ratio drop from 1.43 to 1.11.
- Assuming no design documents currently meet the new requirement would see the benefit-cost ratio drop from 1.43 to 1.18.

Time cost rates for building industry practitioners would make a difference as well. For example, higher (lower) hourly rate for inspections would reduce (increase) the benefit-cost ratio to 1.36 (1.89). However, for the plausible range of hourly rates, it is hard for the positive results to be reversed.

Construction price increases

Since we began our analysis for Building and Energy, there has been substantial pricing pressures reported for key building input prices (e.g. timber, steel etc.).

However, increasing input price is likely to have a neutral impact on the cost-benefit analysis results as it will both increase benefits (increased size of the problem to be solved that is the avoided cost to fix the defects), and costs (increased compliance costs such as inspection, auditing and rectification costs). Because the benefits are bigger than the costs, the impact of recent price hikes on benefits would be bigger than the impact on costs. Furthermore, the recent price hikes, due to the pandemic and conflicts, may be temporary. As a result recent large increases in input prices have not been directly modelled using sensitivity analysis.

The input price hike may lead to lower profit if the output prices will not increase accordingly. A reduction in profit could result in the industry having a lower propensity to adopt reforms because reduced profits tend to mean increased cost cutting and increased defects being found through inspection. This impact has been tested with a slower cultural change scenario.

A slower cultural change is also a large driver of the reforms' cost. If more defects are identified and rectified through inspections rather than being avoided all together, the benefit-cost ratio drops to 1.33.

1 Introduction

Background

Over the past decade, weaknesses in building regulatory systems have become increasingly apparent.

- There have been a series of state-based reviews across several states highlighting weaknesses in building regulation. This includes:
  - The independent review of the Building Professionals Act 2005 in NSW
  - The Victorian Auditor-General's report
  - The Wallace Review in Queensland.
- The use of non-compliant highly combustible polyethylene cladding on a number of high-rise buildings (including commercial and apartment buildings) has raised concerns over the safety of building products used in the Australian construction industry. The use of combustible cladding has resulted in high rectification costs and/or exposed building users to safety risks. The use of unsafe products has come to light following incidents, such as:
  - a fire in the Lacrosse building, in Nov 2014, in Melbourne's docklands in which over 400 occupants were evacuated
  - the Grenfell Tower fire in London, in June 2017, in which 72 residents lost their lives.
- Major structural defects have emerged in a number of apartment buildings, including the Opal Tower and Mascot Tower in Sydney, and 9 apartment buildings in Darwin with insufficient transfer slabs, resulting in the evacuation of residents and the potential for substantial rectification costs.

Building Confidence Report

In response to community and industry concerns, Professor Peter Shergold AC and Ms Bronwyn Weir were commissioned to examine compliance and enforcement problems in Australia's building and construction systems. The resulting Building Confidence Report (BCR) was released in February 2018 with 24 recommendations.[1]

1 Shergold P. and B. Weir 2018, *Building Confidence: Improving the effectiveness of compliance and enforcement systems for the building and construction industry across Australia*, February 2018.

The CIE completed a high-level assessment of implementing these recommendations for the Australian Building Codes Board (ABCB) in 2020 and the report was updated in 2021.[2]

The Western Australian context

The *Building Act 2011 (WA)* (the Building Act) and its subsidiary regulations have been in force in Western Australia since April 2012. The Building Act is the primary piece of legislation governing building approvals in Western Australia.

Following the release of the Building Confidence Report (BCR), the Western Australian Government reviewed the Building Act to improve the effectiveness of multiple areas of the Act including the building approval process for residential and commercial buildings, and builder registration requirements in Western Australia, and implement the BCR's recommendations.

Three Consultation Regulation Impact Statements (CRISs) have been released for comment, two in 2019 and one in 2020 (which this analysis will focus on):

- Registration of Builders (and other related occupations) Reforms in Western Australia: Consultation Regulatory Impact Statement, October 2020[3]
- Reforms to the building approval process for single residential buildings in Western Australia: Consultation Regulatory Impact Statement, September 2019[4]
- Reforms to the approval process for commercial buildings in Western Australia: Consultation Regulatory Impact Statement, December 2019.[5]

A separate CRIS on the registration of building engineers is understood to have also been released, but has been the subject of a separate analysis.[6]

A substantial volume of public and industry feedback was received in response to the CRISs, with support for many of the reforms proposed to the Building Act.

Following a review of the feedback, the Department of Mines, Industry Regulation and Safety (DMIRS) – Building and Energy Division (Building and Energy) is preparing a

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2 CIE 2021, *Building Confidence Report: A case for intervention*, report prepared for The Australian Building Codes Board, July 2021.

3 Building and Energy, Registration of Builders (and related occupations) Reforms: Consultation Regulatory Impact Statement, Government of Western Australia Department of Mines, Industry Regulation and Safety, October 2020

4 Building and Energy 2019a, *Reforms to the building approval process for single residential buildings in Western Australia: Consultation Regulatory Impact Statement*, Government of Western Australia Department of Mines, Industry Regulation and Safety, September 2019

5 Building and Energy 2019b, *Reforms to the approval process for commercial buildings in Western Australia: Consultation Regulatory Impact Statement*, Government of Western Australia Department of Mines, Industry Regulation and Safety, December 2019

6 Building and Energy 2020, *Registration of Building Engineers in WA: Consultation Regulatory Impact Statement*, Government of Western Australia Department of Mines, Industry Regulation and Safety, July 2020.

Decision Regulatory Impact Statement (DRIS) detailing the final recommendations for consideration by the Western Australian Government.

The DRIS proposes substantial reforms to the Building Act and builder registration framework to implement many of the recommendations from the BCR and improve the effectiveness of the building approvals process in Western Australia. To support these recommendations to the Government, a cost-benefit analysis (CBA) is commissioned to assess the potential economic and societal impacts of the reforms against the current baseline measures.

The CBA builds upon preliminary analysis completed as part of the CRISs.

This report

This report presents the approach and findings of the CBA.

General approach

The report will form part of a DRIS, which is required for proposed changes to Western Australia's building legislation. This analysis has been conducted to be consistent with the Western Australian Better Regulation Principles (box 1.1).

1.1 Western Australian Better Regulation Principles[7]

Regulation should be design to:

1 support policy objectives and deliver maximum net benefits to the community;

2 allow for risk based regulatory assessments and decision making focused on outcomes;

3 provide clarity and certainty for affected parties, recognising that different groups may be affected differently;

4 avoid duplication or conflict with other existing or proposed regulations; and

5 allow for well-considered, efficient and effective administration and enforcement arrangements.

To inform the analysis, we have

- consulted extensively with relevant industry stakeholders
- reviewed the available (albeit limited) evidence
- conducted surveys of:

7 Government of Western Australia Department of Treasury 2020, *Better Regulation Program: Information paper for* agencies, March 2020, p. 3.

  - a random sample of homeowners (both Classes 1 and 2) to assess the prevalence of defects and the cost of rectifying them; and
  - building industry practitioners to understand the extent to which the reforms are likely to reduce the problem.

This report refers to Classes 1 and 2 as *residential (use) buildings* and Classes 3 to 9 as *other commercial (use) buildings* in accordance with their major uses. Class 10 buildings are implicitly included in the residential buildings as our estimates are based on the total residential building activities as reported by ABS.

Structure of this report

The remainder of this report is structured as follows:

- the next chapter discusses the building industry in Western Australia and estimates the size of the problems that proposed reforms are seeking to address;
- chapter 3 introduces the proposed reforms;
- chapter 4 discusses the likely impacts that the proposed reforms may bring about;
- chapter 5 estimates the potential costs that the proposed reforms may mean to the industry, government and the society;
- chapter 6 estimates the potential benefits that the proposed reforms may bring to the society; and
- chapter 7 presents the CBA results with sensitivity analysis of key variables and assumptions.

2 The building industry and perceived problems

The building industry in Western Australia

The building industry is an important component of the Western Australian economy. In 2019-20, the building construction industry (i.e. the construction industry excluding heavy and civil engineering construction) contributed to about $13.6 billion or 4.3 per cent of Western Australia's gross state product (GSP).[8]

The building construction industry directly employs over 115 000 employees in full time equivalent (FTE) terms, including 5,522 registered building practitioners and 573 building surveyors.[9] 20 per cent of building industry roles are filled outside of greater Perth. The industry accounts for 9.5 per cent of Western Australia's total employment.[10]

The size of the building industry

Residential buildings

According to the latest Census data available, there were about one million dwellings in 2016 in Western Australia. Western Australia accounts for 10.1 per cent of Australia's total dwellings (table 2.1).

2.1 Dwelling count at Census 2016

	Separate house	Townhouse	Low-rise apartments	High-rise apartments	Other	All dwelling
	'000	'000	'000	'000	'000	'000
Western Australia	819	156	46	26	27	1 074
Australia	**7 043**	**1 269**	**860**	**534**	**219**	**9 925**

Note: For "townhouses" we use semi-detached, row or terrace houses; for "low rise apartments" we use flat or apartment in a block of 3 stories or less; for "high rise apartments" we use flat or apartment in a block of 4 or more stories; other is all other categories (including not applicable)

Source: ABS Census

A majority (76 per cent) of dwellings in Western Australia are separate houses. Less than 25 per cent of dwellings are townhouses and apartments.

8 Western Australia Economic Profile October 2021, Western Australian Department of Jobs, Tourism, Science and Innovation

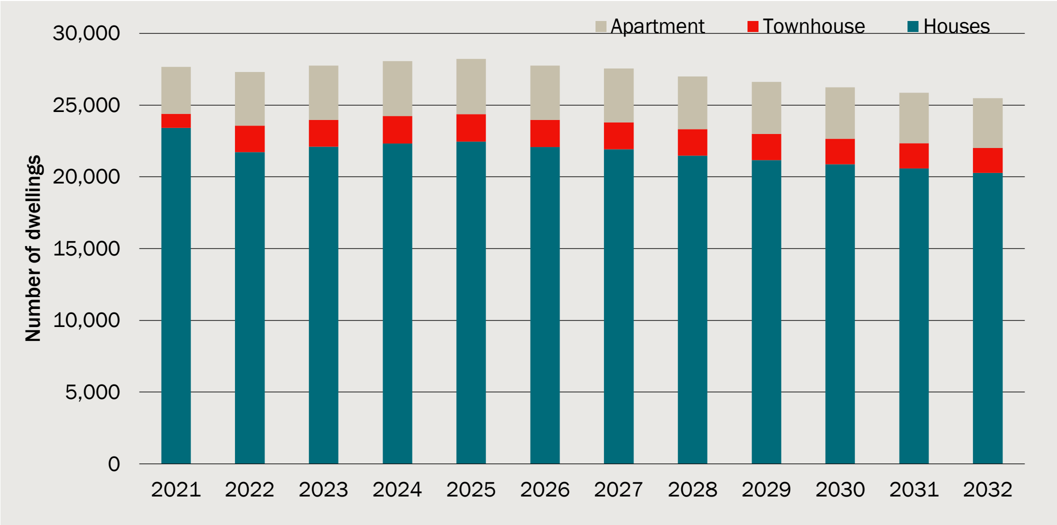
9 DMIRS, *Registration of building practitioners and building surveyors data,* 2021

10 ABS Employed persons by greater capital city and rest of state, category number 6291.0.55.001, 2021

Falling population growth after 2025 in Western Australia, is expected to reduce the total number of new construction of dwellings over the next decade, however the impact is marginal. New dwellings are estimated to fall from just above 27 200 in 2023 to around 25 500 by 2032 (chart 2.2).

The share of new houses as a share of total residential dwellings increased during COVID-19 from 76 per cent in 2019 to 85 per cent in 2021, however, it is projected that the level will return to the five-year average of 80 per cent over the next decade. The share of townhouses and apartments has been declining over the past five years from their highs in 2016, of 10 and 19 percent respectively. Due to trends of increased density of living across Australia, it is assumed that the share of townhouses and apartments will increase to the five-year averages of 7 per cent and 12 per cent respectively.

2.2 Projected number of dwelling completions in Western Australia



Data source: CIE

Non-residential commercial buildings

In 2020 there were 3 384 new non-residential buildings (with a value over $50k) built in Western Australia (table 2.3). The type of non-residential with the highest volume was retail and wholesale trade, the type with the highest value of construction were offices.

2.3 New non-residential buildings approved in 2020

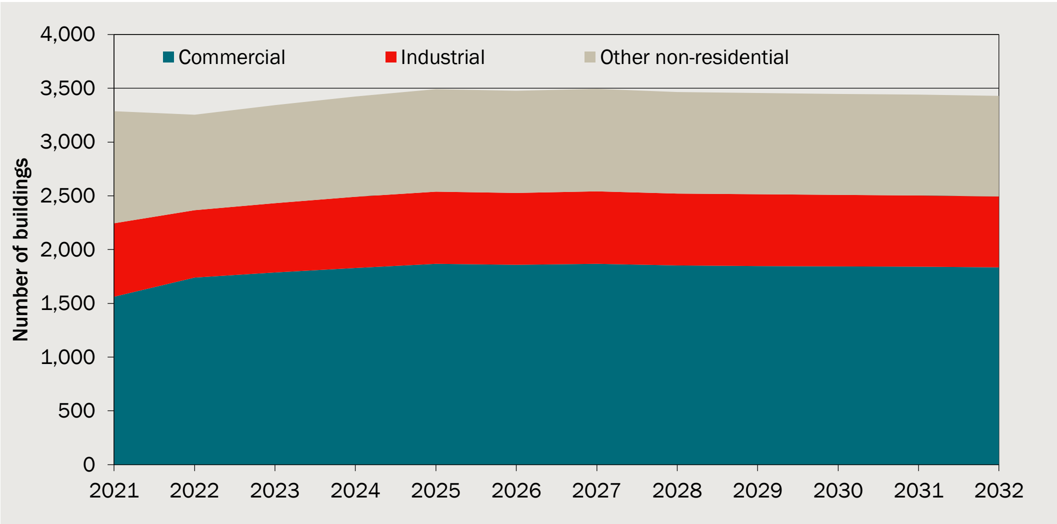
Building type	New buildings	Value of new buildings
	number	$m
Retail and wholesale trade	819	652
Transport	33	205
Offices	596	707
Commercial buildings n.e.c	64	74
Factories and other secondary production buildings	121	88

Building type	New buildings	Value of new buildings
	number	$m
Warehouses	267	284
Agriculture and aquaculture	147	47
Other industrial n.e.c	126	258
Education	294	400
Religion	29	27
Aged care	38	207
Health	123	297
Entertainment and recreation	177	143
Short term accommodation	67	130
Other non-residential n.e.c	283	240
Total commercial	**3 384**	**3 766**

Source: ABS Building Approvals, Australia, Category number 8731.0, tables 56 and 64

Taking consideration of demographic and economic growth, the CIE projected that approximately 3 450 new non-residential dwellings will be added to the non-residential building stock each year over the ten-year period from 2022 to 2032 (chart 2.4).

2.4 Historical and projected addition to the commercial building stock by building type



Note: **Commercial**: retail and wholesale trade, transport, offices. **Industrial**: factories and other secondary production buildings, warehouses, agriculture and aquaculture. **Non-residential**: education, religion, aged care, health, entertainment and recreation, short term accommodation.

Data source: CIE analysis using ABS Building Approvals, Australia, Category number 8731.0, tables 56 and 64.

Based on approved dwellings in 2021, 84 per cent of building activity will occur within Greater Perth, with the remainder occurring across the rest of Western Australia.

Professionals in the building industry

According to Census 2016, there were 37 455 practitioners working in the building industry (table 2.5). The classification in the table has been transformed from the Census occupation classifications (using ANZSCO classifications) to the one in line with the occupations set out in the BCR.

2.5 Building professionals in Western Australia, 2016

	Person
	No.
Architects and Draftsperson	345
Designer	219
Engineer	740
Technician	3 055
Building surveyor	865
Construction manager	5 422
Plumber	4 233
Building practitioners	5,522
Other trades worker	17 054
Total	**37 455**

Source: CIE compilation based on ABS Census 2016

Since 2015, building activity in Western Australia reduced from a high of 31 755 dwellings down to a low of 18 511 in 2019. A significant reduction in residential dwellings it a primary driver of reduced activity, as a result building professionals have left the industry. However, since 2020, government stimulus as part of the COVID response re-started a boom in construction, increasing the building activity. It was estimated that in 2021 the number of dwellings completed reached 30,951, 67 per cent higher than completions in 2019. To meet demand, it is assumed many building professionals re-joined the industry, resulting in employment levels returning to similar levels as 2016, with an estimated 36,484 persons employed.

Projections for the number of builders is related to the value of building activity occurring in Western Australia. Increased activity over the next three years will drive growth in employment, however following 2025, it is estimated that population growth will slow, resulting in fewer residential dwellings being completed and a slow decrease in the number of persons working in the building industry, however this impact will be marginal.

The costs of building defects

A significant number of buildings across Western Australia are completed containing defects. The focus of the reforms assessed in this report is to address defects during the construction process that result from non-compliance with the National Construction Code (NCC). This excludes superficial defects (i.e. those that mainly relate to aesthetics); and defects that may emerge due to a lack of proper building maintenance.

Buildings that do not comply with the NCC can impose significant costs on the community, including:

- costs associated with rectifying defects
- adverse safety outcomes (including fire safety outcomes) or unnecessarily high safety risks
- other costs, including:
  – costs associated with evacuating buildings that are unsafe (prior to rectification)
  – higher insurance premiums for building practitioners
  – costs associated with any legal action to get defects rectified
  – stress and anxiety associated with delays in getting defects rectified.

Prevalence of defects

To understand the size of the problem caused by building defects it is important to understand the prevalence of defects in completed buildings in Western Australia under current regulatory arrangements.

Sources of data on the prevalence of defects

There are several (albeit incomplete) sources of data on defects, including CIE's survey of Western Australian households.

Compliance Inspections of Class 1a buildings by Building and Energy

The Building and Energy audits the work and conduct of registered builders, including inspections to monitor how building standards are being applied in Western Australia, under section 65 of the *Building Services (Complaint Resolution and Administration) Act 2011*. This includes both compliance and general-purpose inspections. The builders are selected at random.

An inspection comprises of 24 building categories. There is a total of 184 separate inspection points for all 24 categories of building work that are assessed during an inspection. Building works are assessed against relevant building standards, i.e. the Building Code of Australia (BCA), and determined to be 'satisfactory' or 'unsatisfactory' depending on whether it complies with applicable building standards.

Table 2.6 summarises the inspection data over five years from 2015-16 to 2019-20.

2.6 Inspection data of Class 1a buildings by Building and Energy

	Total inspections	Satisfactory rate	Unsatisfactory rate
	number	%	%
Brickwork	6 988	73.7	26.3
Bushfire area requirements	153	49.7	50.3
Ceilings	378	81.0	19.0
Drainage work	20	65.0	35.0
Energy efficiency	120	65.8	34.2

	Total inspections	Satisfactory rate	Unsatisfactory rate
	number	%	%
Excavation work	194	72.2	27.8
External render and plaster	213	77.9	22.1
Fire separation between 2 prop	417	93.3	6.7
Fixtures internal	179	84.4	15.6
Glazing	105	61.0	39.0
Painting	35	94.3	5.7
Render and plaster	286	86.0	14.0
Roof cladding	1 387	74.0	26.0
Roof tie down	1 791	63.4	36.6
Safe movement and access	69	63.8	36.2
Slabs	1 839	74.2	25.8
Steel framing	138	83.3	16.7
Structural steel	1 028	63.9	36.1
Termite management	407	30.0	70.0
Timber roof framing	3 288	65.3	34.7
Timber wall framing	355	61.1	38.9
Ventilation	9	55.6	44.4
Wall and floor finishes	72	66.7	33.3
Wet areas and external waterproof	99	52.5	47.5
Total	**19 570**	**70.2**	**29.8**

Note: Over five years from 2015-16 to 2019-20 for Class 1a buildings

Source: CIE compilation based on Building Commissioner's inspection data (not public)

The most inspected category is brickwork, with a total of 6 988 inspections points over the period from 2015-16 to 2019-20. It is followed by timber roof framing (3 288 inspection points), slabs (1 839 inspection points), roof tie down (1 791 inspection points), roof cladding (1 387 inspection points) and structural steel (1 028 inspection points).

The average satisfactory rate is 70.2 per cent, and 13 categories have a satisfactory rate lower than the average.

The category with the lowest satisfactory rate is termite management (30 per cent satisfactory rate). It is followed by bushfire area requirements (49.7 per cent), wet areas and external waterproof (52.5 per cent), ventilation (55.6 per cent) and glazing (61 per cent).

It is noted that 'a failure to comply with a building standard does not necessarily mean' relevant building works 'fail to perform'.[11]

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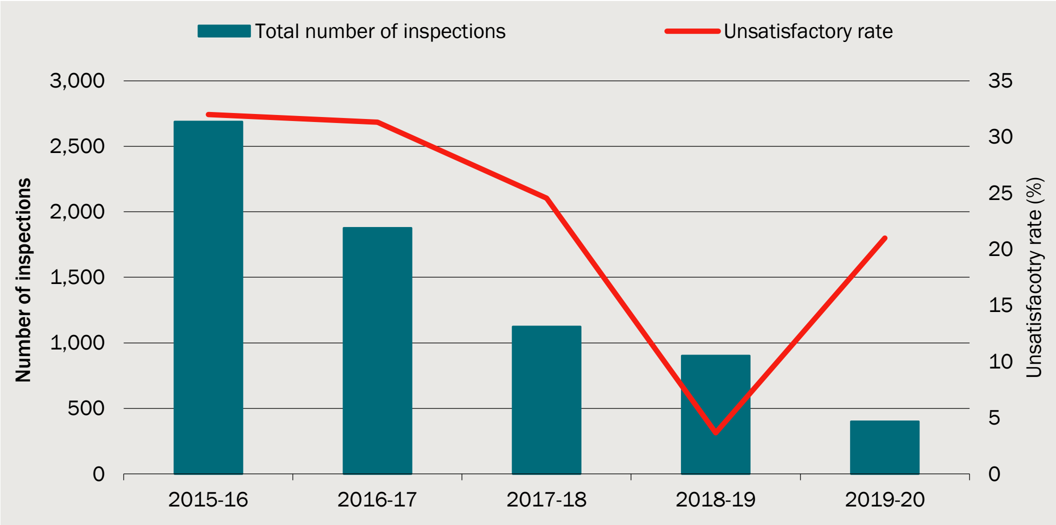
11 Building Commission 2016, *Roof Construction: A general inspection into the construction of sheet metal clad timber framed roofing in Perth metropolitan and South West regions*, Final Report, Building Commission General Inspection Report One (GIR1), p.1

The unsatisfactory rate appears to have declined over time – from 32 per cent in 2015-16 to 21 per cent in 2019-20 (chart 2.7), although the number of inspections was lower in later years and the results could be distorted by over-concentration in some categories.

2.7 Annual number of inspections and unsatisfactory rate



Data source: CIE compilation based on Building Commissioner's inspection data (not public)

Australian Apartment Advocacy surveys of Class 2 buildings

Australian Apartment Advocacy (AAA) undertook surveys in 2019 and 2021 which asked resident owners and investors of apartments across Australia about the prevalence of defects in Class 2 buildings.[12] Table 2.8 summarises the results for Western Australia.

It was found in 2019 that 70 per cent of Western Australian apartment owners and investors experience one or more defects, the highest in the nation, compared to 60 per cent in NSW, 59 per cent in Victoria and 61 per cent nationwide.[13]

However, the same survey in 2021 found a lower share (59 per cent) of Western Australian apartment owners and investors have experienced defects.[14] Although this share was still higher than that in NSW (52 per cent), Victoria (52 per cent) and Queensland (49 per cent).[15]

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12 Australian Apartment Advocacy (AAA) 2019, *2019 Apartment Defects Survey: Resident Owners and Investors of Apartments*;
AAA 2021, *2021 Apartment Survey Research Results: Western Australia/NSW/Victoria/QLD*

13 AAA (2019), op.cit., p.9

14 AAA (2021), op.cit., p.43

15 AAA (2021), op.cit., p.97, p.146, p.194.

2.8 Australian Apartment Advocacy surveys of Class 2 buildings in Western Australia

Defect type	2021	2019	2019 – 'Most serious'
	%	%	%
Proportion experiencing any type of defect	**59**	**70**	**NA**
Poor waterproofing	31	36	4
Defective plumbing	32	32	5
Structural cracking	45	42	15
Water penetration from outside	38	52	30
Faulty guttering	16	12	0
Defective roofing	20	21	3
Tiling problems	23	26	0
Noise	25	18	3
Defective balustrades on the balcony	11	14	2
Lack of fire safety system	6	6	3
Defective fire protection system	6	8	2
External cladding is not fireproof	2	9	6
Airconditioning system not effective	10	NA	NA
Electrical problems	12	NA	NA
Concrete cancer	11	NA	NA
Wooden flooring warping	4	NA	NA
Brick growth	2	NA	NA
Asphalt / car park floor lifting	10	NA	NA
Problem with doors	19	NA	NA
Problems with lift / elevators	24	NA	NA
Windows / sliding doors not closing	20	NA	NA
Other	20	39	27

Note: N/A indicates data was not collected

Source: Australian Apartment Advocacy owner and resident survey 2019 and 2021

The surveys found that the most common defects were water penetration from outside, poor waterproofing within the apartment, and structural cracking. The most serious defects identified by owners were water penetration and structural cracking.[16]

The most serious defects are likely to affect multiple units or the whole building.[17]

CIE household survey

To complement available data, the CIE undertook a survey of households in Western Australia, focusing on the prevalence of defects in Class 1 and 2 buildings and the cost to rectify those defects. Table 2.9 summarises the results of the survey.

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16 AAA (2019), op.cit., p.10-11; AAA (2021), op.cit., p.43

17 AAA (2019), op.cit., p.13

The survey received 911 responses from Western Australian residents, 853 responses for Class 1 buildings and 58 for Class 2. Results showed that 58 per cent of Class 1 and 62 per cent of Class 2 buildings had at least one defect resulting from the initial build which needed rectification.

The most common defect identified in Class 1 buildings were structural (18.9 per cent) which were typically identified by cracking, however, other responses included missing support beams and poorly laid slab. Waterproofing/weather proofing (14.5 per cent), roof and rainwater disposal (14.9 per cent), and plumbing and drainage (16.8 per cent) were also common defects.

2.9 The Centre for International Economics survey of Class 1 and 2 buildings

Defect	Class 1	Class 2
	%	%
Building fabric and cladding (excluding flammable cladding)	10.6	1.7
Fire protection	1.2	3.4
Waterproofing / weatherproofing	14.5	31.0
Roof and rainwater disposal	14.9	22.4
Structural	18.9	24.1
Plumbing and drainage	16.8	22.4
Safety	1.8	6.9
Electrical, lighting and data	11.1	5.2
Natural light and ventilation	10.9	13.8
Entry to or exit from the building	5.2	5.2
Swimming pools, gyms, playground equipment	1.8	1.7
Flammable Cladding	0.5	0.0
Lift / elevator, gas supply or garbage chute problem	0.2	3.4
Other	3.5	3.4

Source: The CIE Household Survey

The four most common defects for Class 2 buildings were the same as Class 1 buildings, however, prevalence of each defect in Class 2 increased. The most common defect was waterproofing / weatherproofing (31 per cent) followed by structural (24.1 per cent), plumbing and drainage (22.4 per cent), and roof and rainwater disposal (22.4 per cent).

Note, that due to the survey respondents only being able to answer about defects that had impacted them during their tenure at the residence, it is likely that the prevalence of defects may be underrepresented, i.e., some defects are present and remain undetected or were rectified before the current tenant moved into the dwelling.

Additionally, costs recorded may not include all costs if the tenant was not able to observe or remember all the costs associated with rectification, i.e. the insurance company may have taken care of communication with builders. As a result, it is expected the size of the problem estimate may be conservative.

Finally, the survey results do not indicate flammable cladding as being a significant issue, unlike other states. This may be for reasons such as:

- Western Australia has actively audited and rectified building with flammable cladding, because of awareness and auditing, the rates of flammable cladding will have reduced in new builds
- residents in buildings with flammable cladding may not be aware of the defect
- there were far less apartment buildings with flammable cladding in Western Australia, than in other places such as New South Wales and Victoria.

In our analysis we have used the 2 per cent prevalence of flammable cladding from the AAA survey and the rectification cost from implied cost from Lacrosse Tower.

The proposed reforms would mostly reduce defects that occur during the construction phase. As such, defects that occur during the occupation phase of the building's lifecycle (such as those due to poor maintenance practices) are outside the scope of this exercise and have been excluded.

It is estimated that there are 1 311 defects caused by the initial build across all 911 survey responses (table 2.10). More than 80 per cent of defects are caused by initial build.

2.10 Defects by cause and dwellings

	Class 1: Detached houses		Class 2: Apartments		Total residential	
	Number	%	Number	%	Number	%
Total defects	1 422	100.0	197	100.0	1 619	100.0
Cause: initial build	1 210	85.1	101	51.3	1 311	81.0
Cause: maintenance & other	212	14.9	96	48.7	308	19.0
Total dwellings	853		58		911	

Note: excludes flammable cladding defects

Source: CIE survey.

Approach to estimating the prevalence of defects

As defects are classified in different ways, the different datasets on the prevalence of defects are difficult to compare. Nevertheless, the CIE household survey appears to suggest defects are somewhat less prevalent than Building and Energy's inspection data for Class 1 buildings, although the datasets on Class 2 buildings are more similar.

Differences across datasets could reflect both: biases in the different approaches to collecting data (such as a sampling bias), as well as actual differences in what the various datasets are measuring.

- The Building and Energy data is likely to capture most non-compliances/defects (although it may not be possible to identify all defects through inspections), including defects that would subsequently need to be rectified, and defects that could remain latent indefinitely. This dataset is therefore likely to be the most accurate reflection of the true level of defects in Class 1 buildings, assuming the houses inspected are broadly reflective of all houses constructed in Western Australia (i.e. a random sample). However, some defects identified in the inspection data may have minimal impact on building performance and therefore may not be identified or rectified (or the cost of rectification would be small). As such, the inspection data may not be a good reflection of actual rectification costs.

- The methodology used for the CIE household survey would mainly capture defects that have been identified and rectified. As such, this methodology could understate the true level of defects, but may better reflect those defects that have been rectified and therefore rectification costs. More specifically, this methodology could potentially exclude the following types of defects.
  - Latent defects would not be captured by the survey. This could include defects that have not yet been identified that will subsequently emerge and need to be rectified (i.e. some types of defects can take some years to emerge). In these circumstances, this survey methodology could under-report true rectification costs.
  - Some latent defects that may not be obvious to building owners and/or occupiers (and therefore not identified as a defect), but could still affect the building functionality. This could include the following.
    - In general, fire safety features are designed to improve safety outcomes in the event of a fire. Fire safety defects therefore increase risks to building occupiers, but may not be identified (or rectified).
    - Non-compliance with NCC energy efficiency requirements would mean some dwellings are less energy efficient than a compliant building. Occupiers could therefore incur higher energy bills and reduced thermal comfort, although this would not necessarily be obvious.
    - Some latent structural defects may not become apparent until triggered by adverse weather conditions (i.e. extreme wind or rainfall)
  - Where defects have been identified and rectified by a previous owner, this would not necessarily be known to the current owner. In these circumstances, this survey methodology would under-report rectification costs.
- Respondents to the AAA survey may not reflect a random sample of apartment owners/occupiers. If those owners/occupiers who have experienced defects may be more likely to respond the survey, it is possible that this survey methodology could over-state the true number of apartment buildings with identified defects.

Given the different strengths and weaknesses of the different datasets, we use the following approaches for the purposes of estimating rectification costs that could potentially be avoided through the proposed reforms.

- For Class 1 buildings we combined our survey results with inspection data from building audits. Table 2.11 shows how inspection audit defects have been mapped to the defect categories used in the CIE survey. Estimates of the prevalence of defects in Class 1 buildings used in overall estimate of the size of the problem (and the subsequent cost-benefit analysis) based on the combined data is shown in table 2.12.
- There is no equivalent inspection audit data relating to Class 2 buildings, as such the issue of latent defects could result in the size of the problem in Class 2 buildings being underestimated. To mitigate this issue, we have combined the AAA Western Australian survey responses with our survey data, taking the maximum prevalence of

a defect. As most of the defects had similar prevalence rates, this marginally increased the size of the problem. It is still likely to be an underestimate. Table 2.11 shows how AAA survey defects have been mapped to CIE categories, with the estimates based on the combined datasets shown in table 2.12.

2.11 Mapping of audit defects and AAA defects to CIE survey

Defect	Inspection Audit Class 1	AAA survey Class 2
Building fabric and cladding (excluding flammable cladding)	Brickwork | External render and plaster | Render and plaster	N/A
Fire protection	Fire separation between two properties	Lack of fire safety system | Defective fire protection system
Waterproofing / weatherproofing	Wet areas and external waterproofing	Poor waterproofing | Water penetration from outside
Roof and rainwater disposal	Ceilings | Roof cladding | Roof tie down | Timber roof framing	Faulty guttering | Defective roofing
Structural	Excavation work | slabs | Steel framing | Structural steel | Timber wall framing	Structural cracking | Concrete cancer
Plumbing and drainage	Drainage work	Defective plumbing
Safety	Safe Movement and access	Defective balustrades on the balcony
Electrical, lighting and data	Fixtures internal	Electrical problems
Natural light and ventilation	Ventilation	N/A
Entry to or exit from the building	N/A	Problem with doors
Swimming pools, gyms, playground equipment	N/A	N/A
Flammable Cladding	N/A	External cladding is not fireproof
Lift / elevator, gas supply or garbage chute problem	N/A	Problem with lift / elevator
Other	Bushfire area requirements | Termite management | Wall and floor finishes | Painting | Glazing	Tiling problems | Wooden flooring warping | Brick growth | Asphalt / car park floor lifting | Windows / sliding doors closing | Other

2.12 Prevalence of defects used in analysis

Defect	Class 1	Class 2
	%	%
Building fabric and cladding (excluding flammable cladding)	21.7	1.7
Fire protection	4.1	6.0
Waterproofing / weatherproofing	32.4	34.5
Roof and rainwater disposal	25.0	24.1
Structural	27.5	32.8
Plumbing and drainage	28.9	32.0
Safety	19.3	11.0
Electrical, lighting and data	14.6	12.0
Natural light and ventilation	28.3	15.5

Defect	Class 1	Class 2
	%	%
Entry to or exit from the building	6.2	19.0
Swimming pools, gyms, playground equipment	3.0	1.7
Flammable Cladding	0.6	2.0
Lift / elevator, gas supply or garbage chute problem	0.4	24.0
Other	28.6	13.2

[a]: Although flammable cladding is not a significant issue in Class 1 buildings, survey respondents commented that there were defects with cladding such as not being installed properly causing potential fire risks. Overall cost contributed 0.3 per cent to the size of the problem.

Source: CIE household survey, AAA apartment owner survey, Building and Energy Inspection data

Estimating avoidable defect rectification costs

The following section sets out the cost associated with rectifying defects in different building classes and how the size of the problem was estimated using these costs.

Defect rectification costs in residential buildings

The size of the problem for Class 1 and 2 (residential use) buildings was estimated using the prevalence of defects in buildings and the average cost to rectify defects. Data was sourced primarily from CIE survey, AAA survey and Building and Energy inspection data.

Defect rectification costs

CIE's household survey was used to estimate defect rectification costs. These costs include: the financial cost of rectification works, time costs and 'other' costs (table 2.13). Costs are estimated on a per dwelling basis.

When analysing survey results the following results were excluded:

- where respondents did not answer any cost questions; and
- where '$0' was reported but the matter is unresolved.

2.13 Components of defect rectification costs

Component	Definition/explanation
Cost of rectification works	Cost of rectification and repair works, including contributions to the body corporate (where applicable), based on estimates provided by the respondent
Time cost	The value of the time the dwelling owner uses to achieve the rectification outcome, for example chasing up repairers, investigating problems, speaking with practitioners (including lawyers), attending body corporate meetings, and so on. It is not a financial cost to the dwelling owners. Rather, it is the opportunity cost of the time (in hours) that the owners could be used to do other things that are valuable to them

Component	Definition/explanation
Other costs	Lost rental income, temporary accommodation costs, extra travel/transport, legal costs, technical/engineering reports, legal costs, extra health care costs, and other costs, based on estimates provided by the respondent

Source: CIE.

Cost of building works to rectify defects

Survey respondents provided estimates of their personal cost and total cost (to all parties) for rectification.

- For Class 1 buildings, 'total cost' (to all parties including owner, builder, insurer and other) to rectify defects is estimated to be $8 688 per dwelling on average.
- For Class 2 buildings, 'total cost' (to all parties including owner, builder, insurer, body corporate and other) to rectify defects is estimated to be $11 206 per dwelling on average.

Table 2.14 reports the rectification costs for different defect types and dwelling types.

2.14 Average cost of rectifying defects

	Class 1 ($/defect)	Class 2 ($/defect)
Building fabric and cladding (excluding flammable cladding)	2 336	1 500
Fire protection	254	4 000
Waterproofing / weatherproofing	3 611	8 500
Roof and rainwater disposal	4 079	8 811
Structural	4 745	8 725
Plumbing and drainage	2 099	3 503
Safety	1 146	484
Electrical, lighting and data	1 107	633
Natural light and ventilation	1 825	1 125
Entry to or exit from the building	945	1 000
Swimming pools, gyms, playground equipment	2 043	-
Flammable Cladding	4 515	34 375
Lift / elevator, gas supply or garbage chute problem	3 000	258
Other	10 515	5 000
Total rectification cost per dwelling	**8 688**	**11 206**

Note: The very high 'other' defect cost for Class 1 building is related to only one respondent who referred the defect to whole house defect which are complicated and impact multiple areas of the dwelling.

Source: CIE estimate.

The high 'other' defect cost for detached houses is related to only one respondent who refers the defect to whole house defects which are complicated and impact multiple areas of the house.

'Willingness to pay' to avoid defects

As a cross check, the defect associated costs could be viewed from another perspective – apartment owners' 'willingness to pay' to avoid defects. The AAA 2021 survey indicates 37 per cent of apartment owners in Western Australia are extremely/very or moderately interested in paying 0.5 per cent of the purchase value of their apartment as a one-off cost to fund an ongoing consumer protection service for apartment owners.[18] The median unit price in Perth was between $390 000 and $415 000 in 2021.[19] This suggest a willingness to pay between $5 309 and $5 650 per unit, equivalent to approximately 50 per cent the average estimated cost of defects per dwelling (table 2.15).

2.15 'Willingness to pay' to protect apartments from defects

	Share of respondents [a]	Assumed ratio [b]	Low [c]	High [c]
	%		$	$
Extremely	5	1.0	19 500	20 750
Very	9	0.8	15 600	16 600
Moderately	23	0.5	9 750	10 375
Slightly	19	0.2	3 900	4 150
Not at all	45	0.0	0	0
Total/average			**5 309**	**5 650**

[a] AAA (2021) survey findings; [b] CIE assumption; [c] medium unit price of $390,000 in March quarter (Low) and $415,000 in December quarter (High) according to the REIWA quarterly data

Source: CIE calculation based on data sources and assumptions noted above

Time costs

Respondents provide an estimate of the amount of time they spend on getting a defect repaired. On average Class 1 owners spent 20.1 hours, whilst Class 2 spent 28.4 hours. A rate of $20.33 per hour, which is equivalent to the minimum wage in Australia, was used as the metric to value time costs across populations. It is estimated that the time cost is $409 per defect on average for Class 1 dwellings and $577 per defect for apartments (table 2.16).

2.16 The time cost associated with defects

	Unit	Class 1	Class 2
Time	Hours	20.1	31.80
Hourly rate	$/hour	20.33	20.33
Cost per defect	$/defect	409	646.45
Cost per dwelling	$/dwelling	923	1 243

Source: CIE.

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18 AAA (2021), op.cit. p.43-44

19 REIWS 2022, *Quarterly median price data – unit,* https://reiwa.com.au/the-wa-market/perth-metro/

The effort required to resolve each defect often occurred over significant periods of time, the AAA survey found that one in five defects that had been resolved took more than two years to fix, though defects in Western Australia were relatively quicker to get fixed.[20]

Table 2.17 shows a count of defects by the length of time it took to resolve from the CIE survey. Despite about one third of defects have not been resolved, most resolved defects took between a week and three months to rectify.

2.17 Time taken to resolve a defect

	Class 1 buildings		Class 2 buildings		All residential buildings	
	Number	%	Number	%	Number	%
Less than a week	219	14.56	9	7.83	228	14.08
One week to one month	293	19.48	21	18.26	314	19.39
2-3 months	197	13.10	11	9.57	208	12.85
4-6 months	99	6.58	12	10.43	111	6.86
7-12 months	67	4.45	7	6.09	74	4.57
1-2 years	51	3.39	7	6.09	58	3.58
More than two years	62	4.12	13	11.30	75	4.63
The problem has not been resolved	516	34.31	35	30.43	551	34.03
Total	**1 504**	**100.0**	**115**	**100.00**	**1 619**	**100.0**
Average length to rectify a defect (Year)	**0.26**		**0.47**		**0.28**	

Source: CIE

The average length to rectify a defect is 0.26 year for Class 1 buildings and 0.47 year for Class 2 buildings. If the defect had not yet been resolved it is assumed to take the average length of time calculated for resolved defects.

Other cost

Using survey responses and considering an adjustment for flammable cladding, it is estimated that other costs associated with defects are $475 per defect for Class 1 dwellings and $1 545 per defect for Class 2.

Annual rectification costs for residential buildings

Combining all costs associated with rectification, we estimate that the average cost associated with defects in Class 1 dwellings is $10 087 and $13 993 in Class 2 dwellings. Combining this with the projected number of completions of Class 1 and Class 2 buildings in Western Australia in 2022 it is estimated the annual size of the problem is approximately $290 million (table 2.18).

20 AAA (2019), op.cit. p.18

2.18 Estimated size of the problem (2022)

Type of building	Class 1	Class 2	Total
Annual completions (No.)	23 573	3 721	27 294
Rectification costs per dwelling ($ per dwelling)			
Rectification cost	8 688	11 206	
Other cost	475	1 545	
Time cos	923	1 243	
Total cost per dwelling	**10 087**	**13 993**	
Total cost of defect rectification ($ million)			
Rectification cost	204.8	41.7	
Other cost	11.2	5.7	
Time cost	21.8	4.6	
Total cost	**237.8**	**52.1**	**289.9**

Source: The CIE

Table 2.19 reports the share of total cost associated with defects for residential use (Class 1 and 2) buildings. The defects that contribute most to the problem (excluding other defects) are structural defects (16 per cent), waterproofing / weatherproofing (15 per cent), and roof and rainwater disposal (12 per cent).

2.19 Share of costs for Classes 1 and 2 buildings

	Class 1	Class 2	Total residential building
	%	%	%
Building fabric and cladding (excluding flammable cladding)	6.1	0.4	5.1
Fire protection	0.3	2.1	0.6
Waterproofing / weatherproofing	13.7	22.8	15.3
Roof and rainwater disposal	11.6	16.4	12.4
Structural	14.9	23.2	16.4
Plumbing and drainage	7.6	9.2	7.8
Safety	2.5	0.6	2.1
Electrical, lighting and data	2.0	0.8	1.8
Natural light and ventilation	7.2	1.7	6.2
Entry to or exit from the building	0.7	1.5	0.9
Swimming pools, gyms, playground equipment	0.8	0.0	0.6
Flammable Cladding	0.3	15.3	3.0
Lift / elevator, gas supply or garbage chute problem	0.1	0.5	0.2
Other	32.3	5.5	27.5
Total	**100**	**100**	**100**

Source: CIE estimates.

Projected rectification costs

The projected size of the problem has been estimated using the number of completions by dwelling type per year, as discussed in section 2. The present value of the problem for all residential buildings is $2.41 billion over a 10-year period (2025-2034) and $3.65 billion over a 30-year period (2025-2054), with a discount rate of 7 per cent per annum (table 2.20).

2.20 Projected size of the problem for residential buildings

	2022	2025-34 [a]	2025-54 [a]
	$m	$m	$m
Class 1	258.2	1 983	3 003
Class 2	56.0	430	651
Total residential	**314**	**2 413**	**3 654**

[a] Present value in 2022 with a discount rate of 7 per cent per annum

Source: CIE

Rectification costs for commercial (Class 3-9) buildings

The 'size of the problem' of defects in commercial buildings is highly uncertain as there is limited publicly available information on this issue to start our analysis with. To reflect this, we have used two methods of estimation to create a range, taking the mid-point of the range for the central case.

Proportional value and prevalence of defects (method one)

The first method compares the proportional value and prevalence of defects in apartment buildings against the value of commercial buildings and stated prevalence of defects. From the practitioner survey undertaken by the CIE, respondents answered questions about the prevalence of defects in commercial and Class 2 buildings, responses show the prevalence of defects in commercial (Class 3-9) buildings was lower than in apartments (Table 2.21).

2.21 Prevalence of major defects (practitioner survey results)

	Class 2	Class 3-9
	%	%
Almost no buildings	0	21
A few buildings	26	18
Some buildings	30	33
Most buildings	23	14
Almost all buildings	19	8
Weighted average	**51**	**37**

Source: CIE practitioner survey

The value of defects in Class 2 buildings was estimated at $56 million annually, or 4.1 per cent of the value of construction of Class 2 buildings. Defects in Class 2 buildings were reported as more frequent than in Class 3-9 buildings. This could be due to the owners of Class 3-9 buildings moving into the building on completion, as opposed to apartments, which developers will sell to the public after completion. It was assumed that Class 3-9 buildings had 27 per cent fewer defects per $ of construction. Using this method, the cost of defects comprises 3 per cent of construction value of Class 3-9 buildings, equivalent to $143.4 million per year (table 2.22).

2.22 Upper bound method size of the problem Class 3-9 buildings

	Class 2	Class 3-9
Value of building ($m)	1 274	4 820
Defect prevalence weighting	1	0.73
Proportional value of defects (%)	4.1	3.0
Value of defects ($m)	**55.8**	**143.8**

Source: CIE estimates

Mixed comparison analysis (method two)

The second method combines prevalence of defects, from the practitioner survey (37 per cent), with the average cost of defects per building. The average cost of defect per building uses two separate values:

- If the value of the Class 3-9 building is less than $1 million, the average cost per building equals that for Class 1 dwellings, $10 087.
- If the value of the Class 3-9 building is greater than $1 million, the average cost per dwelling has been taken from an audit of NSW, $331 829.[21]

It is estimated that the lower bound cost of defects in building Class 3-9 is $95.6 million per year (table 2.23).

2.23 Lower bound method size of the problem Class 3-9 buildings

	Class 3-9 (<$1m)	Class 3-9 (>$1m)	Class 3-9 Total
Prevalence of defects (%)	37	37	37
Building completions (2022)	2 751	552	3 302
Average cost per building ($)	10 087	331 829	
Cost of defects ($m)	**28**	**68**	**96**

Note: For less than $1 million the average cost is applied to all buildings, for greater than $1 million it is only applied to impacted dwellings.

Source: CIE

[21] Construction NSW 2021, *Improving consumer confidence: Research report on serious defects in recently completed strata buildings across New South Wales*, September 2021

Defect rectification costs for commercial (Class 3-9) buildings

Taking the average cost of defects across the two methods we arrive at our central case. In 2022 it is estimated that the size of the problem for Class 3-9 buildings is $119.7 million, across 10 years this is equal to $1 514 million (real, present value with a discount rate of 7 per cent per annum) (table 2.24)

2.24 Size of the problem Class 3-9 buildings

	Value
	$ m
Annual size of the problem (method one)	143.8
Annual size of the problem (method two)	96.0
Annual size of the problem (average)	**119.7**
Size of the problem (2025-2034) [a]	**980.0**

[a] Present value assuming a discount of 3 per cent per annum

Source: CIE estimate

Safety outcomes/risks

Defects are not always rectified immediately.

- Some buildings may have defects that are not immediately identified.
- Even when identified, survey evidence suggests that around 3 per cent of defects are not rectified.[22]
- In other cases, it may take some time for a defect to be rectified (particularly where there is a legal dispute). For example, the Mozo Property Pain Survey found that:
  - 21 per cent of owners had to wait for between 3 to 6 months for the completion of repairs; and
  - 9 per cent wait for more than 6 months.

Buildings with defects may result in some adverse safety outcomes (or an increased safety risk, even when the safety risks are not realised). These adverse safety outcomes could include: property damage or loss, injuries, and loss of life for occupants and building owners. However, the evidence on these outcomes comes in the form of qualitative small sample data and/or case studies (where some contain quantitative data; others do not).

Fire safety risks

Where fire safety defects are not rectified (or there is delay between when the defect emerges and it is identified and rectified), the fire safety risks may be higher for building users (either temporarily or permanently), compared with NCC-compliant buildings.

22 CIE analysis of: Easthope H., Randolph B. and Judd S. 2009, Managing Major Repairs in Residential Strata Developments in NSW, A study by the City Futures Research Centre at UNSW provided with the assistance of the NSW Office of Fair Trading, July 2009

The Productivity Commission Report on Government Services reports that there were more than 1 241 structure fires attended by fire service organisations in 2018-19 across Western Australia. However, it is not clear to what extent these fires were a result of non-compliance with the NCC fire safety provisions (or where non-compliance led to worse outcomes).

Previous work by the CIE for the ABCB suggests there have generally been relatively few fire-related fatalities in Class 2 and Class 3 residential buildings. Based on data from the National Coronial Information System (NCIS), there were around 3 fatalities per year over the period from July 2000 to December 2015 across the whole of Australia (table 2.25). Western Australia was reported as having 7 per cent of total fires reported in Australia.

2.25 Number of fire-related fatalities from July 2000 to December 2015

	Across Australia	Average per year	Average per year in Western Australia
	No.	No.	No.
Flat, Apartments, Terrace House	39	2.5	0.17
Boarding House, Hotel, Backpackers Hotel	5	0.3	0.02
Motel, Hotel	1	0.1	0.07
Nursing Home	1	0.1	0.07
Total	**46**	**3.0**	**0.33**

Source: ABCB, NCC 2019, Fire Safety in Class 2 and Class 3 residential buildings, NCIS Fatalities Report.

Another study (also using the NCIS database) reports preventable deaths per year from residential fires (mostly in separate houses) over the period from July 2003 to June 2017.[23] Over the period 2004 to 2017, there was an average of around 6 preventable deaths per year in residential buildings in Western Australia.

- Not all fire-related fatalities are due to building defects. We are not aware of any Western Australian data on the percentage of these preventable deaths in residential fires were due to non-compliance with NCC requirements. However, ACIL-Allen reported that based on data from Fire and Rescue NSW (FRNSW), around 5 per cent of all fire fatalities (25 in total) in NSW from 2004 to 2014 were due to design, installation and/or construction issues (implying non-compliance with the NCC).[24] Transferring these NSW estimates to Western Australia implies an average of around 2 preventable fatalities every 5 years due to fire safety defects.
- A standard approach to valuing safety-related costs in economic analysis is based on the value of a statistical life (VSL). VSL is an estimate of the value society places on

23 Coates, L. Kaandorp, G. Harris, J. van Leeuwen, J. Avci, A. Evans, J. George, S. Gissing, A. van den Honert, R. and Haynes, K., 2019, *Preventable Residential Fire Fatalities in Australia*, July 2003 to June 2017, Bushfire and Natural Hazards CRC, p. 64.

24 ACIL-Allen 2015, *Independent Review of the Building Professionals Act 2005: Cost Benefit Analysis of Proposed Recommendations*, Report to Building Professionals Board, 16 December 2015, p.A-15; Figure A,4, p.A-16.

reducing the risk of dying. The Office of Best Practice Regulation (OBPR) recommends using a VSL of $5.1 million (in 2021 dollar terms) based on international and Australian research.[25]

This information suggests that the cost of human lives lost due to non-compliance with the NCC fire safety provisions could be around $1.85 million per year (table 2.26).

2.26 Estimated annual cost of lives lost due to building defects in Western Australia

Item	Unit	Value
	No.	$ million
Number of preventable fatalities [a]	No.	6.3
Number of lives lost due to building defects [b]	No.	0.4
Cost of lives lost due to building defects [c]	**$ million**	**1.85**

[a] Coates et. al. 2019, p. 37. [b] Assumes 5 per cent of fatalities are related to non-compliance with the NCC based on ACIL-Allen, 2015, p. A-15. [c] Based on a VSL of $5.1 million as recommended by OBPR (August 2019).

Source: Coates, L. Kaandorp, G. Harris, J. van Leeuwen, J. Avci, A. Evans, J. George, S. Gissing, A. van den Honert, R. and Haynes, K., 2019, *Preventable Residential Fire Fatalities in Australia*, July 2003 to June 2017, Bushfire and Natural Hazards CRC; ACIL-Allen 2015, *Independent Review of the Building Professionals Act 2005: Cost Benefit Analysis of Proposed Recommendations*, Report to Building Professionals Board, 16 December 2015, p.A-15; Figure A,4, p.A-16; Office of Best Practice Regulation Guidance Note: Value of statistical life, August 2019.

Non-compliance with the NCC could also exacerbate property damage. Building and contents insurance claims relating to fires is one indicator of the extent of property damage (although this would exclude uninsured losses). According to data reported by the Productivity Commission, these insurance claims had approximately doubled in real terms over the period from 2009-10 to 2017-18, although fell significantly in 2018-19. Although property prices have appreciated in real terms over this period, this is largely attributable to the value of land, rather than structures (and other property), which are more likely to be affected by fire.

Based on the Productivity Commission data, we estimate that the cost of property damage due to fire safety defects could be around $2.9 million per year (table 2.27). This estimate is based on the following assumptions.

- Over the 3 years to 2018-19, the Productivity Commission data suggests that the average value of property damage due to building fires was around $98 million per year.
- As for fatalities, not all property damage in buildings is caused by non-compliance with the NCC. Based on data from FRNSW as reported by ACIL-Allen, about 3 per cent of property damage due to building fires in NSW from 2004 to 2014 were due to design, installation and/or construction issues.[26]
- It has previously been estimated that residential sprinklers required as of NCC 2019 in Class 2 and 3 buildings above 4-storeys have the potential to halve property loss from

25 Office of Best Practice Regulation Guidance Note: Value of statistical life, August 2019.

26 ACIL-Allen 2015, *Independent Review of the Building Professionals Act 2005: Cost Benefit Analysis of Proposed Recommendations*, Report to Building Professionals Board, 16 December 2015, p.A-15; Figure A,4, p.A-16.

fire.[27] However, it is unclear from the Productivity Commission data what proportion of property damage relates to apartment buildings higher than 4 storeys.

2.27 Estimated annual property damage due to fire safety defects

	Total property damage	Estimated property damage related to defects[a]
	$ million	$ million
Residential	47.0	1.4
Commercial	50.5	1.5
Total	**97.5**	**2.9**

[a] Assumes 3 per cent of property damage relating to defects based on ACIL-Allen 2015, p. A-15.

Note: The Productivity Commission data does not disaggregated commercial insurance claims by state/territory. We therefore allocate the national-level estimate across states/territories using the same proportions as residential claims.

Source: Productivity Commission; ACIL-Allen 2015, *Independent Review of the Building Professionals Act 2005: Cost Benefit Analysis of Proposed Recommendations*, Report to Building Professionals Board, 16 December 2015.

Stress and anxiety

The literature notes that where defects are discovered, prior to repair and/or where repair does not occur, the defects can impose emotional and financial stress on residents. For example, interviews of homeowners with cladding issues found that shock, stress, anger, anxiety, frustration and disappointment were common among homeowners.[28] This issue was also raised in consultations, with anecdotal evidence that these impacts are significant.

Our survey asked residents about the emotional stress they felt because of defects. Whilst 51 per cent and 45 per cent of Class 1 and 2, respectively, answered that they felt little to no emotional stress as a result of the defect, a significant proportion answered that they had felt moderate, quite a lot or extreme emotional stress (table 2.28).

2.28 Emotional stress associated with defects

	Class 1	Class 2
	%	%
Little or no emotional stress	51	45
Moderate emotional stress	34	43
Quite a lot of emotional stress	11	11
Extreme emotional stress	3	1

Source: CIE

Disability weights are one indicator of the impact that these disorders can have on quality of life. Disability weights are a weight factor intended to reflect the severity of a disease

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27 ABCB 2018, *Regulation Impact Statement for Final Decision: Fire safety in new Class 2 and Class 3 residential buildings,* November 2018, https://www.abcb.gov.au/-/media/Files/Resources/Consultation/Final_RIS_Fire_Safety_in_new_Class_2_and_3_residential_buildings_PDF.pdf

28 Oswald, David 2020, "Flammable cladding: What about the homeowners", RMIT University.

on a scale from 0 (perfect health) to 1 (equivalent to death).[29] As part of the Global Burden of Disease study (2017), disability weights were estimated for a wide range of diseases and disabilities, including major depressive disorders and anxiety disorders of varying severity (table 2.29).

2.29 Indicative cost of mental disorders

	Disability weight[a]	Annual cost[b]
		$ per incidence
Mild major depressive disorder[d]	0.145	31 190
Moderate major depressive disorder[e]	0.396	87 912
Mild anxiety disorder[g]	0.030	6 660
Moderate anxiety disorder[h]	0.133	29 526

[a] From Global Burden of Disease study 2017. [b] Based on a Value of a Life Year of $222 000, as recommended by OBPR. [d] A person with a **mild major depressive disorder** feels persistent sadness and has lost interest in usual activities. The person sometimes sleeps badly, feels tired, or has trouble concentrating but still manages to function in daily life with extra effort. [e] A person with a **moderate major depressive disorder** has constant sadness and has lost interest in usual activities. The person has some difficulty in daily life, sleeps badly, has trouble concentrating, and sometimes thinks about harming himself (or herself [g] A person with a **mild anxiety disorder** feels mildly anxious and worried, which makes it slightly difficult to concentrate, remember things, and sleep. The person tires easily but is able to perform daily activities. [h] A person with a **moderate anxiety disorder** feels anxious and worried, which makes it difficult to concentrate, remember things, and sleep. The person tires easily and finds it difficult to perform daily activities.

Source: Global Burden of Disease Study 2017, http://ghdx.healthdata.org/record/ihme-data/gbd-2017-disability-weights, accessed 26 August 2020; Office of Best Practice Regulation Guidance Note: Value of statistical life, August 2019.

The impacts of suffering from these mental disorders for a year can be monetised by applying the disability weight to the value of a life year (VLY). The VLY can be interpreted as the value society places of a year of life free of injury, disease and disability. OBPR recommends using a VLY of $222 000 (in 2021 dollar terms) in regulatory impact analysis.[30]

This analysis suggests that the mental health impacts of major defects in a single high-rise apartment building (which could include several hundred residents) could easily run into the tens of millions of dollars. Across the whole economy, these mental impacts could therefore be a significant contributor to the problem associated with building defects.

However, there is limited quantitative information on the incidence of mental health issues associated with building defects in an Australian context. In an attempt to quantify the associated cost, we made the following assumptions about the mapping from emotional stress associated with defects in table 2.28 to the mental disorder in table 2.29:

- ‘Little or no emotional stress’ and ‘Moderate emotional stress' are equivalent to no ‘depressive disorder’;
- ‘Quite a lot of emotional stress’ is equivalent to ‘Mild depressive disorder’; and
- ‘Extreme emotional stress’ is equivalent to ‘Moderate depressive disorder’.

[29] World Health Organisation website, https://www.who.int/healthinfo/global_burden_disease/daly_disability_weight/en/, accessed 26 August 2020.

[30] Office of Best Practice Regulation Guidance Note: Value of statistical life, August 2019.

With these assumptions, it is estimated that about 2 163 people would have mild mental issues and another 553 having moderate mental issues each year due to defects (table 2.30).

The weighted average length of time to rectify a defect is 0.26 year for Class 1 buildings and 0.47 year for Class 2 buildings according to the survey results as reported in table 2.17. As the average length is less than one year, we use the statistical value of life (SVL) of $222 000 and the disability weights for relevant mental disorders in table 2.29 to estimate the mental health cost due to defects.

2.30 Estimated number of people having mental issues due to defects

	Class 1	Class 2	All residential
Number of dwellings (No.)	23,573	3,721	27,294
Proportion of buildings with a defect	69%	72%	69%
Impacted dwellings	16,222	2,695	18,916
Number of people having mental issues due to defects			
Mild major depressive or anxiety disorder	1,855	305	2,160
Moderate major depressive or anxiety disorder	529	23	552

Note: using construction data in 2022

Source: CIE estimates

It is estimated that the mental health cost due to defects is about $33.5 million per year if using disability cost for depressive disorder or $8.6 million per year if using anxiety cost. The average mental health cost is about $21 million per year (table 2.31).

2.31 Estimated annual mental health cost due to defects

	Class 1	Class 2	Total
	$m	$m	$m
Depressive disorder			
Mild	15.7	4.6	20.3
Moderate	12.2	1.0	13.2
Total cost	**27.9**	**5.6**	**33.5**
Anxiety disorder			
Mild	3.2	1.0	4.2
Moderate	4.1	0.3	4.4
Total cost	**7.3**	**1.3**	**8.6**
Average mental health cost	**17.6**	**3.4**	**21.0**

Note: using construction data in 2022

Source: CIE estimates

Total size of the problem

Table 2.32 summarises the total size of the problem associated with defects due to non-compliance for 2022. Central estimate is used for Classes 3 to 9 (other commercial buildings), taking the average of the upper and lower bound estimates. Total size of the problem amounts to $435 million per year.

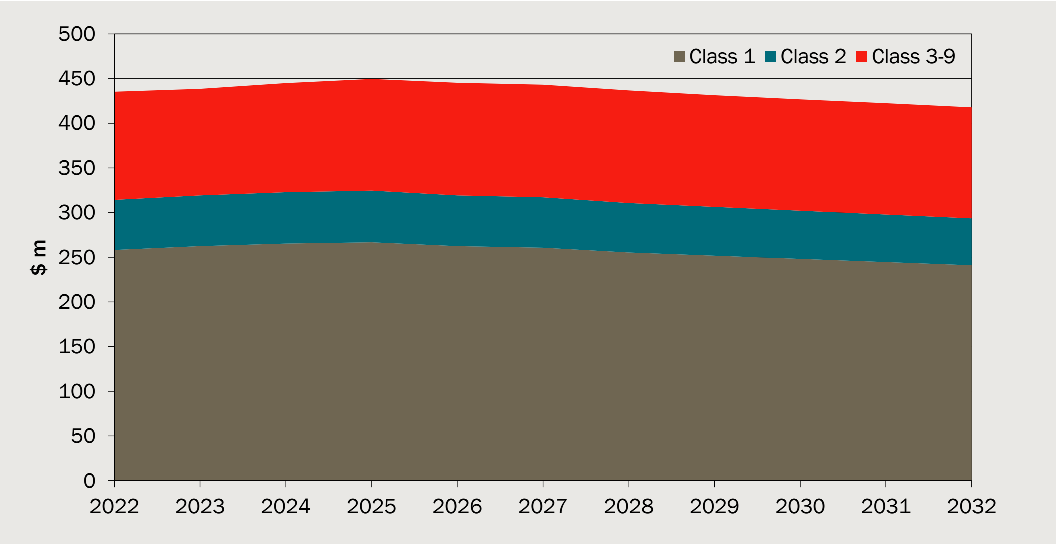
2.32 Total size of the problem (annual)

Type of cost	Total size of problem (Annually)
	$m
Class 1 buildings	
Rectification cost	204.8
Other cost	11.2
Time cost	21.8
Fatalities / insurance claims	2.8
Mental health cost	17.6
Sub-total cost	**258.2**
Class 2buildings	
Rectification cost	41.7
Other cost	5.7
Time cost	4.6
Fatalities / insurance claims	0.4
Mental health cost	3.4
Sub-total cost	**56.0**
Class 3-9 buildings	
Rectification, other, time costs	119.5
Insurance claims	1.5
Sub-total cost	**121.0**
All costs	**435.2**

Source: CIE

Chart 2.33 shows the change in the size of the problem each year across 10 years. Initially the size of the problem is likely to grow, however over time, as population and GDP growth slows the total number of building completions is estimated to reduce in turn reducing the size of the problem, however, only marginally.

2.33 Projected size of the problem over 10 years



Data source: CIE

Other costs

Other costs arising from NCC non-compliance are described below. These have not been separately quantified because they have either been included in the other costs associated with defects (for example evacuation costs) or there was insufficient reliable data.

Evacuation costs

There are costs associated with the need to find alternative accommodation if a building is temporarily or permanently deemed to be uninhabitable or during the period of rectifying the defects. While how this accommodation is organised and who funds it varies, it is clear from the length of time involved that the need for alternative accommodation is costly.

We are not aware of any systematic data for buildings in Western Australia that have required evacuation and the costs associated. However, our survey asked owners of residential dwellings how much they spent on temporary accommodation because of defects. So, the evacuation costs in principle have been included in the other cost item associated with defects discussed in the previous section.

Insurance

Practitioners in the building industry are required by law or commercial imperatives to hold professional indemnity insurance to cover claims against the professional services they provide.[31] Table 2.34 summarises the insurance requirement for selected practitioners.

2.34 Insurance requirements for building industry practitioners

Practitioner	Government requirements, intervention	Exclusions permitted/ strictness of requirement
Building Surveyors	▪ Required by law to have professional indemnity insurance, which is provided by private companies	Exclusions are permitted
Engineers	▪ Not required to hold insurance, though many choose to ▪ If they choose to register with an industry organisation, e.g. Institute of Fire Engineers, this body generally requires them to hold adequate privately provided insurance	Exclusions are permitted
Architects	▪ Except in Queensland, architects are required to hold private indemnity insurance; in most cases, this requirement is made via codes of conduct, registration requirements, etc.	Exclusions are generally allowed, in some cases this is at the discretion of the architect
Builders	▪ The insurance market is slightly different for builders: state and territory governments (except Tasmania) have created mandatory warranty schemes for Class 1 buildings only. These are either government provided or provided by private insurers who have reinsurance from government. ▪ These schemes give home owners the opportunity to seek compensation for losses where builders fail to complete work or where defects occur, etc.	The terms differ in each state and territory

Source: PwC (2019), pp. 12-14.

A high proportion of buildings with defects increases the risk to insurers. This has reportedly resulted in either:

- significant increases in insurance premiums for practitioners
- exclusions, such as those covering cladding, or
- in some cases, some practitioners unable to get insurance.

Stakeholders indicated that insurance premiums have risen 200-300 per cent over the past 5 years, where premiums could now be as high as $100,000 for building surveyors. However, it was indicated that insurance providers don't differentiate across states as they are global providers, indicating that to lower insurance costs for building industry practitioners in Western Australia, reforms would need to be implemented across Australia.

The impact on insurance costs as a result of NCC non-compliance has not been separately included in the 'size of the problem'. The increase in insurance premiums is, to a significant extent, a consequence of a high incidence of non-compliance — rising costs associated with rectifying defects leads to higher insurance payouts, higher perceptions of risk and therefore higher premiums so insurers can cover their risks/costs. Conceptually

31 PwC 2019a, *Strengthening the professional indemnity insurance environment for building industry professionals in Queensland,* interim report to Department of Housing and Public Works, 24 July 2019, https://www.hpw.qld.gov.au/__data/assets/pdf_file/0021/4917/safebuildingspwcreport.pdf

the increase in insurance premium should not be added to the avoided rectification costs to avoid double counting, for example rectification costs could be covered through insurance claims.

Legal costs

There are legal costs in cases where there is a legal dispute (even where the dispute is settled out of court). A study relating to 'leaky homes' in New Zealand found that where these defects are repaired, non-repair costs (design, legal, expert costs and consequential costs) were estimated to make-up around 43 per cent of repair costs.[32]

In our survey of residential building owners, respondents were asked to provide their legal costs associated with defects. In that sense, legal costs have been included in the total size of the problem, at least partly.

Additional maintenance costs

Building defects can also occur during the operation phase (such as due to poor maintenance). Some of these defects will be caused by poor maintenance practices by building managers. As noted in the national analysis of the impacts of the BCR recommendations, others can arise where key building information (such as maintenance schedules, compliance requirements for Performance Solutions and related information) is not passed on when the building changes ownership or management.[33] Further, in addition to creating defects that may need to be rectified, many defects caused by non-compliance with the NCC will add to future maintenance costs and other costs.

Underlying causes

According to the Productivity Commission, information asymmetry between the builder and the purchaser is the key market failure creating the need for building regulation.[34] Essentially, it is difficult for many buyers to ascertain or understand key safety characteristics of buildings, such as structural integrity and fire safety.

Regulations that aim to ensure compliance with the NCC are already in place in Western Australia. However, the evidence presented above suggests that weaknesses in these existing compliance and enforcement regimes are failing to prevent non-compliance with the NCC in some cases.

During consultation stakeholders were asked what contributed to the problem in Western Australia, findings are summarised below:

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32 PwC 2009b, *Weathertightness – Estimating the Cost*, report for the New Zealand Department of Building and Housing, 29 July 2009, https://www.interest.co.nz/sites/default/files/PWC-leaky%20homes%20report.pdf, Figure 61, p.69.

33 CIE 2021, *Building Confidence Report: A case for intervention*, Prepared for the Australian Building Codes Board, July 2021, p. 20.

34 Productivity Commission 2004, *Reform of building regulation,* p. XXII

- Inspections are occasionally done by in house building surveyors creating a conflict of interest when certifying the building.
- There are incentives for builders to cut corners to reduce cost increasing the likelihood of defects
  - Design documentation only completed to 80 per cent, engineering design skipped due to expense. This is driven by consumers able to walk away leaving a sunk cost of design and allows builders to substitute material after design documentation is approved.
  - Reduced levels of testing.
  - Minimal inspections prior to building sign off.
- Understanding of NCC is not at the required level, some inspectors may have outdated information when conducting an inspection.
- Shortages of trades and skilled labourers

The combination of multiple factors drives the size of the problem in Western Australia, however many of the reforms suggested as part of this CBA seek to solve these issues.

3 Proposed reforms

Summary of proposed reform package

The proposed reforms to the building approvals process and registration are comprehensive, and can be summarised as follows:

- mandatory inspections for all new BCA Class 1 to 9 buildings at prescribed notifiable stages;
- increased requirements for design documentation;
- clarifying the role of the FES Commissioner in the fire safety design process for BCA Class 2-9 buildings;
- requiring building manuals for all new Class 2-9 buildings;
- improving process to document and approve variations;
- independent third-party review of structural and fire safety engineering designs for BCA Class 2 buildings over 25m in height;
- documentation of maintenance or occupancy conditions for performance solutions on certificates of design and construction compliance and occupancy permit.
- requirements for building surveyors' engagement, including Code of Conduct;
- requiring building permits for prescribed high-risk structures including retaining walls of certain dimensions;
- requiring new Class 1b buildings to obtain both certificates of construction compliance and occupancy permits;
- requirement for permit authority to respond to Building and Energy notice;
- various administrative and enforcement reforms;
- a two-tiered model of registration for builders
  - Tier 1: Open builder class, NCC classification of any size
  - Tier 2: Low rise buildings – restricted to
    - Class 1 and 10 buildings of any size
    - Class 2-9 buildings that are type C, with GFA not more than 2,000m^2;
- mandatory Continued Professional Development for registered building practitioners and building surveyors on the NCC
  - 3 hours annually for builders
  - 7 hours annually for building surveyors; and
- extending builder registration requirements to remote and regional areas of Western Australia, where registration is not currently required.

It is noted that there was a proposal to register project managers on large commercial (Class 3–9) buildings to ensure individuals and entities are competent in their field and have a strong understanding of the NCC and their supervision obligations. It is likely that this proposal will not go ahead and is thus not included in the central case of the cost-benefit analysis (CBA). Rather it is subject to a sensitivity analysis of the CBA.

Table 3.1 provides a rough mapping of the proposed reforms in Western Australia to the corresponding *Building Confidence Report* (BCR) recommendations.

3.1 Proposed reforms to building approvals process in Western Australia

Proposed reforms	Corresponding BCR recommendations
Mandatory inspections	18-19 (inspection regime)
Design documentation	13-15 (adequacy of documentation and record keeping); 1-2 (registration of designers)
Role of FES Commissioner	8 (involvement of fire authorities in building design)
Building manuals for class 2-9 buildings	20 (post-construction information management)
Third-party review	17 (independent third-party review)
Process to document and approve variations	16-17 (adequacy of documentation and record keeping)
Building surveyors' engagement and code of conduct	9-11 (integrity of building surveyors)
Building permits for prescribed high risk structures Occupancy permits for class 1b buildings Permit authority to respond to Building and Energy notice Administrative and enforcement reforms	5-8 (role and responsibility of regulators), 13-15 (adequacy of documentation and record keeping)
Two-tiered model of registration New registration requirements for project managers on large commercial construction [a] Extending builder registration requirements to remote and regional areas of Western Australia	1-2 (registration of building practitioners) (consistent requirements for registration)
Mandatory CPD for registered building practitioners and building surveyors on the NCC	3 (continued professional development)

[a] It is included in the sensitivity analysis of cost-benefit analysis (CBA) rather than the central case CBA

Source: CIE.

Further details of each element of the reform package are provided below.

Proposed reforms to the building approval process

Details of the proposed reforms to building approvals processes are set out below.

Mandatory inspections

Mandatory inspections are proposed for all new BCA Class 1 to 9 buildings at prescribed notifiable stages. This is probably the most important measure among the reforms.

The purpose of the inspection scheme is to ensure the building work being carried out meets the applicable building standards and approved plans and specifications, thereby ensuring buildings meet the requirements as to health, safety and amenity and avoid potential costs to owners for rectifying defective/non-compliant works at a later stage.

The SBS (being the statutory building surveyor who issued the CDC or named on the building permit) will be responsible for carrying out on-site inspections once a 'notifiable stage' of the building work has been reached. The SBS may engage a competent person to assist in carrying out the inspections, or elements of the inspection.

Inspections must be carried out in accordance with industry standards and Directions issued by the Building Commissioner. The Building Commissioner will prepare and publish Directions for different classes of buildings.

After each inspection, the inspector will issue an Inspection Report, detailing (among other things) what element(s) of the construction was inspected, compliance of the element(s) inspected with plans/specifications and applicable building standards, the outcome (satisfactory/not satisfactory) and directions to proceed to the next notifiable stage.

If the inspected element(s) is unsatisfactory, the SBS must still give an Inspection Report, stating (among other things) what element(s) inspected did not comply (and why) and directions in respect to the notifiable stage (e.g. rectification/reinspection, apply for amended permit to deal with variation to approved plans etc.), and whether works can conditionally continue or not continue. The Builder must ensure any additional work required to meet the notifiable stage is completed, before arranging for an additional inspection and obtaining a passed Inspection Report.

For BCA Class 2-9 buildings, the SBS where non-compliance is detected with an element sampled during the prescribed minimum notifiable stage (e.g. waterproofing in wet areas), or otherwise during a specified notifiable stage, will have the authority to direct in the Inspection Report that a larger sample be reinspected.

Non-compliance in this sense would be only where the element sampled does not comply with the applicable standards, not where the work is incomplete at the time of inspection, or there has been a variation to the approved plans and specifications.

The SBS must notify the permit authority if the builder does not comply with directions in the Inspection Report for consideration of the issue of a Building Order by the permit authority.

For BCA Class 1 buildings, the builder must not give the Notice of Completion (NoC) to the permit authority unless a satisfactory Inspection Report for each notifiable stage has been given. The NoC must be accompanied by a copy of Inspection Reports in respect to each notifiable stage. A statement will be included in the NoC that requires the builder to specify that an Inspection Report for each notifiable stage indicating compliance has been given.

Higher penalties (including a daily penalty) will apply for failing to give a NoC and missing inspections.

For BCA Class 2-9 buildings, the Certificate of Construction Compliance (CCC) will be required to include a statement that an Inspection Report for each notifiable stage indicating compliance has been given, and a copy of all Inspection Reports must be included in the application for an Occupancy Permit.

Proposed notifiable stages and inspection contents

Notifiable stages are defined differently for Class 1 buildings and Class 2-9 buildings.

For Class 1 buildings, there are four proposed notifiable stages:

- footing stage – after the excavation of the foundation material but before footings poured;
- slab stage – after the placement of the formwork and reinforcing but before the concrete slab is poured;
- framing stage – for timber or metal construction, after completion of the wall and roof framing but before the structure is covered up by cladding or linings, or for masonry construction (if the wall cavities are to be filled) before the wall cavities are filled; and
- final stage – once the building work is complete (including bushfire compliance where applicable), but before notice of completion is submitted.

For all Class 2-9 buildings, there are at least seven (7) notifiable stages. The SBS may specify additional notifiable stages on the CDC or by a specialist on a technical certificate referenced in the building surveyor's CDC.

The minimum notifiable stages are:

- after the commencement of the excavation for, and before the placement of any membranes or concrete for any footing;
- 30 per cent of reinforcing steelwork for footings and structural elements must be inspected before pouring concrete;
- 30 per cent of each type of structural framework prior to enclosing, covering or otherwise concealing from inspection;
- fire protection at service penetrations and openings to building elements that are required to resist fire or smoke spread at least one (1) type of each protection method for each type of service per storey of the building;
- prior to covering any underground service connections, e.g. stormwater drainage, sewer and etc.;
- after the building work has been completed and prior to any notice of completion or certificate of construction compliance being issued in relation to the building; and
- fire safety system testing (as per existing requirement in the Building Regulations).

Additional minimum notifiable stages will apply for Classes 2-4 and 5-9 buildings.

- For Classes 2, 3 or 4 buildings:
  - prior to enclosing, covering, or otherwise concealing from inspection, the junction of any internal fire-resisting construction that forms part of construction bounding a sole-occupancy unit, and any other building element required to resist internal fire spread, inspection of rated elements in a minimum of 30 per cent of sole-occupancy units on each storey of the building containing sole-occupancy units;
  - prior to enclosing, covering, or otherwise concealing from inspection, 20 per cent of all required external waterproofing membranes, flashing, sarking or like materials forming part of the weatherproofing elements of a building; and
  - prior to enclosing, covering, or otherwise concealing from inspection, 20 per cent of rooms with sanitary fixtures within a building, required waterproofing membranes and water resistant substrates on each storey of the building.
- For Classes 5, 6, 7, 8 or 9 buildings, prior to enclosing, covering, or otherwise concealing from inspection, the junction with any other building element of any internal construction required to resist fire or smoke spread, inspection of a minimum of 30 per cent of fire resisting elements on each storey of the building.

Where an inspection is to occur of a sample of certain building elements, it is expected that the SBS will take a risk-based approach that may, depending on the circumstances, focus on a higher percentage of samples on lower levels of the building and, where satisfied, a smaller sample on higher levels of the building. This will be for the SBS to determine.

Design documentation

The proposal will introduce greater rigour to the design documentation and specifications that must be provided to support an application for a building permit for all classes of buildings.

Requirements include:

- All documentation (including plans and specifications) that supports a CDC for any class of building must:
  - demonstrate compliance with applicable building standards and include sufficient information for assessment (by the SBS);
  - state any revision number, date and author; and
  - comply with any Directions issued and published by the Building Commissioner for buildings of that type or class.
- Plans and specifications for BCA Class 2-9 buildings must be prepared by a registered building designer of the appropriate class (to be prescribed at a later date by regulations made under the *Building Services (Registration) Act 2011*)
  - This requirement will likely apply to BCA Class 2 buildings initially, with other classes to be prescribed later.
- A registered building designer who prepares a design, or component of a design (a regulated design), must include a Declaration of Design Compliance (Declaration). The Declaration must (among other things):

  - state that (to the best of the building designer's knowledge) the regulated design, or component of the regulated design, complies with the applicable buildings standards;
  - the name of the building designer and registration number;
  - version/revision number; and
  - dependencies/assumptions relied upon.
- CDC, CCC and OP for a BCA Class 1b and 2-9 building to state any occupancy and maintenance conditions for a performance solution that must be met.
- NoC for all buildings to include a Declaration of Construction Compliance by the builder that the building work has been completed in accordance with the approved plans/specifications.

Building manual

A building manual, in accordance with the Australian Building Manual Guidelines, is required for all new BCA Class 2 buildings. The building manual must be provided to the building owner and the permit authority as part of the occupancy permit application.

Class 3-9 buildings will be prescribed later to require building manuals.

Third-party review

This proposal will introduce independent Third-Party Review (TPR) of structural and fire safety designs for high-risk buildings, being BCA Class 2 buildings with an effective height greater than 25 metres. There will be a power to prescribe other building classes at a later date (if necessary).

The purpose of TPR is to ensure a more robust, transparent and independent review of regulated designs and to improve the overall regulatory compliance of the building design and protect building owners.

Structural and fire safety components of a regulated design for a high-risk building, must be reviewed by an appropriately qualified, competent, and, if applicable, registered practitioner (e.g. a registered engineer) ('Reviewer'). The Reviewer must provide a Declaration of Independence, stating that they:

- did not (themselves) prepare the regulated design, or component of a regulated design; and
- do not have any material interest in the building the subject of the regulated design, or conflict of interest with the designer, builder or SBS (i.e. an owner or part owner of the contracting business).

The Reviewer is responsible for independently reviewing and validating the regulated design, reports, calculations and documentation to determine compliance with applicable building standards. Regulated designs must be prepared by a registered building designer of the appropriate class.

The Reviewer must provide a report (Review Report) detailing the outcome of the review, including any recommended amendments, and certificate of review. The Review Report and the original designer's response to any recommendations must be submitted as part of the documents supporting the CDC.

Process to document and approve variations

Variations made to the design during the construction process that affect compliance with applicable building standards will be documented and approved.

The builder is responsible for notifying the SBS if there are intended variations to the approved plans and specifications prior to the works being carried out.

The SBS is to assess whether the change is a major or minor variation.

If the SBS determines that the change is a major variation, the SBS may direct the builder (in writing) to apply to the permit authority for an amended building permit.

All documentation associated with the variation must be prepared, including the CDC, FES Commissioner's comment, regulated design, Declaration and TPR Certificate (as the case may be).

The process for applying for an amended building permit will be similar to the processes for applying for a building permit, with a lower fee.

The decision of the permit authority on whether to grant an amended permit will be reviewable by the State Administrative Tribunal.

If the SBS determines that the change is a minor variation, then construction work continues, and the variation is documented concurrently. The amended documentation is attached to the CCC, if applicable, or NoC, and forms part of the OP application, if applicable.

Where the variation is identified after the construction (i.e. through an inspection), the SBS may direct the builder to apply for the amended building permit in the Inspection Report.

Fire and Emergency Services (FES) Commissioner

Reforms to clarify the role of the FES Commissioner in the building approval process.

- Express obligation for the SBS, within 10-day timeframe, to provide FES Commissioner in writing a response to advice provided under 18B of the regulations, including reasons for incorporating/not incorporating advice in plans and specification.
- FES Commissioner's advice, and any required response, must be provided to the building owner;
- prescribed information to be included by the SBS in any required response to the FES Commissioner;
- FES Commissioner's advice may be provided early.

Engagement of building surveyors

The SBS undertaking statutory building surveying work has to be engaged by the building owner of the proposed building for the duration of a building permit and be named on the building permit.

If the SBS's contract to provide statutory building surveying work is terminated early, then:

- both parties to the contract must notify the Building Commissioner of the fact and the reason(s) why the contract is terminated, using a prescribed form;
- in the case where a permit has been issued for the work, the building surveyor must notify the permit authority; and
- a new SBS must be appointed within 10 business days and, if a permit has been issued, an amended permit must be applied for, naming the new SBS.

It is our understanding that this is a procedural requirement to support the mandatory inspection requirement.

Building permits for prescribed high risk structures

Prescribed structures, including retaining walls on subdivisions – excepting those specifically exempted in regulation – are required to obtain building permits, even where the structure is not incidental to a building.

This is intended to capture high risk structures, including retaining walls of certain dimensions, built by developers or building owners on vacant lots in advance of a building being constructed.

As will be seen in the Administrative reforms section, the definitions of *building work* and *incidental structure* will be amended to provide that certain high risk structures which are not incidental to a building will require a building permit and must comply with the applicable building standards.

It is not known how many structures this reform will affect.

Occupancy permits for Class 1b buildings

New Class 1b buildings are required to obtain both certificate of construction compliance (CCC) and occupancy permits.

Permit authority to respond to Building and Energy notice

Where an authorised person from Building and Energy considers building work is non-compliant, and the builder refuses to rectify it, the authorised person may notify the building owner and the permit authority of the non-compliance.

The permit authority will then have 90 days in which to respond to the building owner and Building and Energy, notifying what action they took, or why they did not take any action.

Administrative reforms

A number of administrative reforms are proposed to address known gaps in the existing legislation, and/or support the reforms mentioned above. These include:

- new provisions for building surveyors and specialists;
- new powers to the Building Commissioner, FES Commissioner, permit authorities and Minister;
- new and/or exact details on certificates and documentation;
- new provisions for high-risk design and structures and other structures and buildings;
- updated penalty provisions; and
- other administrative reforms.

These reforms are not anticipated to have any significant cost or time impacts.

Building surveyors and specialists

Administrative reforms related to building surveyors and specialists include:

- building surveyors will be required to act in the public interest when undertaking *statutory building surveying work*;
- the building surveyor will have to be engaged by the building owner;
- the building surveyors' payment for *statutory building surveying work* may not be made conditional on the issuance of a certificate of compliance, or a permit; and
- specialists will be prescribed who may issue technical certificates.

Building Commissioner

Under the proposed administrative reform, the Building Commissioner will be empowered to

- issue Commissioner's Directions on prescribed technical matters; and
- enter and inspect any construction site.

Permit authority

New head of power for regulations to prescribe that uncertified occupancy permit applications may be made to permit authorities for buildings of certain classifications.

Permit authorities will be empowered to report activities of accredited practitioners to the accrediting body.

If agreed in writing between the applicant and the permit authority, an applicant may pay the prescribed fee for an application for a building or demolition permit on an aggregated basis.

Allow a local government permit authority to engage a non-government employee for the purposes of arranging inspections.

New powers for Minister

Minister will be empowered to make Ministerial orders to:

- temporarily exempt permit authorities from the requirement to refund permit application fees by failing to make a decision in the prescribed timeframe, and to provide that the amount is not recoverable in a competent court; and
- allow the permit authority CEOs to temporarily reduce, waive or refund any fee required for an application under the Building Act.

New and/or exact details on certificates and documentation

These administrative reforms include:

- documentation must state the author's name, and registration number if applicable;
- building surveyor's certificate of construction compliance will state that work complies with the applicable standards rather than 'plans and specifications';
- builder's notice of completion will state that work has been completed in accordance with the approved plans and specifications; and
- a certificate of compliance must contain a record of each supporting document, including the revision number or date.

Penalty

Penalty provisions will be updated and modernised to reflect penalties for equivalent offences in other legislation.

Other administrative reforms

Entry warrant details are amended to exclude the name of the issuing Justice of the Peace.

Replace owner signature requirement for building permit application with an owner consent requirement.

Amend Work on Other Land provisions to clarify:

- a Magistrates Court can only order a temporary encroachment onto adjoining land;
- *adversely affect land* does not apply to 'bearing capacity'; and
- the obligation for sharing the cost of maintenance or repair of a boundary retaining wall only applies to a shared wall.

Registration of builders and related occupations

Details of proposed reforms to registration arrangements for builders and related occupations are set out below.

Two-tiered model of registration

A two-tiered model of registration is proposed for registered builders in Western Australia.

The purpose of this reform is to better align qualifications and experience with the type and complexity of work builders are entitled to undertake. This is particularly important as Western Australia transitions towards higher density living that could result in builders that have typically worked on low rise residential buildings, trying to build more complex mixed-use buildings, driven by the desire to maintain their share of residential construction. The implementation of this reform will primarily help to reduce the number of defects that may occur due to unqualified builders working on complex buildings. These reforms may also increase the ability to access builder registration for less complex building projects.

The scheme will be applied to all current and future registered building practitioners and contractors in Western Australia. Current builders will be allowed to continue to build all sized and types of buildings unless their existing registration is limited. In addition, the scheme will narrow the existing registration pathways to align with the two registration levels.

There are no proposed changes in the cost of registration for practitioners, which under the Building Services (Registration) Act (BSR Act) requires builders to renew registration on a three-year basis. However, following implementation of the reforms new building practitioners that are initially registered in Level 2 Low rise tier will need to pay a fee and successfully apply and be granted registration in Level 1 Open builder tier before they may carry out more complex building work.

Current education requirements align with the future requirements for Tier 1 registration, including the completion of a Diploma of Building and Construction (Building) as a minimum qualification, however experience will need to include a minimum amount of commercial building experience, following a lead-in period. An Open builder registration pathway for applicants with building degrees will also be added to encourage specialisation and higher education.

Level 2 builders on the other hand will have a slightly adjusted educational requirement and experience. Qualifications will be reduced from the Diploma of Building and Construction (Building) to a skillset (group of national competencies) comprising the Certificate IV in Building and an estimated five units of competency from the Diploma of Building and Construction (Building) with reduced experience requirements.

This reform will also require an ongoing compliance requirement for building contractors to have at least one nominated supervisor who is registered as a building practitioner in the appropriate class of building service (table 3.2).

Building practitioners are required to meet prescribed qualifications and experience requirements for that class of building service practitioner; be a fit and proper person and an eligible person. Following initial registration, building practitioners do not have to prove their qualifications and experience on renewal of registration.

3.2 Eligible nominated supervisors

Registration title	Scope of work	Eligible nominated supervisors
Level 1 – Registered Building Contractor – Open	All NCC Class buildings of any size	Must be a registered building practitioner Level 1
Level 2 – Registered Building Contractor – Low rise	Restricted to Classes 1 and 10 buildings of any size; and other NCC classes up to 2 000 m^2 and Type C construction	Must be a registered building practitioner Level 1 or 2

Source: DMIRS

In a tiered registration regime, permit authorities will need to check whether the builder is registered in the appropriate tier. In addition, Building and Energy may take action for breaches of the BSR Act. The grandfathering proposals will ensure that these costs are limited for the short to medium term. The grandfathering arrangements are an important component of the reforms. The proposal is that existing registered builders are migrated to Level 1 registration, unless they have existing restrictions on their registration. This will mean that the alignment of skillsets to the particular tier of registration will change slowly in response to new builder registrations.

Mandatory Continued Professional Development on the NCC

This reform proposes to introduce mandatory Continued Professional Development for registered building practitioners and building surveyors on the NCC to increase the understanding of the NCC and in turn reduce the number of defects caused by poor understanding of the standards.

The Building Confidence Report noted that not all practitioners operating in the building industry and associated professions have a sufficient understanding of the NCC, which is updated every three years. Recommendation 3 of the Building Confidence Report states:

> ‘That each jurisdiction requires all practitioners to undertake compulsory Continuing Professional Development on the Construction Code’.

The ABCB is currently developing short training modules on the NCC for a range of building related occupations. Training is provided online for a cost recovery fee and various courses will be made available to practitioners. The reform proposes the following number of hours annually as a condition of registration / renewal:

- Three hours CPD annually for builders
- Seven hours CPD annually for building surveyors
- Annual CPD can comprise of regular online or face-to-face CPD courses on the NCC, or an alternative NCC related course approved or provided by Building and Energy, with CPD courses on building defects in Western Australia building construction also available under the scheme.

Compulsory CPD on the NCC may initially apply at lower yearly levels than those specified above until there is a sufficient offering of quality courses for participants. The requirements would initially apply to building surveyors, before being extended to builders given the higher variance in work undertaken.

New registration requirements of project managers on large commercial construction

The reform to registration of project managers on large commercial construction is considered in the sensitivity analysis, it has not been included in the central case of cost-benefit analysis.

Under the proposed reforms, there will be a new requirement for project managers working on large commercial construction projects to be registered. The intent of this requirements would be to ensure these individuals and entities are competent in their field, have a strong understanding of the NCC and their supervision obligations. Failure to comply with minimal standards could result in disciplinary action.

Project managers are often employed by the building contractor to plan a construction project to ensure it runs on time and on budget or by the building owner as part of the contract management team. For high rise commercial building projects, the construction or project manager will engage with a design team and experts such as the architect or architectural team, a range of engineers (fire safety, mechanical, hydraulic, electrical, etc.), a building surveyor and quantity surveyor. A poorly managed building can lead to increased costs, which in turn can lead to cost cutting methods which may increase the number of defects in a building.

The National Registration Framework (NRF) proposes two tiers of project manager registration:

- Level 1 Open/Commercial – Project management work for a building of NCC Classes 2 to 9 of any size; and
- Level 2 Restricted/Commercial – Project management work for a building of NCC Classes 2 to 9 no greater than three storeys in height and 2 000 m^2 in area.

Registration in Level 1 Open/Commercial would require a degree or advanced diploma level qualifications in project management and 4 years documented experience or practising senior project management accreditation by AIPM. Registration in Level 2 Restricted/Commercial would require diploma level qualifications and 3 years documented experience, or practising project manager accreditation through AIPM.

New costs would apply for commercial project managers. This reform would increase costs through ongoing audit, legal and compliance costs incurred by the Building Services Board and Building and Energy in administering registered occupations under the BSR Act. The main benefit would be expected to be better managed building construction with less defects.

Extending builder registration requirements to remote and regional areas of Western Australia

This proposal would require the registration of building practitioners in remote and regional areas of Western Australia. This would ensure that building standards are consistent across all of Western Australia.

Due to low population densities, and difficulties in getting qualified and experienced builders to service all regional and remote areas of Western Australia, exemptions from the requirement to use a registered builder have been in place since builder registration requirements were first introduced in the 1930's. These exemptions were carried into the building services registration legislation introduced in 2011.

Building industry stakeholder groups in Western Australia have previously called for the extension of registration requirements to the whole of the State, on the grounds that the current exemptions provide an unfair competitive advantage to unregistered builders in those areas, as well as concerns about building standards.

While the availability of qualified builders in more remote areas of Western Australia may still be an issue, given the increasing complexity of the BCA and significant health and safety risks involved in the building and construction industry, it is appropriate to consider extending builder registration requirements to all areas of the State.

Legislation mandates both when and where builder registration is currently required. Regulation 13 of the BSR Regulations defines 'builder work' for which registration is required as building work:

- For which a building permit is required; and
- Has a value of $20,000 or more; and
- Is carried out in an area of Western Australia set out in Schedule 3, BSR Regulations, which lists those areas of the state where a registered builder is required (table 3.3).

3.3 Areas of state

Local government district	Area
South West Division	South West Division in the *Land Administration Act 1991* Schedule 1, other than the local government districts of Mukinbudin, Mt Marshall and Narembeen
Greater Geraldton	Whole district
Chapman Valley	Whole district
Northampton	Whole district
Kalgoorlie Boulder	Townsites of Kalgoorlie and Boulder
Esperance	Townsites of Esperance, Salmon Gums, Grass Patch, Scaddan, Condingup, Coomalbidgup, Cascade and Gibson
Yilgarn	Townsites of Southern Cross, Marvel Loch, Moorine Rock, Bullfinch and Bodallin
Coolgardie	Townsites of Coolgardie, Kambalda and Kambalda West
Dundas	Townsite of Norseman
Laverton	Townsite of Laverton
Ravensthorpe	Townsite of Munglinup
Ashburton	Townsites of Tom Price, Paraburdoo and Onslow
East Pilbara	Townsites of Newman, Nullagine and Marble Bar
Exmouth	Townsite of Exmouth

Local government district	Area
Port Hedland	Townsites of Port Hedland, South Hedland and Wedgefield
Karratha	Townsites of Karratha, Roebourne, Point Samson, Dampier and Wickham
Carnarvon	Townsites of Carnarvon, Coral Bay and Mauds Landing
Halls Creek	Townsite of Halls Creek
Broome	Townsite of Broome
Derby West Kimberley	Townsites of Derby, Fitzroy Crossing and Camballin

Source: Building Services (Registration) Regulation, Schedule 3

The proposed reform extends the mandated requirements for registration to align with the geographical areas where building permits are required which covers all areas of Western Australia apart from those areas identified in table 3.4). There will be a phasing in of registration reforms and scope for reduced requirements on a geographical basis.

3.4 Area where building permit not required for building work for building other than Class 10 building or incidental structure

Local government district	Area
Kent	Whole district other than townsite of Nyabing, Pingrup
Meekatharra	Whole district other than townsites
Mt Magnet	Whole district other than townsites
Murchison	Whole district
Sandstone	Whole district other than Sandstone Ward
Tryning	Whole district other than townsites of Trayning, Kununoppin, Yelbeni
Wongan-Ballidu	Whole district other than townsites of Wongan Hills, Balidu, Cadoux, Kondut, Burakin

Source: Building Regulations 2012, Schedule 4 - Building work that does not require building permit, Column 3

4 The impacts of reforms

Cost-benefit analysis framework

All government policy decisions will have both costs and benefits for the community. Cost-benefit analysis (CBA) is a systematic approach to weighing up both the costs and benefits of policy proposals to assess whether or not the reform is likely to deliver a net benefit to the community (i.e. the benefits outweigh the costs). CBA is a key element of regulatory impact analysis. Key steps in a CBA are outlined in box 4.1.

4.1 Key Steps in a CBA

- **Articulating the decision that the CBA is seeking to evaluate**. As noted above, the specific changes would need to be articulated upfront.
- **Establishing the reference case** (or 'base case') against which to assess the potential socioeconomic and environmental impacts of changes. The base case would be the existing regulatory arrangements around interment (i.e., *Cemeteries and Crematoria Act 2013* and *Cemeteries and Crematoria Regulation 2014*).
- **Quantifying the changes (from policy reform options)** relative to the base case. This will focus on the incremental changes/impacts resulting from alternative policy options. The changes may be known with certainty or could also be defined in probabilistic terms. The quantification should focus on key changes that will be utilised in the valuation stage.
- **Placing values on the changes** and aggregating these values in a consistent manner to assess the outcomes. For example, estimating the value that the downstream community places on any increase in risk.
- **Generating the Net Present Value (NPV) of the future net benefits stream**, using an appropriate discount rate, and deciding on the Decision Rule on which to assess the different options. The best decision rule is to choose the scenario that has the highest net benefits (or BCR).
- **Undertaking sensitivity analysis** on a key range of variables, given the uncertainties related to specific benefits and costs.
- **Deciding on which option is better for society**. In practice, additional information, aside from the CBA results, may also be utilised when deciding on the preferred option.

Evaluation period

We have used a 10-year regulatory period for the cost-benefit analysis. That is, we will evaluate the impacts (both costs and benefits) of the proposed changes on new buildings to be built in a 10-year period following the implementation of the proposed changes.

Given the scope of the legislative reforms required and the expected lead in time for implementation, the evaluation period commences from 2025. We understand from Building and Energy that some reforms may commence earlier, some may commence in stages and others may be slightly later. For the purpose of our analysis, a commencement of 2025 has been chosen as the closest approximation for all reforms.

As the life of buildings is much longer, the impact of the new buildings built in the 10-year period will last to the end of their life. To capture this effect, we will allow the benefits to be calculated for another 30 years in the sensitivity analysis (although defects generally emerge much sooner in the building's life).

Discount rate

Choice of discount rate (the rate at which future costs and benefits are discounted to present value terms) potentially has a significant impact on the outcome of a CBA. The Western Australian Government typically adopts the discount rate recommended by the Commonwealth Office of Best Practice Regulation (OBPR). Consistent with OBPR recommendations, we therefore use a discount rate of 7 per cent for the central CBA estimates, and vary the discount rate from 3 per cent to 10 per cent for sensitivity analysis.

Baseline

A key step in a CBA is establishing a baseline, against which the impacts of a policy proposal (in this case reforms to the building approvals process and registration requirements) are assessed. The baseline is typically the scenario that would have played out in the absence of the policy proposal. The choice of baseline effectively determines what impacts are being measured.

As is typically the case when the impacts of regulatory reform options are being assessed, the baseline assumes that current regulatory arrangements will continue of the evaluation period and therefore current industry practices will also continue.

The benefits of the proposed reforms mainly relate to avoiding the costs associated with defects (as estimated in chapter 2 above). As these estimates are largely based on survey results and other information that reflect the current practice, it is reasonable to assume that the current prevalence of defects would continue under the baseline scenario where regulatory arrangements remain unchanged.

The costs of the proposed reforms will reflect additional costs, over and above costs incurred under current practices. In this regard, there is limited information on some current industry practices, which could have a significant impact on cost estimates. Although there are currently no mandatory inspections required, some industry stakeholders reported that some inspections do occur under current regulatory arrangements.

A 2019 Marsden Jacob Associates (MJA) survey for Building and Energy indicated that there are few inspections by permit authorities, especially for Class 1 buildings. For those local government permit authorities that do carry out inspections, they generally only carry out one or two inspections, and each focus their inspections at different times during the build.[35]

However, our survey of building industry practitioners indicates that inspections (by private building surveyors, architects or engineers) have been common practice even though they are not mandatory. As shown in table 4.2, the rate of existing inspections is 49.1 per cent on average for Class 1 buildings, 71.9 per cent for Class 2 buildings and 63.6 per cent for other non-residential commercial buildings.

4.2 Assumed rate of existing inspections in the baseline

	Class 1	Class 2	Classes 3-9
	Per cent	Per cent	Per cent
Footing	39.7	62.5	58.6
Slab	44.2		
Steel reinforcing		70.8	63.4
Structural framing	50.5	59.8	59.7
Fire penetration/ smoke rated elements		73.7	68.0
Underground service connections		35.5	37.1
Fire safety system testing		82.2	77.6
Final inspection	57.5	92.2	81.0
Average	**49.1**	**71.9**	**63.6**

Source: CIE survey of building practitioners

As inspections already occur on a significant proportion of buildings (even though it is not mandatory), this would reduce the additional costs associated with the proposed mandatory inspection requirements.

These rates of existing inspections are also used as baseline proxy for other cost estimates (such as design costs); that is, we assume a similar proportion of designs would have already met the proposed requirements.

Impacts

The major expected positive impact of the proposed reforms would be a decline in non-compliance with NCC requirements and thus defects. At the same time, the industry and government would need more resources and thus more costs to comply with the new requirements.

35 Marsden Jacob 2020, *Residential Building Approvals: Cost assessment for Local Government approvals*, revised final report to Department of Mines, Industry Regulation and Safety, p.17.

Expected benefits

The expected benefits of the proposed reform package include the following.

- The primary benefits from the proposed reform package are reducing or avoiding defects and the associated costs (see chapter 2 for estimates of the costs associated with building defects). Reducing costs associated with building defects could also have flow-on impacts, such as reducing insurance premiums for some industry participants (particularly building surveyors). All elements of the reform package contribute to reducing defects.
- Other benefits could include reduced maintenance costs due to better building documentation.

Consistent with the intent of the BCR, the reforms are treated as a package for the purpose of estimating the associated benefits. The general approach focuses on estimating the extent to which the proposed reform package will reduce the size of the problem estimated in Chapter 2.

Expected costs

The main costs of the proposed reforms are the additional costs of complying with the proposed changes in regulation and/or enforcement. These costs include:

- administrative costs for regulators in establishing new regulatory systems and any ongoing costs in administering them; and
- any additional costs imposed on industry, including
  - more cost associated with more frequent inspection and checks;
  - more resource cost incurred to achieve higher quality work as a result of higher scrutiny and enforcement;
  - potential delay in going through the certification and approval procedures;
  - more time spent on developing and preparing design documentation and other required documents;
  - new registration costs for building designers;
  - more cost associated with obtaining additional permits; and
  - potentially higher legal costs to settle the dispute and preparing legal documents.

We found from the national study of implementing BCR recommendations that the cost of rectifying/avoiding defects that are identified through the various reforms is the most significant cost of reform (although the costs of identifying and rectifying defects earlier tend to be much lower than when identified later), followed by inspection and review costs. Nevertheless, as discussed above, the costs may vary depending on the responses of building practitioners to proposed reforms. Some 'cultural changes' in the industry or better knowledge of practitioners may imply minimal costs.

Other costs such as training cost and registration cost are related to other recommendations of the BCR, and may not directly relate to the proposed reforms to the building approvals process in Western Australia. It should be pointed out, however, that these costs may be implicitly reflected in the charges of building industry practitioners, for example, hourly rate of inspectors may be higher due to additional registration and training requirements (for example there will be an initial training cost to implement mandatory inspections, separate to Building Confidence Report recs 2-3.). Equally, new registration and training costs will eventually apply to those professionals preparing regulated designs.

Table 4.3 provides a summary mapping of the proposed reforms with the major cost categories. We will discuss this mapping and cost estimation in more detail in the following sections.

4.3 Summary mapping between proposed reforms and costs

Proposed reforms	Inspection cost	Rectification/ construction cost	Delay cost	Documentation costs	Permit fee	Legal cost	Administrative cost
Mandatory inspections	XX	XX	XX			X	X
Design documentation			X	XX		X	XX
Third party review (Class 2)			X	XX			XX
Building manuals for class 2-9 buildings				XX			X
Process to document and approve variations	X	X	XX	XX	X		XX
Building surveyors' engagement	XX	X	X	X		X	XX
Building permits for prescribed high risk structures	X	X	X	XX	XX		XX
Occupancy permits for class 1b buildings			X	XX	XX		XX
Permit authority to respond to Building and Energy notice						X	XX
Administrative reforms			X			X	XX
Two tiered registration							X
Mandatory CPD							X
Registration of project managers				X			X
Extending registration to remote Western Australia				X			X

Note: 'X' denotes that proposed reform leads to a benefit, while 'XX' denotes a more direct, strong relationship.

Source: CIE and RLB

Same as the benefits, the costs are additional to the baseline costs for the current building approvals process requirements. Double counting should also be avoided for estimating the costs.

In general, the costs could be estimated using a bottom up approach informed by the survey, consultation and literature. For example, as used in the CRIS for the reform of approval process for commercial buildings[36], the cost of additional review and inspection of building design and construction could be estimated from

- hourly rate of reviewers and inspectors;
- multiplying hours required for different items of design and for each stage of inspection for different value of projects;
- multiplying by total number of projects with assumed share of buildings required for review and inspection; and then
- aggregating the above estimated costs up to the state level.

Relevant parameters are estimated through multiple ways, including survey data, stakeholder consultation, existing literature and RLB, the Quantity Surveyor, estimates.

36 Building and Energy 2019b, *Reforms to the approval process for commercial buildings in Western Australia: Consultation Regulatory Impact Statement*, Government of Western Australia Department of Mines, Industry Regulation and Safety, December 2019, https://www.commerce.wa.gov.au/sites/default/files/atoms/files/cris_-_commercial_building_approval_reform_0.pdf

5 Potential costs to implement the reforms

Summary of estimated costs

The main costs of the proposed reforms are the additional costs of complying with the proposed changes in regulation and/or enforcement. These costs include

- administrative costs for regulators (including Building and Energy and permit authorities) in establishing new regulatory systems and any ongoing costs in administering them; and
- any additional costs imposed on industry, including
  - more cost associated with more frequent inspection and checks;
  - more resource cost incurred to achieve higher quality work as a result of higher scrutiny and enforcement;
  - potential delay in going through the certification and approval procedures;
  - more time spent on developing and preparing design documentation and other required documents;
  - new registration costs for building designers;
  - more cost associated with obtaining additional permits; and
  - potentially higher legal costs to settle disputes and prepare legal documents.

Other costs such as training cost and registration cost are related to other recommendations of the BCR and may not directly relate to the proposed reforms to the building approvals process in Western Australia. It should be pointed out, however, that these costs may be implicitly reflected in the charges of building industry practitioners, for example, hourly rate of inspectors may be higher due to additional registration and training requirement (for example there will be an initial training cost to implement mandatory inspections, separate to Building Confidence Report recs 2-3.). Equally, new registration and training costs will eventually apply to those professionals preparing regulated designs.

It is estimated that total cost to implement the proposed changes would be around $153.8 million each year (table 5.1). In addition, an initial, one-off cost of $1.1 million will be incurred by the Government to set up the systems for various reforms. The costs are estimated using construction data in 2022, which serves for the comparison with the estimated size of problem in the same year as discussed in chapter 2. It is noted that the commencement of the proposed reforms will be in 2025 as discussed in the previous chapter.

Additional inspection cost, documentation costs and construction costs are among the biggest cost times.

5.1 Estimated cost to implement the proposed reforms

	Class 1	Class 2	Class 3-9	All new buildings
	$m	$m	$m	$m
On-going costs				
Inspection cost				
Initial inspection	29.44	11.75	20.45	61.64
Reinspection	2.67	0.85	1.08	4.60
Audit and independent review cost				
Audit	0.67	0.27	0.46	1.40
Third part review	n.a	0.24	n.a	0.24
Construction cost	19.77	3.99	11.59	30.67
Documentation cost				
Design	15.84	0.84	7.21	23.93
Variation	4.42	1.56	4.37	10.32
Building manual		0.35	5.25	6.54
Cost of delay	5.96	5.96	5.96	8.47
Permit and other procedural requirements				
Role of FES Commissioner	n.a.	0.07	2.48	2.55
Permit fee	0.07	n.a.	n.a.	0.05
Engagement of building surveyors	0.19	0.00	0.03	0.22
Permit authority response to Building and Energy notices	0.10	0.02	0.01	0.13
Registration				
Expansion to regional areas				0.30
CPD				2.76
Administrative	Included in other categories			
Total on-going cost [a]	**79.53**	**25.91**	**58.90**	**153.84**
Initial one-off costs				
Building manual guidelines etc				0.31
Notification system of building surveyor engagement				0.38
Set-up for 2-tier registration system				0.20
CPD IT system set-up				0.19
Total [a]				**1.07**

[a] costs for registration, CPD and one-off cost are not distributed to sector of building

Note: costs for year 2022; n.a. – not applicable

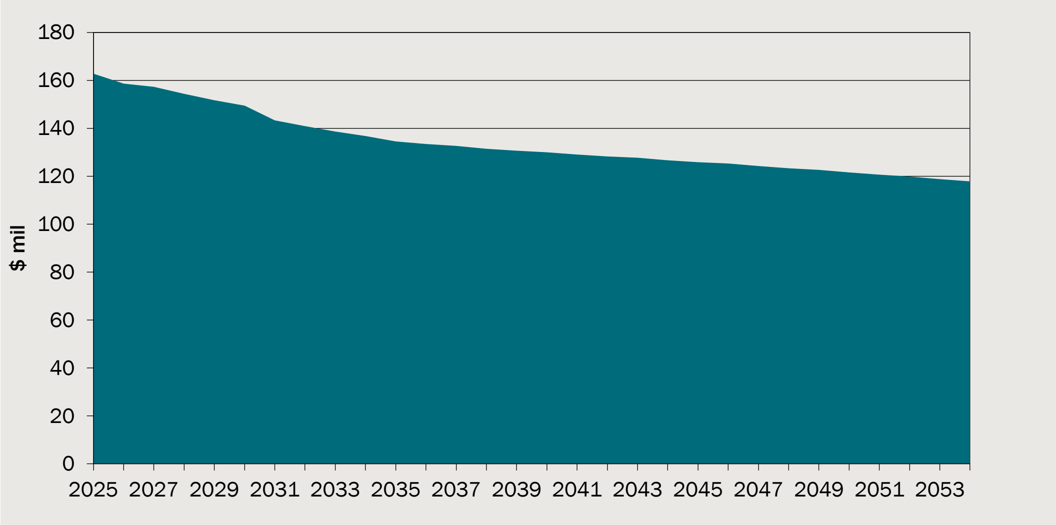
Source: CIE estimates

It is noted that the above totals do not include the cost to register project managers which will be $4.1 million in the first year including an initial set-up cost of $150 000, and in ongoing years the cost will fluctuate between $1.1 -$2.7 million depending on if a majority of project managers re-register (occurring every third year). This previously proposed reform will be subject to the sensitivity analysis.

It is also noted that the annual cost to implement the reforms will fall over time due to better responses by the industry, for example the cost of delay will fall due to better scheduling after the implementation of the reform, and 'cultural change' will mean that more of the defects could be avoided from the beginning (chart 5.2).

We will discuss the estimation of these costs in detail below.

5.2 Annual costs associated with reforms over time



Data source: CIE estimates

Inspection costs

The proposed reforms will lead to an increase in inspection costs, especially with the requirements of mandatory inspection and engagement of building surveyors.

As set out above (see chapter 3), under the proposed reforms inspections will be mandatory at specified notifiable stages and content of inspections will also be specified. This will lead to additional inspection costs from both a greater number of inspections and higher unit cost per inspection.

In addition, when a defect that needs to be rectified is identified during an inspection, a follow up inspection may also be required. The inspection regime may also be expanded to increase the sample size of the item inspected.

Government employees may be engaged for inspections, and their cost should be measured at the market cost in principle.

Class 1 buildings

The survey of local councils conducted by MJA for Building and Energy suggested the inspection time varies significantly across regions and over inspection points.[37] Similarly, Engineers Australia suggested that at least 2 hours would be required for each inspection, including 30 minutes travel each way, and at least 30 minutes should be applied for preparing the Inspection Report.

Following a review of various data sources and expert opinion, the estimated inspection times used in the CBA are as follows:

- 2 hours for slabs and footings, comprising 1 hour for travel and 30 minutes each for inspection and preparing the Inspection Report;
  - 2.15 equivalent hours (at a rate of $200/hr) for slabs, including allowance for a structural engineer with higher hourly rate ($250/hr) for 30 per cent of Class 1 buildings;
- 3.5 hours for structural framing, comprising 1 hour for travel and 2 hours for inspection and 30 minutes preparing the Inspection Report;
- 4.5 hours for final/completion (including bush-fire requirements where applicable).

In regional areas, additional travel time will likely be required, but this will vary depending on the location of the building relative to the township, or if, a building surveyor needs to travel from Perth, or relies of videos/photos. It is estimated that broadly an additional 20 percent in additional travel time will be required.

Based on ABS data, 83.9 per cent of approved Class 1 buildings are in Greater Perth.[38] It is assumed that the remaining 16.1 per cent of buildings will be in regional areas and thus require more travel time.

The MJA survey indicates that some local councils inspected close to 100 per cent of Class 1a buildings during the construction phase, while a number did no inspections. Of those local councils that do carry out inspections, they generally only carry out one or two inspections, and each local council focuses their inspections at different times during the build.[39]

Our survey of building industry practitioners suggests that between 40 and close to 60 per cent of Class 1 buildings are currently being inspected, depending on the inspection stage (second column of table 5.3). After taking consideration of this baseline, additional inspection time would be 6.05 and 7.26 hours, respectively, for metropolitan and regional areas in Western Australia (third column of table 5.3).

Inspections generally involve building surveyors, and sometimes may require structural engineers. MJA survey found that councils are charged $200 per hour for engaging an external consultant. The hourly rate of a contractor would be cheaper. But as a contractor is guaranteed with certain amount of work and bears less risk to income, the rate does not reflect the market rate. For this reason, a $200 hourly rate is assumed.

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[37] Marsden Jacob Assocates (MJA) (2020), op.cit., Table 8, p.19

[38] Australian Bureau of Statistics, Building Approvals Australia, Category number 8731.0

[39] MJA (2020), op.cit. p.16-17

With the above-mentioned information and assumptions, it is estimated that additional inspection cost would be around $1 248.8 for Class 1 buildings on average at a per dwelling basis (the last column of table 5.3).

5.3 Estimated additional inspection costs per building for Class 1 buildings

	Inspection time [a]	Current inspection rate [b]	Additional time	Additional inspection cost [c]
	Hour	%	Hour	$
Metropolitan				
Footing	2.00	39.7	1.21	241.00
Slab[d]	2.15	44.2	1.20	240.02
Structural framing	3.50	50.5	1.73	346.43
Final inspection	4.50	57.5	1.91	382.38
Total for metropolitan areas	**12.15**		**6.05**	**1 209.84**
Total for regional areas	**14.58**		**7.26**	**1 451.81**
Average for whole Western Australia [e]	**12.50**		**6.24**	**1 248.80**

[a] total time adopted from EA, and allocated to each inspection stage using inspection time in Table 12 of MJA (2020); [b] CIE survey of building industry practitioners; [c] assuming hourly rate of $200 [d] assumes 30 per cent of slab inspections require a structural engineer at $250 per hour; [e] assumes 83.9 per cent in metropolitan areas and the remaining in regional areas which requires 20 per cent more inspection time to allow more travel time.

Note: the table presented the costing at a per dwelling basis

Source: CIE estimates based on data and assumptions as noted above

Class 2-9 buildings

Building and Energy commissioned a QLD building surveying firm, DevCert, to estimate the costs of mandatory inspections for commercial buildings (Classes 2-9). DevCert assessed the hours required to inspect buildings across three categories, less than 3 storeys, between 3 stories and 25 metres, and above 25 metres.[40] Table 5.4 summarises DevCert's estimates of the number of hours it would take an inspector to inspect different items. The times indicated include reasonable estimates for travel and reporting.

Where the time taken was 'per inspection' the following assumptions were made about the number of inspections required:

- one inspection for foundation/piers
- two inspections for foundation/footings and ground slab
- average of one inspection per two apartment buildings for pool shells, pool barriers and pool disabled person access

These assumptions were made because not all buildings will require all types on inspections such as pool shells, or more importantly, buildings which exceed scale and geometry of Class 1A buildings do not fall neatly into the concept of mandatory stage inspection. Using slab as an example, for one site a single slab of 5 000m^2 may be cast in a single day. While on another site, much smaller slabs need to be cast over multiple days

40 DevCert 2022, *Mandatory Inspections – Class 2-9 Buildings*

because of logistics associated with the site. This can result in the need for multiple inspections as proportions of the whole storey are prepared and cast each day.[41]

5.4 Estimated hours to inspect Class 2-9 buildings

Inspection item	≤ 3 Storeys	> 3 Storeys < 25m	≥ 25m	Frequency	Inspection point
	Hours	Hours	Hours		
Foundations / Piers	6	9	10	Per inspection	Footing
Foundations / Footings	6	9	10	Per inspection	Footing
Ground Slab	6	9	10	Per inspection	Footing
Pool shells	4	6	8	Per inspection	Footing
Pool Barriers	2	3	4	Per inspection	Footing
Pool disabled persons access	2	2	4	Per inspection	Footing
Insitu-concrete columns	7	9	9	Per Storey	Footing
Blockwork - reinforced	7	8	9	Per Storey	Footing
Structural steel	6	9	11	Per Storey	Steel reinforcing
Suspended floor slab	6	9	11	Per Storey	Structural framing
Sound Insulation	2	3	3	Per Storey	Structural framing
Passive fire safety systems (Walls/Fame)	2	3	3	Per Storey	Fire / smoke rated elements
Passive fire safety systems (Walls) - 1st layer plasterboard - per storey	2	3	3	Per Storey	Fire / smoke rated elements
Passive fire safety systems (Walls) - 2nd layer plasterboard - per storey	2	3	3	Per Storey	Fire / smoke rated elements
Passive fire safety systems - other fire compartments - per storey	1	2	2	Per Storey	Fire / smoke rated elements
Passive fire safety systems (Penetrations)	2	5	5	Per Storey	Fire / smoke rated elements
External wall - weather resistance - sarking - condensation - energy efficiency	2	3	3	Per Storey	Structural framing
External wall - non-combustibility	2	3	3	Per Storey	Fire / smoke rated elements
External cladding - non-combustibility	2	3	3	Per Storey	Fire / smoke rated elements
Roof framing	6	10	10	Once	Structural framing

41 DevCert 2022, *Mandatory Inspections – Class 2-9 Buildings*

Inspection item	≤ 3 Storeys	> 3 Storeys < 25m	≥ 25m	Frequency	Inspection point
	Hours	Hours	Hours		
Active fire safety systems (hydraulic)	6	10	10	Per Storey	Fire / smoke rated elements
Active fire safety systems (mechanical vent)	6	6	10	Per Storey	Fire / smoke rated elements
Emergency Lighting	2.5	4	4	Per Storey	Service connections
Fire detection systems	6	8	10	Per Storey	Fire / smoke rated elements
Wet area Waterproofing - substrate	2	2	2	Per Storey	Structural framing
Wet area Waterproofing - membrane / puddle flange	2	2	2	Per Storey	Structural framing
Wet area Waterproofing - tile bed	2	2	2	Per Storey	Structural framing
Wet area Waterproofing - tiles - fall to waste	2	2	2	Per Storey	Structural framing
Fire stairs cores - Goings and risers / handrails / exit widths	2	3	4	Per Storey	Fire / smoke rated elements
Non-fire isoalted stairs - Goings and Risers / Handrails	2	4	4	Per Storey	Fire / smoke rated elements
Disabled persons access	3	4	4	Per Storey	Structural framing
Mechanical Vent (non-smoke hazard management)	6	10	10	Per Storey	Structural framing
Bin chute	2	2	2	Per Storey	Structural framing
Balustrading	4	6	6	Per Storey	Structural framing
AS1657 plant space - platforms, access ladders, gantries	0	0.25	0.25	Per Storey	Service connections
General inspection - per storey above the third storey	0	16	18	Per Storey	Final
Final	10	15	20	Per Storey	Final
Special fire service witness and interface testing	4	8	16	Per Storey	Fire testing

Note: Hours for inspections have been combined across who inspects, further detail can be found in DevCert report. Hours are primarily undertaken by Building Surveyors and structural engineers, with a range of other experts undertaking more specialist inspections, including fire system designer, waterproof installer, electrical engineer, etc.

Source: DevCert Mandatory Inspections – Class 2 – 9 Buildings

Class 2 inspection time

Adding additional storeys to a building increases the complexity and size of the building, requiring additional inspections and increasing the length of time taken to inspect. As a result, the number of storeys is important to determine the average length of time taken to inspect apartments.

The assumptions used to determine the number of storeys by apartment type are mostly straight forward; 1.5 storeys for all 1-2 storey apartments, 3 storeys for all 3 storey apartments, and 6 storeys for all 4-8 storey apartments, however, to estimate the average size of apartments larger than 9 stories require additional assumptions.

Results from the Australian Apartment Advocacy group's 2021 survey were used to estimate an approximate number of storeys. Survey respondents indicated that 14 per cent lived in buildings that were 9-19 storeys and 8 per cent lived in 20+ storey buildings.[42] Assuming an even distribution between 9-19 storeys and 20-24 storeys results in the average number of storeys being 16.9.

Table 5.5 shows the hours per inspection point for the different apartment sizes. It is estimated that the weighted average (using the number of apartments built in 2021 as weights) of inspection hours is 1 756 hours for apartment buildings.

5.5 Hours for inspection

Inspection point	1-2 storeys	3 storeys	4-8 storeys	9+ storeys	Weighted average
Proportion of completions (%)	3	6	52	39	100
Hours of inspection					
Footing	55	76	153	362	226
Steel reinforcing	9	18	54	185	101
Structural framing	56	105	280	804	465
Fire / smoke rated elements	53	105	318	1 014	565
Service connections	4	8	26	72	42
Fire testing	4	4	8	16	11
Final	15	30	186	642	347
Total	**196**	**348.5**	**1030**	**3 113**	**1 756**

Source: Australian Apartment Advocates Defect Survey 2021 and CIE analysis

Class 3-9 inspection time

Commercial buildings cover a wide spectrum of building type, varying by cost and use. The largest proportion cost between $50 000 - $250 000, the smallest number cost more

42 Australian Apartment Advocacy 2021, *2021 Apartment Survey Research Results: Western Australia/NSW/Victoria/QLD*, p.38

than $50 million. Most are built for retail or wholesale trade with the fewest built for aged care or religions. Because of the variety in type and cost of commercial buildings we have split the analysis into buildings which are above or below $1 million.

Where Class 3-9 projects align with the geometry of Class 1A buildings (i.e. single or double storey, and smaller than 500m^2) the inspection staging will generally be the same.[43] As a result buildings which cost less than $1 million to construct are considered to take a similar time to inspect to Class 1A buildings (table 5.6).

5.6 Time to inspect Class 3-9 buildings (<$1 million)

Inspection point	Average hours
Footings	2
Slab	4
Structural framing	3.5
Final / completion	4.5
Total	**14.5**

Source: CIE analysis

Table 5.7 shows the number of buildings, assumed number of storeys for each building type and the corresponding hours taken to inspect for commercial buildings which cost more than $1 million to build.

Using this we estimated based on weighted average of building completed, average number of stories and hours to complete inspections, it would have taken an average of 373 hours per building in 2020 to inspect Class 3-9 buildings which cost greater than $1 million (table 5.8).

43 DevCert 2022, *Mandatory Inspections – Class 2-9 Buildings*, Table 3, p.9

5.7 Assumed storeys and inspection hours for buildings greater than $1 million

Building type	$1-$5 mil			$5-$20 mil			$20-$50 mil			$50+ mil		
	Buildings	Storeys	Hours	Buildings	Storeys	Hours	Buildings	Storeys	Hours	Building	Storeys	Hours
Retail and wholesale trade	76	2	237	18	3	338	5	5	854	0	7	1 172
Transport	8	1	137	3	2	237	4	2	237	0	2	237
Offices	61	3	338	3	5	854	0	9	1 672	2	17	3 098
Commercial buildings n.e.c	13	2	237	0	4	695	1	6	1 013	0	9	1 672
Factories and other secondary production buildings	21	1	137	2	2	237	0	3	338	0	4	695
Warehouses	56	2	237	9	3	338	1	4	695	0	5	854
Agriculture and aquaculture	3	1	137	2	2	237	0	3	338	0	4	695
Other industrial buildings n.e.c	17	2	237	7	3	338	2	4	695	1	5	854
Educational	52	3	338	16	5	854	2	7	1 172	0	9	1 672
Religion	4	2	237	1	3	338	0	5	854	0	6	1 013
Aged care facility	7	2	237	3	4	695	2	6	1 013	1	8	1 332
Health	19	3	338	5	5	854	1	7	1 172	2	9	1 672
Entertainment and recreation	34	2	237	4	4	695	0	6	1 013	0	7	1 172
Short term accommodation	5	3	338	1	5	854	1	9	1 672	1	17	3 098
Other non-residential n.e.c	31	3	338	7	5	854	0	7	1 172	1	9	1 672

Note: Average storey have been cross checked against inspection cost per $ of construction between Class 2 and Class 3-9 buildings. Class 3-9 buildings tend to have larger dimensions, and fewer stories resulting in a lower average inspection cost per $ of construction when compared to Class 2.

Source: CIE analysis

5.8 Average inspection time for Class 3-9 buildings (>$1 million)

Inspection point	Average hours
Footings	63
Steel reinforcing	19
Structural framing	100
Fire / smoke rated elements	112
Underground service connections	9
Fire safety system testing	4
Final / completion	66
Total	**373**

Source: CIE analysis

Current inspection rate Class 2-9 buildings

According to the CIE's survey of building industry practitioners in Western Australia, commercial buildings (Classes 2-9 buildings) are currently subject to more frequent inspections than Class 1 buildings. Non-residential commercial (Classes 3-9) buildings have slightly lower frequent inspections than apartment (Class 2) buildings (table 5.9). This is probably due to less frequent inspections for small value non-residential building works.

5.9 Current inspection rate for commercial buildings

	Class 2	Classes 3-9
	%	%
Footings	62.5	58.6
Steel reinforcing	70.8	63.4
Structural framing	59.8	59.7
Fire penetration/ smoke rated elements	73.7	68.0
Underground service connections	35.5	37.1
Fire safety system testing	82.2	77.6
Final / Completion	92.2	81.0

Source: CIE survey of building industry practitioners

As opposed to inspecting single houses (Class 1), inspections of commercial buildings often involve large firms which charge higher hourly rates. It is assumed an hourly rate of $250 for inspecting Classes 2-9 buildings, accordingly.

With these assumptions, it is estimated that additional inspection cost for Class 2 buildings is around $126 309 per building, $1 141 per Classes 3-9 building under $1 million and $331 395 per Classes 3-9 building above $1 million (table 5.10).

5.10 Estimated additional inspection costs per building for commercial buildings

	Class 2	Classes 3-9 under $1m	Classes 3-9 above $1m
	$	$	$
Footings	21 160	207	6 344
Steel reinforcing	7 393	366	1 704
Structural framing	46 715	353	9 906
Fire penetration/ smoke rated elements	37 101		8 776
Underground service connections	6 712		1 381
Fire safety system testing	478		232
Final / Completion	6 750	214	3 052
Total	**126 309**	**1 141**	**31 395**

Note: at a per building basis
Source: CIE estimates

Reinspection

Once defects are found during an inspection and the builder is required to fix, there is generally a reinspection to follow. Therefore the occurrence of reinspection is a function of the probability of defects detected during an inspection. For simplicity, we assume the occurrence of reinspection would be equal to the prevalence of defects.

As discussed previously, there will be 'cultural change' over time in the building industry after the proposed reforms are implemented – more and more compliance and thus defects would be avoided from the beginning due to stricter compliance checks. This implies that the occurrence of reinspection will fall over time.

It is estimated from the survey results that the prevalence of reinspection at the beginning of implementing the proposed reforms would be 9.05 per cent, 7.28 per cent and 5.3 per cent, respectively, for Class 1, Class 2 and Classes 3-9 buildings (table 5.11).

5.11 Estimated reinspection cost per building

	Prevalence of reinspection	Unit reinspection cost per building
	%	$
Class 1	9.05	113.06
Class 2	7.28	9 189.42
Class 3-9 under $1m	5.30	60.43
Class 3-9 over $1m	5.30	1 663.20

Note: at a per building basis
Source: CIE estimates

Accordingly, the reinspection cost per building would be $113.06 for Class 1 buildings, $9 189.42 for Class 2 buildings, $60.43 for Class 3-9 buildings under $1 million and $1 663.2 for Class 3-9 buildings over $1 million (last column of table 5.11).

Total annual inspection cost

With the above information and assumptions, it is estimated that total annual inspection costs amount to $66.24 million, including $61.64 million for initial inspections and $4.6 million for reinspection (table 5.12).

5.12 Estimated annual inspection costs

	Number of new buildings	Additional initial inspection		Additional Reinspection		Annual additional cost
		Unit	Annual	Unit	Annual	
	Number	$	$m	$	$m	$m
Class 1	23 573	1 248	29.44	113.06	2.67	32.10
Class 2	93	126 308	11.75	9 189	0.85	12.61
Class 3-9 under $1m	2 751	1 141	3.14	60.43	0.17	3.30
Class 3-9 over $1m	552	31 395	17.31	1 663.2	0.92	18.23
All new buildings			**61.64**		**4.60**	**66.24**

Note: for the year of 2022
Source: CIE estimates

Audit and third-party review costs

Cost of audits

As an integral component of the inspection regime, additional audits of the inspection process will be conducted. A greater level of audits of inspections will be conducted by the Building Commissioner.

These additional audits are endogenous to the overall performance of the inspection regime. For simplicity, it is assumed a fixed cost of additional staff (in FTE terms) required for audit and on-going education. DMIRS estimated the fixed cost is around $1.1 million per year based on 7 FTE per year required for audit and development of training content, at an average salary of $159,500. Staffing costs are detailed in table 5.13.

5.13 Staffing costs

Staffing title	$ p.a
General Inspection Manager	$184,511
Specialist Building Surveyors (Audit)	$322,582
Investigators	$286,475
Specialist Building Surveyors (Standards)	$322,582
Total	**$1,116,150**

Note: Based on 2021 Western Australian Public Sector Industrial Agreement Wages, plus 25 per cent on-costs
Source: Building and Energy

This ‘administration cost’ will be funded in two ways:

- Government meets the cost through Consolidated Revenue appropriations; or

- Industry meets the cost through a marginal increase to the BSL levy to match the expected costs.

These two options of funding imply transfer of costs (from the government to the industry or vice versa) and thus would not change the amount of cost from the perspective of the whole society.

That said, there is one complication to the first model. Consolidated Revenue is generally tax revenues and taxation causes further costs known as deadweight losses or excess burden. For example, according to the Henry Tax Review, the marginal excess burden ranges from 5 per cent (additional welfare loss of 5 cents to collect $1 of tax revenue) to over 70 per cent, depending on the type of taxes.[44] We use the average which is about 25 per cent to estimate the additional cost to the first model. This suggests a total cost of $1.4 million per year.

Third party review

Independent third-party review of structural and fire safety designs for high-risk BCA Class 2 buildings with an effective height greater than 25 metres.

Building and Energy recently sought advice from the Northern Territory Government which has implemented an independent third-party review requirement for the structural elements of significant and complex buildings (which include Class 2 buildings above 25 m in height). It was indicated that the cost of independent review is equivalent to 5.5 per cent of the structural design cost.

In line with the estimates in the CRIS, the review of fire safety elements would be less than structural elements.

In combination, it is assumed that the cost of the third-party review would be equivalent to 10 per cent of the design cost, with 5.5 per cent for structural review and 4.5 per cent for fire safety review.

It is further assumed that design costs account for about a half per cent of total construction costs according to stakeholder consultations.

According to ABS, average value of apartment building projects in Western Australia in the past 5 years is about $718 million per year for apartments with four or more storeys, and $323 million per year for apartments with nine or more storeys.

An apartment building with an effective height of 25 meters is equivalent to a 9-storey building given that each floor has a height between 3-3.3 meters and the top floor does not count into the effective height.

Applying the growth rate from average between 2016 and 2020 to 2022, the value of apartment building projects subject to third party review is estimated to be about $488 million in 2022.

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44 Henry, Ken, Jeff Harmer, John Piggott, Heather Ridou and Greg Smith 2009, *Australia's future tax system: Report to the Treasurer*, Final Report, Part 1, Chart 1.5, p.13

Applying the above assumed proportions, it is estimated that the third-party review costs amount to $0.24 million.

Construction cost

Additional construction cost is expected once a defect is detected, and the builder is required to fix it. This additional construction cost is generally less than the cost of rectifying defects left after the completion of construction.

Many defects (through non-compliance with the NCC) are likely to occur at the baseline because of attempts to minimise construction costs. This implies that improving compliance could mean higher construction costs, or smaller profit margins, such as through the use of higher quality materials, costs associated with avoiding defects altogether and costs associated with addressing defects as they arise (rather than waiting until they become evident after the building is completed).

The increase in construction cost would be highly dependent on which stage the defects are detected. For example, if the defects and non-compliance are detected in the design stage, there may be negligible cost in rectifying them (unless they are detected by an increased investment in design). By contrast, if the defects and non-compliance are detected during the commissioning phase, the cost to rectify them could be high.

The CRIS Residential presented some case studies that compared the rectification costs during construction and after completion. Table 5.14 summarises the CRIS results with adjustment for the price changes since then.

5.14 Estimated rectification costs for single dwellings in CRIS

Inspection stage/defects	Scenario	At construction	At completion	'At construction' as % of 'At completion' a
		$	$	%
Footing	1 - Incorrect/insufficient sand pad and poor compaction of soil			
	Minor damages to bd3 (10 m^2)	1,551	5,940	26.1
	Minor damages to bd2,3,4 and kitchen (92 m^2)	3,437	35,375	9.7
	Average for minor damages			12.1
	Major damages to bd3 (10 m^2)	3,091	15,900	19.4
	Major damages to bd2,3,4 and kitchen (92 m^2)	7,367	69,164	10.7
	Average for major damages			12.3
	Average for all damages			12.2
Footing	2 - Footing incorrect size and not able to support the structure			
	Damages to bedroom 3 (10 m^2)	1,685	5,501	30.6
	Damages to bedrooms 2, 3, 4 and kitchen (92 m^2)	3,886	26,749	14.5

Inspection stage/defects	Scenario	At construction	At completion	‘At construction’ as % of ‘At completion’ [a]
		$	$	%
	Average			17.3
Footing	3 - Site is low lying with insufficient build-up of foundation (Damage to one bedroom 3 but need to raise entire pad)	21,295	48,825	43.6
Footing	4 - Incorrect sitting and setbacks (Rear set back encroachment)	8,951	19,044	47.0
Roof framing	Omission of the tie-down straps on a timber framed roof that has a sheet metal roof, located in a wind zone that requires a roof tie-down system (50% of total floor area of 228 m^2)	250	6,250	4.0
Completion	Constructed in a BAL-12.5 and not meet all bushfire construction requirements			
	Affecting bedroom 3 (9.6m^2)	1,520	1,960	77.6
	Affecting bedrooms 2, 3 ,4 and kitchen (43 m^2)	5,589	6,469	86.4
	Average			84.3
Completion	The plasterboard lined ceilings have been installed with an inadequate amount and size of adhesive daubs			
	Affecting bedroom 3 (9.6 m^2)	420	5,336	7.9
	Affecting bedrooms 2, 3 ,4 and kitchen (43 m^2)	970	9,656	10.0
	Average			9.3
Waterproofing	Incorrect/insufficient installation of a water-proof membrane to wet areas (6 m^2)	2,200	15,750	14.0

[a] CIE calculation based data in previous columns

Note: Averages are CIE calculation

Source: RLB revision based on Building and Energy (2019a), Appendix 3

As shown in the table, these case studies suggest that the rectification cost during construction is between 4 per cent and 85.4 per cent of the rectification cost after completion, depending on the inspection stage and the nature of defects.

RLB, the Quantity Surveyor, have done further case studies in a similar way to the case studies in CRIS to complement the defect types (tables 5.15 and 5.16).

5.15 Further case studies for Class 1 buildings by RLB

	Scenario	At construction	At completion	'At construction' as % of 'At completion'
		$	$	%
R1	Inspection of Brickwork prior to any claddings, plaster, render or other finishes being applied	1,500	13,210	11.4
R2	Inspection of Roof Cladding prior to internal finishes commencing	17,500	39,350	44.5
R3	Inspection of Structural Steel prior to any claddings or other finishes being applied	7,360	28,305	26.0
R4	Inspection of Timber / Steel Roof Framing prior to any roof cladding or ceiling finishes being applied	7,360	28,305	26.0
R5	Inspection of Timber / Steel Wall Framing prior to any wall cladding being applied	3,980	12,300	32.4
R6	Inspection of Sarking / Rain Barriers prior to any external wall cladding being applied	5,260	11,650	45.2
R7	Inspection of Roof Drainage Systems (gutters and downpipes) prior to completion of project	5,260	11,650	45.2
R8	Inspection of Ground Level Drainage No. 1 (stormwater systems) prior to backfilling	4,960	10,820	45.8
R9	Inspection of Ground Level Drainage No. 2 (pavement levels and falls) prior to completion of project	8,590	12,360	69.5

Source: RLB

5.16 Further case studies for Class 2 buildings by RLB

	Scenario	At construction	At completion	'At construction' as % of 'At completion'
		$	$	%
R10	Inspection of Brickwork prior to any claddings, plaster, render or other finishes being applied			11.4
R11	Inspection of Roof Cladding prior to internal finishes commencing			44.5
R12	Inspection of Structural Steel prior to any claddings or other finishes being applied			26.0
R13	Inspection of Timber / Steel Roof Framing prior to any roof cladding or ceiling finishes being applied			26.0
R14	Inspection of Timber / Steel Wall Framing prior to any wall cladding being applied			32.4
R15	Inspection of Sarking / Rain Barriers prior to any external wall cladding being applied			45.2
R16	Inspection of Roof Drainage Systems (gutters and downpipes) prior to completion of project			45.2
R17	Inspection of Ground Level Drainage No. 1 (stormwater systems) prior to backfilling			45.8

	Scenario	At construction	At completion	'At construction' as % of 'At completion'
		$	$	%
R18	Inspection of Ground Level Drainage No. 2 (pavement levels and falls) prior to completion of project			69.5
R19	Reinforced Concrete Structural Framework (columns, suspended slabs, core walls (lifts and stairs), shear walls etc.)	6,780	32,660	20.8
R20	Fire Spreading Reduction measures / systems (fire rated doors, fire rated walls, fire rated service penetrations, floor to floor separation,	5,500	20,500	26.8
R21	Smoke Spreading Reduction measures / systems (smoke doors, smoke baffles, smoke exhaust etc.)	15,000	59,950	25.0

Note: Scenarios R10 to R18 have the same proportion as for Class 1 in table 2.14, and therefore the contruction cost numbers at construction and at completion are not provided

Source: RLB

These case studies provide basis for the estimation of additional construction costs to achieve the outcome of avoiding defects after the completion. For example, as shown in table 5.14, to fix a roof framing defect, the additional construction cost would be equivalent to only 4 per cent of the avoided cost of fixing this defect after completion. On the other hand, fixing ground level drainage defects, the additional construction cost would be equivalent to 69.5 per cent of the benefit (avoided cost of fixing the defect after completion).

Table 5.17 summarises the case studies applicable to the type of defects for estimating the additional construction cost. Average share is used for those defect types that no specific case studies are assigned. For more than one applicable case studies, the average share of relevant case studies is used.

5.17 Applicable case studies for construction cost estimates by defect type

	Class 1	Classes 2-9
Building fabric and cladding (excluding flammable cladding)	R1	R10
Fire protection	CRIS BAL-12.5	R19, R20, R21
Waterproofing / weatherproofing	CRIS waterproofing	CRIS waterproofing
Roof and rainwater disposal	R6, R7, R8, R9	R15, R16, R17, R18
Structural	CRIS footing, CRIS roof framing, R3, R4, R5	R12, R13, R14
Plumbing and drainage	R6, R7, R8, R9	R15, R16, R17, R18
Safety	average	average
Electrical, lighting and data	average	average
Natural light and ventilation	average	average

	Class 1	Classes 2-9
Entry to or exit from the building	average	average
Swimming pools, gyms, playground equipment	average	average
Flammable Cladding	CRIS plasterboard	CRIS plasterboard
Lift / elevator, gas supply or garbage chute problem	average	average or R21
Other	average	average

Source: CIE and RLB assumptions

Table 5.18 summarises the assumed additional construction costs (as percentage of the benefit – avoided rectification cost after completion).

5.18 Assumed percentage of additional construction cost as of rectification costs after completion

	Class 1	Classes 2-9
	%	%
Building fabric and cladding (excluding flammable cladding)	11.4	11.4
Fire protection	84.3	24.2
Waterproofing / weatherproofing	14.0	14.0
Roof and rainwater disposal	47.6	47.6
Structural	26.1	28.1
Plumbing and drainage	47.6	47.6
Safety	33.1	33.6
Electrical, lighting and data	33.1	33.6
Natural light and ventilation	33.1	33.6
Entry to or exit from the building	33.1	33.6
Swimming pools, gyms, playground equipment	33.1	33.6
Flammable Cladding	9.3	9.3
Lift / elevator, gas supply or garbage chute problem	33.1	33.6
Other	33.1	33.6
Average	**33.1**	**33.6**

Source: CIE and RLB assumptions

It is noted that these percentages would be smaller if compared to the total benefits (avoided cost of rectification, timing and other costs).

According to the industry practitioner survey, between 48 and 52 per cent of defects would be avoided after the implementation of proposed reforms, depending on the building classes. Among these avoided defects, 48 per cent could be avoided from the beginning due to cultural change and only 52 per cent would need to be fixed after detection in the inspections.

With these assumptions, it is estimated that the total additional construction cost to fix the defects during construction is $31 million (table 5.19).

5.19 Estimated additional annual construction cost

	Class 1	Classes 2	Classes 3-9	All new builds
Building fabric and cladding (excluding flammable cladding)	0.4	0.0		
Fire protection	0.1	0.1		
Waterproofing / weatherproofing	1.0	0.4		
Roof and rainwater disposal	3.1	0.9		
Structural	2.1	0.7		
Plumbing and drainage	1.8	0.5		
Safety	0.5	0.0		
Electrical, lighting and data	0.3	0.0		
Natural light and ventilation	1.1	0.1		
Entry to or exit from the building	0.1	0.1		
Swimming pools, gyms, playground equipment	0.1	0.0		
Flammable Cladding	0.0	0.1		
Lift / elevator, gas supply or garbage chute problem	0.0	0.0		
Other	6.3	0.2		
Total	**16.9**	**3.0**	**10.7** [a]	**30.7**

[a] applying average percentage in table 5.18

Note: annual cost for 2022

Source: CIE estimates

Additional documentation costs

Additional documentation costs are the direct result of the requirement of introducing more rigour to the design documentation, requiring designs to meet minimum Directions/lists; providing a building manual for all new Classes 2-9 buildings; documenting variations made to the design during the construction process and the new permit requirement; and the requirement for designs to be prepared by registered design professionals for certain prescribed classes of buildings (starting with Class 2 apartment buildings)

Documentation costs include the additional time and resources spent on preparing, handling and reviewing these documents. Additional costs would also apply for having designs prepared by registered professionals for certain classes of buildings.

The costs for the scheme of registration for design professionals has not been included, as it is understood these details will be refined further prior to the making of relevant regulations. Registration costs are likely to be similar to those for building surveyors.

Additional design cost

Building and Energy engaged SCRIBE Architects to produce two sets of example plans and specifications for Class 1a buildings (a single- and a two-storey house). This work provides both an example for industry of the standard of documentation required based on a proposed minimum guideline, and also an estimate of the additional costs in preparing plans and specifications to meet this draft guideline. It is estimated that the design work would need 15 per cent more time than the current requirement, but this would reduce over time as template designs are updated. Table 5.20 summarise the results.

5.20 Estimated additional design costs for Class 1a buildings

	Additional designer time and cost		Additional structural engineer time and cost		Total additional cost
	hour	$	Hour	$	$
Single storey					
3b x 1bth	3	438	3	750	1,188
3b x 2bth	4	584	3	750	1,334
4b x 2bth (medium)	6	876	3	750	1,626
4b x 2bth (Large/complex)	6	876	4	1,000	1,876
Two storey					
4b x 2bth (simple)	10	1,590	4	1,000	2,590
4b x 2bth (complex)	12	1,908	5	1,250	3,158

Note: estimates for Class 1a buildings
Source: SCRIBE Architects

The above estimates are based on the following average hourly rates:

- $146 for designer working on a single storey house;
- $159 for designer working on a two-storey house; and
- $250 for structural engineer.

There is no data about the composition of Class 1a buildings detailed enough to apply the SCRIBE estimates. The ABS data on new dwelling builds distinguishes between only one storey and two or more storeys for semi-detached, row or terrace houses, townhouses only, and does not provide storey composition for (detached) houses. Given this, we use the SCRIBE estimates for a single storey house with three bedrooms and two bathrooms for detached house and townhouses. For each apartment dwelling unit, we assume 2 hours each would be required for a designer and a structural engineer. This represents one hour less than the single storey house with three bedrooms and one bathroom in table 5.20

For practitioner hourly rate, we assume $150 per hour for designers (close to the average of $146 and $159 as suggested by SCRIBE) and $250 for structural engineers.

These assumptions suggest a unit design cost of $1 350 per detached house or townhouse and $800 per apartment unit.

There are 23 573 new detached houses and townhouses in 2022 in Western Australia with a project value of about $6.8 billion. The number of new apartment units is 3 721 with a value of $1.3 billion.

The estimated design costs would be $34.8 million for all residential units in 2022 (table 5.21), equivalent to 0.43 per cent of the project value.

5.21 Estimated design costs for residential buildings

	Designer	Structural engineer	Unit design cost	Number of new dwelling units	Design cost	Already met new requirements	Annual additional design cost
	hour	hour	$	number	$m	%	$m
Class 1	4	3	1 350	23 573	31.82	50.2	15.84
Class 2	2	2	800	3 721	2.98	71.9	0.84
All residential					**34.80**		**16.68**

Note: annual data for 2022

Source: CIE estimates

Stakeholders during the consultation suggested that some of them have met the new requirement in design. We therefore use the existing inspection rate as a proxy to account for those meeting the new requirement in the baseline.

The average current inspection rate is 50.2 per cent for Class 1 buildings and 71.9 per cent for Class 2 buildings. With these rates, it is estimated that annual additional design cost for residential buildings would be $16.7 million (table 5.21).

Total value of non-residential building projects is about $4.6 billion in 2022, implying a design cost of $19.86 million assuming the same percentage for residential buildings. With the adjustment made to account for those already meeting the new requirement (63.7 per cent) in the baseline, it is estimated that additional annual design cost is about $7.2 million (table 5.22).

The total annual additional design cost due to proposed reforms is therefore $23.9 million.

5.22 Estimated additional design costs

	Project value	Design cost without adj for baseline	Already met new requirements	Additional design cost
	$m	$m	%	$m
Classes 1 and 2	8 061	34.80	52.07	16.68
Classes 3-9	4 601	19.86	63.71	7.21
All new builds	**12 662**	**54.67**		**23.89**

Source: CIE estimates

Cost of documenting variations

Variations are common during construction. According to the survey of building industry practitioners, on average there are slightly less than 4 variations for each Class 1 building, and 6-7 variations for each Class 2 building (table 5.23).

The survey also indicated that variations for Class 1 buildings distribute relatively evenly across the ranges given in the survey, while Classes 2-9 skew towards the high end (more than 8 variations). For example, over three quarters of respondents working on Class2 buildings reported more than 8 variations.

5.23 Frequency of variations during construction

Number of variations	Class 1	Class 2	Classes 3-9
	%	%	%
<1	7.17	3.23	1.75
1	7.97	3.23	0.00
2	19.12	0.00	7.02
3 – 4	33.86	6.45	24.56
5 – 7	15.94	9.68	15.79
>8	15.94	77.42	50.88
	100	**100**	**100**
Average number of variations	**3.88**	**7.03**	**6.02**

Source: CIE survey of building industry practitioners

Not all these variations would require documentation as many of them are very minor. A scope recommended by Building and Energy is to distinguish minor and major variations, with only major variations to require a new permit (table 5.24).

5.24 Permit requirement for variations

Minor variation	Major variation (new permit)
Does not alter the floor area or height of the building	An increase or decrease to the building's floor area or height
Does not require significant redesign of any of the building's structural elements	Redesign of structural elements
Do not change the use or classification of the building	A change in the building's classification or use
Do not affect other land	A change in the way the building affects other land
Involve material substitutions, where the substituted material is commonly used for the same purpose as the material originally specified	Alterations affecting the building's active or passive fire safety performance. Note that this will likely also affect fire brigade operations, in which case revised documentation must be submitted to the FES Commissioner in accordance with r.18B(1) and (2)

Source: DMIRS

We assume that 5 per cent of these variations would need to be documented as major variations. This assumption suggests that for every 5 new Class 1 buildings there would be one incidence of documenting the variation. For Class 2-9 buildings, the assumption suggests for every 3 new buildings there would be around 1 incidence of documenting a major variation.

It is further assumed that for Class 2-9 buildings, about one quarter of the variations requiring documentation include fire safety elements and would need re-submission for DFES comment prior to the issue of the CDC.

The CRIS Residential assumes the following time required for each variation documented in Class 1 buildings:

- 2 hours for an architect/engineer ($85 per hour);
- 2 hours for a building surveyor ($125 per hour); and
- 1 hour for an administrative officer ($35 per hour).

The assumed hourly rates (in brackets above) are significantly less than industry provided market rates, for example see the discussion about hourly rates in previous sections. To be consistent, the following rates are assumed:

- $185 per hour for an architect/engineer (average of the hourly rates for designer and structural engineer provided by SCRIBE, see discussion below table 5.20 on page 84); and
- $200 per hour for a building surveyor working on Class 1 buildings (see discussion in the inspection cost section).

As for administrative officer's time, it is included in the application fee, and thus not separately costed to avoid double counting.

For each application, the following charges are applicable for Class 1 buildings:

- Application fee of 0.19 per cent of the estimate value of the building work for certified application or 0.32 per cent for uncertified application for Class 1 buildings, but not less than $110,[45] according to Schedule 2 of the *Building Regulations*; and
- Building Services Levy (BSL) of 0.137 per cent of the estimate value of the building work under Part 7 Division 2 of the *Building Services (Compliant Resolution and Administration) Act 2011*.

Although these fees and charges are prescribed by existing regulations, their application is triggered by the requirement of documenting the variations, and thus can be seen as additional costs of implementing the reform.

The estimated value of the building work refers to the amended work, rather than the value of the whole building. There is no data to determine the value of variations. We use the application fee rate and the minimum charge to make the assumptions for the variation value. For example, the minimum charge for certified applications in Class 1 buildings is $110 and the application fee rate is 0.19 per cent, implying a threshold variation value of $57,895 that the application fee calculated using the charge rate is equal to the minimum charge. The threshold value of variations is slightly more than 20 per cent of the total building construction cost for Class 1 buildings. We therefore assume 20 per cent for the value of variations in the calculation.

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45 The existing fees applicable, see https://www.commerce.wa.gov.au/building-and-energy/building-act-fees-0, last accessed 22 February 2022

The same percentage is applied to Class 2-9 buildings despite their total construction costs are much higher. This is because we use the variation values as a base to scale up the cost of documenting major variations for Class 1 buildings to Class 2-9 buildings and some of the major variations in these buildings would require re-submission for DFES comments prior to CDC and thus incur higher costs.

Table 5.25 shows the calculation of the application fee and BSL charge.

5.25 Application fee and BSL charge each major variation

		Class 1	Class 2	Class 3-9
Average building cost ($000)	$000/building	288	13,691	1,264
Assumed proportion of amended work	%	20.00	20.00	20.00
Assumed value of amended building work	$	57,545	2,738,171	252,752
Application fee				
Proportion of certified applications	%	90	100	100
Rate of application fee	%	0.19	0.09	0.09
Application fee (certified)	$	110.00	2,464.35	227.48
Proportion of uncertified applications	%	10		
Rate of application fee	%	0.32		
Application fee (uncertified)	$	184.14		
Average application fee	$	117.41	2,464.35	227.48
Building Services Levy (BSL)				
BSL rate	%	0.137	0.137	0.137
BSL charge	$	78.84	3,751.29	346.27
Total charges	**$**	**196.25**	**6,215.65**	**573.75**

Source: CIE estimates

With these assumptions, it is estimated that the average cost of documenting major variations would be about $187.38 for each new Class 1 building (table 5.26).

5.26 Estimated variation documentation cost for Class 1 building

	Time/fee	Rate	Cost
	Hour; number	$/hour; $/application	$
Architect/engineer	2	185.00	370.00
Building surveyor	2	200.00	400.00
Application fee and BSL [a]	1	196.25	196.25
Total cost per variation			**966.25**
Average variation per building			0.19
Variation documentation cost per building			**187.38**

[a] fee per application

Source: CIE estimates

We use the same approach to estimate the costs of documenting major variations in Class 2-9 buildings by scaling the hours required to document variations using the assumed value of variations in table 5.25. The regulations have similar prescribed application fee and BSL charge for Class 2-9 buildings:

- Application fee of 0.09 per cent of the estimated value of the building work for Class 2 to 9 buildings, but not less than $110; and
- Building Services Levy (BSL) of 0.137 per cent of the estimate value of the building work

It is estimated that the cost of documenting major variations is $16 741 per application on average for Class 2 buildings and $1 322 per application for Class 3-9 buildings (table 5.27).

5.27 Estimated variation documentation cost for Class 2-9 building

	Class 2	Class 3-9
	$	$
Architect/engineer	17 605	1 625
Building surveyor	23 791	2 196
Application fee and BSL [a]	6 215	573
Total cost per variation	**47 612**	**4 395**
Average variation per building	0.35	0.30
Variation documentation cost per building	**16 741**	**1 322**

[a] fee per application

Source: CIE estimates

It is estimated that the total cost of documenting major variations amounts to $10.32 million per year by applying the variation cost per building across the industry (table 5.28).

5.28 Estimated variation documentation costs for all new buildings

	Unit cost	Annual cost
	$ per building	$m
Class 1	187	4.42
Class 2	16 741	1.55
Class 3-9	1 322	4.35
Total		**10.32**

[a] annual cost in 2022

Source: CIE estimates

Cost of preparing building manuals

A building manual, in accordance with the Australian Building Manual Guidelines, is required for all new BCA Class 2 buildings. The requirement for Class 3-9 buildings will be prescribed at a later date and cost of implementing the reform is also included.

Some studies have provided estimates of the time required to prepare a building manual for commercial buildings:

- 15 hours by ACIL-Allen for the Lambert Review;[46]
- 30 hours by the CIE for ABCB BCR CBA;[47] and
- 80-100 hours for tier 1 ($10million and above projects) and tier 2 ($1 million to $10 million projects).[48]

Based on these studies, the following assumptions about time required to prepare a building manual are made:

- 25 hours for an apartment building;
- 10 hours for a small non-residential commercial building under $5 million; and
- 25 hours for a large non-residential commercial building over $5 million.

As mentioned above, building surveyors working on large commercial buildings and structural engineers charge a rate of $250 per hour. Other practitioners with lower rates could be engaged to prepare building manuals. For this reason, we adopt the assumption of $150 per hour in the CIE's national study of BCR for ABCB.[49]

With these assumptions, it is estimated that total annual cost to prepare building manual amounts to $5.6 million per year (table 5.29).

5.29 Estimated costs to prepare building manual

	Time required	Hourly rate	Unit cost	Number of buildings [a]	Total annual cost [b]
	hours	$/hr	$	number	$m
Class 2 building	25	150	3,750	93 [b]	0.35
Classes 3-9 under $5m	10	150	1,500	3,172	4.76
Classes 3-9 over $5m	25	150	3,750	130	0.49
All new commercial buildings					**5.60**

[a] for the year of 2022; [b]assuming 40 units per apartment building

Source: CIE estimates

Additionally, there will be a one-off cost to the Government of $250 000 for development, training and advice following the implementation of the reform. Applying a 25 per cent increase from dead weight loss, this takes the total cost to $312 500.

Cost of potential delay

Delay in building completion may happen due to

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46 ACIL-Allen 2015, *Independent Review of the Building Professionals Act 2005: Cost Benefit Analysis of Proposed Recommendations*, Report to Building Professionals Board, 16 December 2015, p.C-20

47 CIE (2021), op.cit., p.81

48 CIE (2021), op.cit., p.81

49 CIE (2021), op.cit., p.81

- more frequent inspections;
- additional time required to fix detected defects (relative to the baseline); and
- additional time to go through new requirements in the approval process, i.e. additional documentation requirements for initial approval, and any variations during construction.

The time to fix detected defects has been factored into the estimates of additional construction costs and will not be separately estimated. The discussion in this section will focus on the costs of potential delays due to additional inspection and documenting variations.

In the CIE building industry practitioner survey, about 40 to 55 per cent of respondents stated that they would expect delays due to inspection, and around 60 per cent of respondents due to variation documentation (table 5.30).

5.30 Estimated delay due to inspection and variation documentation

	Unit	Class 1	Class 2	Classes 3-9
Inspection				
Delayed	%	55.6	40.6	51.3
Average days of delay	days	11.3	8.8	5.2
Average days of delay per dwelling unit/building	days	6.3	3.6	2.7
Current inspection rate	%	50.2	71.9	63.7
Expected additional delay per dwelling unit/building	days	3.1	1.0	1.0
Variation documentation				
Delayed	%	63.8	65.6	65.2
Average days of delay	days	10.3	10.4	10.5
Average days of delay per dwelling unit/building if requiring to documenting variations	days	6.6	6.8	6.8
Number of variations need documentation per dwelling unit/building	number	0.19	0.35	0.30
Expected additional delay per dwelling unit/building	days	1.27	2.40	2.06
Total expected additional delay per dwelling unit/building	**days**	**4.39**	**3.40**	**3.03**

Source: CIE calculation based on the CIE survey of building industry practitioners

For those expected delays, the average length of delay is between 5 and 11 days due to inspection, depending on the class of buildings, and a little over 10 days due to variation documentation.

These survey results suggest that the average delay due to inspection is between 2.7 and 6.3 days, and between 6.6 and 6.8 days due to variation documentation, depending on the building class.

Taking into consideration the existing inspections in the baseline and the number of variations requiring documentation, the expected additional delay would be between 1 to 3.2 days due to inspection and between 1.3 and 2.4 days due to variation documentation.

In total, additional delay due to inspection and variation documentation is expected to be 4.39 days, 3.4 days and 3.03 days, respectively, for Class 1, Class 2 and Classes 3-9 buildings (table 5.30).

From the CBA perspective, the delays impose resource costs to society in the form of delayed provision of services provided by a completed building. This is different to the incidence of the costs, for example, builders may face delay costs in the form of *preliminary costs* which comprises labour, site equipment hire, administration and insurance costs and so on.

For this reason, we use the lost rental revenue as a proxy to value the delay. Currently the average weekly rent in Perth is $397 and $326, respectively, for houses and apartments.[50]

As for other non-residential commercial buildings (Classes 3-9), the average construction cost per building is about $1.46 million. Assuming a 5 per cent yield, the weekly rent for these buildings is about $1 398 per building (second row of table 5.31).

5.31 Estimated costs of delays

	Unit	Class 1	Class 2	Classes 3-9	Total
Expected additional delay	days	4.39	3.40	3.03	
Weekly rent	$/week	397.00	326.00	1,398.20	
Expected unit delay cost	$	249.03	158.33	604.60	
Number of dwelling units/number of buildings [a]	number	23 573	3 721	3 305	
Annual total	**$m**	**5.87**	**0.59**	**2.00**	**8.47**

[a] new builds in 2022

Note: for the year of 2022

Source: CIE estimates

With the rental information, and the expected delays as discussed above, the expected unit cost of delay is $249.03 per house, $158.33 per apartment unit and $604.6 per non-residential commercial building (third row of table 5.31).

Multiplying the number of new builds in 2022, it is estimated that total annual cost of delay amounts to $8.47 million (last row of table 5.31).

It was noted in the consultation that some delays could be avoided through revised scheduling to reflect the new norm of industry practice including the length of project delivery after the implementation of proposed reforms, and thus in these cases would not present additional cost. It is therefore assumed that the delays would be eliminated after 10 years of implementing the proposed reforms. It will be tested in the sensitivity analysis for different phasing out periods.

50 https://reiwa.com.au/the-wa-market/perth-metro/, accessed 9 February 2022

Costs of changes in permit and other procedural requirements

Role of Fire and Emergency Services (FES) Commissioner

The proposed reforms clarify the role of the FES commissioner in the building approval process. Most of the changes would be procedural, and would not increase the administrative costs of the relevant agencies.

As an illustrative estimate of the potential costs to the industry that the changes may bring, we assume that each new projects in Class 2-9 building would need five hours to prepare additional briefings and to respond to any new changes the reforms may incur. With an hourly rate of $150, it is estimated that the costs relevant to this change will be in the order of $2.55 million per year (table 5.32).

5.32 Estimated costs associated with clarified roles of the FES Commissioner

	Number of building projects [a]	Time spent	Rate	Cost
	Number	hour	$/hour	$m
Class 2	93	5	150	0.70
Classes 3-9	3 302	5	150	2 48
Total	**3 395**			**2 55**

[a] Class 2 (apartment) buildings are number of apartment buildings assuming 40 units per building

Note: for the year of 2022

Source: CIE estimates

Costs of new permit requirements

Building permits are required for prescribed high-risk structures including retaining walls on subdivisions even where the structure is not incidental to a building. In addition, new Class 1b buildings are required to obtain both certificate of construction compliance and occupancy permits.

To meet these new requirement, additional time is needed to prepare relevant materials for the permits. These additional costs may be estimated on a per permit basis, adjusted with building types.

There is no data on the number of high-risk structures that are not already captured by being incidental to a building. However, discussions suggested that there hardly any. Therefore, we will only cost the permit fees for Class 1b buildings. If more information about the number of high-risk structures is available, the relevant costs could be estimated in a similar way, that is, multiplying the unit cost by quantity. It can also be seen from the discussion below; the cost would be negligible.

Class 1b buildings are defined as a boarding house, guest house or hostel that has a floor area of less than 300 m^2. In Western Australia there is an average of 59 short term accommodation dwellings with build value less than $1 million completed each year over the period from 2016 to 2020, which have been classified as Class 1b buildings. Taking consideration of the growth, it is estimated that there are 61 Class 1b buildings in 2022.

For these buildings, we assume

- 2 hours each to complete the certificate of construction compliance (CCC) and the occupancy permit;
- An hourly rate of $200 for building surveyors to prepare the documentation;
- $110 of permit fee for each application of CCC and occupancy permits; and
- $61.65 of BSL for each application (assuming a value of $45,000 per application).

With these assumptions, it is estimated that the annual cost for new permit requirements is around $53 708 in 2022.

Engagement of building surveyors

The proposed reforms include specific requirements for engaging building surveyors. If a building surveyor's contract is terminated early, the Building Commissioner should be notified of the change and certain procedures should be followed. We estimate the associated costs as more time spent on preparing for the notice, filling in forms and so on.

As an illustrative estimates, it is assumed that

- change of building surveyors may happen for 2 per cent of all the building projects, which translates to 539 changes each year (using 2022 as an example);
- 2 hours on average spent on following the necessary procedures; and
- an hourly rate of $200 for Class 1 and $250 for Class 2-9 buildings.

With these assumptions, it is estimated that the additional costs to the industry associated with the engagement requirement of building surveyors will be $222 500 a year (table 5.33).

In addition, the Government will incur an one-off cost of $300 000 to set up the notification system. Including the deadweight loss, the cost to Government will be $375 000.

5.33 Estimated cost of building surveyor engagement requirement

	Building projects [a]	Change	Time	Rate	Cost
	#	%	hour	$	$000
Cost to industry					
Class 1	23 573	2	2	200	188.6
Class 2	93	2	2	250	0.9
Classes 3-9	3 302	2	2	250	33.0
Total cost to industry	**26 968**				**222.5**
Cost to Government					

Notification system costs (one-off)	**375**

[a] Class 2 (apartment) buildings are number of apartment buildings assuming 40 units per building

Note: for year of 2022

Source: CIE estimates

Permit authority to respond to Building and Energy notice

Where an authorised person from Building and Energy considers a building work is non-compliant, and the builder refuses to rectify it, the authorised person may notify the building owner and the permit authority of the non-compliance.

The permit authority will then have 90 days to respond to the building owner and Building and Energy, notifying what action they took, or why they did not take any action.

We estimate the costs associated with this requirement in a way similar to the engagement requirement discussed above. On average the prevalence of non-compliance is about 69 per cent according to practitioner survey. It is further assumed that 2 per cent of these non-compliances would not be rectified by the builder and thus be notified by Building and Energy to the permit authority. It is estimated that there are about 421 such cases each year that the permit authority needs to respond.

Assuming an average response time of 2 hours for each case and an hourly rate of $150, it is estimated that the cost associated with requirement will be $126 300 per year (table 5.34).

5.34 Estimated of response costs of permit authority to Building and Energy notice

	Number of dwellings/ buildings	Prevalence of Non-compliance	Proportion of not rectified	Time spent for each notice	Hourly rate	Cost
	number	%	%	hour	$/hour	$000
Class 1	23 573	69	2	2	150	97.3
Class 2	3 721	69	2	2	150	15.4
Classes 3-9	3 302	69	2	2	150	13.6
All new buildings	**30 597**					**126.3**

Note: for the year of 2022

Source: CIE estimates

Registration costs

Additional registration costs are the direct results of the requirement for tiered registration of builders and the inclusion of project managers and remote / regional builders.

Registration costs include the additional time spent by practitioners to register, additional cost of registration, and the cost to government of enforcing new registration requirements.

Cost to implement tiered registration of builders

Currently there are 5,523 building practitioners and contractors registered to work in Western Australia. This scheme would see these builders transition into a two tiered registration model:

- Level 1 (Open builder) for NCC Class of buildings of any size; and
- Level 2 (Low rise builder) – restricted to
  - Classes 1 and 10 buildings of any size; and
  - Classes 2 to 9 buildings with a gross floor area of not more than 2 000 m^2 but not including Type A or B construction, i.e. Classes 2-9 buildings that are Type C construction

These reforms will not change the annual cost of registration for builders, as a result the only cost associated with registration will be changes to the existing IT systems owned by DMIRS to allow for split registration and the additional cost associated with enforcing tiered registration.

Updating the current system to allow for tiered registration, could be undertaken by an ICT consultancy at a daily rate of $1,500. It is assumed that 130 days, equivalent to 1 FTE full time for 6 months, would be able to update the system. The total cost would be $195 000.

The cost associated to enforce the tiered system is expected to be contained within the current registration costs. The grandfathering of current builders into Tier 1 means only new builders will be required to register as either Tier 1 or Tier 2. Tier one builders will have the opportunity to work across all building types, as such it will be important to enforce the restrictions on tier 2 builders. It is estimated that there may be roughly 123 new Tier 2 builders register each year. The associated additional cost to enforce the restrictions on these new Tier 2 builders would be minimal and thus not estimated.

Cost to register project managers

Extending registration requirements to project managers in Western Australia will increase costs through the monetary and time cost of registration and education. For the purposes of this analysis this reform is considered as a sensitivity and not included in the central case of cost.

It is assumed that the extra administration costs for Building and Energy would be partially off-set by registration fees provided there is a sufficient number of registrants.

It is estimated from the ABS Census data that there are 1 202 project managers working on non-residential construction in Western Australia in 2022. Under this scheme project managers in the building industry would be required to become registered and renew that registration once every three years. Based on application fees of $124 and registration fee of $1 020, project managers would have increased costs of $1 144, every three years or $381 on average per year. [51]

Collating documents and completing forms for registering is a time-consuming activity. Initial registration could take as long as 3 hours to demonstrate experience in the industry or proof of education. Renewal of registration is expected to become less time consuming taking on average 1 hour. With an average earning of a project manager in Australia of $62 per hour, this could cost $186 for the initial registration, reducing to $62 for renewal following registration around 3 years later.

It is therefore estimated that the total registration cost will be about $1.6 million initially for three years (or $521 000 per annum) and $1.4 million (or $471 000 per annum) for renewal (table 5.35).

5.35 Project manager registration cost

	Initial registration	Renewal
Number of project managers	1 202	1 202
Registration fee ($/person)	1 114	1 114
Registration time cost ($/person)	186	62
Total registration cost for 3 years($ 000)	**1 563**	**1 414**
Average annual registration cost ($ 000)	**521**	**471**

Source: CIE

It is likely that an avenue of registration will require levels of education in project management. For the purpose of this modelling, it is assumed that all current project managers will not need to pursue education to remain in their work, however, future project managers may need to undertake educational courses to become registered.

Stakeholder engagement indicated that not all project managers in the building industry have formal education, with many transitioning from roles such as engineering or building practitioners into project managers. However, like building practitioners, there may be multiple avenues into construction project management requiring either project management in other industries, experience in the industry or formal education.

Stakeholders indicated that roughly 20 per cent may have come from other industries with minimal training. As such, we assume 20 per cent of future new project managers would require additional education, equivalent to 19 new project managers per year.

A project management courses can cost approximately $4,000 and require 18 hours per week for four semesters,720 hours in total. This could increase the cost of new project managers entering the industry by $1.5 million per year.

It is assumed that project managers need to complete 4 hours of CPD each year and the cost for CPD is $115.15 per hour (including both course fee and time cost). The total CPD cost for project managers is therefore around $550 000 per annum.

51 Registration Building Practitioner (set 1) Form 5, www.commerce.wa.gov.au/sites/default/files/atoms/files/form_05_building_practitioner_set_1_initial_application.pdf

In addition, the Government would incur costs to run the system, including

- administration cost $147 000 per year for the licensing and registration of project managers (assuming 1.5 FTEs at L3 level);
- CPD contents development and delivery cost of $50 000 per year; and
- an initial, one-off cost of $150 000 to set up the IT system.

In sum, it is estimated that the costs to register project managers would be around $4.1 million in the first year including an initial set-up cost of $150 000, in ongoing years the cost will fluctuate between $1.1 -$2.7 million depending on if a majority of project managers re-register (occurring every third year).

Cost to expand registration in regional and remote Western Australia

This proposed reform includes the extension of registration requirements into regional and remote Western Australia. Currently there are exemptions for the building of Class 10 buildings in 54 areas, and the building of Class 1-9 buildings in 8 of those.[52] Within each location, the exemptions do not extend into the townships except Murchison where the exemptions are across the whole district.

Within the 8 locations that have exemptions to build all types of buildings, there is a population of approximately 5,721 based on the 2016 census, a majority of those, roughly 4,000, live in townships where the exemptions do not extend.[53] As a result, it is likely that most builders building Class 2-9 buildings are located within the township and require registration.

The exception is Murchison, where 153 people live. The council has a 5-man construction crew, which do not appear to be registered. Larger work is carried out by contractors brought into the area.[54]

Due to the low population bases, and the requirement for builders in townsites to be registered, it is unlikely there would be a significant cost to implement this reform, as there are few builders in these regional locations that currently would be unregistered. However, it must be noted that some Class 10 buildings may be constructed by locals, such as sheds, these are likely the largest impacted building class.

It is therefore assumed that 50-100 individual builders and 50-100 contractors may be affected by this registration expansion. The registration costs are:

- $386 application fee plus $3 136.75 registration fee for contractors; and
- $235 application fee plus $677 registration fee for individual practitioners.

In addition, one to three hours would be spent on preparation for registering, assuming that building practitioners will be able to demonstrate experience to become registered

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52 Building regulation 2012, Schedule 4 ‘Areas where building permit not required for certain work’

53 ABS census, 2016

54 Murchison Shire Council ‘works’ accessed at www.murchison.wa.gov.au/councilworks.aspx

without the need of further education. With hourly opportunity cost of $47.24, the unit time cost for registration ranges from $47.24 to $141.72.

The CPD cost would be $305 per year per registration, assuming 3 points CPD at a unit cost of $101.7 per point including both course fee and time cost.

The total cost per registration is therefore $1 264 to $1 359 for individual practitioners and $3 875 to $3 970 for contractors.

With the assumed total number of 50-100 individual practitioners and 50-100 contractors to be affected, it is estimated that the total cost of expanding registration to regional areas would be between $298 000 and $596 000 each year.

Continuous professional development costs

Continued professional development (CPD) will be required for all builders (practitioners) and building surveyor practitioners following the implementation of reforms. CPD costs include the time and monetary cost to those undertaking the training, the cost to develop content and the cost associated with enforcing training.

The NCC introduces new standards once every three years, annual CPD will provide builders and building surveyors the time to learn the changed standards and refresh them each year. The ABCB is helping to navigate the changes and challenges facing the building and construction industry with tailor-made CPD about the NCC. They have created NCC CPD courses which address the most common challenges experienced with the NCC and meeting its requirements for key practitioner groups. These courses are offered online, each running for one hour at a cost of $55.

Building surveyors and builders will need to complete 7 and 3 hours, respectively, of CPD per year. As well as the monetary cost of the course, the time spent doing the courses has an associated cost. The unit cost of CPD is $101.7 per hour for building practitioners and $98.4 per hour for building surveyors. It is estimated that the total cost of CPD will be around $2.1 million per year (table 5.36).

5.36 Cost of mandatory CPD

	Building practitioners	Building surveyors	Total
Registrations	5 459	566	
Hours of CPD	3	7	
Unit cost per hour of CPD ($)[a]	101.7	98.4	
Annual cost of CPD ($m)	**1.67**	**0.39**	**2.06**

[a] Average hourly wage in Perth of a building surveyor and practitioner is equal to $43.99 and $47.24 respectively https://www.payscale.com/research/AU/Job=Building_Surveyor/Salary/63dbe0c4/Perth, Average hourly cost of CPD $55 https://ncc.abcb.gov.au/education/cpd

Source: CIE

Additional costs of CPD for Building and Energy or other groups in developing and updating of content is assumed to be covered in the cost paid by the practitioners to undertake CPD, and at registration. Including this cost may result in double counting.

It is understood however that Building and Energy will incur costs in approving courses, enforcing CPD requirements and annual course development that will not be recoverable. The fixed cost estimate of these costs is $700,000 per annum, including

- 2FTEs at a cost of $205 000 per annum to administer approvals of courses/providers;
- 1 FTE at a cost of $162 000 per annum to develop content; and
- $200 000 per annum for content and delivery costs.

In addition, it is expected that there will be an initial one-off setup cost of $187 000 of the IT system for the CPD requirement.

Legal costs

The proposed reforms include provisions of settling disputes. For example, any decision by a permit authority to issue a building order in respect to a direction given in an Inspection Report on the grounds that the building work did not pass each required notifiable stage will be reviewed by the State Administrative Tribunal if the builder appeals the decision. These reviews may involve additional legal costs for both parties.

A question to be asked is whether it is also possible that specific dispute resolution processes could actually reduce the cost of resolving disputes through the courts (although those avoided costs are in the benefits). More accurate design documentation may also reduce construction disputes and associated legal costs.

On balance, increase in legal costs is likely to be minimal as a result of the implementation of proposed reforms. During targeted consultations, legal costs were not mentioned by any stakeholders as a major factor. It is therefore not separately estimated.

Additional administrative costs and Government costs

These are costs for regulators in establishing new regulatory systems and/or improving existing systems, and any ongoing costs in administering them.

These administrative reforms are not anticipated to have any significant on-going cost or time impacts because some costs of engagement would be incurred irrespective of the reforms. The additional cost is the work of the SBS for inspections, which is already being factored above. There are likely to be initial set-up and adjustment costs associated with implementing the changes for Building and Energy. These include the development of guidelines for industry, training materials and IT system changes, which have been discussed separately in previous sections. The fixed cost estimate for these costs is $1.1 million, these costs have been included within the estimates of each reform above.

Some measures are supporting other reforms and the costs are therefore not separately identified.

Although some tasks, for example inspections, are carried out by regulators and government employees, they are recoverable and counted in other cost categories. As a result they should not be included in the administrative cost.

Some reform measures have been the common practice, for example, a record of each supporting document, including the revision number or date, has been included in a certificate of compliance, as assured by building surveyors. They should not be double counted.

6 Benefits of reforms

Summary of estimated benefits

The benefits will depend on the extent to which the proposed reforms reduce the number of buildings completed containing defects and therefore reduce the associated costs. These costs are estimated at around $435 million per year (based on the estimated level of building activity in 2022 — see chapter 2).

On average, Western Australian building industry practitioners expect the proposed building reforms to reduce the costs associated with building defects by around 50 per cent (although this varies across building types). If realised, this would imply an annual benefit of around $217 million per year (table 6.1).

6.1 Estimated benefits

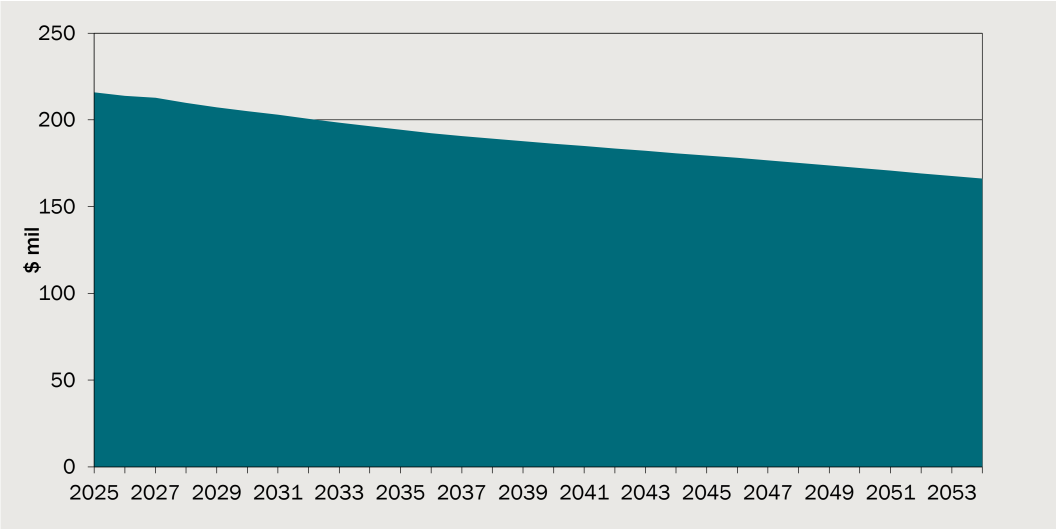
	Size of the problems due to non-compliance	Reduction	Benefit
	$m	%	$m
Class 1	258.2	51.7	133.5
Class 2	56.0	45.1	25.23
Classes 3-9	121.0	48.3	58.50
Total	**435.2**		**217.24**

Note: for the year of 2022

Source: CIE estimates

Over time, the benefit of reforms will gradually decrease from 2025 (chart 6.2) reflecting the projected level of construction activity.

6.2 Annual benefits of reforms over time



Data source: CIE estimates.

Estimating the effectiveness of the proposed reforms

The benefits of the reforms depend on the extent to which they would be effective in reducing the number of buildings that are completed containing defects and therefore reducing the associated costs as estimated above (see Chapter 2).

Approach to estimating benefits

A key challenge with *ex-ante* evaluation (i.e. evaluation before the change has been made) is that the impacts of the proposed changes cannot yet be observed. One potential approach to overcome this problem is to compare observed outcomes in other jurisdictions with a particular regulatory regime in place and those without. However, given the complexity of building regulation and a lack of comprehensive datasets across jurisdictions, this approach is not possible.

Following the general approach used for the national study estimating the impacts of implementing the BCR recommendations, we have estimated the extent to which the reform package will reduce the size of the problem based on estimates from Western Australian industry practitioners gathered through:

- a survey of a range of practitioners, including:
- subscribers to Building and Energy's mailing list; and
- members of various industry groups that agreed to circulate the survey.
- interviews with various industry practitioners and relevant industry groups.

These estimates effectively reflect a consolidated measure of expert opinion.

This approach estimates the impact of the proposed reforms as a package, rather than each reform separately. This reflects both conceptual and practical considerations.

- As the reforms essentially tighten various aspects of the compliance and enforcement system they are inter-related. From that perspective, the benefits of implementing the reforms as a package would be expected to exceed the sum of implementing each of the reforms separately. In that regard, it is conceptually appropriate to consider them as a package, in line with the intent of the BCR.
- Given the complexity of the reform package, it would be cognitively difficult for industry stakeholders to provide a considered opinion on the impact of each of the proposed reforms separately. From this practical perspective, it is also appropriate to estimate the reforms as a package.

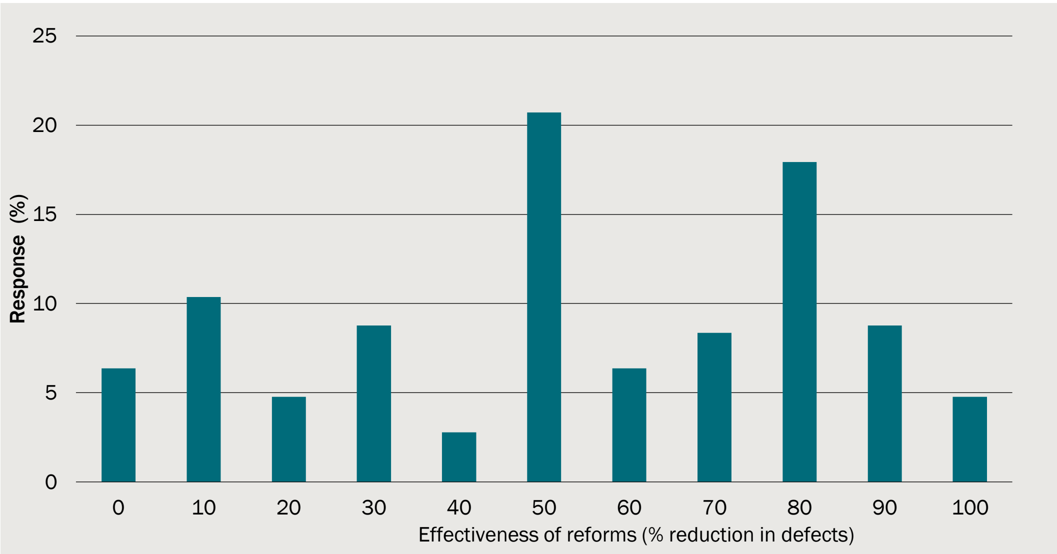
Estimated effectiveness of proposed reforms

In the survey of building industry practitioners, respondents were asked how much they expect the proposed reform would reduce the problems due to non-compliance. On average, respondents suggested around half of problems could be avoided after the implementation of the proposed reforms. More specifically, the average response of building industry practitioners was that the reforms would reduce defects by:

- 51.7 per cent in Class 1 buildings (see chart 6.3 for frequency distribution of survey responses);
- 45.1 per cent in Class 2 buildings (see chart 6.4 for frequency distribution of responses); and
- 48.3 per cent for Class 3-9 buildings (see chart 6.5 for frequency distribution of responses).

However, there was significant variation in responses across all types of buildings (charts 6.3 to 6.5). These significant differences of opinion suggest there is significant uncertainty around the effectiveness of the proposed reforms.

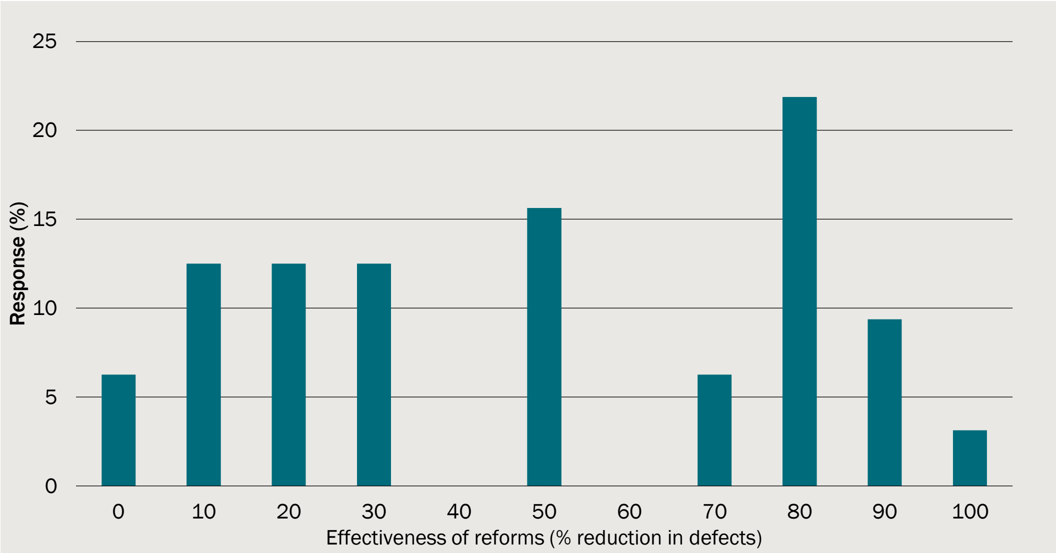
6.3 Distribution of responses for defect reduction in Class 1 buildings



Note : 0 represents reforms will have no impact on reducing defects, 100 represents reforms will eliminate all defects

Data source: CIE practitioner survey

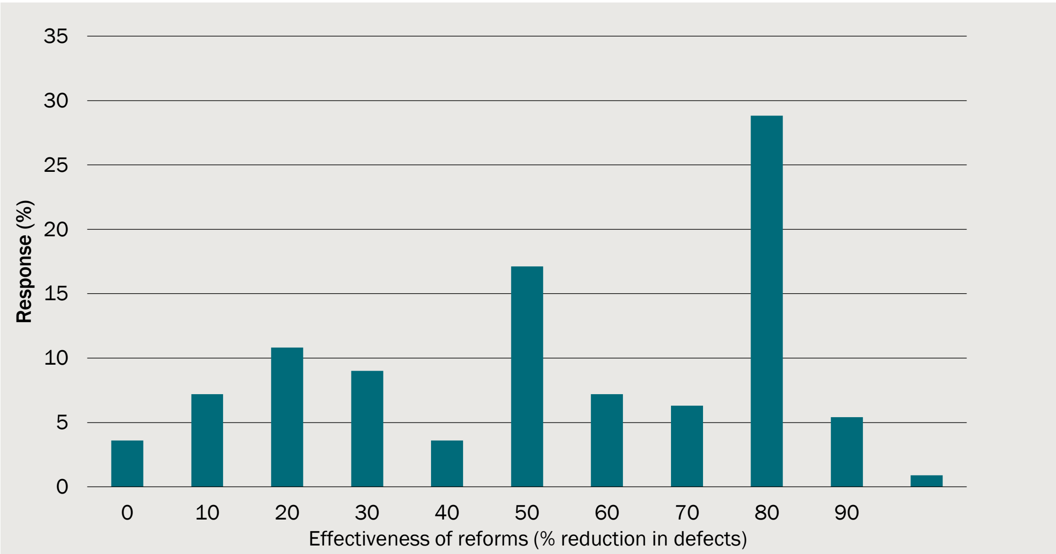
6.4 Distribution of responses for defect reduction in Class 2 buildings



Note : 0 represents reforms will have no impact on reducing defects, 100 represents reforms will eliminate all defects

Data source: CIE practitioner survey

6.5 Distribution of responses for defect reduction in Classes 3-9 buildings



Note : 0 represents reforms will have no impact on reducing defects, 100 represents reforms will eliminate all defects

Data source: CIE practitioner survey

Other benefits

The proposed reforms may achieve some other benefits. We provide a qualitative discussion because there are not enough data to quantify them,

Access to insurance

The reforms may lead to other flow on benefits. For example, insurance premiums and excesses for building industry practitioners have increased dramatically following the recent incidences in the building industry. In some cases the practitioners could not have their business covered at all. The proposed reforms will reduce the incidence of defects and therefore the risks that insurers are exposed to. Over time, this should lower insurance premiums.

Equally, it may also assist to facilitate other insurance products to come onto the market, particularly for Class 2 apartment buildings, such as defect insurance, or for reputable builders to offer longer contractual warranties.

Reduced maintenance cost

In addition to reduced rectification costs due to reduced incidence of defects as discussed above, the proposed reforms that result in better documentation about the buildings, particularly the provision of building manuals, will also help directly to reduce the maintenance cost during the use of the buildings. According to our consultation with strata mangers for the national study, better documentation would help them identify the causes of any issues more quickly and solve them more efficiently. This benefit will be enhanced if the documents are held in an accessible and searchable database.

Other reforms are expected to reduce the maintenance costs in an indirect way.

7 Cost-benefit analysis

In this chapter we bring together the cost and benefit estimates in previous chapters in a cost-benefit analysis (CBA) framework.

Benefits and costs are considered over a period of 10 years from 2025 to 2034. A discount rate of 7 per cent is used to calculate the present value in 2022. A set of sensitivity analyses to the central case are carried out to test the robustness of CBA parameters.

Central case

Table 7.1 summarises the CBA results for the central case.

7.1 Summary of cost- benefit analysis in central case

	Class 1	Class 2	Class 3-9	All new buildings
Benefit ($m)				
Avoided rectification cost	844	161	419	1 424
Other benefits	73	12	5	90
Total benefit	916	173	424	1 514
Cost ($m)				
Inspection	220	86	161	468
Documentation	139	19	139	297
Construction	111	20	74	206
Delay	25	3	9	36
Other	23	7	24	54
Total cost	519	135	408	1 061
Net benefit ($m)	**398**	**39**	**17**	**453**
Benefit Cost Ratio (ratio)	**1.77**	**1.29**	**1.04**	**1.43**

Note :Present value over a 10-year period from 2025 to 2034 with 7 per cent discount rate.

Source: CIE analysis

The proposed reforms are expected to have benefits that significantly overwhelm costs to implement them. The present value of total benefits is $1 514 million over a period of 10 years, while total cost is $1 061 million, leading to a net benefit of $453 million. The benefit-cost ratio is 1.43.

It is also shown from the table that reforms applied to new Class 1 buildings are expected to have the highest benefit-cost-ratio because the sector has proportionately lower costs, driven by lower inspections cost. The benefit-cost-ratio is lowest for Class 3-9 buildings due to the significant cost involved with inspections.

Sensitivity analysis

There is significant uncertainty around the assumptions made to derive the results. To illustrate the impact of this uncertainty, a series of sensitivity analyses (SA) have been conducted. Table 7.2 describes the SA scenarios.

7.2 Sensitivity analysis scenarios

Scenario	Description
3 per cent discount rate	3 per cent discount rate
10 per cent discount rate	10 per cent discount rate
30 year appraisal period	from 2025 to 2054
Slower cultural change	20% avoided all together 80 from inspections for first five years, then back to central case of 58% avoided all together, 42% from inspections
Increase inspection hourly rates	$250 per hour for all inspections
Decrease inspection hourly rates	$100 per hour for all inspections
Higher rectification cost	50 per cent on average of rectification during construction as of that after completion
Delay take longer to reduce	20 years to reduce delays to zero instead of 10 years
Lower baseline inspection rate	Lowering baseline inspection rate by 30 per cent on average
Low satisfying design documentation	100% don't satisfy new requirement for design documentation
Include project manager reform	Reform to register project managers benefit and cost included
Reduced effectiveness of reforms	Reducing the effectiveness of reforms – slightly less than 40 per cent on average reduction of defects (first quartile of the survey results) as a result of the proposed reforms

Source: CIE construction

Table 7.3 reports the sensitivity analysis results. It can be seen from the table that the results are robust – there will be net positive benefits (a benefit-cost ratio greater than one) to the society under all scenarios considered.

A sensitivity which has not been directly assessed is increasing input prices. Supply chain constraints in 2021 and 2022 has led to a 15.4 per cent increase in input prices for building material (timber, metal etc), which has partially been passed on to consumers with a 10.1 per cent increase in output prices.[55] The overall impact of this is uncertain, increase in prices impact both the costs and benefits of the reforms by increasing the size of the problem pre-implementation of reforms (which resolving will drive benefits higher after implementation), and the cost to rectify (driving costs higher). However, these

55 Australian Bureau of Statistics, Producer Price Index, Australia, March 2022

impacts are likely to be temporary, in the long run demand and supply constraints are likely to ease, resulting in a return to normal price growth.

The impact of increased input prices has been indirectly modelled using a sensitivity on cultural change. The 5.1 per cent gap between input costs and output prices will reduce producer profits, leading to increased desire for producers to reduce cost, which could in turn increase defects. Modelling a slower cultural change, i.e. more defects are found through inspections, captures this impact. A further flow on impact of increased input prices and reduced profits for producers will be a reduced desire to implement regulation that might increase their costs.

The reform of project manager registration has been included as a sensitivity. The estimates of costs to implement this reform has been discussed in the cost chapter. For benefits, they are estimated using answers from the practitioner survey, where respondents ranked reforms from 'most important' to 'not important'. Registration of project managers was regarded as having slightly higher rank over the average of other reforms in reducing the non-compliance. As a result, including this reform would see the net benefit increase from $453 million to $479 million and the benefit-cost ratio from 1.43 to 1.45.

The discount rate does not change the BCR because the implementation of reforms will not have a comparatively large upfront cost (i.e. the benefits and costs will occur at the same time, and annual benefits and costs are proportional to each other).

7.3 Sensitivity analysis results

	Net benefits	Benefit-cost ratio
	$m	Ratio
Central case	453	1.43
3 per cent discount rate	552	1.43
10 per cent discount rate	395	1.42
30 year appraisal period	786	1.45
Slower cultural change	372	1.33
Increase inspection hourly rates	398	1.36
Decrease inspection hourly rates	711	1.89
Higher rectification cost	368	1.32
Delay take longer to reduce	441	1.41
Lower baseline inspection rate	148	1.11
100% don’t satisfy document design	234	1.18
Reduced effectiveness of reforms	113	1.11
Include project manager reform	479	1.45

Source: CIE estimates

The most significant factor is related to the assumed effectiveness of the reforms. With significantly reduced effectiveness assumptions, from around 52 per cent in the central case to less than 40 per cent, the proposed reforms will still pay off, but the net benefit of the reforms will reduce to only $113 million, or a benefit-cost ratio of 1.11.

Another important, but less significant factor is the baseline assumptions for inspections and the proportion of design documents that satisfy the new requirement.

- Lowering the baseline inspection rate by 30 per cent would see the benefit-cost ratio drop from 1.43 to 1.11.
- Assuming no design documents current meeting the new requirement would see the benefit-cost ratio drop from 1.43 to 1.18.

Time cost rates for building industry practitioners would make a difference as well. For example, higher (lower) hourly rate for inspections would reduce (increase) the benefit-cost ratio to 1.36 (1.89). However, for the plausible range of hourly rates, it is hard for the positive results to be reversed.

Finally, a slower cultural change is also a large driver of the reforms cost. If more defects are identified and rectified through inspections rather than being avoided all together the benefit-cost ratio drops to 1.33.

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Attachment B

- Draft Building Commissioner's Direction for design documentation for residential buildings.
- Example Drawings Single Storey Class 1a building.
- Example Drawings Two Storey Class 1a building.

Building Commissioner's Direction (or Standard)
Minimum requirements for design documentation (plans and specifications) for Class 1 buildings and Class 10 buildings and incidental structures

Overview

This document describes proposed minimum requirements for design documentation proposed for Class 1 buildings and Class 10 incidental structures.

Glossary

applicable building standard: a building standard for a building or incidental structure that is prescribed in the Building Regulations. The primary applicable building standards, for building permit applications, are the requirements in relation to the technical aspects of the construction of a building or incidental structure in:

- the current edition of the BCA in effect at the time the building permit application is made, or
- the edition of the BCA in effect 12 months before the time the building permit application is made;

BCA: Building Code (of Australia) as defined in regulation 3A of the Building Regulations 2012. For the purposes of this document, this means Volume Two of the National Construction Code;

building: includes part of a Class 1 and Class 10 building;

Building Act: *Building Act 2011* (WA);

Building element: a technical aspect of building work;

Building Regulations: *Building Regulations 2012;*

building work: has the meaning given in the definition of "building work" in s. 3 of the Building Act as it relates to a Class 1 and Class 10 building or incidental structure;

CDC: Certificate of design compliance. A building surveyor must decide whether to sign a CDC for the proposed building or incidental structure that is the subject of a building permit application. The CDC must contain a statement that if the proposed building or incidental structure is completed in accordance with the plans and specifications specified in the certificate, the building or incidental structure will comply with each applicable building standard;

design engineer: the registered structural engineer responsible for ensuring the structural design of the overall building complies with the relevant building legislation, codes and standards, and that the structural design requirements are communicated through documentation for certification of design compliance;

designer: the architect or building designer who prepares plans and specifications;

incidental structure: a structure attached to or incidental to a building and includes: (a) a chimney, mast, swimming pool, fence, free-standing wall, retaining wall or permanent protection structure; and (b) a part of a structure;

permit authority: normally the local government in whose district the building or incidental structure that is the subject of the plans and specifications is, or is proposed to be, located;

protection structure: anything placed into or onto land beyond the boundaries of works land the purpose of which is to prevent works land or any other land being adversely affected by the work. This includes chemical grouting or the like which forms part of the protection structure;

SBS: statutory building surveyor. The independent building surveyor appointed by the building owner. The SBS may be a private or local government building surveyor. The SBS's functions include assessing plans and specifications in order to decide whether to issue a CDC, inspecting or arranging inspections by a competent person of each mandatory notifiable inspection stage of building work in order to decide whether to issue a satisfactory inspection reports for each notifiable inspection stage;

TC: technical certificate. A certificate in relation to a specific building standard applicable to, or any other technical aspect of, the construction or demolition of a building or incidental structure that is the subject of an application for a building permit, demolition permit, occupancy permit or building approval certificate;

works land: land on which the building work is done or is to be done;

"Y": indicates that requirement applies to plans and specifications for a Class 10 building and incidental structure, but only if applicable to the relevant project or building work.

A column for 'Guidance Notes' has been included (if applicable) in the table below. These notes will assist designers meet the minimum requirements for particular items.

To be read in conjunction with the applicable building standards and the Explanatory Information at the end of this list.

Item	Guidance Notes (if applicable)	Applies to Class 10
All projects		
Title block		
Designer (usually name, address and contact number).		Y
Drawing number (including revision numbers and date and number of drawings in set.		Y
Project address.		Y
Client name.		Y
Cover page		
Designer's name.		Y
Project address.		Y
Owner or client name.		Y
Land title reference number (certificate folio and volume).		Y
Index of all drawings, specifications, schedules and attachments.		
Total floor areas of each level and decks.	*Measured in accordance with NCC Vol Two Schedule 3 Definitions*	Y
Proposed termite barrier, including manufacturer's information and construction details if applicable.	*Where non susceptible materials or treated timbers are used this should be specified.*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
Design Parameters		
Design wind speed.	1. *Specify the design wind speed for the site.* 2. *Specify the design wind speed to which the building has been designed.* 3. *If AS 4055 is not used in the design, the plans should specify if internal pressures have been catered for and nominate AS/NZS 1170.2 – Structural design actions – wind actions.* 4. *If applicable, water penetration resistance and wind pressures required for proposed windows should be specified.*	Y
Site classification.	1. *A site report or other means of confirming site classification should be attached. Any site works required by the site report should be shown on the drawings.* 2. *Site classification for Class 10 buildings may not be required for simplistic or small structures or where pre-engineered designs contain a range of soil designs. For large Class 10 buildings, the designer should consider whether a soil classification is required.*	Y
Earthquake.	*If applicable, specify AS/NZS 1170.4 earthquake hazard design factor (Z) to which the building has been designed.*	Y
Dead/live loads.	*Specify the design loadings to AS/NZS 1170.1 –balconies/two storey etc./suspended floors etc.*	Y
Climate zone.	*A climate zone for Class 10 is only required where the Class 10 contains a conditioned space.*	Y
Designated Bushfire-Prone Area BAL rating.	*BAL rating to be nominated (where applicable) in accordance with AS 3959 2018 - Construction of buildings in bush-fire prone areas.*	Y
Corrosion environment considerations.	*Protective coatings for steelwork to be described in accordance with Table 3.4.4.7 of NCC Volume Two.*	Y
Importance level.		Y
Other known site hazards (flooding, landslip, dispersive soils, saline soils, sand dunes, mine subsidence, landfill etc.).		Y
Site Plan (1:200) NB Site plans may be drawn at different scales where necessary		
The title boundaries, dimensions and building line.	*North Point to be shown.*	Y
The position and dimensions of any drains or service easements on the works land.		Y

Item	Guidance Notes (if applicable)	Applies to Class 10
The name of any street or way onto which the works land abuts.		Y
The position and dimensions of any driveways, parking areas and kerb crossovers.	*When determining surface levels from road access to the allotment and within the allotment where driveways, parking areas and crossovers are proposed, plans are to consider stormwater flow from driveways, parking areas and crossovers.*	Y
The location and dimensions of any local authority assets and other services in the road reserve and footpath/verge.	*Provide the local authority with details relating to any proposed works in the road reserve, including removal or pruning of street trees, alterations to footpaths, street furniture, bus stops, street signs, light poles, power poles, service pits and the like.*	Y
Position and dimensions on allotment of the proposed building work (new building and/or incidental structure or alteration of or an extension to existing building and/or incidental structure). The position and dimensions of the proposed building work and its relationship to- • The boundaries or the works land. • Any existing building or structure on the works land. • All easements. The location of any proposed retaining walls, and the details of any protection structures or fire separation setbacks etc. Protection structures to be endorsed by the design engineer. There should be an indication of the location of any existing building or structure on adjoining land which may be affected by the building work.	1. *Details and setbacks of any existing building or structure on the works land will determine if the proposed building work may affect or be impacted by any existing building or structure on:* • *adjoining land due to such factors as excavation, vibration and protection structure work; or* • *on the works land due to such factors as fire separation between buildings and/or reduced boundary clearances.* 2. *'Work affecting other land' provisions of the Building Act will need to be considered when undertaking building and demolition works.* 3. *Drawing notes to refer to the relevant requirements of NCC Volume Two - P2.1.1 Structural stability and resistance and Part 3.1 Site preparation, in particular Table 3.1.1.1 Un-retained embankment slope ratios, and Part 3.1.3 Drainage details.* 4. *Details of any proposed chemical grouting used in protection structures to be endorsed by the design engineer.*	Y
Site Levels: The site plan is to include sufficient spot levels and / or contours to clearly show the proposed FFL(s) relative to all proposed and existing ground levels, a Temporary Bench Mark (TBM) or Australian Height Datum (AHD). Contours ideally to be provided at 0.5m intervals over the building site.	1. *Where excavation or fill are proposed, the site plan, or other document must clearly detail the method of retention (and any required drainage system) or suitable banking in accordance with the BCA.* 2. *For land with a high water table and areas prone to flood, levels should be noted in relation to AHD.* 3. *If applicable, liaise with the relevant appropriate authority to ascertain the prevalence of high water tables or flood prone areas.* 4. *For Class 1 additions or Class 10 buildings (where the existing ground level over the building's footprint of the new work exceeds 1m deep) drawing plans must contain sufficient detail regarding dimensions, depths, bulk excavations, cuts, batters and any required methods of drainage control.* 5. *Include levels to demonstrate the overflow relief gulley (ORG) rim relative to*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
	the lowest sanitary plumbing fixture outlet and surrounding finished surface level.	
Sewer: Location of sewer drains (and any excavation required), including invert levels, on-site wastewater management systems including their land application area.		Y
Stormwater: Location of existing and proposed stormwater system including soak-wells, sumps, connection point to a stormwater system, with dimensions from buildings and boundaries. Calculations or sufficient dimensions to enable calculations to be made to clearly show how stormwater and drainage systems proposed including soak-wells will comply with the applicable building standards. Calculations or dimensions may be included either on the drawings or within separate documentation.	1. *Where permitted by the local government, overland stormwater disposal to be documented with measures used to contain stormwater within boundaries detailed.* 2. *Include roof stormwater drainage systems to Class 10 buildings (liaise with local government to determine if applicable).* 3. *Drainage plan can be included on the site plan or can be included on a stand-alone drawing.* 4. *Any drainage required for retaining walls or site works should be clearly shown with discharge/connection points to stormwater system location nominated.* 5. *Attention should be given to the detailing and specification of site drainage where abnormal site conditions occur.* 6. *The permit authority will need to be satisfied with calculations and dimensions provided.*	Y
Floor Plan (1:100)		
Dimensions (including room dimensions).		
Room uses.		
Floor levels.		
Facilities.		
Windows and doors.		
Location and specification of solid fuel, oil or gas heating appliances.		
Garage doors.	*Note – Garage doors in cyclonic areas must comply with AS/NZS 4505*.	Y
Identification of existing structure.		Y
Identify demolition, any asbestos containing material.		Y
Safe movement and access details (direction of stairs and ramps).		

Item	Guidance Notes (if applicable)	Applies to Class 10
Fire separation requirements.		Y
Floor wastes.	*Refer to the Sewerage (Lighting, Ventilation and Construction) Regulations 1971.*	Y
New and existing works (NB: if relevant)		
If the proposed building work relates to an addition to an existing building or incidental structure, the plans must clearly highlight and differentiate the new proposed building work from the existing building(s) or incidental structure(s) and any part of an existing building(s) or incidental structure(s) that is proposed to be demolished.	1. *New proposed building work can be highlighted in a variety of ways, including:* i. *using colours for the new work; or* ii. *shading or cross hatching; or* iii. *providing clouds.* *Whichever method is used, there must be a clear differentiation between the new proposed building work and the existing part of the building(s) and/or incidental structure(s).* 2. *As alterations and additions often involve partial dismantling and demolition of existing building elements, this should be documented and described.*	Y
Slab Plan / Floor Framing Plan (1:100) and Construction Details (1:20)		
Specifications and installation details of proprietary and other specialised systems.		Y
Nominated founding depth and description of founding material including any engineering bearing or compaction requirements.		Y
Concrete slab and footing details		
Concrete strength finishing and curing requirements.		Y
Footing/slab preparation including materials, thickness, compaction requirements, vapour barrier specifications and installation details.		Y
Dimensioned plan and construction details of footings including penetrations, step down details and placement of reinforcement including concrete cover. Footing/slab thickening under service pipes, including wrapping if applicable.	Documentation to include sufficient details to demonstrate compliance with BCA referenced standards – AS2870, AS/NZS 3500, AS3600, or include performance solution. Documentation to include for required thickening where service pipes pass through footing/ slab	Y
Dimensioned plans and construction details for concrete slabs including levels, falls and gradients.		Y
Construction details of penetrations, step downs in beams, set downs in slabs and placement details of reinforcement including cover and re-entrant or internal corner reinforcing.		Y

Item	**Guidance Notes** (if applicable)	**Applies to Class 10**
Retaining walls, dimensioned and showing position of drainage, founding levels and heights. If any retaining wall is at or near the boundary, the plans should clearly show the position and relationship of the wall and any footings to the boundary line.	1. *This will determine if the proposed building work may affect any building or structure on adjoining land.* 2. *Sectional detail of retaining wall should clearly show the location of the boundary in relation to the wall and any footings. This will assist in establishing if any encroachment on adjoining land will occur, and if a BA20 submission, in accordance with the Building Act, will be required.* 3. *Plans need to nominate specific requirements of fill material and/or any fill compaction levels specified by engineer where appropriate.*	
Floor framing details		
Sub-floor vents (location and size per metre).	*Drawings must detail location of sub floor vents required to avoid dead air spaces and to provide cross flow air, including all internal sub floor walls. Provide calculations to demonstrate compliance with the applicable building standards.*	Y
Specify dimensions of engaged and isolated piers.		Y
Show minimum clearances to ground level of flooring system members.		Y
Framing drawings or schedules to indicate each structural member, dimensions, orientation, material, grade and size, spacing and span.		Y
Joint, support and bearing details.		Y

Item	**Guidance Notes** (if applicable)	**Applies to Class 10**
Timber framing.	*Timber framing is to be detailed and must be job specific to the proposed project (e.g. structural timber to comply with AS 1684 Residential Timber-framed Construction should instead be expressed as: joists 150x35 MGP10 @ 450MM c/c).*	Y
Steel floor framing.	*To be included in engineering certified drawings (separately attached) or endorsed on plans by design engineer.*	Y
Masonry Construction		
Unreinforced and reinforced construction specifications/details.		Y
Structural and non-structural walls.	*Nominate structural loadbearing walls on the drawing.*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
Fire rating requirements.	*If applicable, the FRL of the wall to be clearly nominated. Specify the appropriate material to achieve the required FRL and include manufacturer's technical data.*	Y
Masonry unit sizes, bond patterns and tooling of joints.		Y
Specification of brick ties and anchorages.		Y
Mortar specification.		Y
Cavity dimension and clean out specifications.		Y
Control joint location and detail.		Y
Lintels and bond beams.		Y
Weatherproofing and waterproofing details.		
Flashings, damp proof course and weepholes.	*Weepholes to be located above FGL and below FFL (where cavity flashing not employed) – Centres to be specified.*	
Weephole guards (insects and bushfire prone areas).		Y

Item	Guidance Notes (if applicable)	Applies to Class 10
Roof Layout Plan (1:100)		
Roof plan to specify and detail load bearing and non-load bearing supporting walls and structures.		Y
Wind classification to be nominated (site specific).	*Roof design wind classification to be nominated on the Roof Layout Plan.*	Y
Tie-down corrosion rating, including details/notes showing tie down materials.		Y
Tie-down installation including drawing details/notes identifying required location, spacing, embedment and connection details.		Y
Timber roof battens within 1200mm of roof edges and in general areas. Timber batten to rafter connection detailed/notes.	*Refer Industry bulletin IB 049/2014 Connection of roof battens to timber rafters in light weight metal roof sheet construction.*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
	Specify: • *Timber species, stress grade and joint group.* • *Type of roof covering.* • *Batten spacing.* • *Maximum batten span and overhang.*	
Metal battens to rafter connection detailed/notes.	1 *When using metal battens, confirm that the fixing method adopted is in accordance with the manufacturer's recommendations.* 2 *Fixing to be aligned with manufacturer's instructions or other specifications and endorsed by design engineer*.	Y
Rafter connections, including drawing details/notes demonstrating struts and fan strut locations and connections to under purlin and ridge and wall plate.		Y
Strut connections, detail/notes showing location.		Y
Collar ties, detail/notes showing collar tie location and spacing.		Y
Timber roof beams, details/notes showing: • Type and grade of timber. • Size and location. • Beam tie down details. • Fixing of supports. • Beam-to-beam connection.		Y
Steel roof beams (if relevant), details/notes endorsed by design engineer showing: • Size and location. • Beam tie down details • Beam tie down connection details. • Connections to timber plate. • Beam-to-beam connection.		Y
Provide roof dimensions.		Y
Roof sheeting or tile specification, including: • Roof pitch. • Batten spacing.		Y

Item	Guidance Notes (if applicable)	Applies to Class 10
• Fixing requirements. • Flashing details. • Roof drainage (including details of gutters, box and valley gutters). • Installation drawings of all required flashings and over flashings. • Roof penetration/flashing details.		
Roof lights.		
Roof ventilation.		
Eaves and overhang information.		Y
Location of roof mounted solar panels, hot water service or air conditioners (if applicable).	1 *Attachment of photovoltaic panels or solar hot water systems to the roof of a Class 1 or Class 10a building only applicable if located in cyclonic wind regions as defined in AS 1170.2.* 2 *Include details of fixings, flashings and penetrations of roof cover.*	Y
Details of roof flashings and pipe penetration flashings.		Y

Item	Guidance Notes (if applicable)	Applies to Class 10
Roof Framing / Bracing Plan (1:100)		
Details and type of supporting framework, load bearing and non-load bearing parts, lintels, beams, eaves details, roof pitch, ceiling height, roof shape or angle.		Y
Roof layout, including structural member dimensions, orientation, material, grade and size, spacing and span, rafters, under-purlin layout and strut/fan strut layout.	*Timber framing is to be detailed and must be job specific to the building (e.g. structural timbers to be clearly specified e.g. 'studs 90 X 35 MP10@600mm c/c' together with reference to comply with AS 1684.*	Y
Ceiling layout, including hanging beam and ceiling joist layout sizes and timber grade.		Y
Joint support and bearing details.		Y
Bracing, tie downs and fixing.		Y
Roof pitch, eave / overhang details.		Y
Fire separation and fire rated construction details, including separating walls, eaves, shared eaves or verandas.	*Drawing details and notes to be in accordance with manufacturer's details and specifications for proprietary fire separation details and materials.*	Y
Wall Framing / Bracing Plan		
Details and type of supporting framework, load bearing and non-load bearing parts, lintels, top and bottom plate and bracing type and location. Framing drawings or schedules to indicate each structural member, dimensions, orientation, material, grade and size, spacing and span.	1. *Where steel framing is used, documentation to be included in project engineer's documents or endorsed by design engineer.* 2. *Timber framing is to be detailed and must be job specific to the building (e.g. structural timber to comply with AS 1684 should instead be expressed as 'studs 90x35 MGP10 @ 600mm c/c').*	Y
Exterior Wall Cladding		
Description of cladding systems, manufacturer, material, cavity detailing.(if applicable).		Y
Fixings, flashings and other details if applicable.		Y

Item	Guidance Notes (if applicable)	Applies to Class 10
Interior Wall Lining		
Specify materials and manufacturer of interior wall lining.		Y
Reflected Ceiling Plan (1:100)		
Details of ceiling penetrations, skylights and exhaust fans.	1. *The plan is to indicate design of all light fittings (watts per fitting, whether ceiling mounted or downlights or both, lighting control per circuit - dimmers, timers, movement sensors and on/off switches). Penetrations formed in insulated ceilings and any adjustment to minimum R-value for "ceiling insulation" to be made in accordance with the applicable (Roofs) table provided in BCA Volume Two.* 2. *These details are required for the purposes of energy efficiency.* 3. *For Class 10 where conditioned space.*	Y
Elevations (1:100)		
Elevations to be shown.		Y
Position of all windows and doors.		Y
Ceiling heights and floor levels.		
Wall and roof cladding types.		Y
Natural ground line dotted.		Y
Daylight and ventilation.	*Floor plans and elevations to include sufficient dimensions to allow daylight and ventilation calculations to be made unless included in a door and window schedule. In addition to or in lieu of the above, detailed door and window schedules can be included within the documentation.*	

Item	Guidance Notes (if applicable)	Applies to Class 10
Sections (1:100)		

Item	Guidance Notes (if applicable)	Applies to Class 10
Sections to be shown, including section through stairs, ceiling / eave height and floor levels.	*Consideration should be given to detailing areas that pose construction difficulties.*	Y
Glazing		
Window and door systems description (i.e. single or double glazed, tinted or low E glass window and door frame material) to clearly demonstrate how compliance with the applicable building standards will be achieved.	*If applicable, include manufacturer's details and specifications to confirm water penetration resistance and wind pressures.*	Y
Glazing: Internal glazing specifications, including wet area glazing, shower screens and doors. Balustrading system specification (if relevant). Overhead glazing, roof or sky lights. Pool fencing (in cyclonic wind regions).		Y
Energy efficiency details (e.g. U value, Solar Heat gain coefficient).	*Only applies to Class 10 where conditioned space.*	Y
Protection of openable windows.	*The BCA requires that the location of certain window openings in buildings be provided with special methods of protection that restrict the opening of a window to prevent a person (especially a young child) from falling through the window when open.*	
Fire Safety		
Smoke and heat alarms, including location and type.		
Fire separation details to clearly demonstrate how compliance with the applicable building standards will be achieved.		Y
Note: (for **Class 1b** buildings) Evacuation lighting.		
Wet Areas		
Waterproofing and water resistance requirements for building elements in wet areas, including details and specifications.		Y
Drawings to clearly show required facilities and demonstrate how compliance with the construction of sanitary facilities is to be achieved.		Y
Daylight and ventilation		

Item	Guidance Notes (if applicable)	Applies to Class 10
Drawings to clearly show how compliance with daylight and ventilation requirements will be achieved.	*Calculations or sufficient dimensions of door and window schedules to allow daylight and ventilation calculations to be made can be included on the drawings or can be in a separate document but must form part of the design submission documentation.*	
Condensation Management		
Specifications and construction detail to show how compliance with condensation management will be achieved.		
Safe Movement and Access (including stairs and ramps)		
Stair design details, balustrade construction, spacing of openings and handrail details.	*Include engineering certification to confirm that balustrades comply with BCA Vol Two Structural provisions, or confirmation that engineering certification will be provided to the permit authority prior to installation of the balustrades.*	Y
Clearance height above stair nosings.		Y
Winders detail.		Y
Dimensions of landings, risers and goings, and non-slip nosings.	*Sections to indicate acceptable ceiling height between levels.*	Y
Method of construction, including aperture size and non-slip requirements.	*Where open risers are included, details/ notes regarding clearance between treads(Max 125mm)*	Y
Ramp slope and surface finish.		
(For **Class 1b** and if applicable, for **Class 10a**). - Disability access requirements, including parking.		
Energy Efficiency		
Building fabric thermal efficiency specification, including: Walls, ceiling, floors and roof. Insulation location and R-Value. Type of sarking/wall wrap.	*Care should be taken to ensure that the architectural drawings are consistent with the energy efficiency specification and requirements in the applicable building standards.* *Only applies for Class 10 where conditioned space.*	Y
Window energy specification.	*Only applies for Class 10 where conditioned space.*	Y
Lighting design plan.	*Only applies for Class 10 where conditioned space.*	Y
Energy rating documentation.	*Only applies for Class 10 where conditioned space.*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
Building sealing and air movement details.	*Building sealing - only applies for Class 10 where conditioned space.*	Y
Pipe and services insulation.		Y
Lighting calculator (if deemed-to-satisfy solution).		Y
Under slab or slab edge insulation.	*Only applies for Class 10 where conditioned space.*	Y
Project Specific Information (May be included within drawings, schedules or specifications, including other consultant's documents)		
Termite Treatment or barrier		
(If applicable) Details of any specialised termite barrier including manufacturer's information and construction details to clearly show how compliance with the applicable building standards will be achieved.		Y
Retaining Walls		
Dimension and construction details, including relationship to boundary and temporary encroachments into neighbouring land.	*This will assist in establishing if a BA20 will be required and if neighbouring property Title Deeds need amendment.*	
If applicable, drainage; tanking and details of any required protection structure. Protection structure to be endorsed by the design engineer.		
Backfill specifications.		
Concrete mix, reinforcement placement.		
Specifications and installation details of proprietary and other systems (if relevant).	*Details of any proposed chemical grouting used in protection structures to be endorsed by the design engineer.*	
Flooring		
Specify any specific or specialised flooring material or systems		Y
This section focusses on structural requirements for factory manufactured (pre-assembled) roof trusses (timber or steel)		
The following process should be used for pre-assembled timber or cold-formed steel roof trusses when the roof truss manufacturer's report is completed before the SBS issues a CDC.	1. *The intent of the two processes presented is to support clarity in coordination between the design engineer for the overall building and the roof truss manufacturer to facilitate the SBS in issuing a CDC and inspecting site works.*	Y

Item	**Guidance Notes** (if applicable)	Applies to Class 10
<u>Step A1</u> The plans and specifications for the building should include indication of the area relevant to the pre-assembled roof trusses. The design engineer should clearly communicate to the roof truss manufacturer the structural performance requirements such as relevant loading information, vertical and lateral load paths through the structure, and deflection limits for the pre-assembled roof trusses. The roof truss manufacturer completes their design and compiles a report in accordance with AS 1720.5:2015, including the following project information: • Name and details of roof truss manufacturer; • The address for the proposed building; • The proposed design and performance parameters such as Australian Standards referenced, design loads adopted, material specification, and design software used; • Information covering or a reference to available documents presenting construction, handling, lifting and storage requirements for the pre-assembled roof truss; and • Any information the manufacturer considers pertinent for the completion of the building design (such as tie-down locations and forces, ceiling diaphragm / bracing assumptions), subsequent construction, occupation and use of the building e.g. fabrication tolerances. • <u>Step A2</u> The design engineer endorses the roof truss manufacturer's report when satisfied that the roof truss design is consistent with the structural requirements for the overall building. <u>Step A3</u> The design engineer completes the engineering design for the overall building to coordinate with the roof truss manufacturer's design as presented in their report. The design engineer's plans and specifications reference the roof truss manufacturer's report, and together these are assessed and referenced by the SBS. If deemed sufficient for the CDC to be issued the design engineer's plans and specifications along with the roof truss manufacturer's report form part of the building permit application. If appropriate, a building permit is granted by the permit authority.	*Coordination between the design of the pre-assembled roof trusses and strategy for building services / air-conditioning is required for either of the two processes presented.* 2. *The first process presented (A1 to A3) requires coordination between the design engineer and roof truss manufacturer early in the building design process and prior to the SBS issuing a CDC. This enables the roof truss manufacturer to respond to complicated roof geometries, and/or to influence the design of the overall building to maximise truss efficiency. This approach facilitates coordination and therefore integrity of load paths through the overall building in transmitting interface forces such as supports and tie-downs.* a. *The design engineer is required to communicate with the roof truss manufacturer to enable roof truss design. For example, roof truss design might commence based on the design engineer's wind classification and the building designer's plans demarking the extent of the pre-assembled roof trusses and required building geometry. Following roof truss design, the design engineer then endorses the roof truss manufacturers report, completes the design for the overall building.* b. *In this scenario the builder is required to use the roof truss manufacturer who completed the report which formed the basis of the design engineer's design, as referenced in the design engineer's plans and specifications. Change of roof truss manufacturer or deviation from the design presented in the roof truss manufacturer's report requires consultation with the design engineer, and depending on timing may require variation to the building permit.* 3. *The SBS may use the design engineer's plans and specifications, and the roof truss manufacturer's report when inspecting on site.* 4. *The alternative process presented (B1 to B4) is to enable the design engineer's plans and specifications in the CDC to demonstrate compliance with the applicable building standards. Incorporating the design engineer's requirements for pre-assembled roof trusses in the plans and specifications before a roof truss manufacturer's report is completed enables the SBS to make the compliance declaration in the CDC prior to detailed pre-assembled roof truss design by the manufacturer. This approach requires the design engineer to define the overall roof truss framing strategy in terms of placement of girder trusses, loaded widths within the roof and the like. It is therefore best suited to*	

Item	**Guidance Notes** (if applicable)	**Applies to Class 10**
An alternative process presented below enables the roof truss manufacturer's report to be completed after the SBS issues a CDC in certain scenarios. This approach is viable in scenarios where the design engineer can establish the roof truss framing strategy (such as locations of girder trusses, and tie-down locations and forces) prior to the roof truss manufacturer completing their design. <u>Step B1</u> The design engineer provides sufficient information within the plans and specifications to allow the roof truss manufacturer to develop their design within the constraints defined by the design engineer, and produce their report, AFTER the building permit is granted, if necessary. For the pre-assembled roof trusses the design engineer's plans and specifications should clearly present all information required for the roof truss manufacturer to complete their design within the constraints defined by the design engineer. For example, the design engineer should indicate the area relevant to the pre-assembled roof trusses, specify the roof truss framing strategy including location where high tie-down capacity is located within the walls appropriate for girder trusses, and applicable design standards. Information presented must include constraints on vertical and lateral load paths through the pre-assembled roof trusses and all required interface forces and locations, i.e. forces transferred into and out of the roof trusses, including required tie-down details and positions. Information should be sufficient to enable the roof truss manufacturer to design pre-assembled roof trusses to achieve the required performance in coordination with the engineering concept for the overall building, whilst ensuring they do not overload any other part of the building structure. Information should be sufficient to enable the roof truss manufacturer to demonstrate coordination, satisfaction of the engineering design intent of the overall building, and compliance with the applicable building standards. <u>Step B2</u> The design engineer signs a TC conditional on future endorsement of the roof truss manufacturer's report, prior to commencement of construction. The TC contains a statement by the design engineer to the effect that if the pre-assembled roof trusses that are the subject of the certificate satisfy the	*simple roof designs and/or scenarios where designs and roof truss manufacturers are familiar to the design engineer.* *a. The design engineer's plans and specifications must identify the extent of the pre-assembled roof trusses and design standard requirements for those trusses, e.g. AS 1720.5:2015.* *b. The design engineer's plans and specifications must contain sufficient information to ensure clear communication of interface locations and loads to be transferred between the roof trusses and supporting or supported structure to allow design of the supporting or supported structure (lintels, structural framework and the like) in accordance with the design engineer's plans and specifications to ensure integrity of load paths, including tie-down forces and locations.* *c. The design engineer's plans and specifications must contain sufficient information to allow the roof truss manufacturer to complete the design of the truss-to-support and truss-to-tie-down connection based on the roof truss framing strategy defined by the design engineer in their documentation.* *d. This process may enable manufacturers to design the roof trusses in a manner consistent with the design engineer's structural intent for the proposed building overall and allow the design engineer to issue a TC, and enable the SBS issuing the CDC to be satisfied that the plans demonstrate compliance with the applicable building standards.* *e. This process assumes that the roof truss manufacturer can demonstrate in their report that the pre-assembled roof trusses are designed to the satisfaction of the requirements as presented in the design engineer's plans and specifications. The design engineer then endorses the roof truss manufacturer's report prior to commencement of construction.* *f. Variation from the design engineer's structural intent in the final roof truss manufacturer's design and therefore deviation from the basis of the design engineer's TC will prevent endorsement of the roof truss manufacturer's report by the design engineer and will require an application for amendment of the building permit to reflect the change in design from the TC to ensure coordination between the design engineer and the roof truss manufacturer. A variation includes a structural variation and may, for example, be a change to positions of interfaces including tie-downs, a change to roof truss framing strategies*	

Item	Guidance Notes (if applicable)	Applies to Class 10
constraints presented in the TC, the design engineer's plans and specifications submitted to the SBS for the CDC remain valid. A copy the TC is then provided to the builder, SBS and the permit authority for their records. <u>Step B3</u> The TC accompanies the design engineer's plans and specifications and may be relied upon by the SBS to sign the CDC before the truss manufacturer's report is available. If deemed sufficient for the CDC to be issued they will then form part of the building permit application. If appropriate, a building permit is granted by the permit authority. <u>Step B4</u> The roof truss manufacturer completes their design and presents their report in accordance with AS 1720.5:2015 with additional information as required to demonstrate design coordination, satisfaction of the engineering design constraints presented in the design engineer's plans and specification, and compliance with the applicable building standards. If appropriate, the design engineer endorses the roof truss manufacturer's report confirming validity of the conditional TC previously issued. If the design engineer is unable to endorse the roof truss manufacturer's report as presented because of variation or deviation from engineering constraints i.e. a structural variation, then either; • the roof truss design must be revised to coordinate with the engineering constraints covered in the issued TC and roof truss manufacturer's report reissued to the design engineer for endorsement prior to commencement of construction, or • the engineering design requires revising to coordinate with the roof truss manufacturer's design presented in their report and an amendment to the building permit will need to be applied for and granted prior to commencement of construction. The design engineer must provide a copy of their endorsement of the roof truss manufacturer's report to the builder, SBS and permit authority for their records prior to commencement of construction.	*such as girder truss locations, or any other change which alters assumed load paths for the overall building.* 5. *Factory manufactured roof trusses must be designed in accordance with the BCA (ABCB protocol for structural software: including geometric design limitations) where the design for timber trusses must be in accordance with AS1720.5:2015 and their manufacture and use complies with the relevant Australian/New Zealand Standards.* 6. *Any steel framing must comply with the National Association of Steel-Framed Housing (NASH) standard.* 7. *Designs may need to include additional structural work to accommodate pre-assembled roof trusses. This may include temporary works, construction loads, or point loads at element interfaces.* **8.** *The SBS may use the design engineer's plans and specifications, the TC and the endorsed roof truss manufacturer's report when inspecting on site.*	
Details of any other engineer designed products (e.g. major beams). These details and any manufacturer's documentation must be endorsed by the design engineer.	*Glue-laminated timber members, I-beams, and the like must be noted on the drawings to be installed in accordance with current manufacturer's guidelines (as selected) if*	

Item	Guidance Notes (if applicable)	Applies to Class 10
	available.	
Exterior Wall Cladding		
Description of specific or specialised cladding systems, manufacturer specifications, material, cavity detailing (if applicable).	*Only applicable for Class 10 in cyclonic areas*	Y
Fixings, flashings and other details if applicable.		Y
Interior Wall Lining		
Specify materials, manufacturer specifications, and any specialised systems of interior wall lining.	*For Class 10 where conditioned space.*	Y
Fire Safety		
For **Class 1b** buildings provide evacuation lighting and location and type of smoke and heat alarms.		
Sound Insulation		
Sound insulation (If applicable).	*The details included in the design documentation should demonstrate how compliance with the applicable building standards will be achieved. Provide calculations in conjunction with details and or notes.*	
Safe Movement and Access (including stairs and ramps)		
Disability access requirements, including parking.	*For Class 1b and if applicable, for Class 10a.*	Y
Additional Construction Requirements		
If applicable, construction requirements for high-wind, earthquake, flood prone and landslide hazards.		Y
Bushfire-Prone Area Specification and Details		
If the building is to be located in a bush fire prone area, specifications and details to clearly show how compliance with applicable building standards will be achieved.	*If using NASH Standard, design cannot be mixed with requirements of AS 3959.*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
Boilers, Pressure Vessels, Heating Appliances, Fireplaces and Chimneys		
Details to show how compliance with requirements for boilers, pressure vessels, heating appliances, fireplaces and chimneys will be achieved.		Y
Swimming Pools and Spa Pools		
Site plan, including: ○ Dimensioned setbacks, and existing and proposed reduced levels (RLs) (including the depth of the pool). ○ Location of the proposed pool. ○ Location of all proposed safety barriers and gates (not limited to pool fence). ○ Locations of existing buildings and structures.	*To the satisfaction of the SBS issuing the CDC.* *Unless structural engineering determines otherwise, in-ground and above-ground pools to be setback to not undermine or surcharge existing buildings and structures respectively.* *While safety barriers do not typically require a building permit (other than 'fences forming part of a safety barrier' located in cyclonic wind regions), the BCA requires compliant safety barriers to be provided as such compliance needs to be demonstrated indicatively, recognising that compliance will be determined at the local government's initial inspection and, if located in cyclonic wind regions, in the building permit for the 'fence forming part of a safety barrier'.* *Note that safety barriers to private swimming pools in most areas of the State are subject to initial and periodic inspections and it is common for them to vary from time to time. Local government inspectors are charged with monitoring compliance of these safety barriers against the specified building standards, not against a building permit. A physical inspection of safety barrier is always going to give a better compliance outcome than an assessment of documents alone.* *Care should be taken when restricting windows to ensure that the natural ventilation requirements in the BCA are not impacted.* *A statement should be included that each part of the pool safety barriers will comply with the regulatory requirements, e.g.:* ○ *Safety barriers to AS 1926.1-2012 and AS 1926.2-2007 incl. Amendments no 1 and 2.* ○ *Boundary fence to be at least:* • *1800mm high on the pool side with a 900mm NCZ5 at the top to AS 1926.1-2012; or* • *1200mm high on the non-pool side with NCZ 1, 2 and 3, etc., to AS 1926.1-2012 as modified by regulation 15B, Building Regulations.*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
	○ *Openable portions of windows to have either security screens or be restricted to open no more than 100mm, to AS 1926.1-2012.* ○ *Gate to open outwards and indicated as such, and be self-closing and self-latching to AS 1926.1-2012.* *Locations of existing buildings and structures should include windows, doors, retaining walls, sheds, etc. (in proximity to the pool and safety barrier).*	
Site design parameters: Nomination of the following, specific to the site: • Seismic hazard factor. • Site classification.	*To the satisfaction of the SBS issuing the CDC.* *Site classification should be as per the relevant edition of the BCA.* *It is generally acceptable to use a site classification report that has been previously used for other building work at the same property/location to reduce costs.* *Local conditions, such as high water tables and flood prone areas, should also be considered.* *Seismic hazard factor should be as per the relevant edition of AS/NZS 1170.4.*	Y
Documentation to include: • Pool/spa construction details and engineering. • Drainage details (surface water and disposal of swimming pool water (BCA performance requirement)). • Compliance statements for: ○ Recirculation system details. ○ Pool water heater details (if applicable). ○ Pool cover details.	*To the satisfaction of the SBS issuing the CDC.* *Pool fence specifics such as material, fixing details, footings, engineering are not required as part of an application for a swimming pool or spa pool unless the fence forms part of the application and the property is located in cyclonic wind regions.* *Additional compliance information for the pool fence should be provided to the owner/occupier from the installer. The owner/occupier can then pass this information on to the local government's inspector during the first inspection of the safety barrier. Typically, the following documents should be provided, where applicable:* • *AS 1288-2006 (incorporating Amendments no 1 and 2) Glass compliance; and* • *AS/NZS 2208:1996 (incorporating Amendment no 1) Safety glass compliance.* *Please note the BCA surface water and disposal of swimming pool water performance requirement.* *Drainage requirements vary between local governments. Discussion with the local*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
	government, prior to the submission of the application for a building permit, is strongly encouraged. *Recirculation systems, water heater requirements, pool cover requirements, as per BCA.*	
Fence, forming part of a safety barrier for a private swimming pool in cyclonic wind regions (AS/NZS 1170.2)		
Site plan, including: • Location of the swimming pool, proposed pool fence and gates, and any other safety barriers. • Dimensioned setbacks. • Locations of existing buildings and structures.	*In cyclonic wind regions, fences forming part of a safety barrier to a private swimming pool (including a spa pool) require a building permit. Compliance of the fence forming part of a safety barrier needs to be demonstrated in the plans and specifications to the satisfaction of the SBS issuing the CDC.* *While the certificate of compliance and/or application for building permit may be limited to the 'fence forming part of a safety barrier', the plans and specifications should demonstrate how the 'fence' forms part of the safety barrier and as such should show <u>locations</u> of all other safety barriers.* *An application for a building permit for a pool fence can be separate to an application for a building permit for a swimming pool as a stage of construction, or both the swimming pool and pool fence can be on the same building permit application. A swimming pool application is not reliant on a pool fence application.* *A statement should be included that each part of the pool safety barriers will comply with the regulatory requirements, e.g.:* ○ *Safety barriers to AS 1926.1-2012 and AS 1926.2-2007 incl. Amendments no 1 and 2.* ○ *Boundary fence to be at least:* • *1800mm high on the pool side with a 900mm NCZ5 at the top to AS 1926.1-2012; or* • *1200mm high on the non-pool side with NCZ 1, 2 and 3, etc., to AS 1926.1-2012 as modified by regulation 15B, Building Regulations.* ○ *Openable portions of windows to have either security screens or be restricted to open no more than 100mm, to AS 1926.1-2012.* ○ *Gate to open outwards and indicated as such, and be self-closing and self-latching to AS 1926.1-2012.*	Y

Item	Guidance Notes (if applicable)	Applies to Class 10
	Locations of existing buildings and structures should include windows, doors, retaining walls, sheds, etc. (in proximity to the pool and safety barrier).	

Item	Guidance Notes (if applicable)	Applies to Class 10
Documentation to include: • Pool fence details.	*To the satisfaction of the SBS issuing the CDC.* *Pool fence details should include:* • *fence type, material, design, and dimensions;* • *fence fixing details;* • *fence footing details;* • *engineering to suit local conditions (wind loads, seismic activity coefficient, soil type);* • *compliance documents, where applicable:* ○ *AS 1926.1-2012 Section 3 Loading requirements compliance reports;* ○ *AS 1288-2006 (incorporating Amendments no 1 and 2) Glass compliance; and* ○ *AS/NZS 2208:1996 (incorporating Amendment no 1) Safety glass compliance.* *Details should also be provided for temporary pool fences that will be erected for a period greater than one month.*	Y

Explanatory Information

The above information is the minimum documentation required to obtain a CDC. For guidance on a complete domestic construction project specification, refer to the current NATSPEC Simple Domestic Specification.

It is not the intent of this list to reduce the standard of Design documentation, but to provide for a mandatory minimum level of documentation. This list specifies the mandatory minimum level of design details required to be provided by plans and specifications to enable a builder to undertake the construction of Class 1 buildings and Class 10 buildings and incidental structures and for the SBS to assess the works for compliance with the applicable building standards.

The list allows designers the freedom to produce a mixture of graphic designs or specifications or both, provided the design work contains sufficient information and details to show compliance with the applicable building standards. This list does not diminish the relevant SBS's right to ask for further design information to be supplied before a CDC can be issued or for a permit authority to request further information before a building permit can be granted.

Application to Class 10 Buildings and Structures

This list specifically identifies the minimum level of design information required for Class 10 buildings or incidental structures. This is shown by the notation (Y) against particular headings. Designers may only need to provide the required minimum level of documentation for Class 10 buildings or incidental structures where a heading refers to that notation.

Documentation Information Requirements

Detailed information provided on drawings or within specifications must be job specific to the proposed project. e.g. structural timber to comply with AS 1684 should instead be expressed as: Joists 150x35 MGP10 @ 450mm c/c.

Performance Design Solutions

Documentation should include all calculations or dimensions sufficient to enable calculations to be made, reports, certificates and manufacturer's information together with a written proposition to support a building solution which is not in accordance with the Deemed-to-Satisfy provisions of the BCA Volume Two.

Example Drawings

The attached Example Drawings are representative of the Building Commissioner's Direction with respect to the list of minimum requirements for design documentation (plans and specifications) for Class 1 buildings, and Class 10 buildings and incidental structures. The content provides examples of how plans and specifications may be prepared for a single storey Class 1a building (25 drawings) and a two storey Class 1a building (27 drawings) to include the required information to demonstrate compliance and to assist mandatory notifiable stage inspections to be carried out on site.

The Example Drawings are for guidance only. The content should **not be taken by a permit authority** to be evidence that plans and specifications meet or do not meet the Building Commissioner's list of minimum requirements and **should not be relied upon** as accurate for another building project.

EXAMPLE (TWO STOREY) DRAWINGS FOR GUIDANCE ONLY

THESE DRAWINGS ARE REPRESENTATIVE OF THE BUILDING COMMISSIONER'S DIRECTION WITH RESPECT TO THE LIST OF MINIMUM REQUIREMENTS FOR DESIGN DOCUMENTATION (PLANS AND SPECIFICATIONS) FOR CLASS 1 BUILDINGS, CLASS 10 BUILDINGS AND INCIDENTAL STRUCTURES.
THE CONTENT PROVIDES EXAMPLES OF HOW PLANS AND SPECIFICATIONS MAY BE PREPARED TO INCLUDE THE REQUIRED INFORMATION TO DEMONSTRATE COMPLIANCE AND TO ASSIST MANDATORY NOTIFIABLE STAGE INSPECTIONS TO BE CARRIED OUT ON SITE.
THE CONTENT SHOULD NOT BE TAKEN BY A PERMIT AUTHORITY TO BE EVIDENCE THAT PLANS AND SPECIFICATIONS MEET, OR DO NOT MEET, THE BUILDING COMMISSIONER'S LIST OF MINIMUM REQUIREMENTS AND SHOULD NOT BE RELIED UPON AS ACCURATE FOR ANOTHER BUILDING PROJECT.
WHERE NOMINATED, NCC/BCA SHALL MEAN THE NATIONAL CONSTRUCTION CODE 2019 VOLUME TWO AMENDMENT 1, BUILDING CODE OF AUSTRALIA CLASS 1 AND CLASS 10 BUILDINGS.

GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

DRAWING SCHEDULE

DRAWING	REV	DRAWING TITLE
A01	0	NOTES AND DESIGN CRITERIA
A02	0	SURVEY PLAN
A03	0	SITE PLAN (GROUND)
A04	0	SITE PLAN (UPPER)
A05	0	SLAB SETOUT PLAN (GROUND)
A06	0	SLAB SETOUT PLAN (UPPER)
A07	0	FLOOR PLAN (GROUND)
A08	0	FLOOR PLAN (UPPER)
A09	0	ELEVATIONS 1 & 2
A10	0	ELEVATIONS 3 & 4
A11	0	CEILING & LIGHTING PLAN (GROUND)
A12	0	CEILING & LIGHTING PLAN (UPPER)
A13	0	ROOF PLAN
A14	0	ROOF STRUCTURE PLAN
A15	0	SECTION A-A
A16	0	SECTION B-B
A17	0	CONSTRUCTION DETAILS
A18	0	CONSTRUCTION DETAILS
A19	0	CONSTRUCTION DETAILS
A20	0	CONSTRUCTION DETAILS
A21	0	STAIR DETAILS
A22	0	ROOM ELEVATIONS
A23	0	ROOM ELEVATIONS
A24	0	ROOM ELEVATIONS
A25	0	ROOM ELEVATIONS
A26	0	WINDOW AND DOOR SCHEDULE
A27	0	ENERGY EFFICIENCY REQUIREMENTS

OTHER REQUIRED DOCUMENTS
(NOT INCLUDED WITH THIS SET)

- SPECIFICATION (GENERAL)
- SITE CLASSIFICATION REPORT
- BAL REPORT (IF LOCATED WITHIN BUSH FIRE PRONE AREA)
- BUSHFIRE HAZARD MANAGEMENT PLAN (IF REQUIRED)
- ENERGY EFFICIENCY ASSESSMENT
- STRUCTURAL ENGINEERING DRAWINGS AND SPECIFICATION
- TRUSS MANUFACTURER DRAWINGS AND DETAILS

STEEL SURFACE TREATMENT AND CORROSION PROTECTION TO NCC/BCA PART 3.4.4.4 AND AS4312:2008 ATMOSPHERIC CORROSIVITY ZONES IN AUSTRALIA

LOCATION	SYSTEM
EXTERNAL	IZS1, HDG300, ILG 100, AM 150, ZB 100/100, OR APPROVED COATING
INTERNAL	IZS1, Z 275, AZ 150, AM 150, IZA75, 1LG 100, OR APPROVED COATING
REPAIRS & WELDS	POWER TOOL CLEAN INORGANIC ZINC SILICATE - 100 MICRON NOMINAL THICKNESS

STEEL WALL FRAMING TO BE MANUFACTURED IN ACCORDANCE WITH AN APPROVED MANUFACTURERS SPECIFICATION.
WIND LOAD DESIGN CRITERIA AS REFERENCED

ULTIMATE (ULS), SERVICEABILITY (SLS), AND WATER PENETRATION RESISTANCE (WPR) LIMIT STATE DESIGN WIND PRESSURE

WIND CLASSIFICATION AS4055	DESIGN GUST WIND SPEED (m/s)		DESIGN PRESSURES FOR WINDOWS (kPa)					
			GREATER THAN 1.2m FROM CORNERS			UP TO 1.2m FROM CORNERS		
	Vh,u	Vh,s						
	ULS	SLS	ULS	SLS	WPR	ULS	SLS	WPR
C3	74	47	-4.44	1.33	0.30	-6.57	-1.99	0.30

WINDOWS TO BE INSTALLED TO MANUFACTURERS/SUPPLIERS SPECIFICATION

THE MATERIALS, PRODUCTS, PLUMBING PRODUCTS, FORM OF CONSTRUCTION AND DESIGN ASSOCIATED WITH THIS PROJECT SHALL BE FIT FOR THEIR INTENDED PURPOSE AND ACHIEVE THE RELEVANT REQUIREMENTS OF THE NATIONAL CONSTRUCTION CODE (NCC/BCA).

NOTE: ALL UNREINFORCED MASONRY TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH AS3700-2018 OR AS4773-2015 PARTS 1 AND 2.

AREA SCHEDULE

SITE AREA	1012.00 m^2
GROUND LIVING	73.54 m^2
UPPER LIVING	193.23 m^2
BALCONY 1	45.51 m^2
BALCONY 2	27.68 m^2
VERANDAH	52.36 m^2
GARAGE	53.41 m^2
WORKSHOP	25.85 m^2
STORE	11.08 m^2
TOTAL	482.66 m^2

SITE INFORMATION

LAND TITLE INFORMATION :	DP00000, 0000 / 000	(PLAN, CERTIFICATE VOLUME AND FOLIO)
IMPORTANCE LEVEL :	2	IN ACCORDANCE WITH NATIONAL CONSTRUCTION CODE AND AS/NZS 1170.1-2002 REFER PART 3.0.3 AND TABLE 3.0.3a DESIGN EVENTS FOR SAFETY
WIND CLASSIFICATION :	C3	SITE CLASSIFICATION TO AS 4055-2012 (REFERENCE REPORT BY AUTHOR)
WIND REGION :	D	
TERRAIN CATEGORY :	TC2	
SHIELDING :	PS	
TOPOGRAPHY :	T0	
SITE CLASSIFICATION :	S	SITE CLASSIFICATION TO AS 2870-2011 (REFERENCE REPORT BY AUTHOR) FOOTINGS AND SLAB CONSTRUCTION TO COMPLY WITH NCC/BCA PART 3.2.5 FOR NOMINATED SITE CLASSIFICATION
NCC CLIMATE ZONE :	1	REFER NCC/BCA VOLUME 2 - FIGURE 2: "CLIMATE ZONES FOR THERMAL DESIGN"; OR TABLE 2 "CLIMATE ZONES FOR THERMAL DESIGN - VARIOUS LOCATIONS" (WWW.ABCB.WA.GOV.AU)
TERMITE TREATMENT :	AS3660-2014	TERMITE TREATMENT TO COMPLY WITH AS3660.1-2014 AND AS3660.3-2014 TERMITE MANAGEMENT SYSTEM TO COMPRISE: UNDER SLAB: INSTALL TERMITE INSECTICIDE IMPREGNATED POLYMER SHEET (WPM) UNDER ENTIRE SLAB. UNDER SLAB SHEETING TO BE INSTALLED TO MANUFACTURER SPECIFICATION WITH JOINTS TO BE LAPPED AND TAPED AS RECOMMENDED. PLUMBING/SERVICE PENETRATIONS: INSTALL TERMITE INSECTICIDE IMPREGNATED HARD AND FLEXIBLE COLLARS (TYPE TO SUIT APPLICATION) TO MANUFACTURER SPECIFICATION TO ALL PLUMBING/SERVICE PENETRATIONS THROUGH SLAB. PERIMETER PROTECTION: INSTALL RETICULATED TERMITE CHEMICAL BARRIER SYSTEM TO ENTIRE PERIMETER OF BUILDING. PROVIDE INSPECTION AND CHEMICAL REFILL POINTS IN COMPLIANCE WITH MANUFACTURER SPECIFICATIONS. NOTE: IT IS THE OWNERS RESPONSIBILITY TO ARRANGE FOR POST CONSTRUCTION PERIODIC TERMITE INSPECTIONS TO BE UNDERTAKEN THAT SHALL BE IN ACCORDANCE WITH AS3660.2-2017
ENVIRONMENTAL CLASSIFICATION :	SEVERE	STEELWORK TO BE PROTECTED IN ACCORDANCE WITH NATIONAL CONSTRUCTION CODE PART 3.4.4.4 AND TABLE 3.4.4.7. CORROSION PROTECTION TO BE APPLIED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATION AND SPECIFICATION
DURABILITY CLASSIFICATION:	R1	ALL BUILT-IN COMPONENTS FOR MASONRY CONSTRUCTION (WALL TIES, LINTELS, SHELF ANGLES ETC) TO COMPLY WITH AS/NZS 2699.1-2000 AND AS/NZS 2699.3-2002 RESPECTIVELY REFER ALSO PART 3.3.5.12 FOR ADDITIONAL CONSTRUCTION REQUIREMENTS
CONDENSATION MANAGEMENT:	-	PROVIDE CONDENSATION MANAGEMENT IN COMPLIANCE WITH NCC/BCA PART 3.8.7. PLIABLE BUILDING MEMBRANE TO COMPLY WITH NCC/BCA PART 3.8.7.2 AND AS/NZS 4200.1-2017 AND INSTALLED IN COMPLIANCE WITH AS/NZS 4200.2-2017 PLIABLE BUILDING MEMBRANE TO BE LOCATED ON THE EXTERNAL SIDE OF THE PRIMARY INSULATION LAYER OF THE WALL ASSEMBLIES THAT FORM THE EXTERNAL ENVELOPE OF THE BUILDING. REFER ALSO NATSPEC TECHNOTE DES004 FOR ADDITIONAL GUIDANCE
BUSHFIRE ATTACK LEVEL (BAL):	N/A	SITE LOCATED OUTSIDE OF BUSH FIRE PRONE ZONE.
EARTHQUAKE PROVISIONS:	H2	REFER APPENDIX A OF AS1170.4-2007 AND REFER NCC/BCA PART 3.10.2 FOR ADDITIONAL REQUIREMENTS
OTHER HAZARDS:		HIGH WIND, EARTHQUAKE, FLOODING, LANDSLIP, DISPERSIVE SOILS, SAND DUNES, MINE SUBSIDENCE, LANDFILL, SNOW & ICE OR OTHER RELEVANT FACTORS

0	12.09.22	ISSUED FOR PERMIT SUBMISSION

scribe DESIGNGROUP

DESIGNER
ADDRESS:
EMAIL: PHONE No:

ISSUED FOR PERMIT SUBMISSION

Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

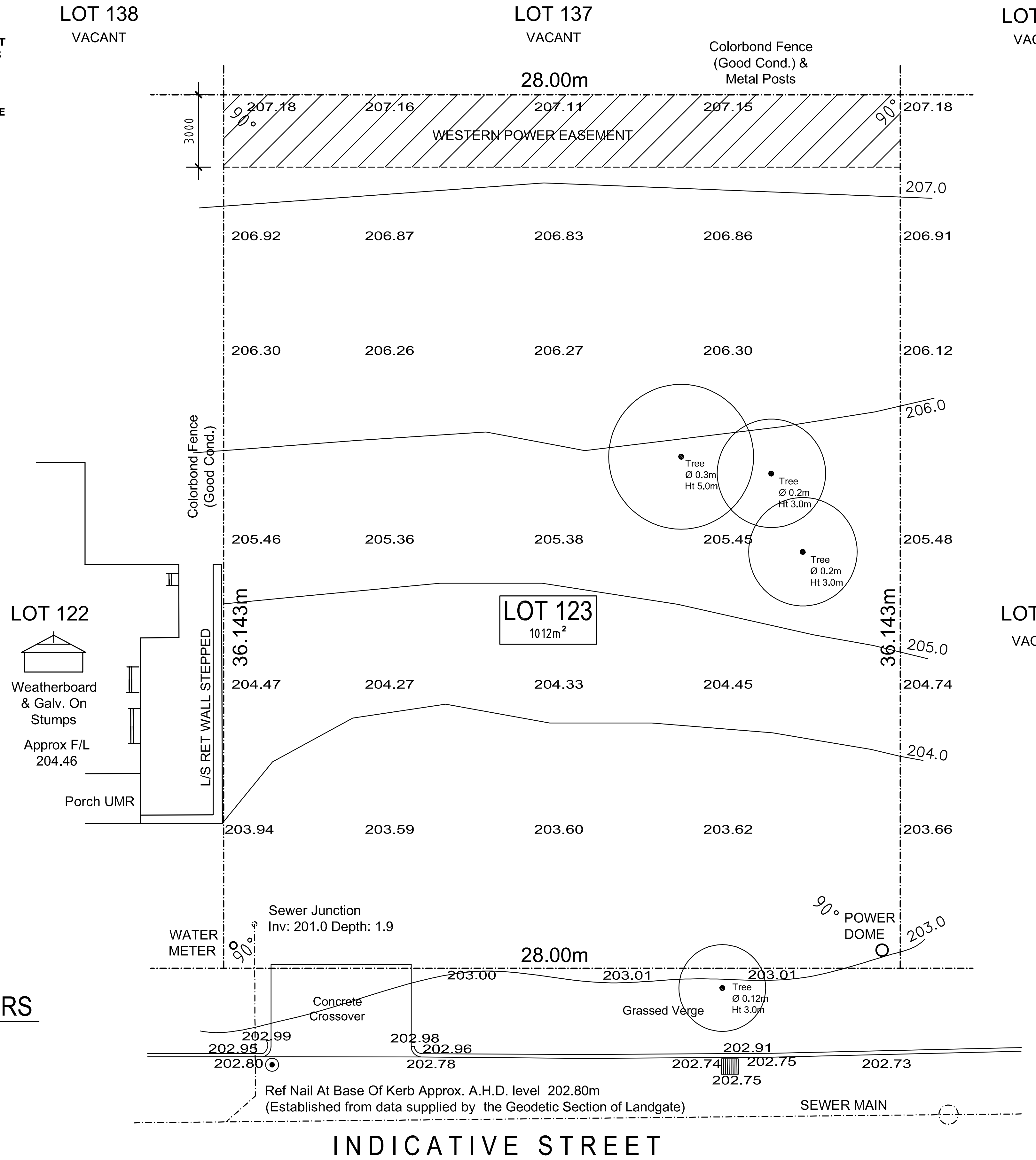
DWG TITLE: **NOTES AND DESIGN CRITERIA**

DATE: JULY 2022 | SCALE: 1:100 AT A3 | DRAWN: SFM | CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: A01 (01 OF 27) | REV: 0

LOT BOUNDARIES AS INDICATED ARE BASED ON LANDGATE TITLE SKETCH OR DIAGRAM OF SURVEY DATA ONLY.

IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL LOT DETAILS, ENCUMBRANCES, EASEMENTS OR OTHER INTERESTS WHICH MAY AFFECT BUILDING ON THE PROPERTY.

SERVICE AVAILABILITY AND LOCATION TO BE CONFIRMED WITH RELEVANT AUTHORITIES. CONTRACTOR TO UNDERTAKE DIAL BEFORE YOU DIG ASSESSMENT PRIOR TO INITIATING WORKS.



FEATURE SURVEY - BY OTHERS

SCALE 1:200

N

1:200 0 2 4 6 8 10 20m

DENSITY CODE R20

REV	DATE	DESCRIPTION
0	12.09.22	ISSUED FOR PERMIT SUBMISSION

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DESIGNER	
ADDRESS:	
EMAIL:	PHONE No:

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GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **SURVEY PLAN**

DATE	JULY 2022	ISSUE	PERMIT SUBMISSION
SCALE	1:100 AT A3		
DRAWN	SFM	DRAWING No	REV
CHECKED	SFM	**A02** (02 OF 27)	0

NOTE : STORM WATER DRAINAGE SYSTEM TO BE DESIGNED FOR 1:100 ANNUAL RAINFALL INTENSITY 24 HOUR STORM EVENT. ROOF PLUMBER TO ALSO REFER TO 'LOCAL COUNCIL' FOR STORM WATER REQUIREMENTS

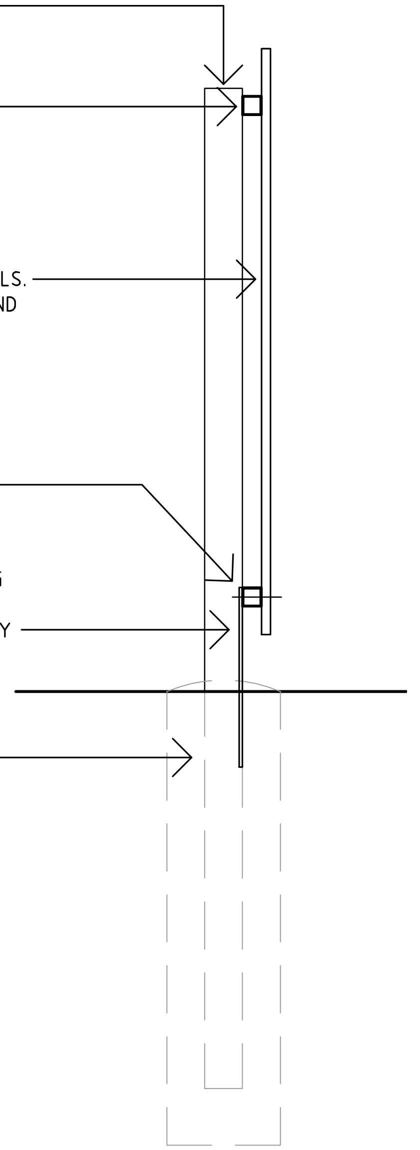
NOTE: CONTRACTOR TO UNDERTAKE PILING AND WORKS CLOSE TO THE BOUNDARY UTILISING PROTECTION STRUCTURES AND EXECUTE WORKS IN A MANNER THAT PREVENTS ADVERSELY AFFECTING ADJOINING LAND

NOTE: STORM WATER TO BE DIVERTED AWAY FROM RESIDENCE AND CONTAINED WITHIN THE LOT AND DISPOSED ONTO THE ROAD AS PER BCA VOL 2 PART 3.1.3.5. BUILDER TO FIX FIBRE CEMENT BOARD TO BOTTOM INSIDE OF ALL BOUNDARY FENCING TO PREVENT STORM WATER FROM FLOWING ONTO ADJOINING LOTS.

NOTE: NEW WATER METERS & SEWER CONNECTIONS ARE TO BE INSTALLED IN ACCORDANCE WITH WATER CORPORATION APPROVAL AND GENERAL REQUIREMENTS

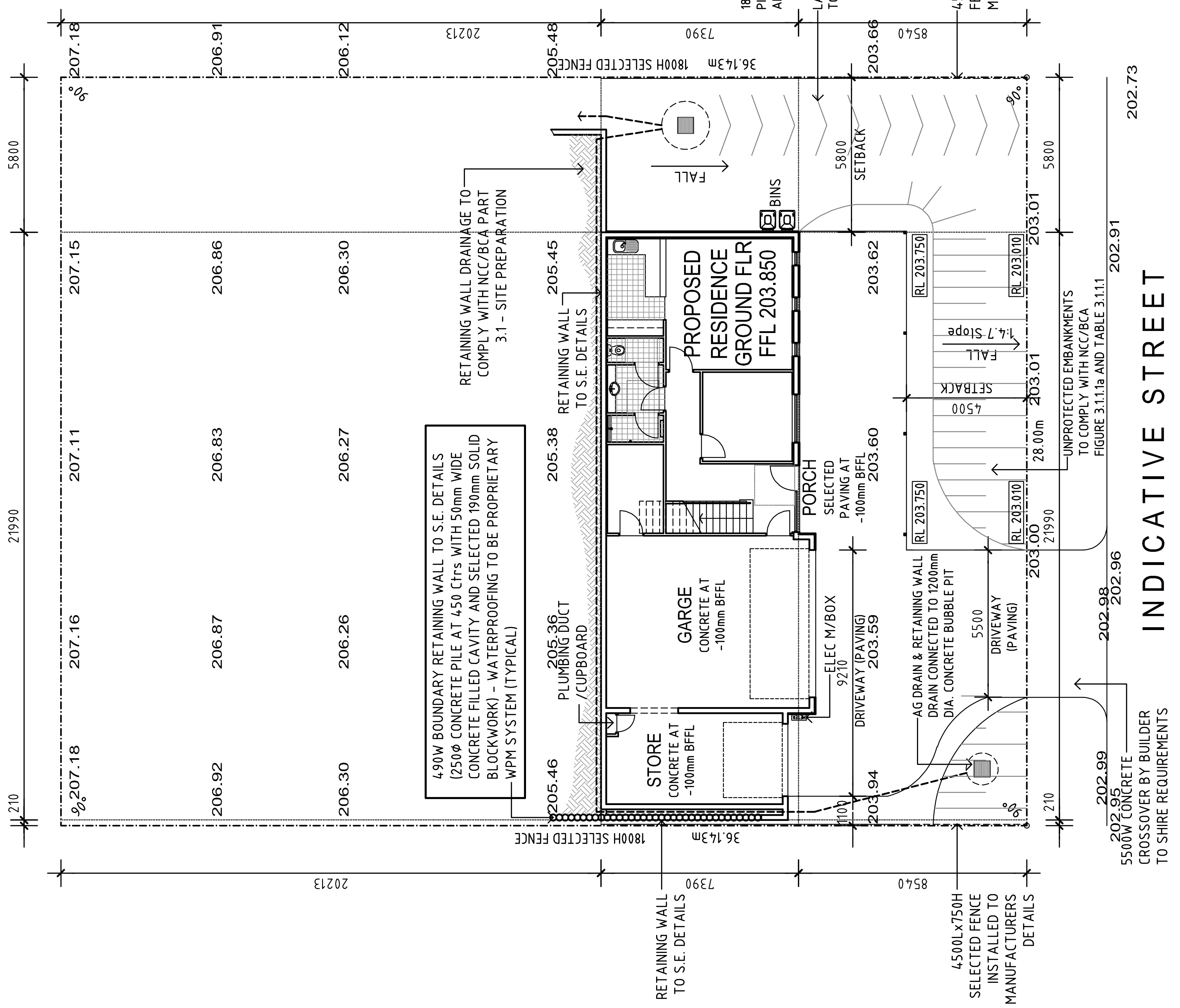
NOTE: BUILDER TO PROVIDE 90mm CONDUITS FOR RETICULATION UNDER PATHS, PAVING AND DRIVE WAYS WITH SEPARATE CUT IN FOR RETICULATION

NOTE: LANDSCAPING BY BUILDER/OWNER/OTHERS



BOUNDARY FENCE DETAIL (REGION D)

SCALE 1:20



SITE PLAN - GROUND FLOOR

SCALE 1:200

DENSITY CODE R20

1:200 0 2 4 6 8 10 20m

REV	DATE	DESCRIPTION
0	12.09.22	ISSUED FOR PERMIT SUBMISSION

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GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **SITE PLAN (GROUND)**

DATE	JULY 2022
SCALE	1:100 AT A3
DRAWN	SFM
CHECKED	SFM

ISSUE: PERMIT SUBMISSION
DRAWING No: **A03** (03 OF 27)
REV: 0

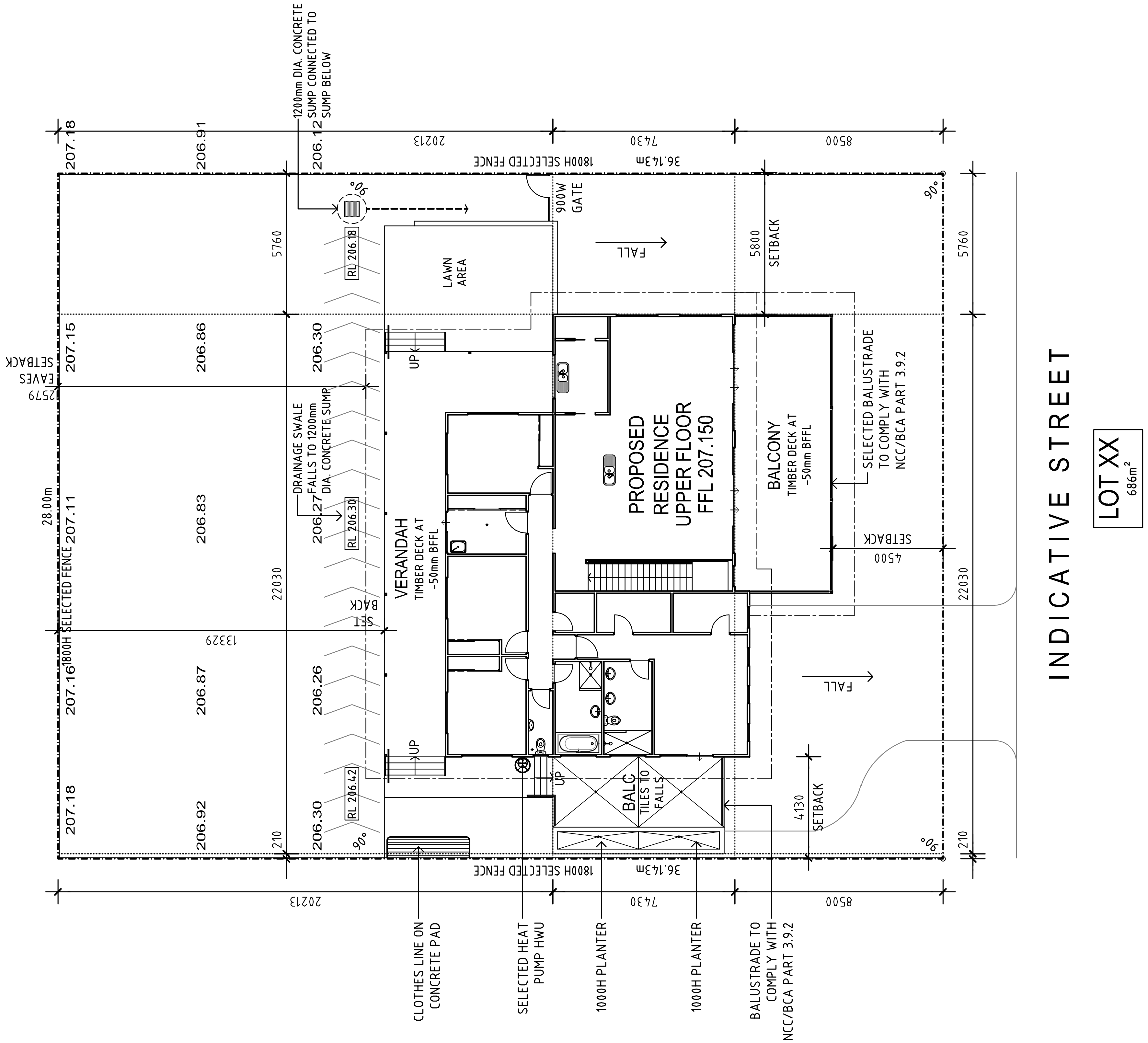
NOTE: LANDSCAPING BY BUILDER/OWNER/OTHERS

NOTE: STORM WATER TO BE DIVERTED AWAY FROM RESIDENCE AND CONTAINED WITHIN THE LOT AND DISPOSED ONTO THE ROAD AS PER BCA VOL 2 PART 3.1.2.3. BUILDER TO FIX FIBRE CEMENT BOARD TO BOTTOM INSIDE OF ALL BOUNDARY FENCING TO PREVENT STORM WATER FROM FLOWING ONTO ADJOINING LOTS.

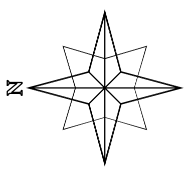
NOTE: BUILDER TO PROVIDE 90mm CONDUITS FOR RETICULATION UNDER PATHS, PAVING AND DRIVE WAYS WITH SEPARATE CUT IN FOR RETICULATION

NOTE : STORM WATER DRAINAGE SYSTEM TO BE DESIGNED FOR 1:100 ANNUAL RAINFALL INTENSITY 24 HOUR STORM EVENT. ROOF PLUMBER TO ALSO REFER TO 'LOCAL COUNCIL' FOR STORM WATER REQUIREMENTS

NOTE: NEW WATER METERS & SEWER CONNECTIONS ARE TO BE INSTALLED IN ACCORDANCE WITH WATER CORPORATION APPROVAL AND GENERAL REQUIREMENTS



SITE PLAN - UPPER FLOOR
SCALE 1:200



1:200 0 2 4 6 8 10 20m

DENSITY CODE R20

REV	DATE	DESCRIPTION
0	12.09.22	ISSUED FOR PERMIT SUBMISSION

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GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **SITE PLAN (UPPER)**

DATE	JULY 2022
SCALE	1:100 AT A3
DRAWN	SFM
CHECKED	SFM
ISSUE	PERMIT SUBMISSION
DRAWING No	A04 (04 OF 27)
REV	0

NOTE: THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS AND SPECIFICATION WITH STRUCTURAL ENGINEERING DOCUMENTATION HAVING PRECEDENCE.

FOOTING AND SLAB CONSTRUCTION TO COMPLY WITH STRUCTURAL ENGINEERS DETAILS AND NCC/BCA PART 3.2.5.1 FOR CLASS 'S' SITE AND FIGURES 3.2.5.3a AND 3.2.5.3b (UNO).

UNLESS NOTED OTHERWISE FOOTINGS SHALL BE 450mm DEEP (MIN) WITH 3-L11TM IN BOTTOM OF STRIP FOOTING AND SL82 REINFORCING MESH WITHIN SLAB. INTERNAL AND EXTERNAL EDGE BEAMS TO FORM AN INTEGRAL STRUCTURAL GRID (REFER AS2870).

CONCRETE MUST BE MANUFACTURED TO COMPLY WITH AS 3600 AND HAVE MINIMUM STRENGTH AT 28 DAYS OF NOT LESS THAN 20 MPa (N20 GRADE) WITH 20mm MAX NOMINAL AGGREGATE SIZE AND HAVE A NOMINAL 100mm SLUMP.

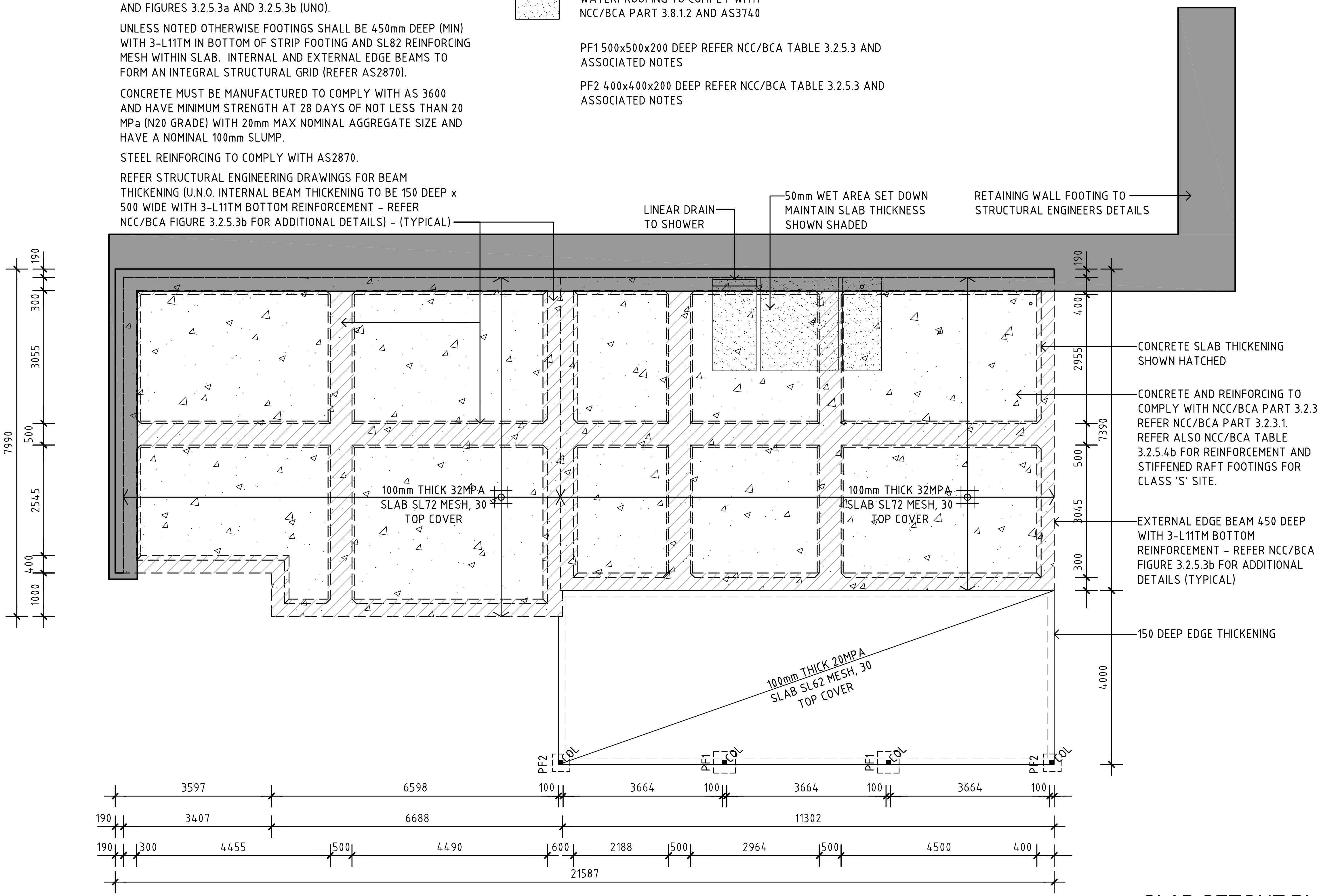
STEEL REINFORCING TO COMPLY WITH AS2870.

REFER STRUCTURAL ENGINEERING DRAWINGS FOR BEAM THICKENING (U.N.O. INTERNAL BEAM THICKENING TO BE 150 DEEP x 500 WIDE WITH 3-L11TM BOTTOM REINFORCEMENT - REFER NCC/BCA FIGURE 3.2.5.3b FOR ADDITIONAL DETAILS) - (TYPICAL)

WET AREAS SHOWN HATCHED WATERPROOFING TO COMPLY WITH NCC/BCA PART 3.8.1.2 AND AS3740

PF1 500x500x200 DEEP REFER NCC/BCA TABLE 3.2.5.3 AND ASSOCIATED NOTES

PF2 400x400x200 DEEP REFER NCC/BCA TABLE 3.2.5.3 AND ASSOCIATED NOTES



SLAB SETOUT PLAN (GROUND FLOOR)

SCALE 1:100

REV	DATE	DESCRIPTION
0	12.09.22	ISSUED FOR PERMIT SUBMISSION

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GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: BUILDING AND ENERGY
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: SLAB SETOUT PLAN (GROUND)

DATE	JULY 2022	ISSUE	PERMIT SUBMISSION
SCALE	1:100 AT A3		
DRAWN	SFM	DRAWING No	REV
CHECKED	SFM	A05 (05 OF 27)	0

FOOTING AND SLAB CONSTRUCTION TO COMPLY WITH STRUCTURAL ENGINEERS DETAIL NCC/BCA PART 3.2.5.1 FOR CLASS 'S' SITE AND FIGURES 3.2.5.3a AND 3.2.5.3b.

UNLESS NOTED OTHERWISE FOOTINGS SHALL BE 450mm DEEP (MIN) WITH 3-L11TM IN BOTTOM OF STRIP FOOTING AND SL82 REINFORCING MESH WITHIN SLAB. INTERNAL AND EXTERNAL EDGE BEAMS TO FORM AN INTEGRAL STRUCTURAL GRID (REFER AS2870).

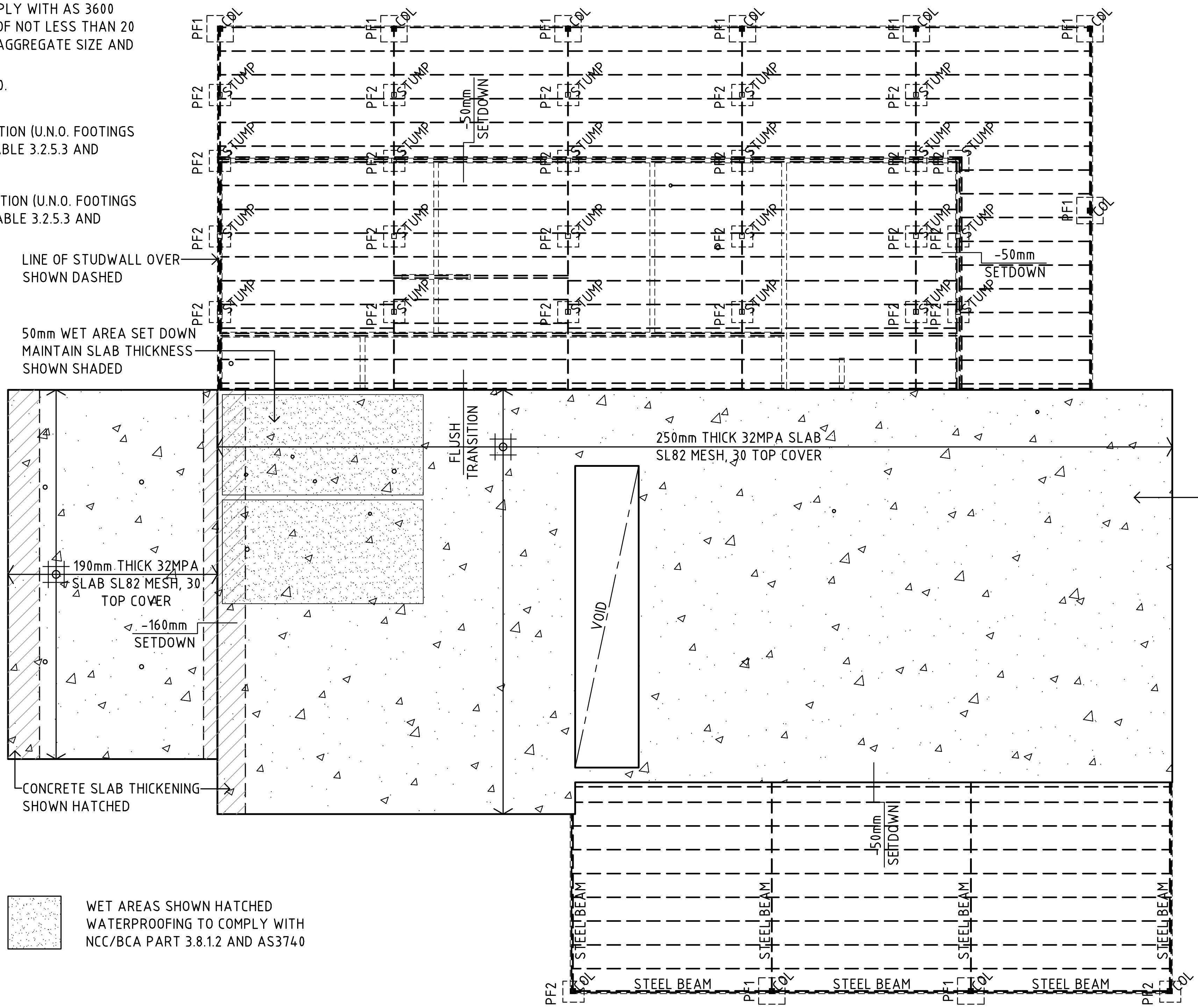
CONCRETE MUST BE MANUFACTURED TO COMPLY WITH AS 3600 AND HAVE MINIMUM STRENGTH AT 28 DAYS OF NOT LESS THAN 20 MPa (N20 GRADE) WITH 20mm MAX NOMINAL AGGREGATE SIZE AND HAVE A NOMINAL 100mm SLUMP.

STEEL REINFORCING TO COMPLY WITH AS2870.

PF1 - TO STRUCTURAL ENGINEERS SPECIFICATION (U.N.O. FOOTINGS TO BE 500x500x200 DEEP REFER NCC/BCA TABLE 3.2.5.3 AND ASSOCIATED NOTES)

PF2 - TO STRUCTURAL ENGINEERS SPECIFICATION (U.N.O. FOOTINGS TO BE 400x400x200 DEEP REFER NCC/BCA TABLE 3.2.5.3 AND ASSOCIATED NOTES)

NOTE: THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS AND SPECIFICATION WITH STRUCTURAL ENGINEERING DOCUMENTATION HAVING PRECEDENCE.



STEEL STUMPS - REFER TO STRUCTURAL ENGINEERS DRAWINGS & DETAILS MUST BE DESIGNED IN ACCORDANCE WITH AS4100 AND SHALL BE FULLY ENCLOSED AND SEALED WITH A WELDED TOP PLATE. STUMPS TO BE ENCASED IN CONCRETE (TO NCC/BCA TABLE 3.2.5.2) SLOPING AWAY FROM STUMP AND FINISH 100mm ABOVE FINISHED GROUND LEVEL. APPLY CORROSION PROTECTION TO NCC/BCA PART 3.4.4

TIMBER BEARER
TO STRUCTURAL ENGINEERS DETAILS

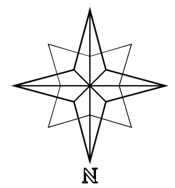
TIMBER JOISTS
TO STRUCTURAL ENGINEERS DETAILS

CONCRETE AND REINFORCING TO STRUCTURAL ENGINEERS DETAILS AND SHALL COMPLY WITH NCC/BCA PART 3.2.3 REFER NCC/BCA PART 3.2.3.1 FOR CONCRETE REQUIREMENTS AND PART 3.2.3.2 AND TABLE 3.2.3.2 FOR STEEL REINFORCEMENT REQUIREMENTS FOR REINFORCING BAR/MESH SIZES.

STEEL COLUMN
TO STRUCTURAL ENGINEERS DETAILS

STEEL BEAM
TO STRUCTURAL ENGINEERS DETAILS

STEEL JOISTS
TO STRUCTURAL ENGINEERS DETAILS AT 450 CTS



SLAB SETOUT PLAN (UPPER FLOOR)

SCALE 1:100

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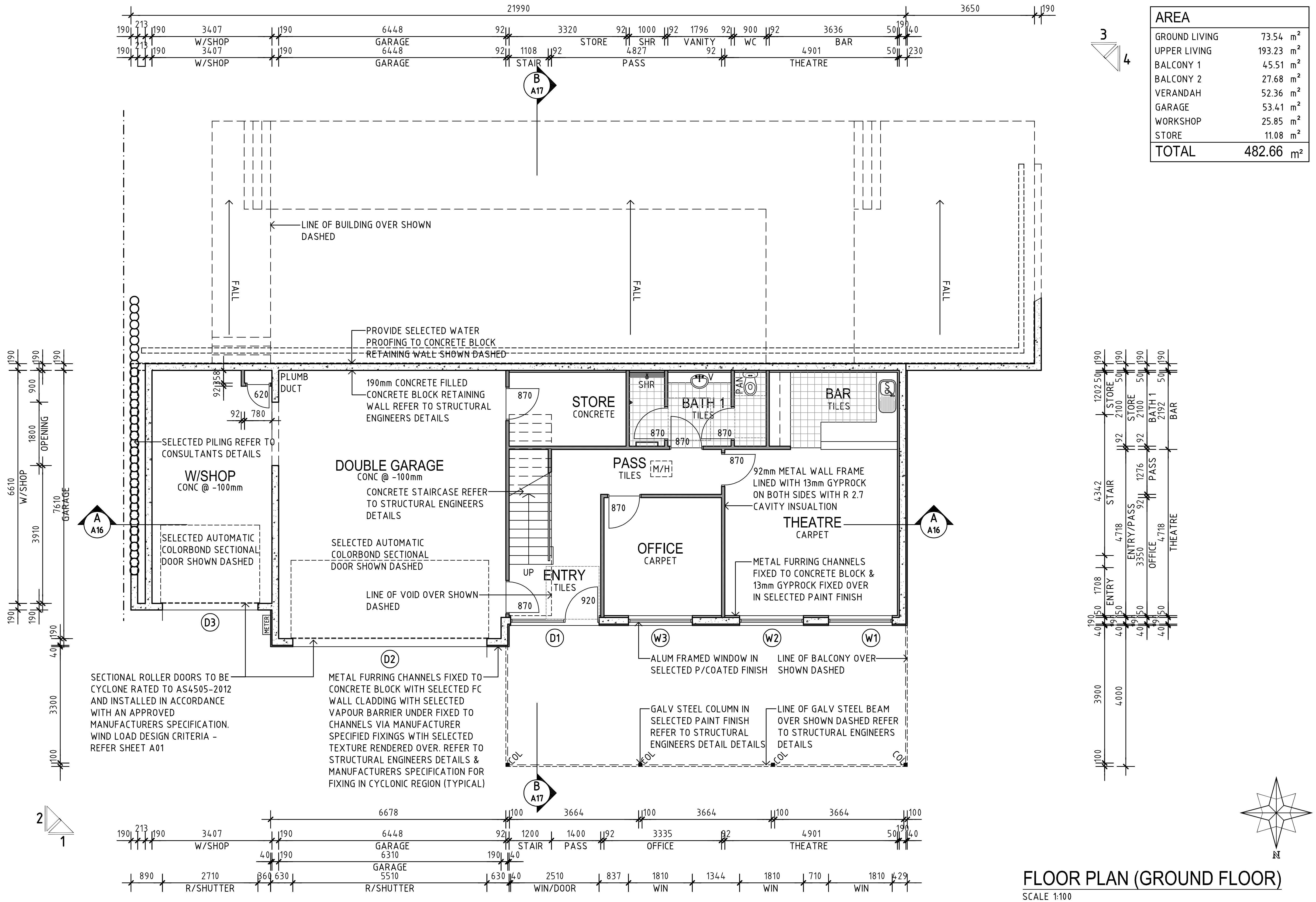
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: BUILDING AND ENERGY

PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: SLAB SETOUT PLAN (UPPER)

DATE	JULY 2022
SCALE	1:100 AT A3
DRAWN	SFM
CHECKED	SFM
ISSUE	PERMIT SUBMISSION
DRAWING No	A06 (06 OF 27)
REV	0



AREA	
GROUND LIVING	73.54 m²
UPPER LIVING	193.23 m²
BALCONY 1	45.51 m²
BALCONY 2	27.68 m²
VERANDAH	52.36 m²
GARAGE	53.41 m²
WORKSHOP	25.85 m²
STORE	11.08 m²
TOTAL	482.66 m²

FLOOR PLAN (GROUND FLOOR)

SCALE 1:100

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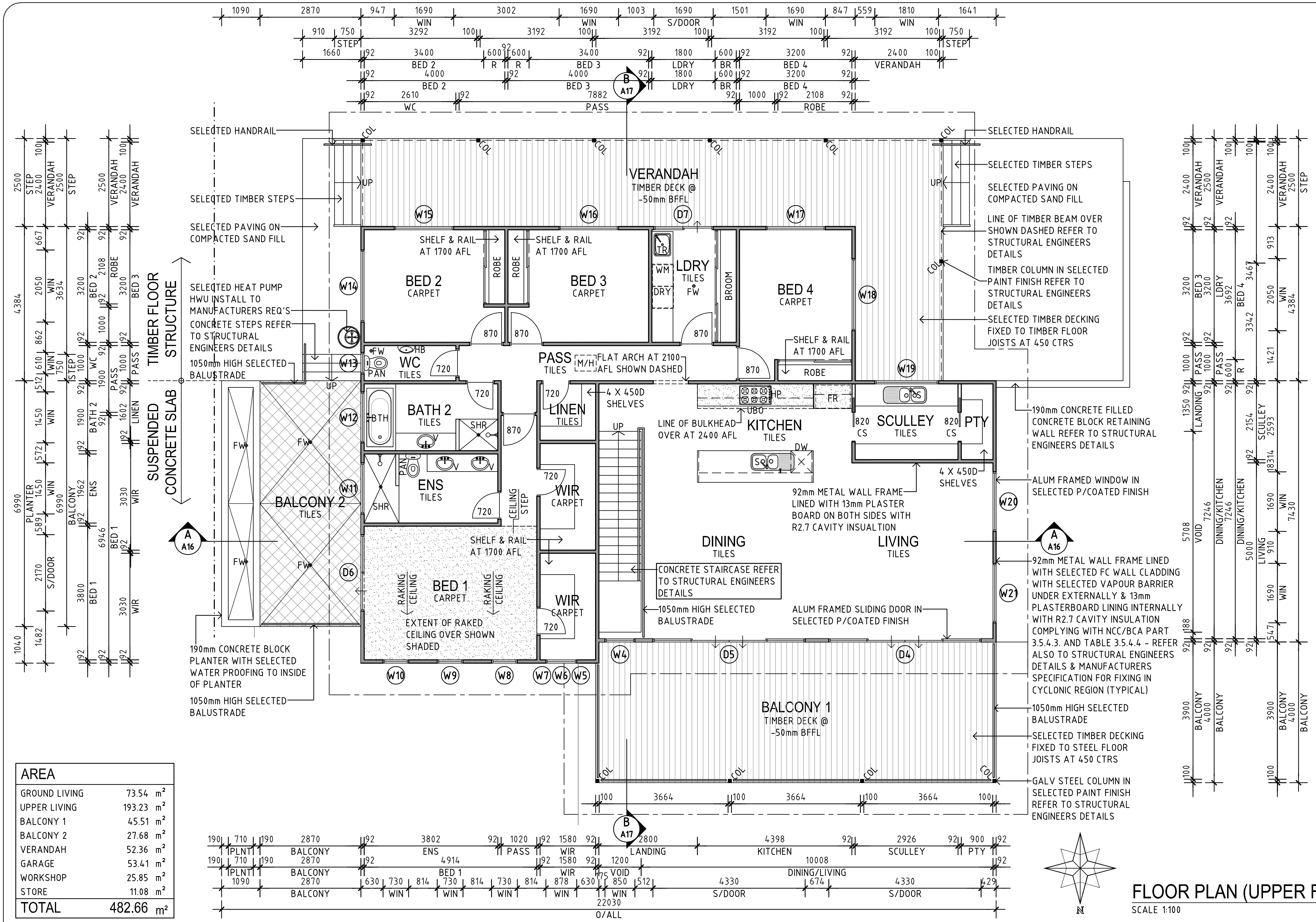
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **FLOOR PLAN (GROUND)**

DATE: JULY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: A07 (07 OF 27)
REV: 0



FLOOR PLAN (UPPER FLOOR)

SCALE 1:100

AREA

GROUND LIVING	73.54	m²
UPPER LIVING	193.23	m²
BALCONY 1	45.51	m²
BALCONY 2	27.68	m²
VERANDAH	52.36	m²
GARAGE	53.41	m²
WORKSHOP	25.85	m²
STORE	11.08	m²
TOTAL	**482.66**	**m²**

ALL STAIRS AND STEPS FOR CLASS 1 AND 10 BUILDINGS TO COMPLY WITH BCA/NCC VOLUME 2 PART 3.9.1

NOTE: BUILDER TO ALLOW PROVISION FOR ELECTRICAL CONDUIT TO ISLAND BENCH FOR ELECTRICAL SUPPLY

ISOLATING STOP COCKS TO BE FITTED TO THE INLET AND OUTLET SIDE OF HWU, INLET SIDE OF WC CISTERN AND TO ALL BATHROOMS, ENSUITES, LAUNDRY AND KITCHENS TO ENABLE ISOLATION OF SEPARATE AREAS FOR MAINTENANCE

NOTE: INSTALL LIFT-OFF HINGES TO ALL SANITARY COMPARTMENT DOORS IN ACCORDANCE WITH NCC BCA PART 3.8.3.3 REQUIREMENTS

ALL WINDOWS TO COMPLY WITH REQUIREMENTS OF AS2047-2014

NOTE: BUILDER TO INSTALL REFLECTIVE SISALATION UNDER ALL ROOF SHEETING INCLUDING OUTDOOR LIVING AND ALFRESCO AREAS.

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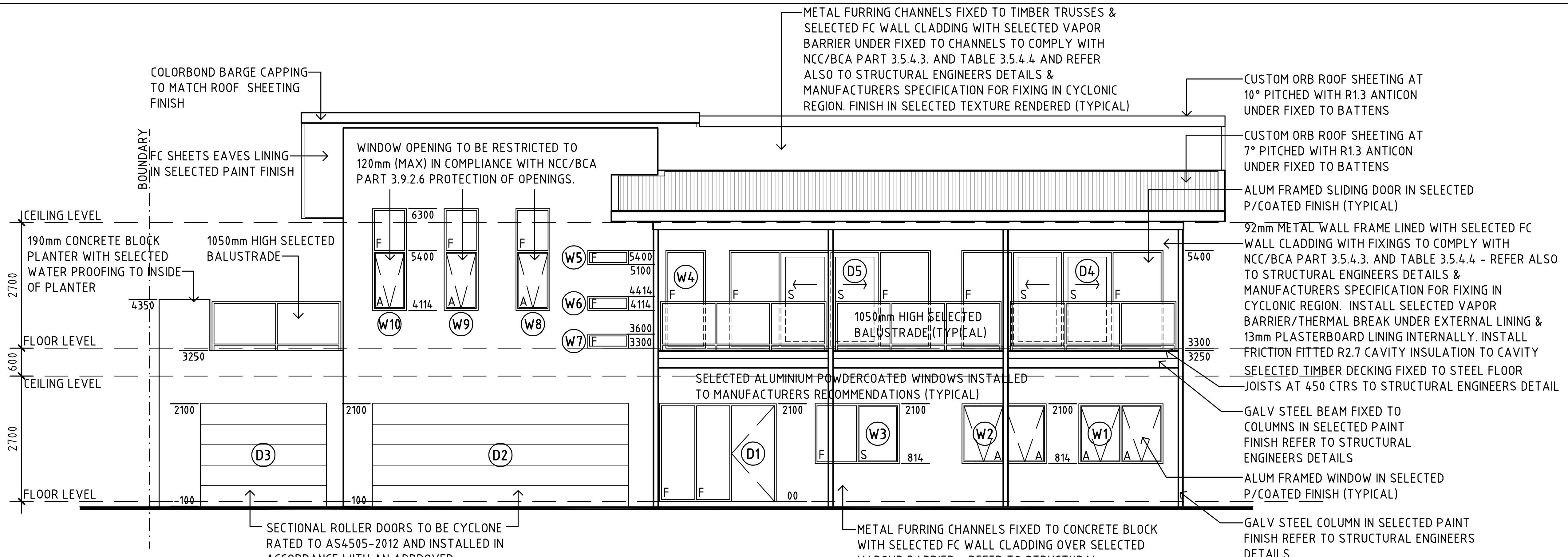
GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

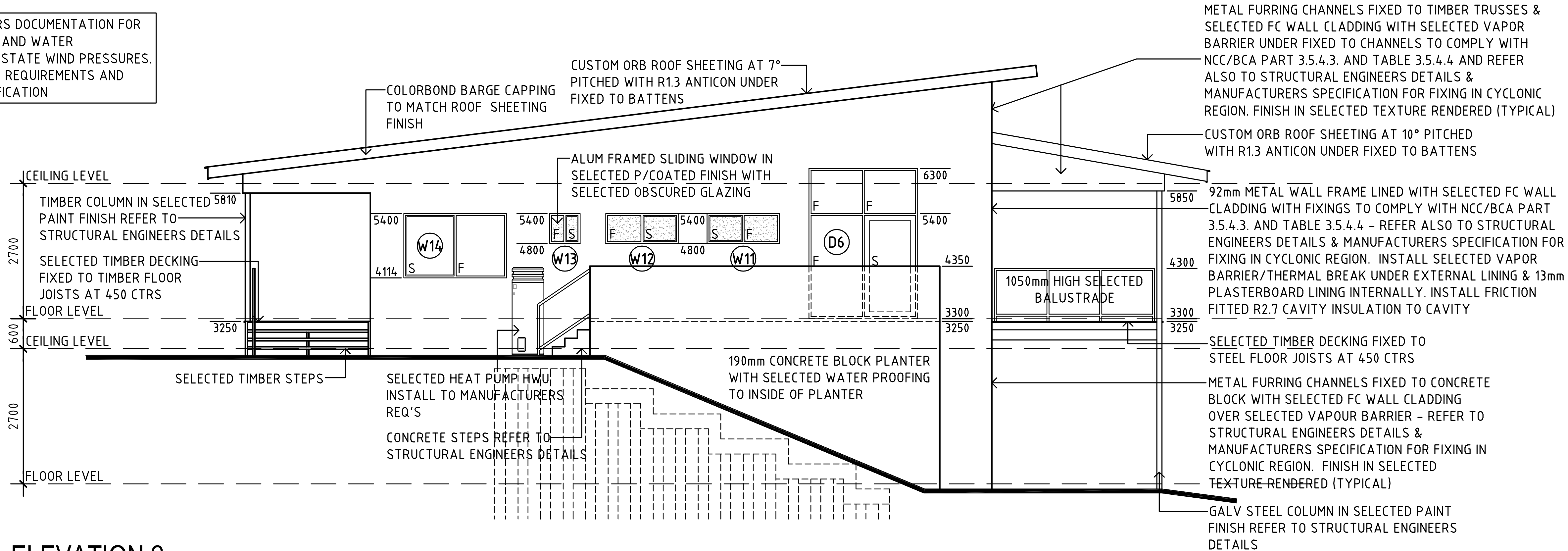
DWG TITLE: **FLOOR PLAN (UPPER)**

DATE	JULY 2022	ISSUE	PERMIT SUBMISSION
SCALE	1:100 AT A3		
DRAWN	SFM	DRAWING No	REV
CHECKED	SFM	A08 (08 OF 27)	0



ELEVATION 1
SCALE 1:100

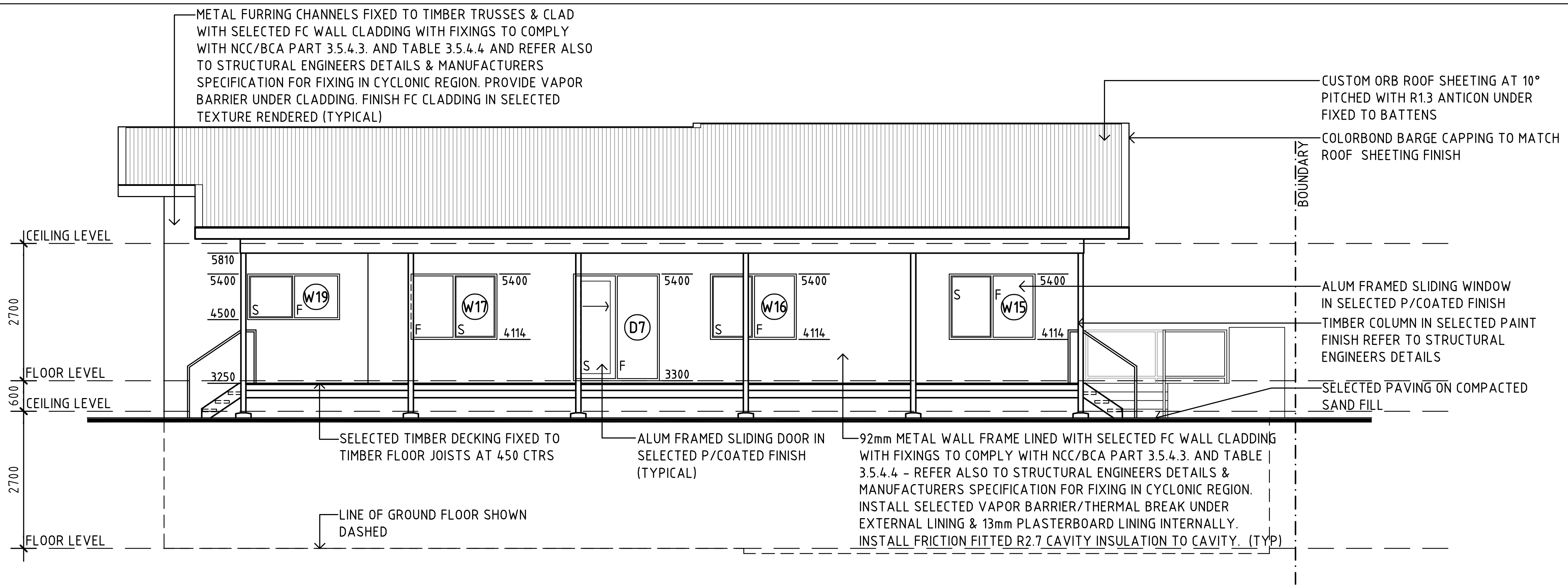
NOTE: REFER TO STRUCTURAL ENGINEERS DOCUMENTATION FOR ULTIMATE (ULS), SERVICEABILITY (SLS) AND WATER PENETRATION RESISTANCE (WPR) LIMIT STATE WIND PRESSURES. WINDOWS AND DOORS TO COMPLY WITH REQUIREMENTS AND INSTALLED TO MANUFACTURERS SPECIFICATION



ELEVATION 2
SCALE 1:100

0	12.09.22	ISSUED FOR PERMIT SUBMISSION	scribe DESIGNGROUP	DESIGNER ADDRESS: EMAIL: PHONE No:	ISSUED FOR PERMIT SUBMISSION	GOVERNMENT OF WESTERN AUSTRALIA Department of Mines, Industry Regulation and Safety

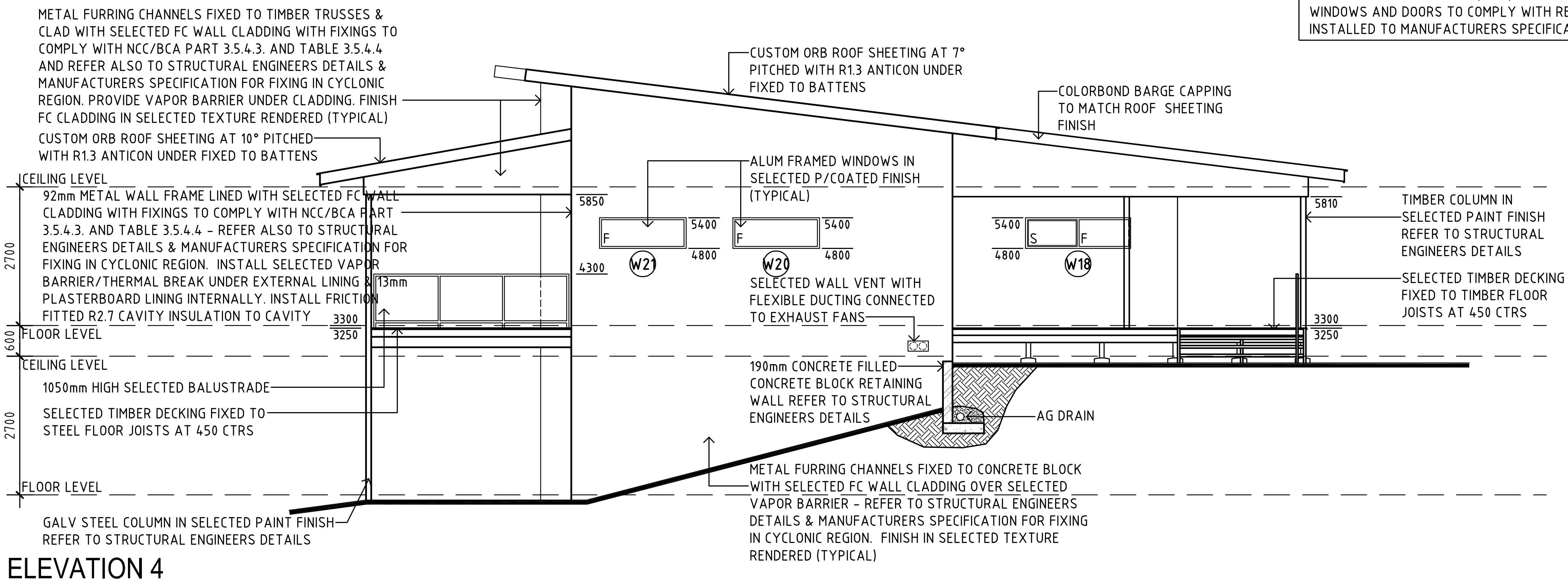
OWNER / CLIENT: **BUILDING AND ENERGY** PROJECT: CLASS 1a (TWO STOREY) EXAMPLE 1 EXAMPLE STREET, WESTERN AUSTRALIA	DWG TITLE **ELEVATIONS 1 & 2**	DATE JULY 2022 SCALE 1:100 AT A3 DRAWN SFM CHECKED SFM	ISSUE PERMIT SUBMISSION DRAWING No **A09** (09 OF 27) REV 0



ELEVATION 3

SCALE 1:100

NOTE: REFER TO STRUCTURAL ENGINEERS DOCUMENTATION FOR ULTIMATE (ULS), SERVICEABILITY (SLS) AND WATER PENETRATION RESISTANCE (WPR) LIMIT STATE WIND PRESSURES. WINDOWS AND DOORS TO COMPLY WITH REQUIREMENTS AND INSTALLED TO MANUFACTURERS SPECIFICATION



ELEVATION 4

SCALE 1:100

0	12.09.22	ISSUED FOR PERMIT SUBMISSION

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GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **ELEVATIONS 3 & 4**

DATE: JULY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: **A10** (10 OF 27)
REV: 0

NOTES

1. FINAL MANHOLE LOCATION TO BE CONFIRMED AND/OR ADJUSTED ON SITE.
2. PROVIDE POWER TO HOT PLATE, SELECTED OVEN AND DUCTED RANGEHOOD AS REQUIRED.
3. DIMMER SWITCHES TO BE INSTALLED ON LIGHTS IN BEDROOMS, LIVING AND DINING AREAS
4. ALL MECHANICAL VENTS TO BE DIRECTED TO OUTSIDE AIR AND REQURIE DRAFT STOPPERS AS PER BCA REQUIEMENTS
5. HEIGHT OF ALL FAN CONTROLS AND LIGHT SWITCHES TO BE 1000mm AFFL AS SPECIFIED (UNO)
6. RECESSED LIGHT FITTINGS TO BE SEALED WITH CANISTERS, CAPS, CONES OR BE OF A SEALED TYPE FITTING
7. MAXIMUM CEILING SUPPORT SPACING AT 600mm CENTERS

ADJUSTMENT OF MINIMUM R-VALUE FOR LOSS OF CEILING INSULATION

MINIMUM R-VALUE OF CEILING INSULATION REQUIRED TO SATISFY BCA 3.1.2.1.2(a) = R4.6

TOTAL HABITABLE CEILING AREA : AREA m^2
AREA OF FANS AND LIGHTS : 0.00 m^2

0.00 / AREA x 100 = 0.5 % OF CEILING AREA UN-INSULATED DUE TO LIGHT FITTINGS AND FANS (SEE NCC/BCA TABLE 3.4.2.1.1b)
NO ADJUSTMENT OF THE CEILING INSULATION IS REQUIRED (IF PERCENTAGE IS LESS THAT 0.5%)

R5.0 BATTS REQUIRED TO CEILING (TYPICAL)

ARTIFICIAL LIGHTING

IN ACCORDANCE WITH NCC VOL. 2, PART 3.12 ENERGY EFFICIENCY CLAUSE 3.12.5.5. "ARTIFICIAL LIGHTING" STATES LIGHT POWER DENSITY OR ILLUMINATION POWER DENSITY OF ARTIFICIAL LIGHTING MUST NOT EXCEED THE FOLLOWING:

i) CLASS 1 BUILDING, 5W/m^2

TOTAL FLOOR AREA	10.00	m^2 =	50.00	W (Max)

ii) VERANDAH, BALCONY OUTDOOR AREA, 4W/m^2

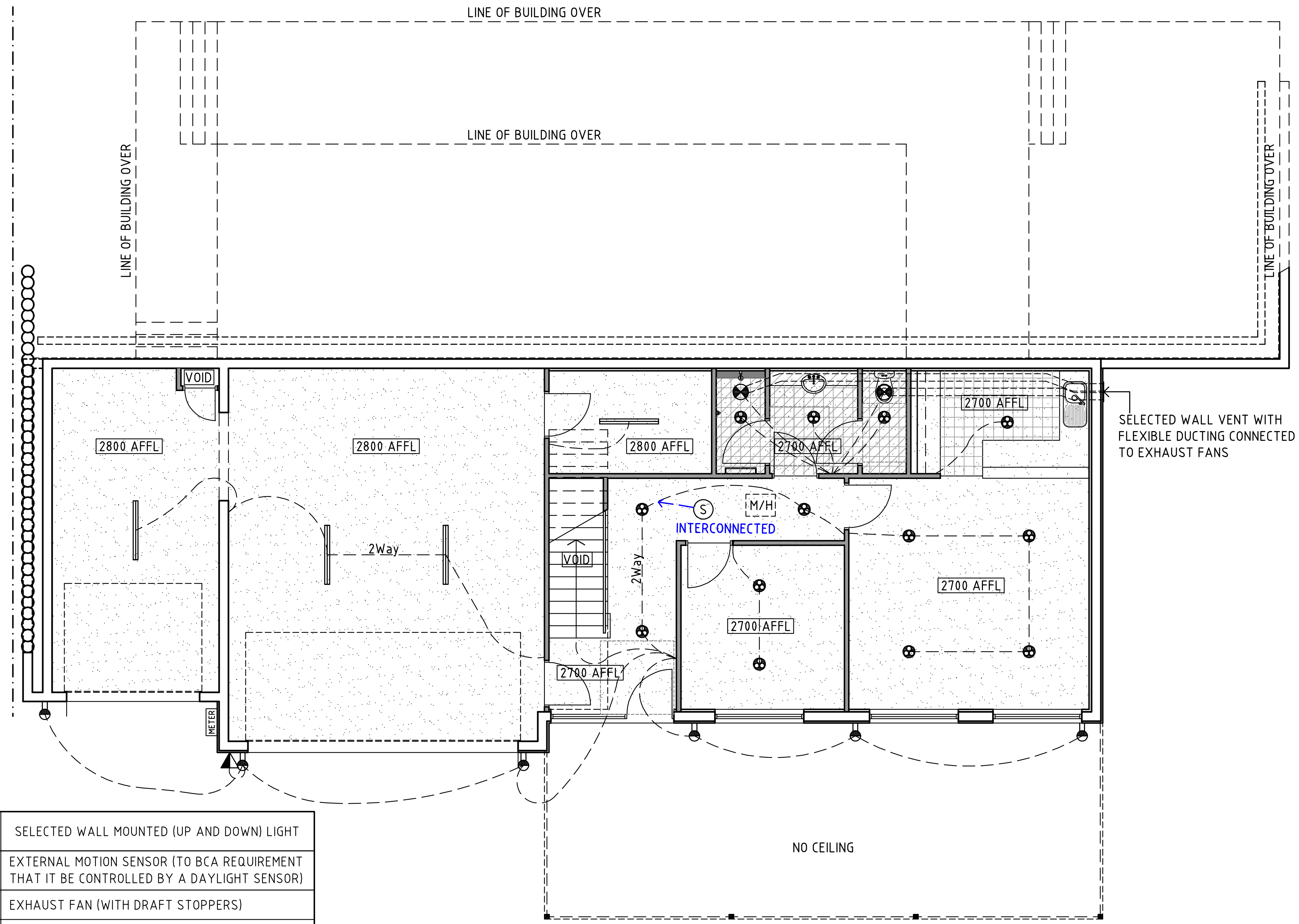
TOTAL AREA	1.00	m^2 =	4.00	W (Max)

iii) CLASS 10a (GARAGE, CARPORT, SHED OR STORE) ASSOCIATED WITH A A CLASS 1 BUILDING, 3W/m^2

TOTAL AREA	1.00	m^2 =	3.00	W (Max)

CEILING LEGEND

	SELECTED TIMBER SOFFIT LINING WITH CLEAR SEAL (SATIN)		13mm THICK AQUACHEK GYPROCK CEILING IN SELECTED PAINT FINISH
	13mm THICK STANDARD GYPROCK CEILING IN SELECTED PAINT FINISH		4.5mm FIBRE CEMENT SHEET EAVES LINING WITH PROPRIETARY STRIP/JOINTING SYSTEM



SELECTED WALL VENT WITH FLEXIBLE DUCTING CONNECTED TO EXHAUST FANS

ELECTRICAL LEGEND

(symbol)	CEILING SWEEP FAN 1200 DIA (U.N.O.)
(symbol)	RECESSED LIGHT - LED
(symbol)	1200mm LED SURFACE MOUNTED BATTEN LIGHT
(symbol)	WALL LIGHT
(symbol)	SELECTED WALL MOUNTED (UP AND DOWN) LIGHT
(symbol)	EXTERNAL MOTION SENSOR (TO BCA REQUIREMENT THAT IT BE CONTROLLED BY A DAYLIGHT SENSOR)
(symbol)	EXHAUST FAN (WITH DRAFT STOPPERS)
METER	ELEC M/BOX WITH 2xRCD UNITS (1 FOR GPOs & 1 FOR LIGHTS) AS PER ELECTRICITY ACT 1945
S	SMOKE ALARMS TO AS3786-2014 & PART 3.7.5. (SMOKE ALARM REQUIREMENTS) OF CURRENT BCA SMOKE ALARMS TO BE INTERCONNECTED & HARD WIRED TO MAINS POWER WITH BATTERY BACK UP.

CEILING & LIGHTING PLAN (GROUND)

SCALE 1:100

0	12.09.22	ISSUED FOR PERMIT SUBMISSION

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GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE **CEILING & LIGHTING PLAN (GROUND)**

DATE	JULY 2022	ISSUE	PERMIT SUBMISSION
SCALE	1:100 AT A3		
DRAWN	SFM	DRAWING No	REV
CHECKED	SFM	A11 (11 OF 27)	0

NOTES

1. FINAL MANHOLE LOCATION TO BE CONFIRMED AND/OR ADJUSTED ON SITE.
2. PROVIDE POWER TO HOT PLATE, SELECTED OVEN AND DUCTED RANGEHOOD AS REQUIRED.
3. DIMMER SWITCHES TO BE INSTALLED ON LIGHTS IN BEDROOMS, LIVING AND DINING AREAS
4. ALL MECHANICAL VENTS TO BE DIRECTED TO OUTSIDE AIR AND REQURIE DRAFT STOPPERS AS PER BCA REQUIEMENTS
5. HEIGHT OF ALL FAN CONTROLS AND LIGHT SWITCHES TO BE 1000mm AFFL AS SPECIFIED (UNO)
6. RECESSED LIGHT FITTINGS TO BE SEALED WITH CANISTERS, CAPS, CONES OR BE OF A SEALED TYPE FITTING
7. MAXIMUM CEILING SUPPORT SPACING AT 600mm CENTERS

ADJUSTMENT OF MINIMUM R-VALUE FOR LOSS OF CEILING INSULATION

MINIMUM R-VALUE OF CEILING INSULATION REQUIRED TO SATISFY BCA 3.1.2.1.2(a) = R4.6

TOTAL HABITABLE CEILING AREA : AREA m^2
AREA OF FANS AND LIGHTS : 0.00 m^2

0.00 / AREA x 100 = 0.5 % OF CEILING AREA UN-INSULATED DUE TO LIGHT FITTINGS AND FANS (SEE NCC/BCA TABLE 3.4.2.1.1b)
NO ADJUSTMENT OF THE CEILING INSULATION IS REQUIRED (IF PERCENTAGE IS LESS THAT 0.5%)

R5.0 BATTS REQUIRED TO CEILING (TYPICAL)

ARTIFICIAL LIGHTING

IN ACCORDANCE WITH NCC VOL. 2, PART 3.12 ENERGY EFFICIENCY CLAUSE 3.12.5.5. "ARTIFICIAL LIGHTING" STATES LIGHT POWER DENSITY OR ILLUMINATION POWER DENSITY OF ARTIFICIAL LIGHTING MUST NOT EXCEED THE FOLLOWING:

i) CLASS 1 BUILDING, 5W/m^2

TOTAL FLOOR AREA	10.00	m^2 =	50.00	W (Max)

ii) VERANDAH, BALCONY OUTDOOR AREA, 4W/m^2

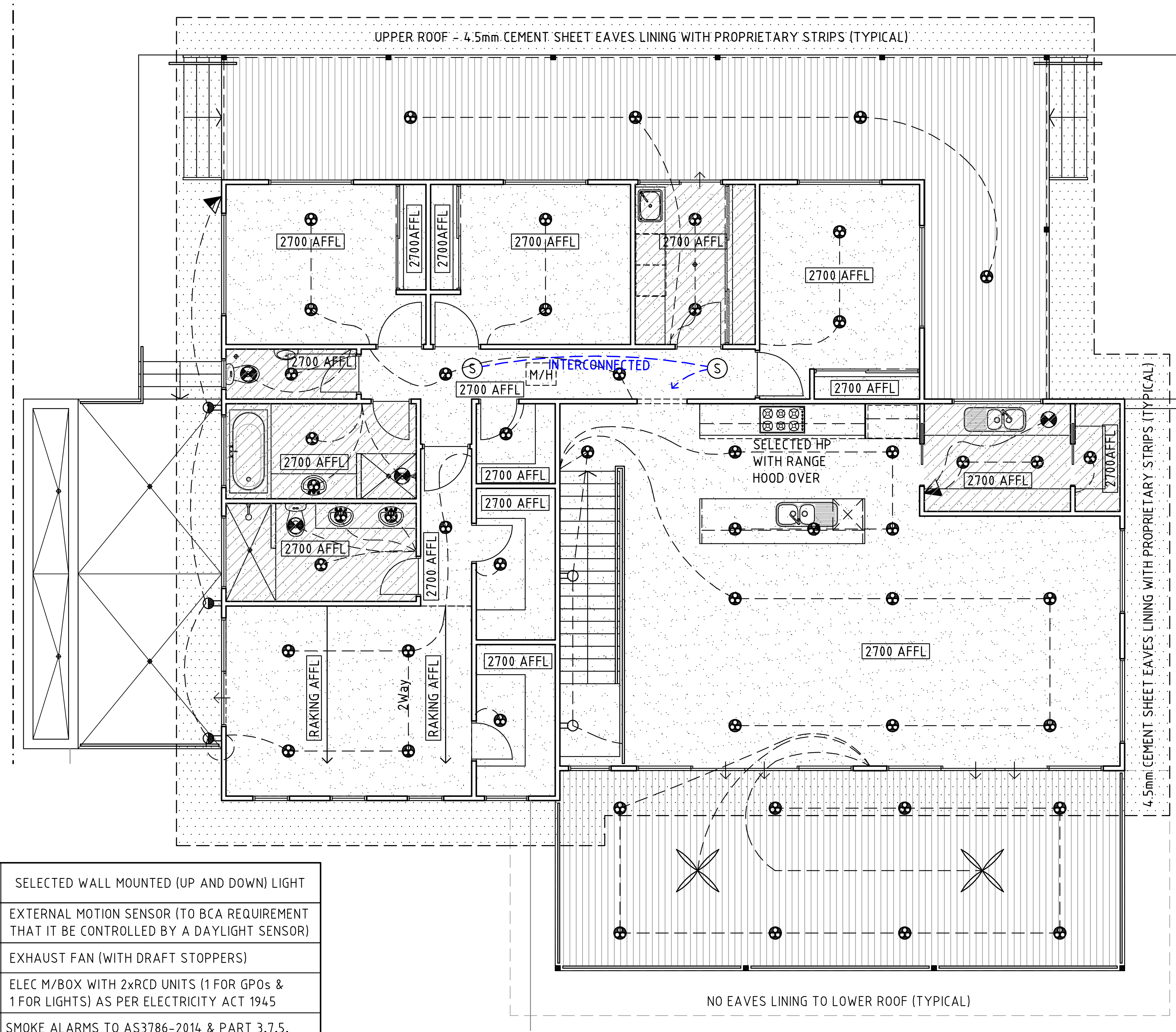
TOTAL AREA	1.00	m^2 =	4.00	W (Max)

iii) CLASS 10a (GARAGE, CARPORT, SHED OR STORE) ASSOCIATED WITH A A CLASS 1 BUILDING, 3W/m^2

TOTAL AREA	1.00	m^2 =	3.00	W (Max)

CEILING LEGEND

(vertical line hatch)	SELECTED TIMBER SOFFIT LINING WITH CLEAR SEAL (SATIN)	(diagonal hatch)	13mm THICK AQUACHEK GYPROCK CEILING IN SELECTED PAINT FINISH
(speckle hatch)	13mm THICK STANDARD GYPROCK CEILING IN SELECTED PAINT FINISH	(dot hatch)	4.5mm FIBRE CEMENT SHEET EAVES LINING WITH PROPRIETARY STRIP/JOINTING SYSTEM



CEILING & LIGHTING PLAN (UPPER)

SCALE 1:100

ELECTRICAL LEGEND

(fan symbol)	CEILING SWEEP FAN 1200 DIA (U.N.O.)	(symbol)	SELECTED WALL MOUNTED (UP AND DOWN) LIGHT
		(symbol)	EXTERNAL MOTION SENSOR (TO BCA REQUIREMENT THAT IT BE CONTROLLED BY A DAYLIGHT SENSOR)
		(symbol)	EXHAUST FAN (WITH DRAFT STOPPERS)
(symbol)	RECESSED LIGHT - LED	METER	ELEC M/BOX WITH 2xRCD UNITS (1 FOR GPOs & 1 FOR LIGHTS) AS PER ELECTRICITY ACT 1945
(symbol)	1200mm LED SURFACE MOUNTED BATTEN LIGHT	S	SMOKE ALARMS TO AS3786-2014 & PART 3.7.5. (SMOKE ALARM REQUIREMENTS) OF CURRENT BCA SMOKE ALARMS TO BE INTERCONNECTED & HARD WIRED TO MAINS POWER WITH BATTERY BACK UP.
(symbol)	WALL LIGHT		

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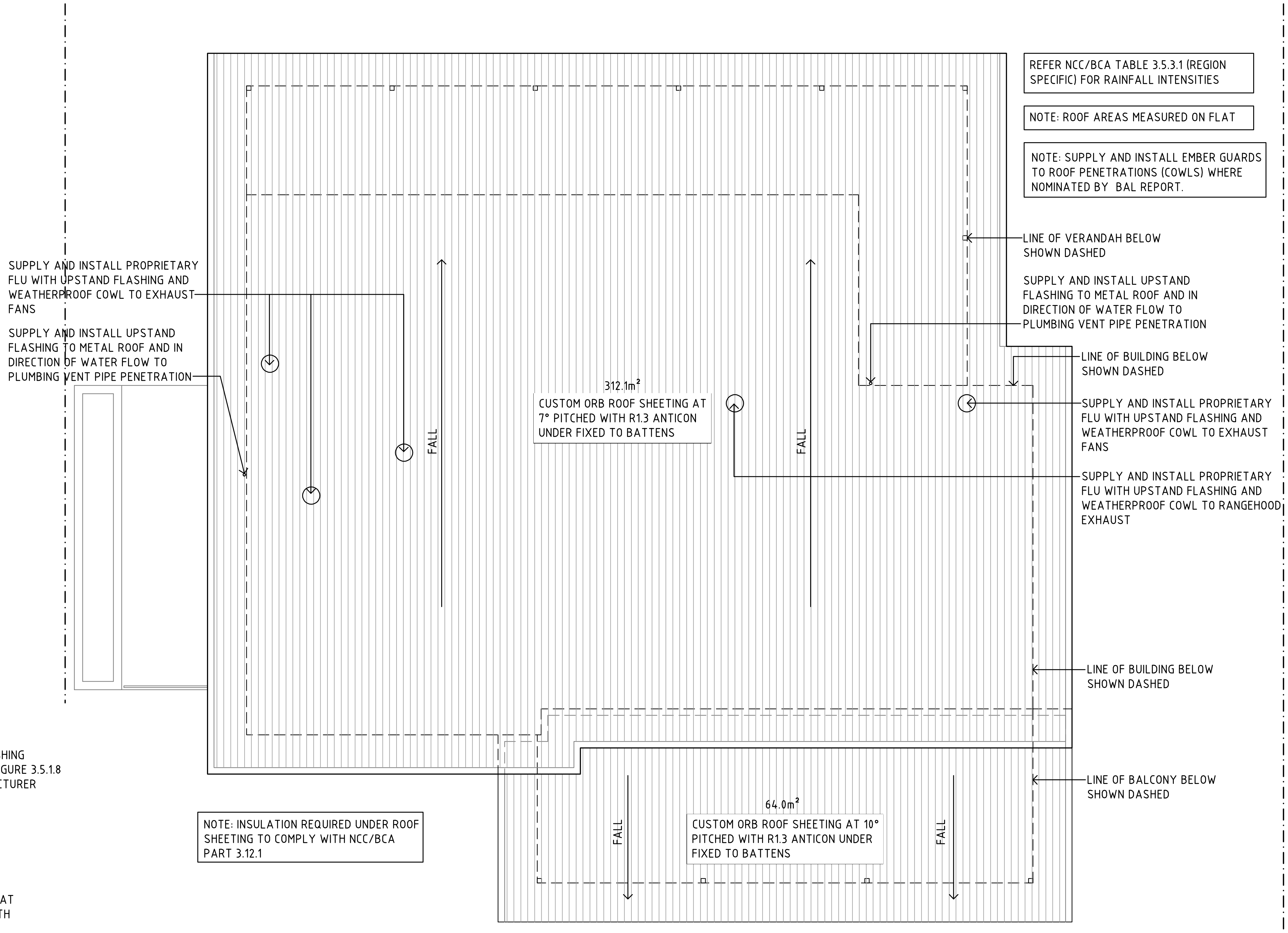
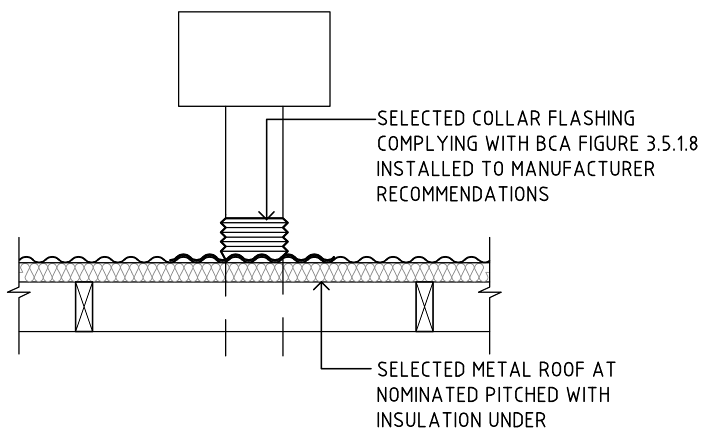
GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **CEILING & LIGHTING PLAN (UPPER)**

DATE: JULY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: **A12** (12 OF 27)
REV: 0





FLU / PENETRATION DETAILS

SCALE 1:20

ROOF PLAN

SCALE 1:100

N

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PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

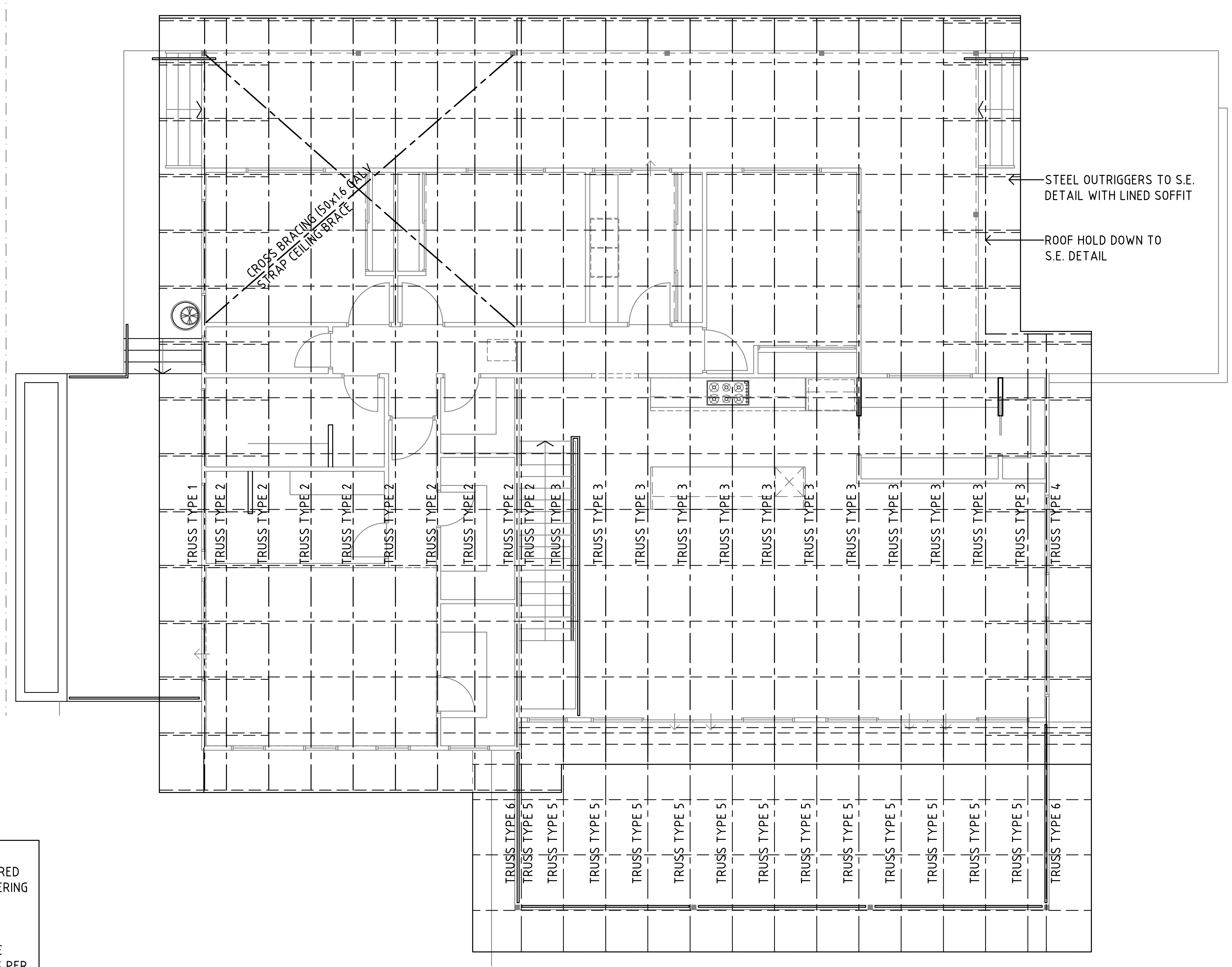
DWG TITLE: **ROOF PLAN**

DATE: JULY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: **A13** (13 OF 27)
REV: 0

NOTE: STEEL CLADDING, CONNECTION AND SUPPORTING MEMBERS TO BE DESIGNED IN ACCORDANCE WITH LYSAUGHT "CYCLONIC AREA DESIGN MANUAL" 7TH AUGUST 2019, AND SHALL COMPLY WITH NCC/BCA VOLUME 2 PART 3.10.1 (LOW HIGH LOW) TESTING REQUIREMENTS.

NOTE: ROOF TRUSSES
S.W. TIMBER NAIL PLATED ROOF TRUSSES, SPACING AT MAXIMUM 900mm CENTERS, ARE TO BE MANUFACTURED IN ACCORDANCE WITH AN APPROVED MANUFACTURERS SPECIFICATION. WIND LOAD DESIGN CRITERIA SHALL BE IN ACCORDANCE WITH AS1170.2:2011

NOTE: GIRDER TRUSSES
HEAVY DUTY TIE-DOWN BRACKETS ARE TO BE PROVIDED FOR THE GIRDER TRUSSES AS DETERMINED BY THE MANUFACTURER'S SPECIFICATION AND FIX TO STIFFENED TOP PLATES AND BEAMS AS REQUIRED.



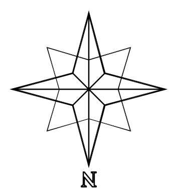
ROOF CLADDING	
MATERIAL	COLORBOND ULTRA
PROFILE	CUSTOM ORB
THICKNESS	0.42 BMT
CYCLONIC WASHERS	YES
FIXING SPACING / LOCATION	CREST FIX, EVERY SECOND RIDGE
FASTENERS	FIXING TO S.W. BATTEN
	BUILDEX M6.5-12x55mm "CORRILOK" CYCLONE ASSEMBLY ROOFZIPS CL4 OR EQUIVALENT
NOTE: REFER MANUFACTURERS INSTALLATION MANUAL FOR ADDITIONAL REQUIREMENTS AND SPECIFICATION	

BATTENS TO TRUSSES	
TRUSS SPACING	900mm
MATERIAL	45x70
THICKNESS/GRADE	MGP10
SPACING	REFER DETAIL
FIXING SPACING / LOCATION	FIXING TO TIMBER
FASTENERS	No 14-10x100mm TYPE 17 BUGLE HEAD SELF DRILLING SELF TAPPING SCREW

NOTE: TRUSS TIE DOWN AS PER MANUFACTURERS SPECIFICATION

TRUSS LAYOUT SHOWN IS INDICATIVE ONLY. TRUSSES TO BE DESIGNED AND MANUFACTURED USING PRYDA OR SIMILAR CERTIFIED ENGINEERING SOFTWARE.
TRUSS MANUFACTURER'S LAYOUT TAKES PRECEDENCE.
BRACING LAYOUT AND REQUIREMENTS TO BE CONFIRMED BY ENGINEER AND INSTALLED AS PER THEIR REQUIREMENTS.

WIND DIRECTION AND BRACING CALCULATIONS TO BE SHOWN, UNLESS DRAWINGS ARE PROVIDED OR CERTIFIED BY A STRUCTURAL ENGINEER.



ROOF STRUCTURE PLAN
SCALE 1:100

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Department of Mines, Industry Regulation and Safety

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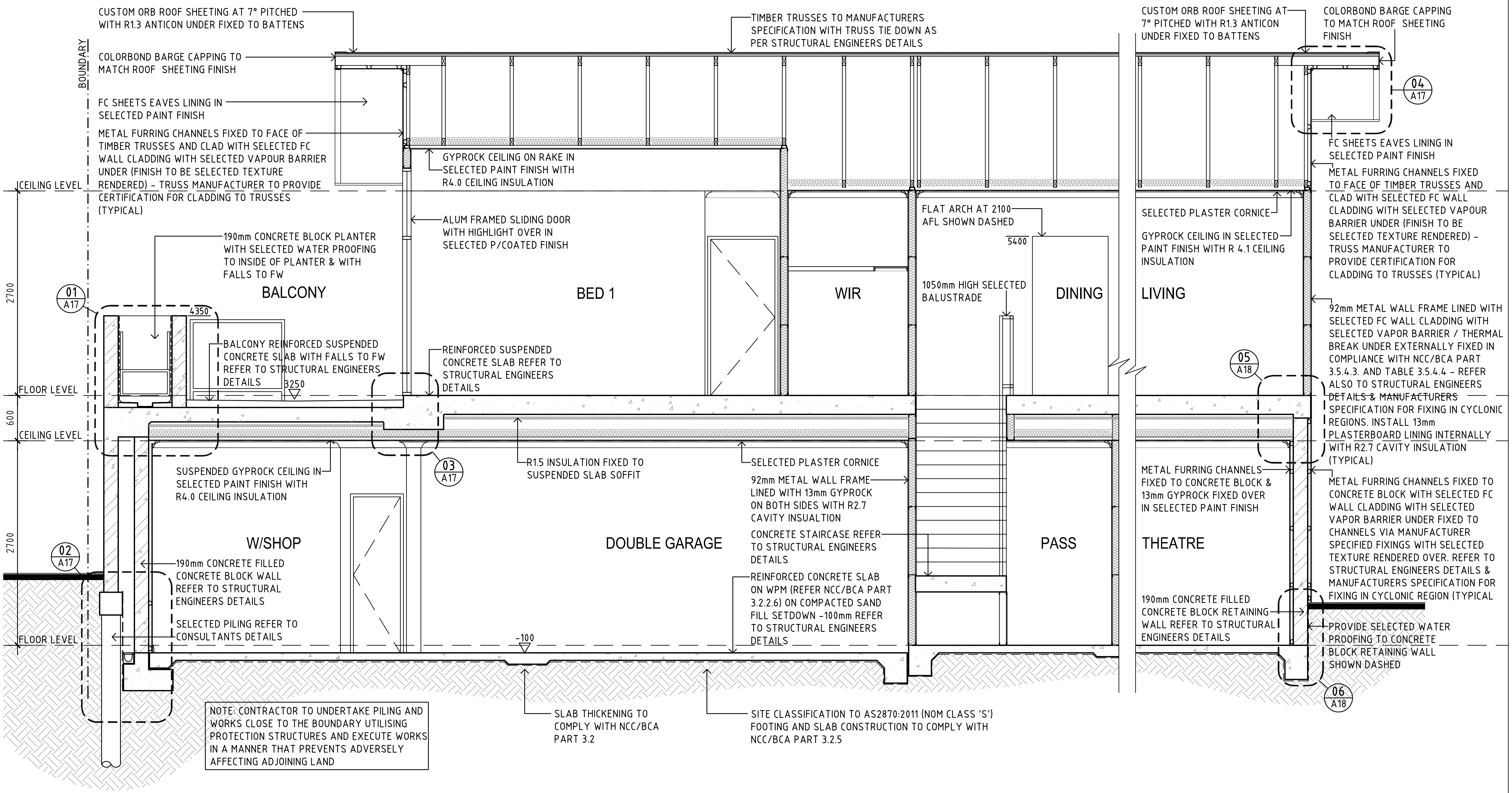
PROJECT:
CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE
ROOF STRUCTURE PLAN

DATE: JULY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: **A14** (14 OF 27)
REV: 0



SECTION A-A

SCALE 1:50

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Department of Mines, Industry Regulation and Safety

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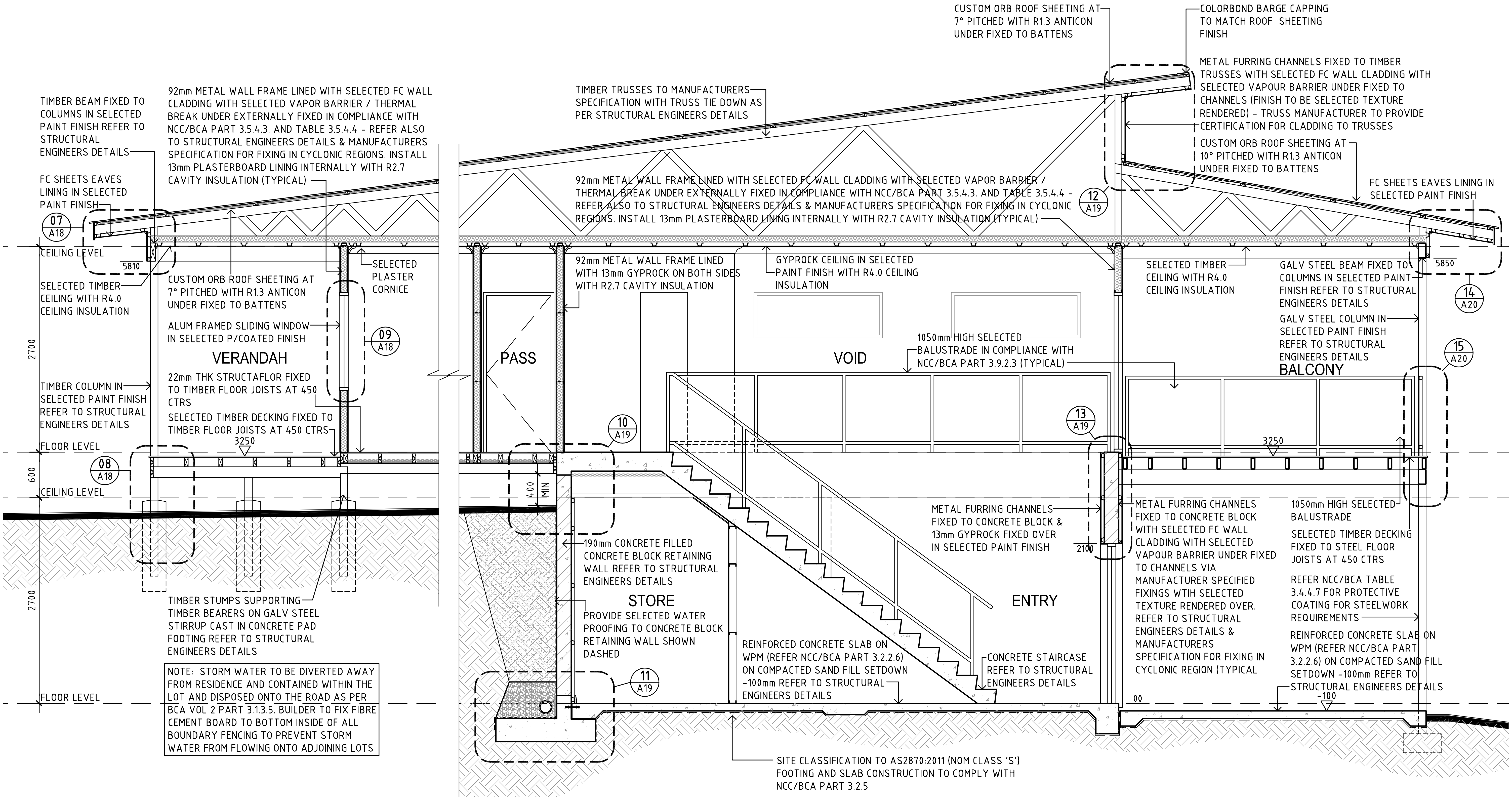
CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE
SECTION A-A

DATE	JULY 2022	ISSUE	PERMIT SUBMISSION
SCALE	1:100 AT A3		
DRAWN	SFM	DRAWING No	REV
CHECKED	SFM	**A15** (15 OF 27)	0



SECTION B-B

SCALE 1:50

REV	DATE	DESCRIPTION
0	12.09.22	ISSUED FOR PERMIT SUBMISSION

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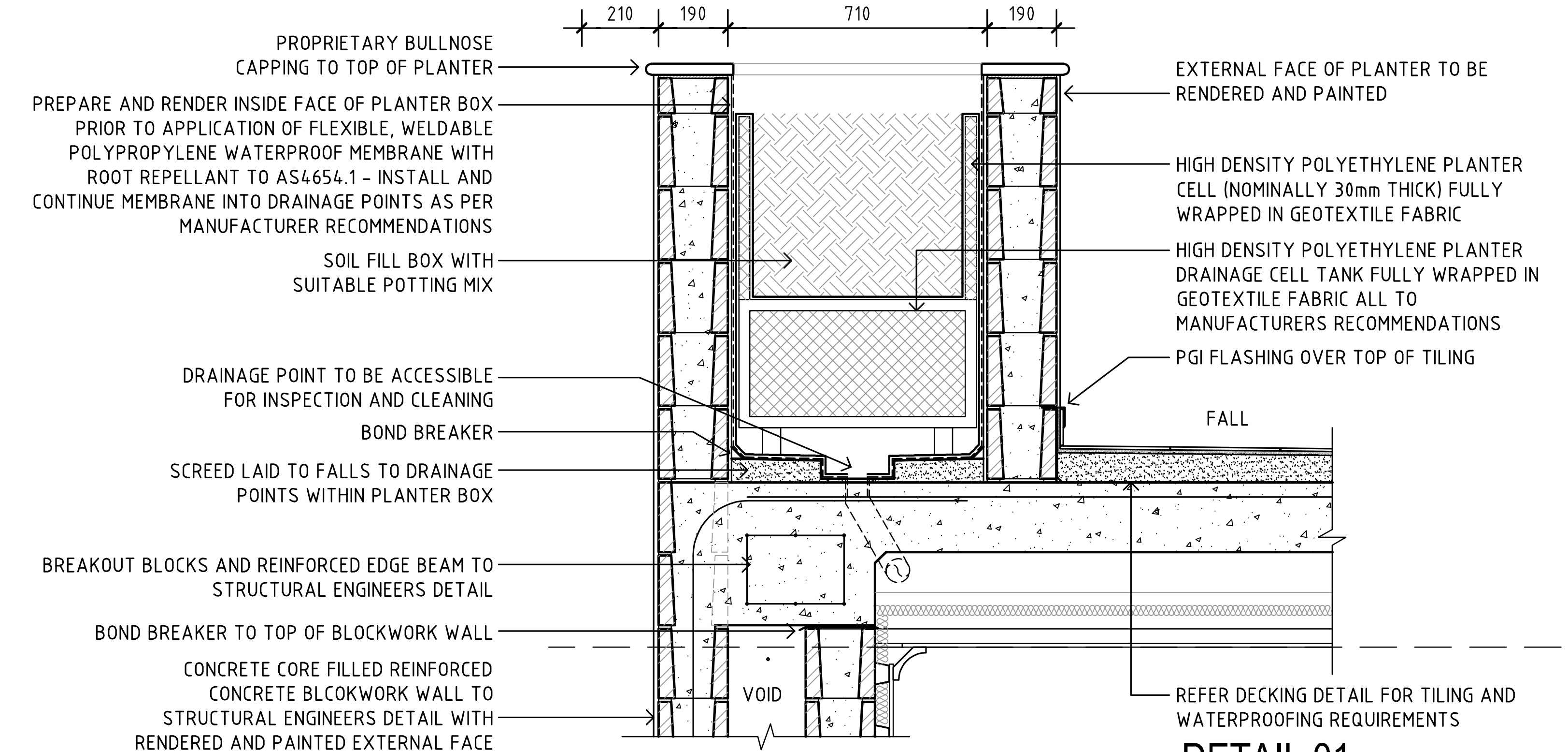
GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

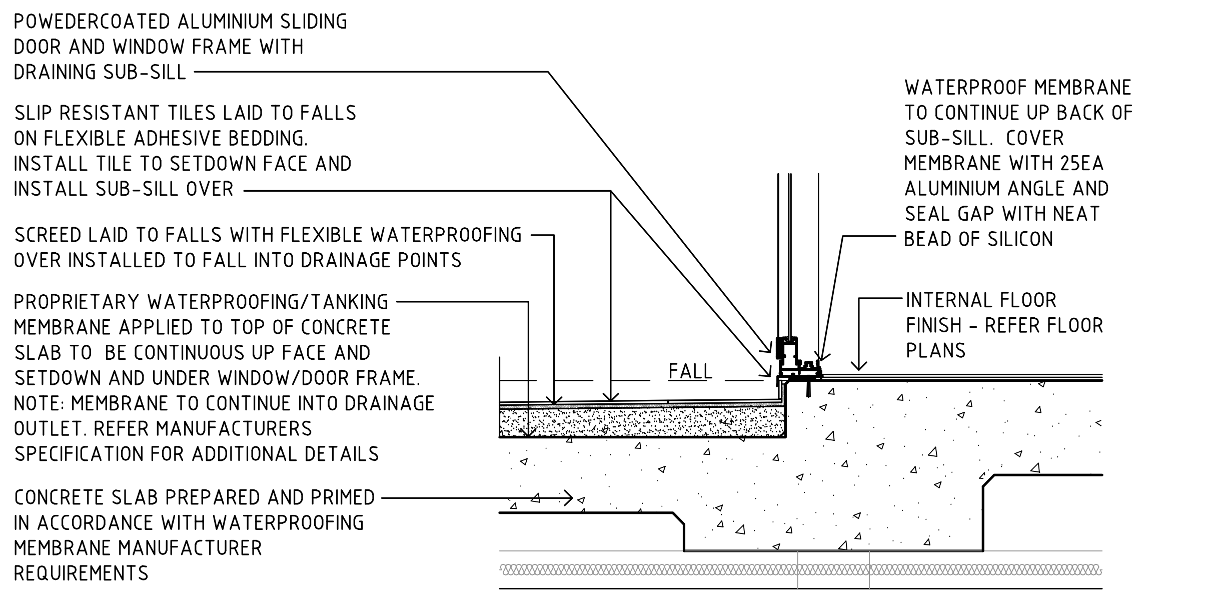
OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **SECTION B-B**

DATE: JULY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: **A16** (16 OF 27)
REV: 0



DETAIL 01
SCALE 1:20

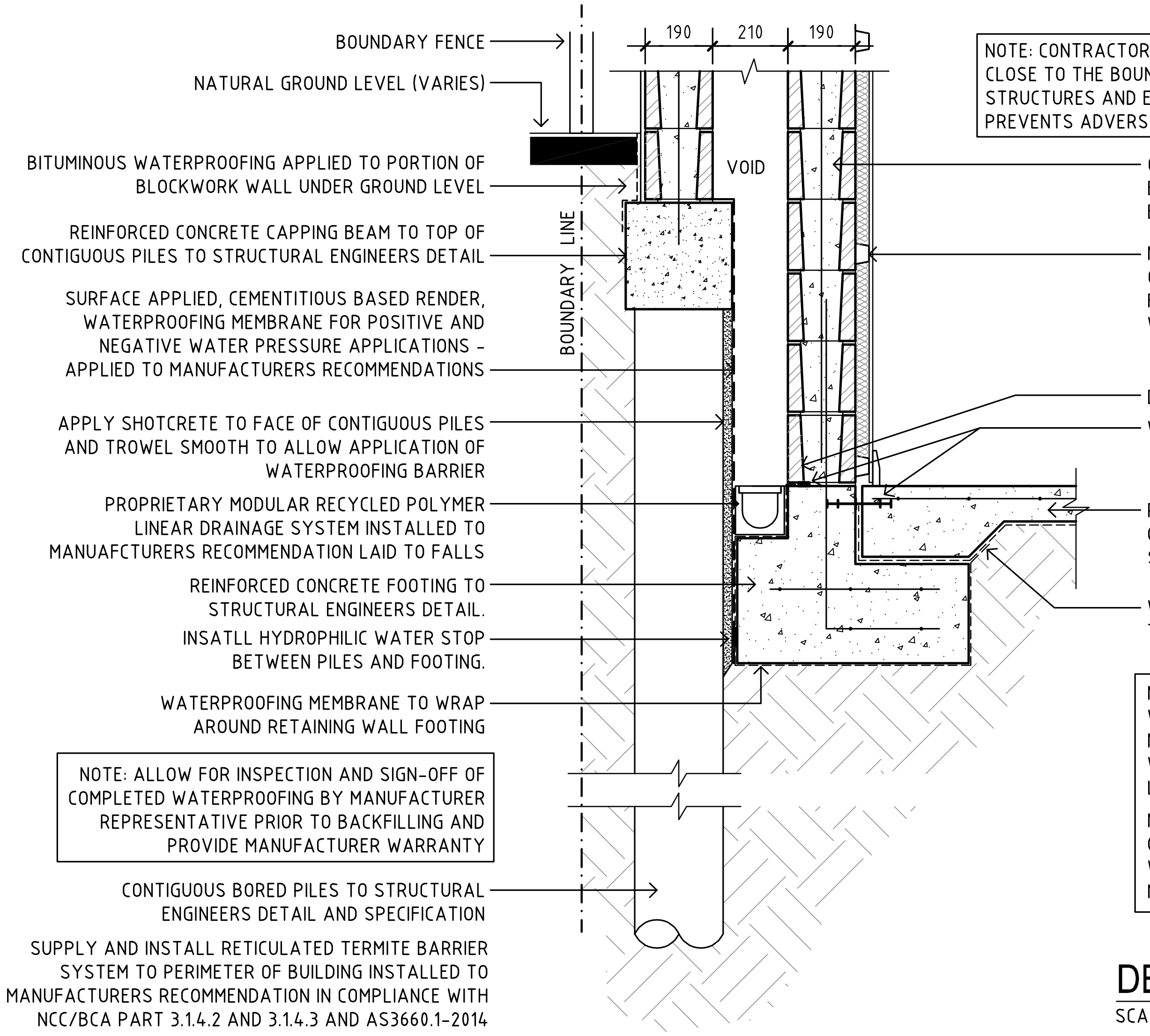


NOTE: PREPARE SUBSTRATES TO ACCEPT WATERPROOFING MEMBRANES IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. WATERPROOFING MUST FORM AN IMPERMEABLE LAYER ON THE SURFACE OF THE SUBSTRATE.

NOTE: SUPPLY AND INSTALL ALL PRIMERS, TAPES, OVERLAPS, CORNERS AND ACCESSORIES FOR WATERPROOFING/TANKING SYSTEM AS PER MANUFACTURERS RECOMMENDATIONS

DETAIL 03
SCALE 1:20

NOTE: CONTRACTOR TO UNDERTAKE PILING AND WORKS CLOSE TO THE BOUNDARY UTILISING PROTECTION STRUCTURES AND EXECUTE WORKS IN A MANNER THAT PREVENTS ADVERSELY AFFECTING ADJOINING LAND

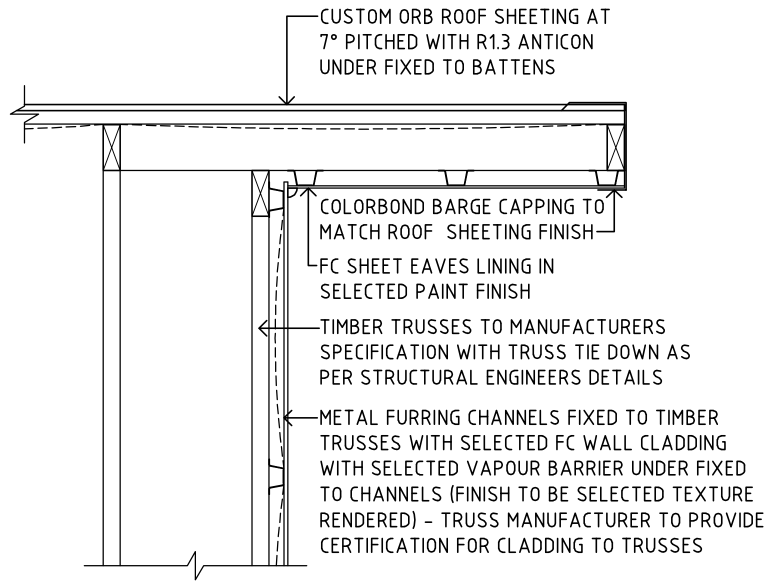


NOTE: ALLOW FOR INSPECTION AND SIGN-OFF OF COMPLETED WATERPROOFING BY MANUFACTURER REPRESENTATIVE PRIOR TO BACKFILLING AND PROVIDE MANUFACTURER WARRANTY

NOTE: PREPARE SUBSTRATES TO ACCEPT WATERPROOFING MEMBRANES IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. WATERPROOFING MUST FORM AN IMPERMEABLE LAYER ON THE SURFACE OF THE SUBSTRATE.

NOTE: SUPPLY AND INSTALL ALL PRIMERS, TAPES, OVERLAPS, CORNERS AND ACCESSORIES FOR WATERPROOFING/TANKING SYSTEM AS PER MANUFACTURERS RECOMMENDATIONS

DETAIL 02
SCALE 1:20



DETAIL 04
SCALE 1:20

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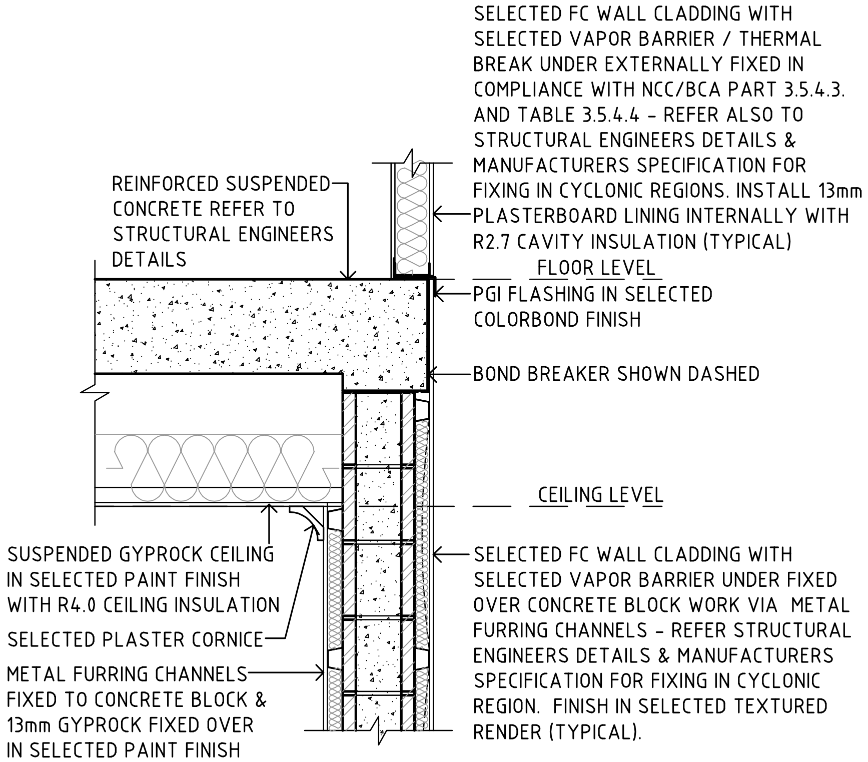
GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT:
BUILDING AND ENERGY
PROJECT:
CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

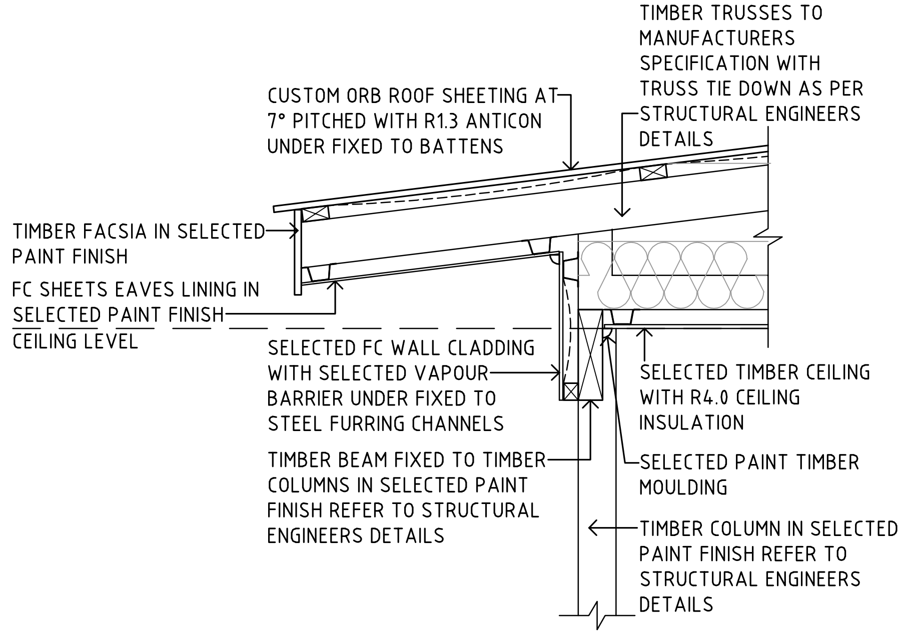
DWG TITLE
CONSTRUCTION DETAILS

DATE: MAY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: A17 (17 OF 27)
REV: 0



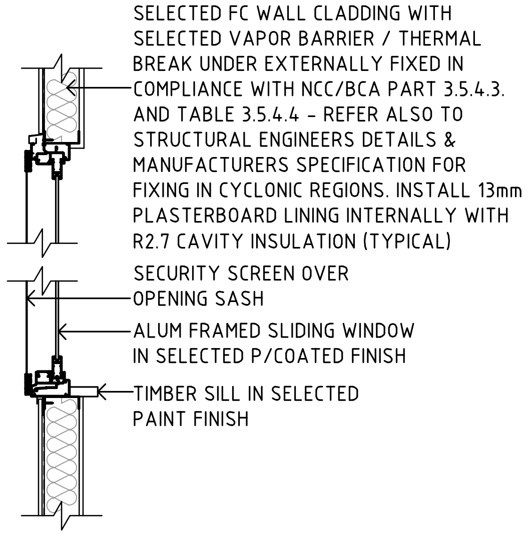
DETAIL 05

SCALE 1:20



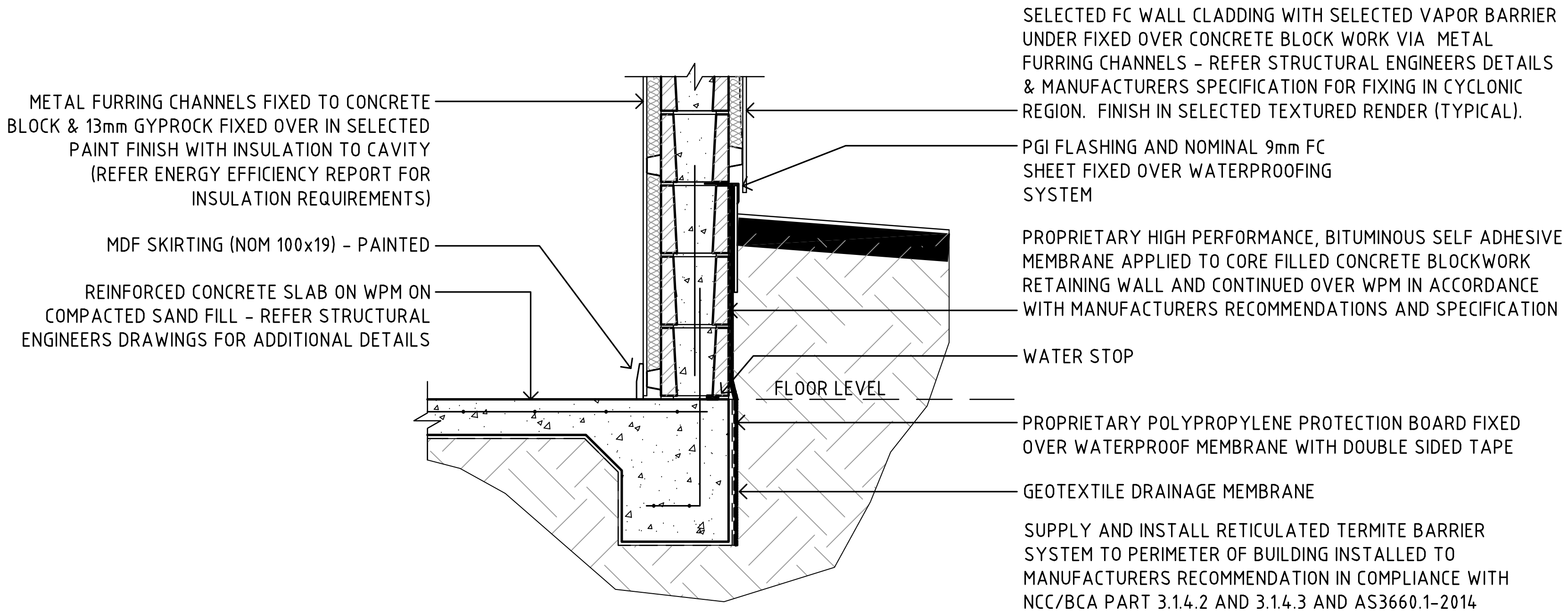
DETAIL 07

SCALE 1:20



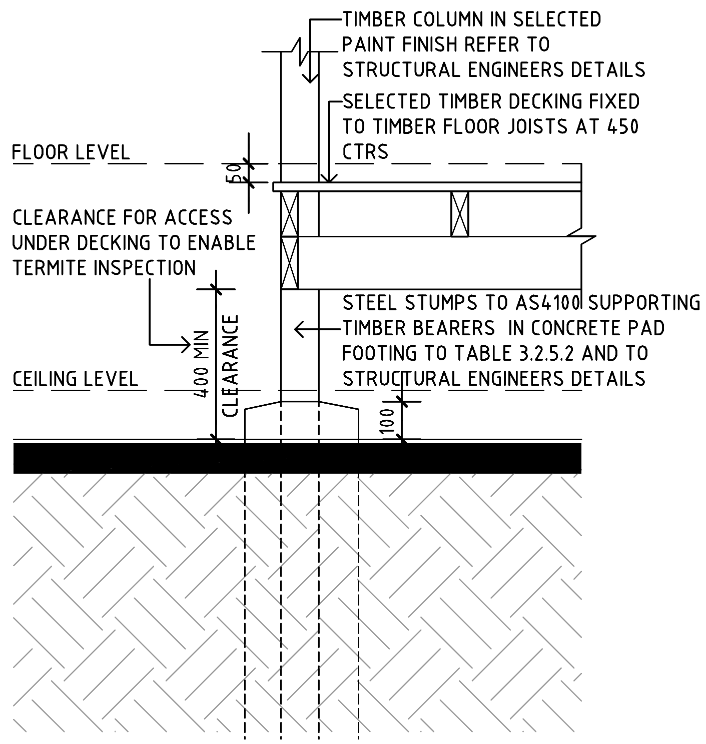
DETAIL 09

SCALE 1:20



DETAIL 06

SCALE 1:20



DETAIL 08

SCALE 1:20

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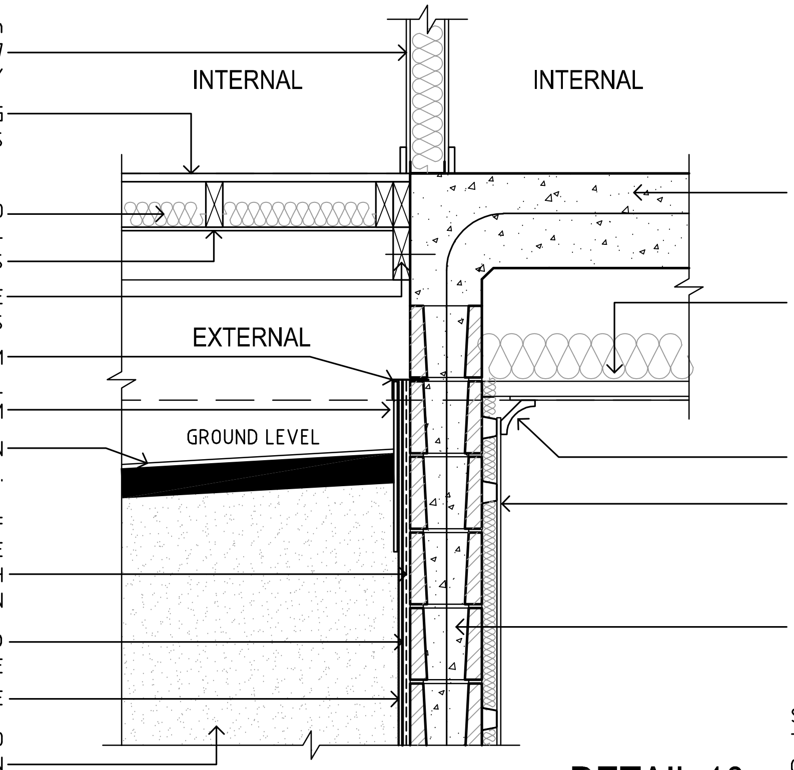
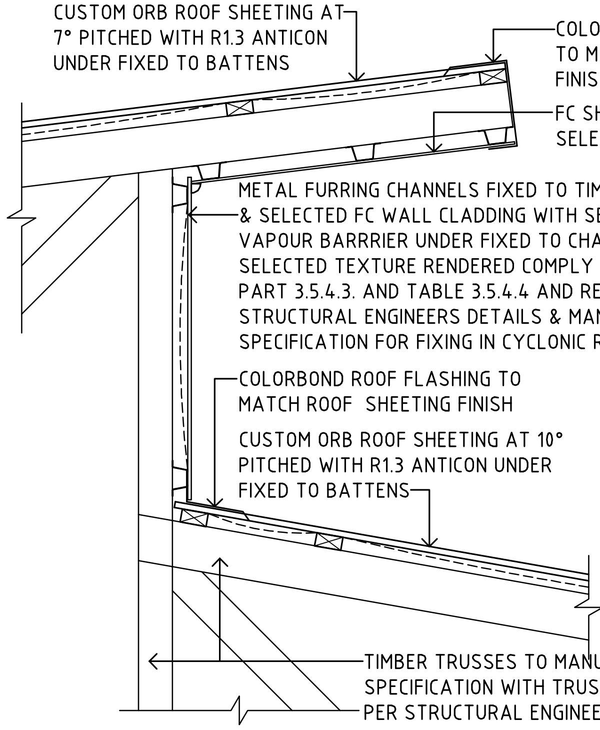
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE, 1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **CONSTRUCTION DETAILS**

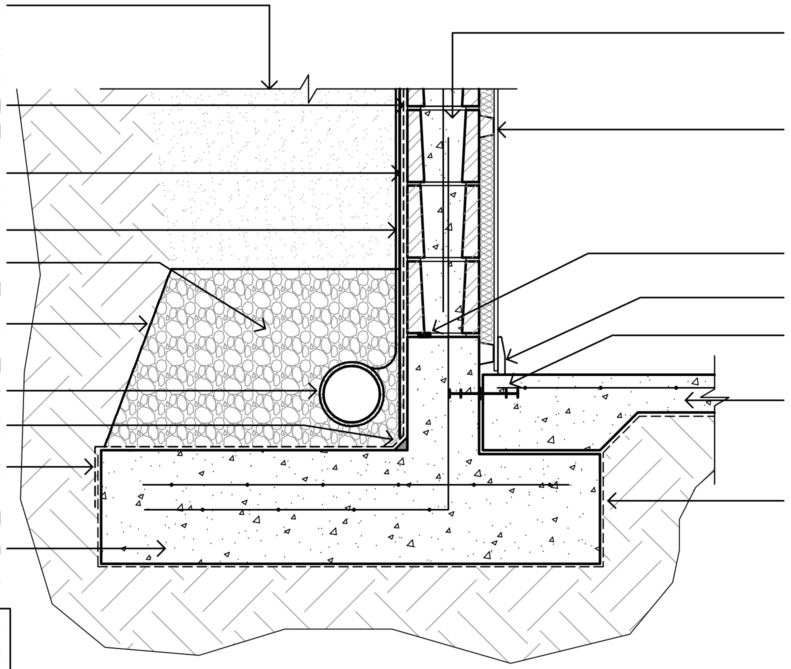
DATE	SCALE	DRAWN	CHECKED	ISSUE	DRAWING No	REV
JULY 2022	1:100 AT A3	SFM	SFM	PERMIT SUBMISSION	A18 (18 OF 27)	0



DETAIL 10
SCALE 1:20



DETAIL 12
SCALE 1:20

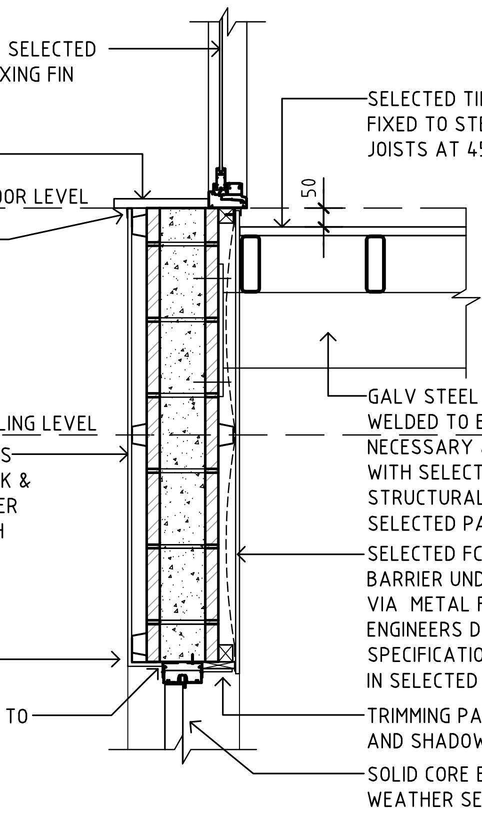


NOTE: ALLOW FOR INSPECTION AND SIGN-OFF OF COMPLETED WATERPROOFING BY MANUFACTURER REPRESENTATIVE PRIOR TO BACKFILLING AND PROVIDE MANUFACTURER WARRANTY

DETAIL 11
SCALE 1:20

NOTE: PREPARE SUBSTRATES TO ACCEPT WATERPROOFING MEMBRANES IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. WATERPROOFING MUST FORM AN IMPERMEABLE LAYER ON THE SURFACE OF THE SUBSTRATE.

NOTE: SUPPLY AND INSTALL ALL PRIMERS, TAPES, OVERLAPS, CORNERS AND ACCESSORIES FOR WATERPROOFING/TANKING SYSTEM AS PER MANUFACTURERS RECOMMENDATIONS



DETAIL 13
SCALE 1:20

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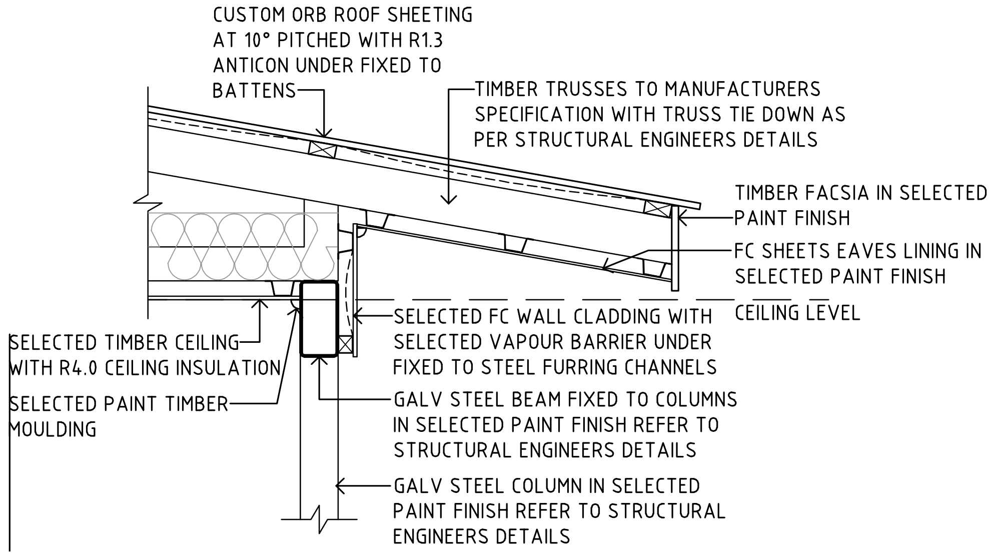
CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

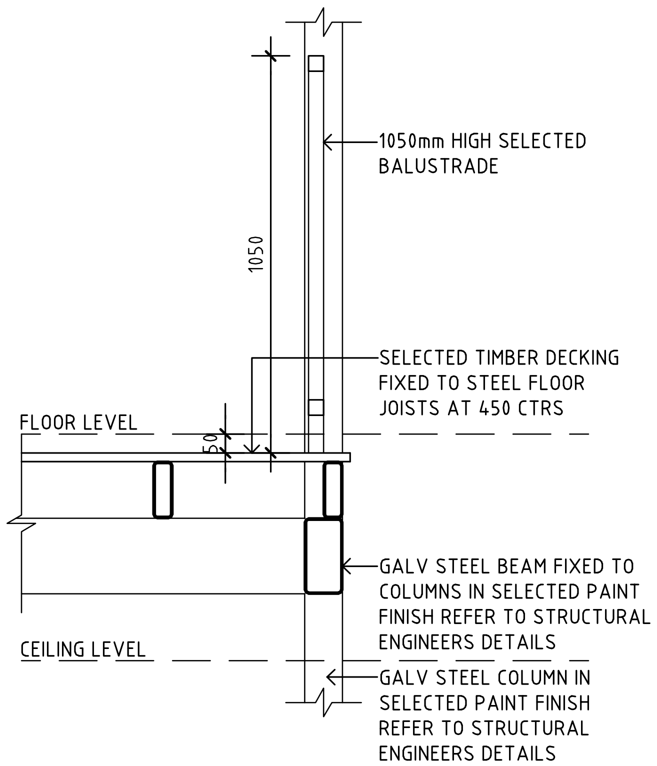
DWG TITLE
CONSTRUCTION DETAILS

DATE: JULY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
CHECKED: SFM
ISSUE: PERMIT SUBMISSION
DRAWING No: **A19** (19 OF 27)
REV: 0



DETAIL 14

SCALE 1:20



DETAIL 15

SCALE 1:20

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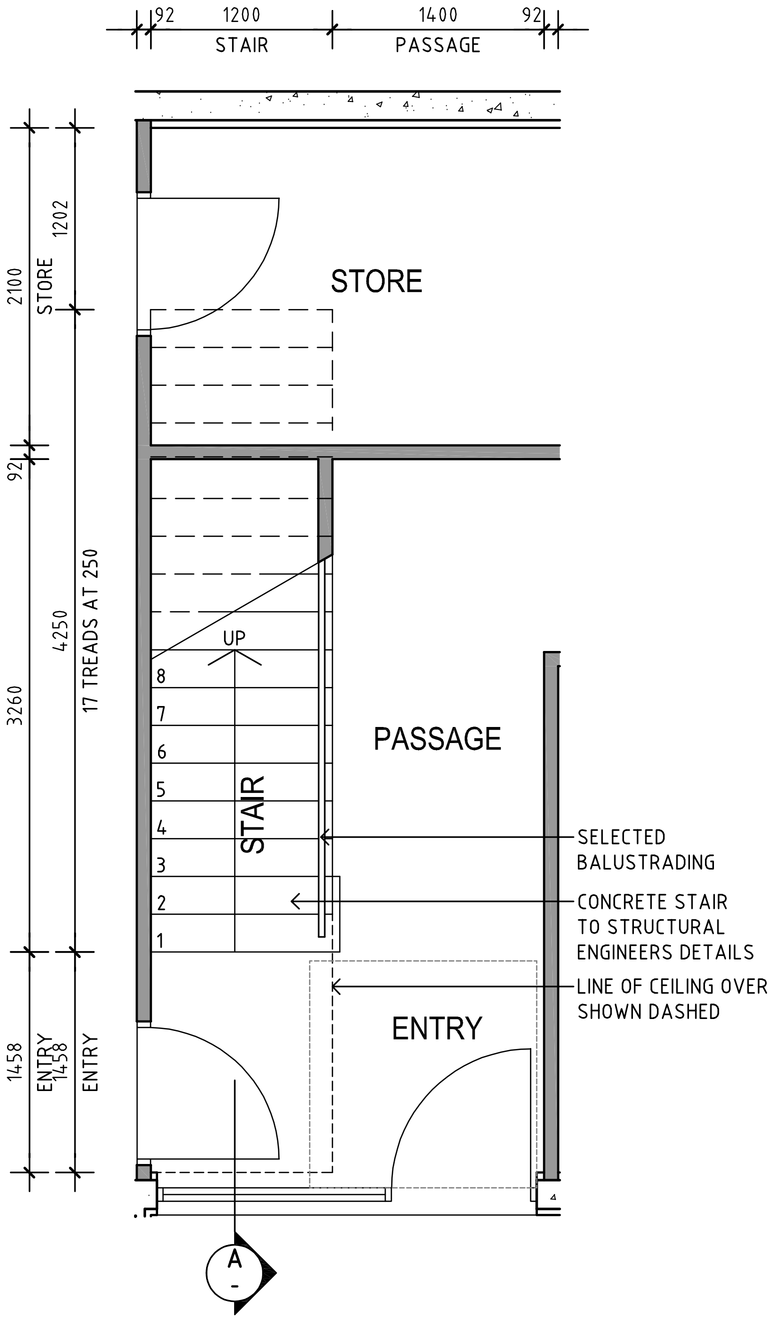
1 EXAMPLE STREET, WESTERN AUSTRALIA

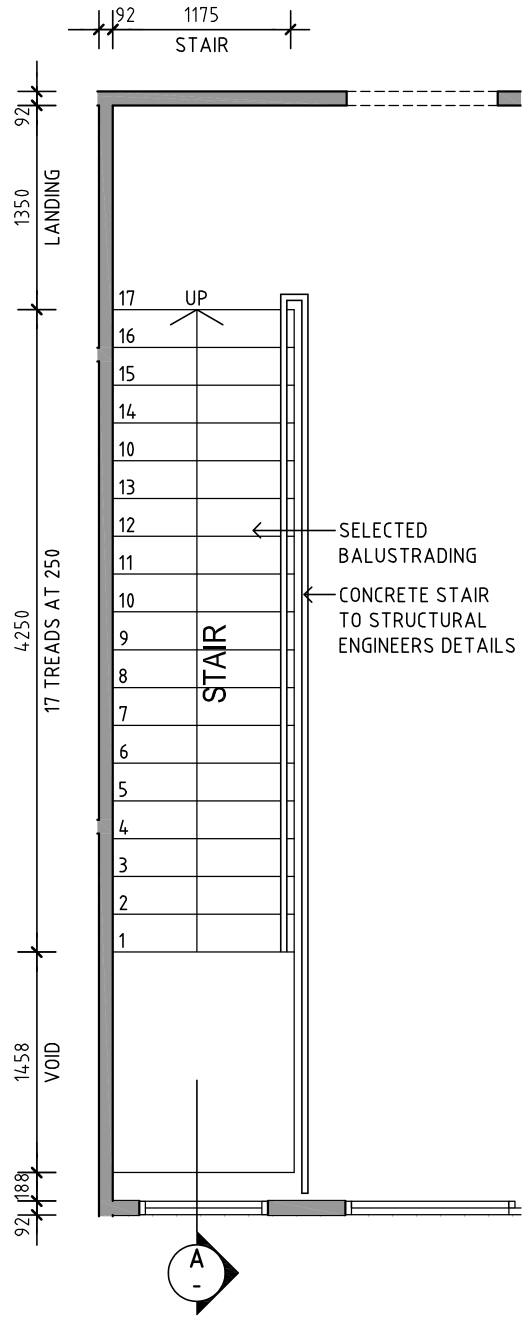
DWG TITLE: **CONSTRUCTION DETAILS**

DATE	JULY 2022
SCALE	1:100 AT A3
DRAWN	SFM
CHECKED	SFM

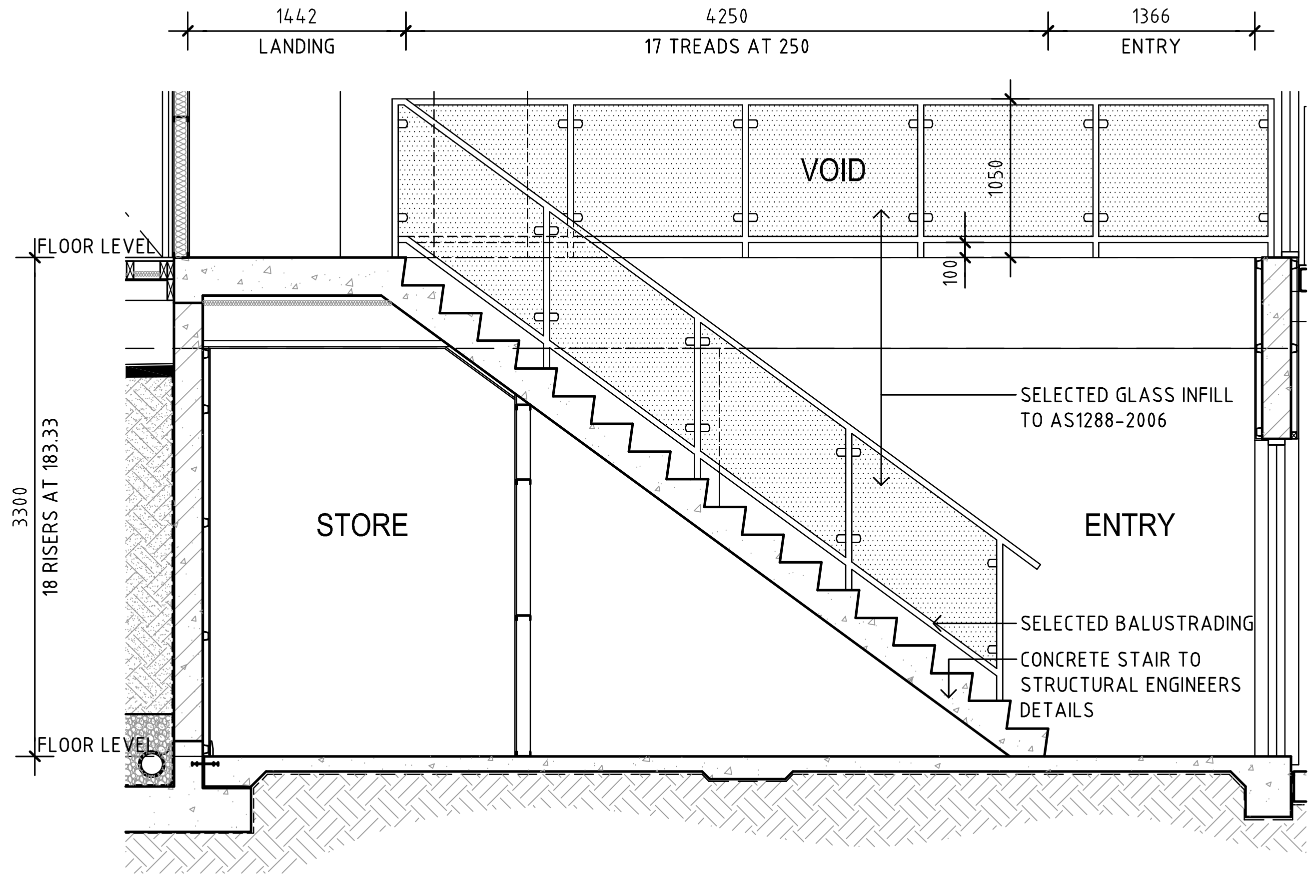
ISSUE: PERMIT SUBMISSION
DRAWING No: **A20** (20 OF 27)
REV: 0



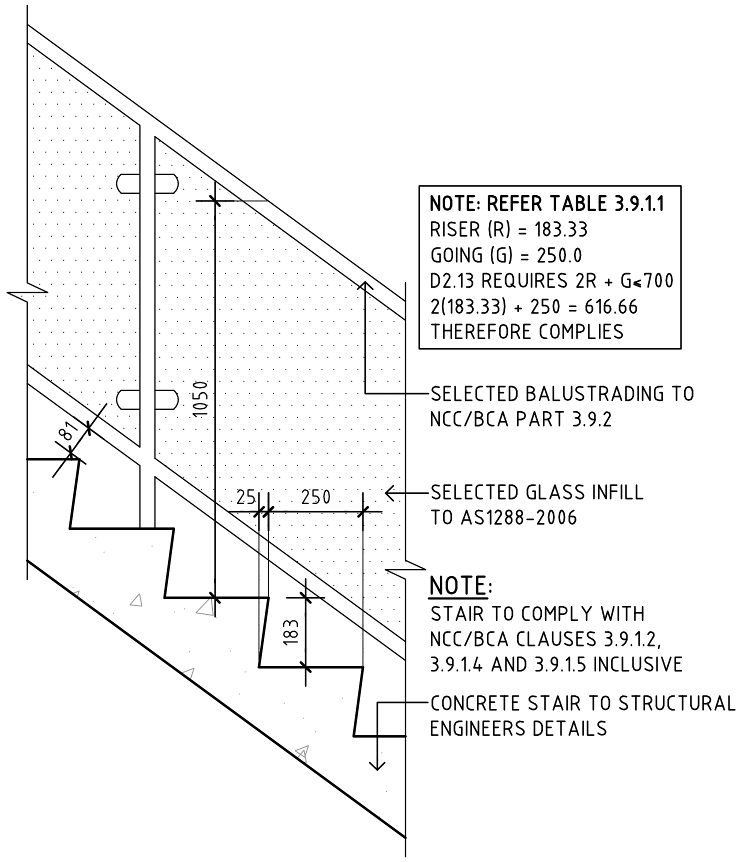
STAIR - GROUND FLOOR PLAN
SCALE 1:50



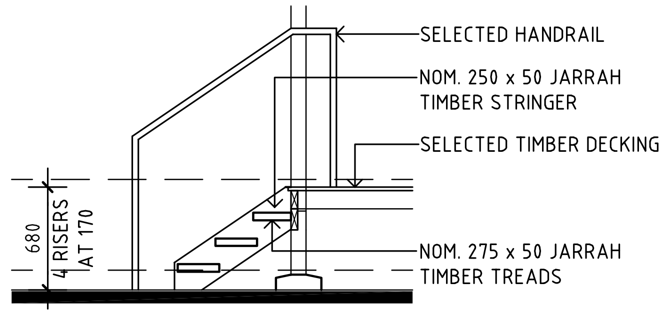
STAIR - UPPER FLOOR PLAN
SCALE 1:50



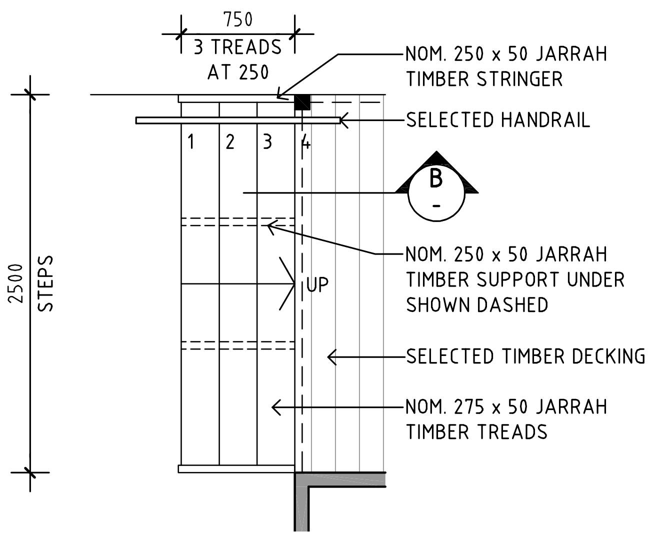
SECTION A
SCALE 1:50



STAIR DETAIL
SCALE 1:20



SECTION B
SCALE 1:50



STEP - UPPER FLOOR PLAN
SCALE 1:50

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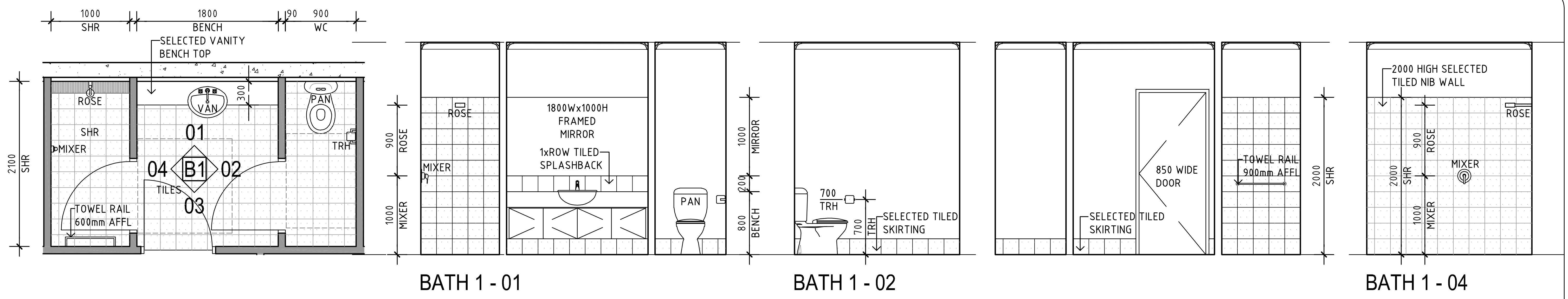
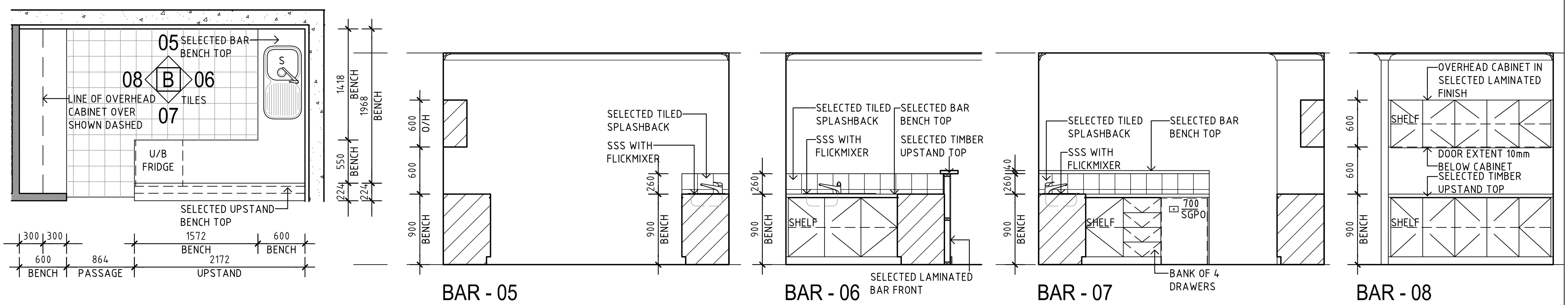
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **STAIR DETAILS**

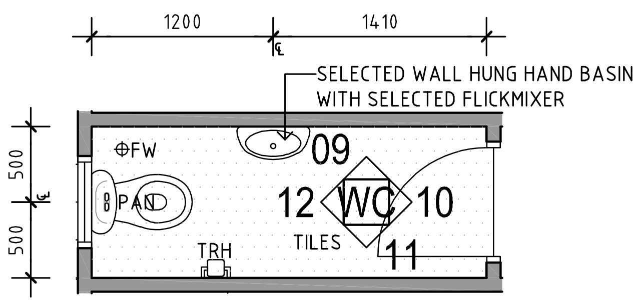
DATE	JULY 2022	ISSUE	PERMIT SUBMISSION
SCALE	1:100 AT A3		
DRAWN	SFM	DRAWING No	A21 (21 OF 27)
CHECKED	SFM	REV	0

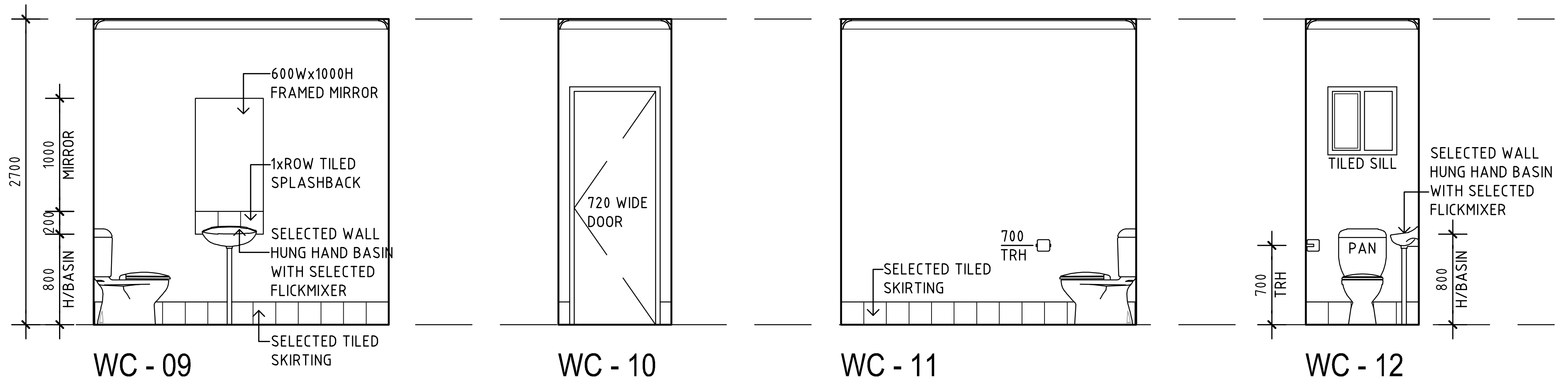




WATERPROOFING TO WET AREAS

AREAS TO BE WATERPROOFED IN ACCORDANCE WITH NCC/BCA PART 3.8.1.2 AND AS3740-2010





ROOM ELEVATIONS

SCALE 1:50

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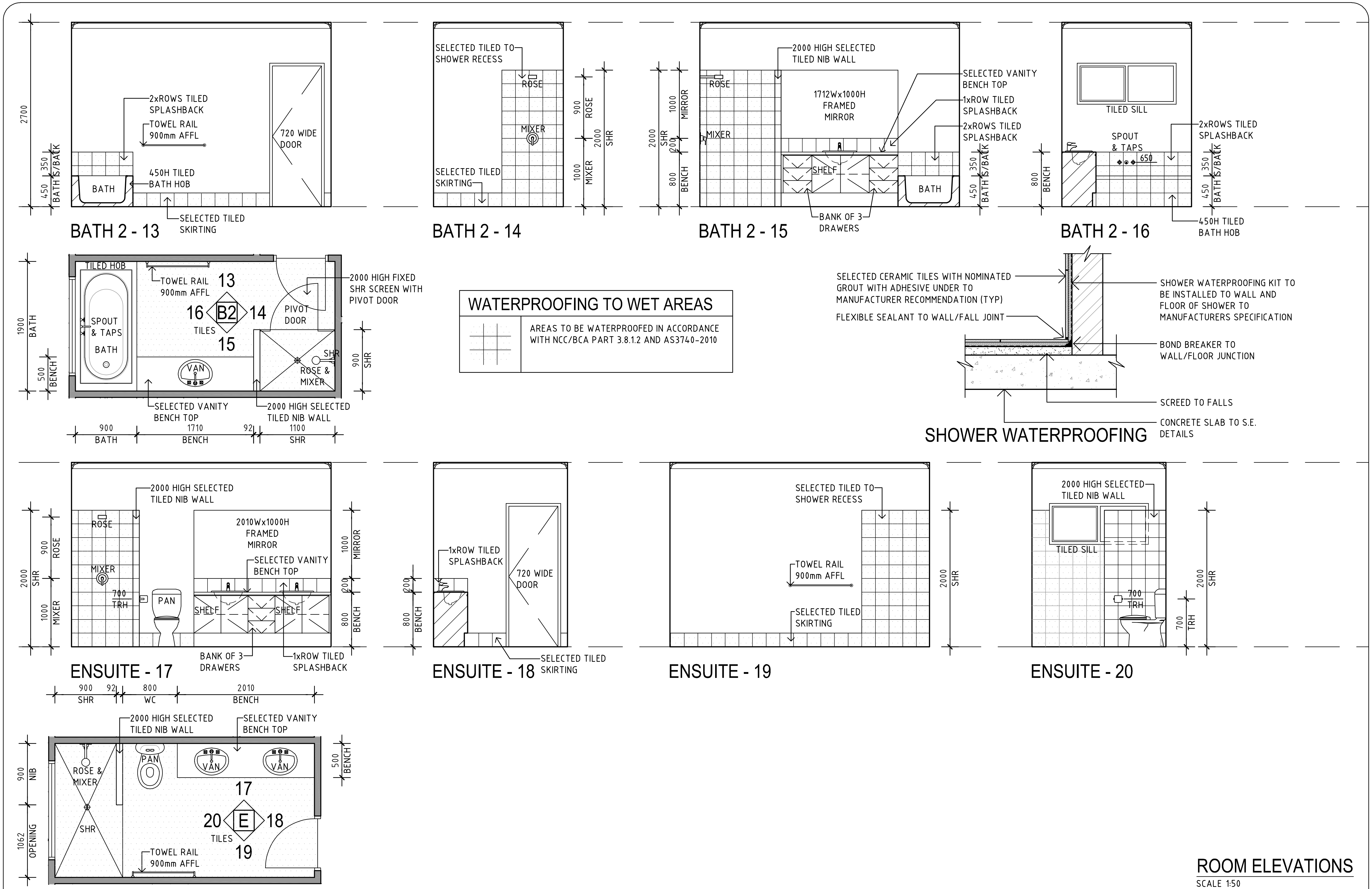
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **ROOM ELEVATIONS**

DATE	JULY 2022	ISSUE	PERMIT SUBMISSION
SCALE	1:100 AT A3		
DRAWN	SFM	DRAWING No	REV
CHECKED	SFM	A22 (22 OF 27)	0



ROOM ELEVATIONS

SCALE 1:50

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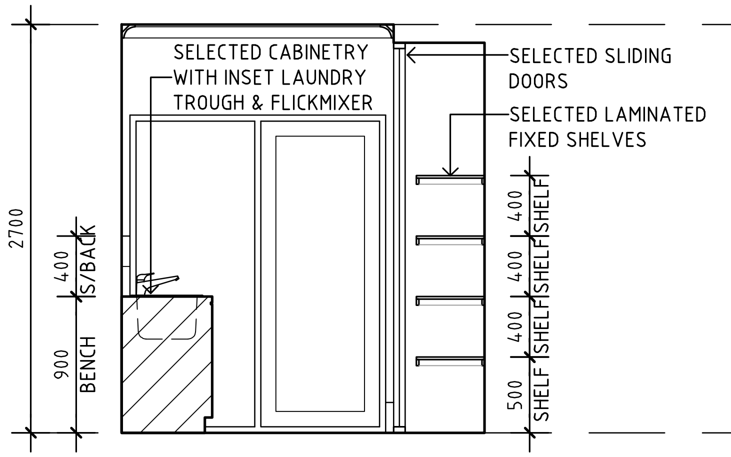
GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE **ROOM ELEVATIONS**

DATE JULY 2022
SCALE 1:100 AT A3
DRAWN SFM
CHECKED SFM
ISSUE PERMIT SUBMISSION
DRAWING No **A23** (23 OF 27)
REV 0



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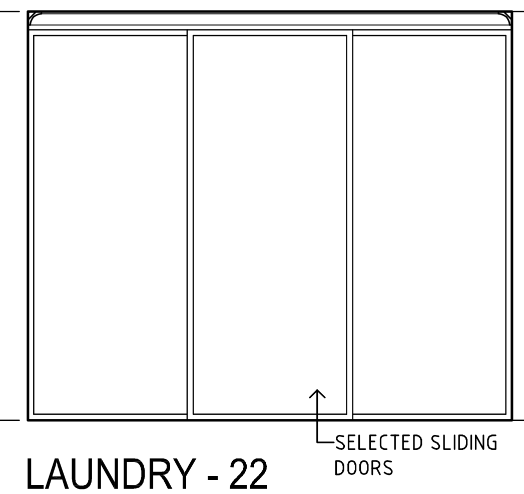

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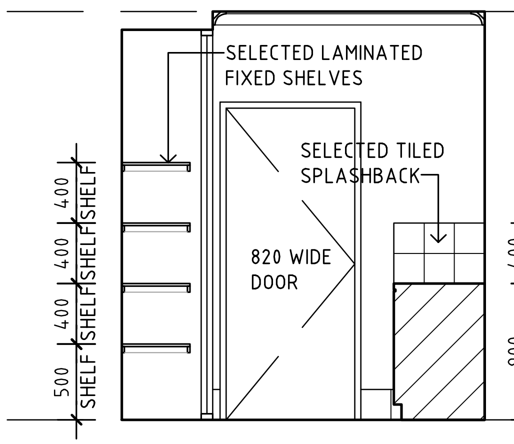

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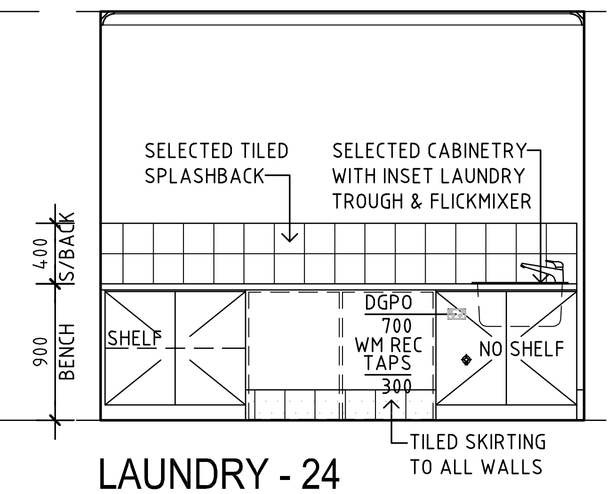

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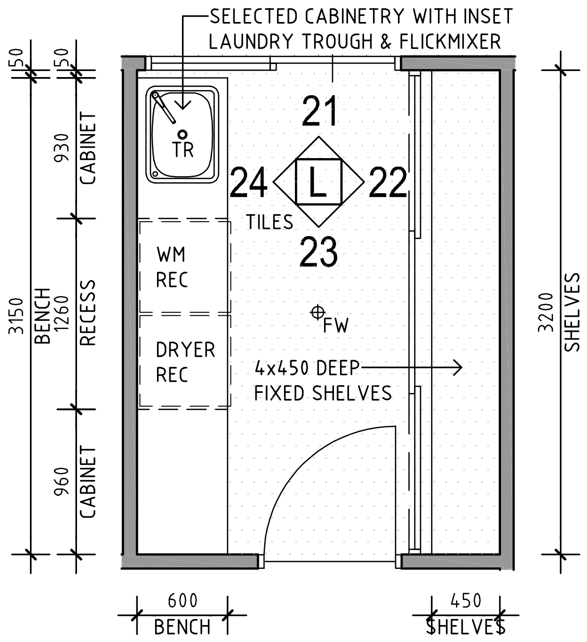
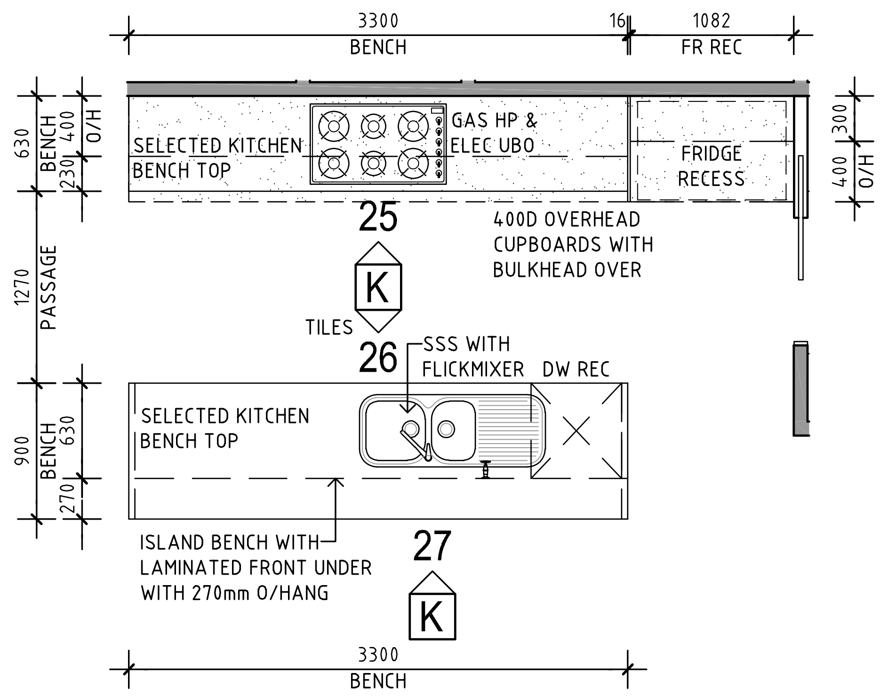
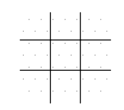
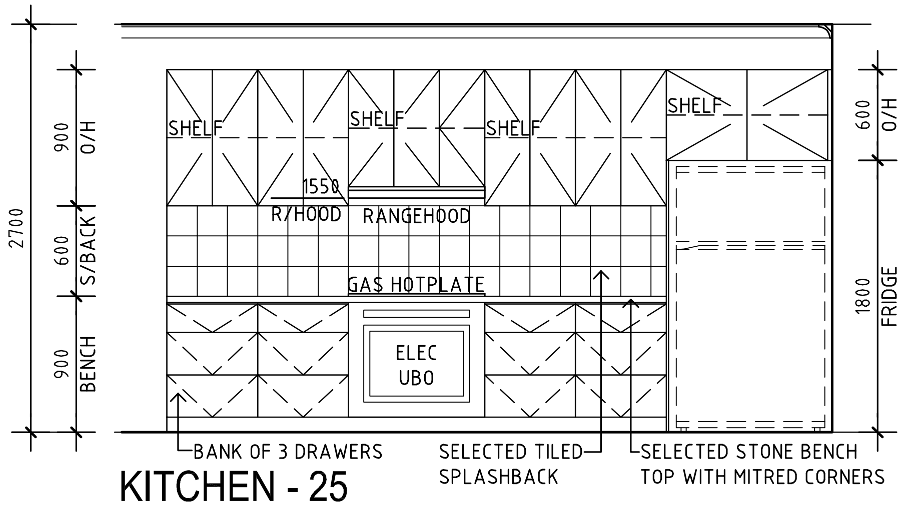




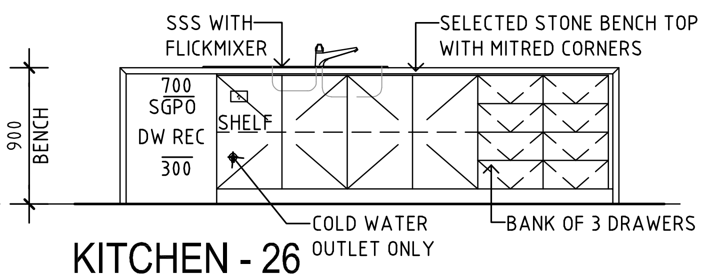
WATERPROOFING TO WET AREAS



AREAS TO BE WATERPROOFED IN ACCORDANCE WITH NCC/BCA PART 3.8.1.2 AND AS3740-2010



KITCHEN - 25



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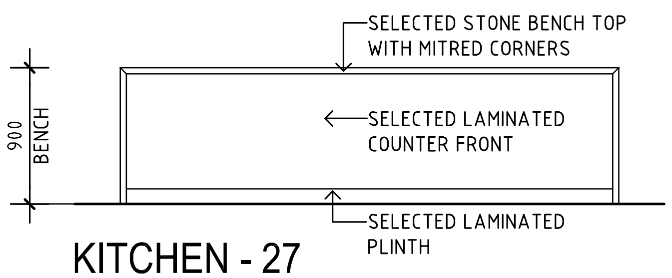

KITCHEN - 27

ROOM ELEVATIONS

SCALE 1:50

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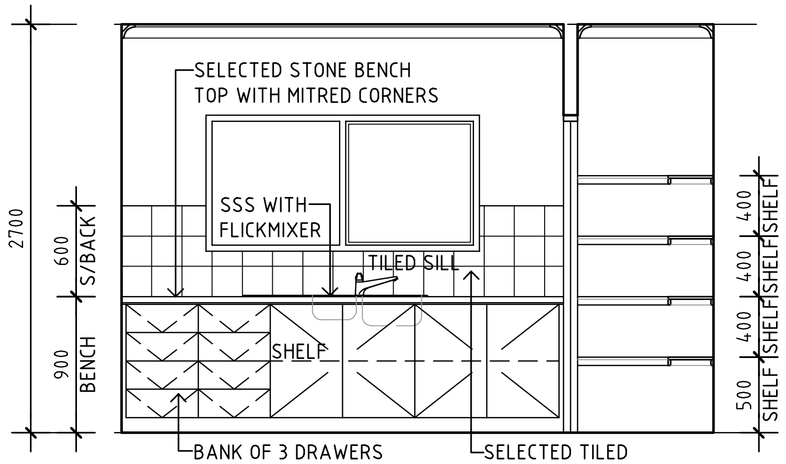
DWG TITLE	DATE	ISSUE
ROOM ELEVATIONS	JULY 2022	PERMIT SUBMISSION
	SCALE 1:100 AT A3	DRAWING No **A24** (24 OF 27)
	DRAWN SFM	REV 0
	CHECKED SFM	



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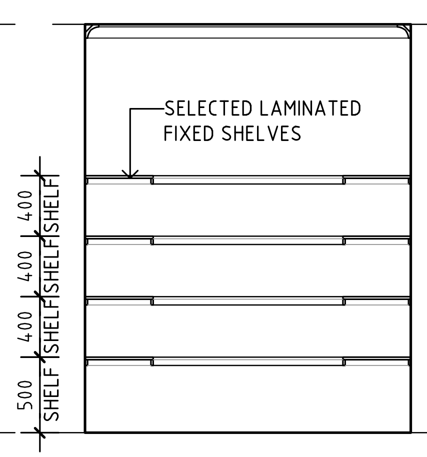

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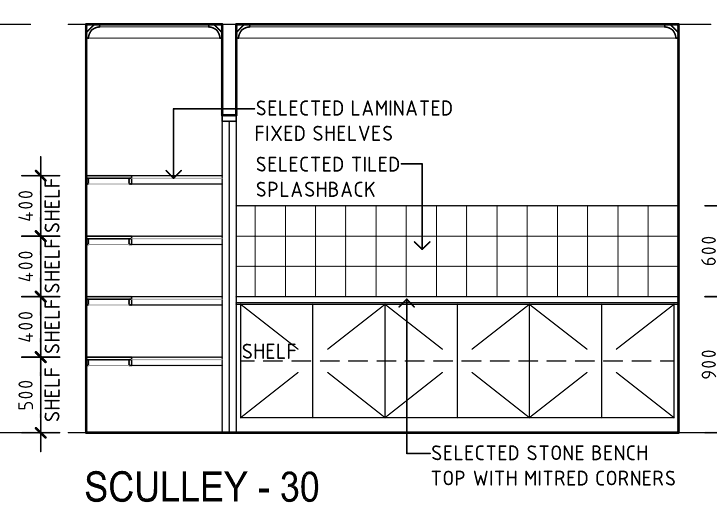

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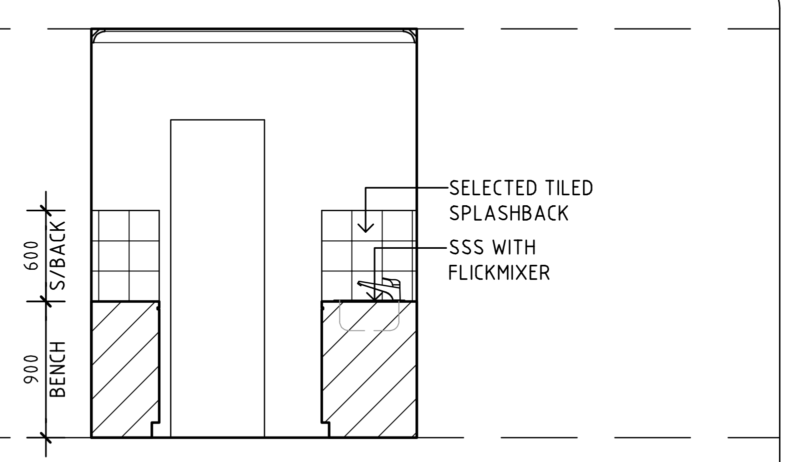

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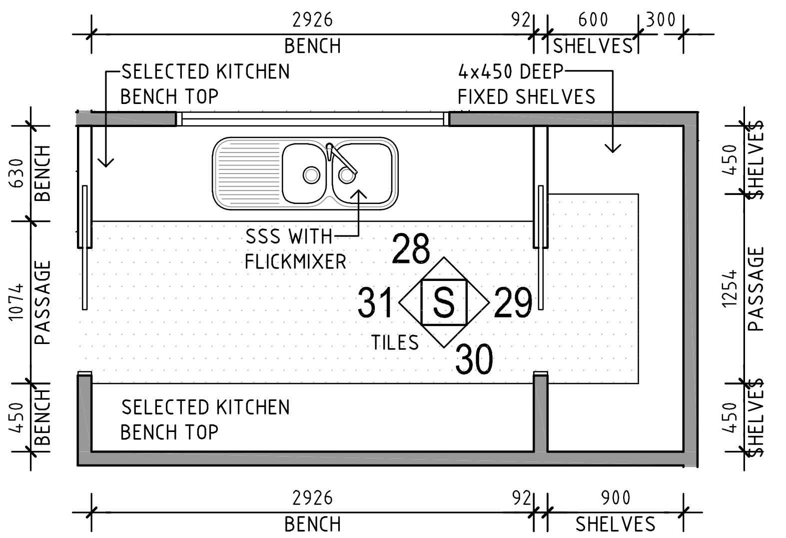

WATERPROOFING TO WET AREAS

AREAS TO BE WATERPROOFED IN ACCORDANCE WITH NCC/BCA PART 3.8.1.2 AND AS3740-2010

ROOM ELEVATIONS

SCALE 1:50

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GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **ROOM ELEVATIONS**

DATE	JULY 2022	ISSUE	PERMIT SUBMISSION
SCALE	1:100 AT A3		
DRAWN	SFM	DRAWING No	REV
CHECKED	SFM	**A25** (25 OF 27)	0

WINDOW SCHEDULE (to be read with Glazing Calculator)

No.	Window Size	Setout	Operation	Opening Size	Glass Values	Glass Types	Frame	Orientation	Notes
W01	1286H x 1810W	Sill @ 814 Head @ 2100	Awning	0.18m^2	Refer to Energy Assessment	Clear Glazing	Aluminium Frame	North	
W02	1286H x 1810W	Sill @ 814 Head @ 2100	Awning	0.18m^2		Clear Glazing	Aluminium Frame	North	
W03	1286H x 1810W	Sill @ 814 Head @ 2100	Sliding	1.01m^2		Clear Glazing	Aluminium Frame	North	
W04	2100H x 850W	Sill @ FL Head @ 2100	Fixed	0.00m^2		Clear Glazing	Aluminium Frame	North	
W05	300H x 878W	Sill @ 1800 Head @ 2100	Fixed	0.00m^2		Clear Glazing	Aluminium Frame	North	
W06	300H x 878W	Sill @ 814 Head @ 2100	Fixed	0.00m^2		Clear Glazing	Aluminium Frame	North	
W07	300H x 878W	Sill @ FL Head @ 2100	Fixed	0.00m^2		Clear Glazing	Aluminium Frame	North	
W08	2186H x 730W	Sill @ 814 Head @ 3000	Awning	0.78m^2		Clear Glazing	Aluminium Frame	North	OPENING RESTRICTED TO 120mm (REFER NCC/BCA PART 3.9.2.6)
W09	2186H x 730W	Sill @ 814 Head @ 3000	Awning	0.78m^2		Clear Glazing	Aluminium Frame	North	OPENING RESTRICTED TO 120mm (REFER NCC/BCA PART 3.9.2.6)
W10	2186H x 730W	Sill @ 814 Head @ 3000	Awning	0.78m^2		Clear Glazing	Aluminium Frame	North	OPENING RESTRICTED TO 120mm (REFER NCC/BCA PART 3.9.2.6)
W11	600H x 1450W	Sill @ 1500 Head @ 2100	Sliding	0.34m^2		Clear Glazing	Aluminium Frame	West	
W12	600H x 1450W	Sill @ 1500 Head @ 2100	Sliding	0.34m^2		Clear Glazing	Aluminium Frame	West	
W13	600H x 610W	Sill @ 1500 Head @ 2100	Sliding	0.12m^2		Clear Glazing	Aluminium Frame	West	
W14	1286H x 2050W	Sill @ 814 Head @ 2100	Sliding	1.25m^2		Clear Glazing	Aluminium Frame	West	
W15	1286H x 1690W	Sill @ 814 Head @ 2100	Sliding	0.94m^2		Clear Glazing	Aluminium Frame	South	
W16	1286H x 1690W	Sill @ 814 Head @ 2100	Sliding	0.94m^2		Clear Glazing	Aluminium Frame	South	
W17	1286H x 1690W	Sill @ 814 Head @ 2100	Sliding	0.94m^2		Clear Glazing	Aluminium Frame	South	
W18	600H x 2050W	Sill @ 1500 Head @ 2100	Sliding	0.50m^2		Clear Glazing	Aluminium Frame	East	
W19	900H x 1810W	Sill @ 1200 Head @ 2100	Sliding	0.69m^2		Clear Glazing	Aluminium Frame	South	
W20	600H x 1690W	Sill @ 1500 Head @ 2100	Fixed	0.00m^2		Clear Glazing	Aluminium Frame	East	
W21	600H x 1690W	Sill @ 1500 Head @ 2100	Fixed	0.00m^2		Clear Glazing	Aluminium Frame	East	

GLAZED DOOR SCHEDULE

No.	Door Size	Setout	Operation	Opening Size	Glass Values	Glass Types	Frame	Orientation	Notes
D01	2100H x 1550W Sidelight	Sill @ FL Head @ 2100	Fixed	0.00m^2	Refer to Energy Assessment	Clear Glazing	Aluminium Frame	North	Sidelight to Entry Door
D04	2100H x 4330W	Sill @ FL Head @ 2100	Sliding	4.25m^2		Clear Glazing	Aluminium Frame	North	
D05	2100H x 4330W	Sill @ FL Head @ 2100	Sliding	4.25m^2		Clear Glazing	Aluminium Frame	North	
D06	3000H x 2170W highlight over	Sill @ FL Head @ 3000	Sliding	2.07m^2		Clear Glazing	Aluminium Frame	West	Highlight over Sliding Door
D05	2100H x 1690W	Sill @ FL Head @ 2100	Sliding	1.58m^2		Clear Glazing	Aluminium Frame	South	

LEGEND & NOTES

REFER TO A09 & A10 ELEVATIONS FOR WINDOW & DOOR POSITIONS AND STYLES.

FLYSCREENS TO BE FITTED TO ALL OPENABLE WINDOWS AND DOORS

SHOWER SCREENS

2000H SEMI-FRAMELESS SHOWER SCREENS TO COMPLY WITH BCA TABLE 3.6.6. & AS1288. MINIMUM 4mm THICK GRADE A TOUGHENED SAFETY GLASS, LABELED TO COMPLY WITH INDUSTRY STANDARDS.

OPAQUE BANDS

WHERE GLAZED DOORS OR SIDE PANELS ARE CAPABLE OF BEING MISTAKEN FOR A DOORWAY OR OPENING, THE GLASS MUST BE MARKED TO MAKE IT REALLY VISIBLE AS FOLLOWS

- MARKING IN THE FORM OF AN OPAQUE BAND NOT LESS THAN 20mm IN HEIGHT;
- THE UPPER EDGE IS NOT LESS THAN 700mm ABOVE THE FLOOR;
- THE LOWER EDGE IS NOT MORE THAN 1200mm ABOVE THE FLOOR.

FLASHINGS TO WALL OPENING

ALL OPENINGS MUST BE ADEQUATELY FLASHED USING MATERIALS THAT COMPLY WITH AS/NZS 2904.

REFER TO DRAWING A11 FOR WINDOW HEAD AND SILL DETAILS. FLASHING TO BE INSTALLED WITH GLAZING MANUFACTURER'S SPECIFICATIONS FOR DOUBLE BRICK WALL CONSTRUCTION.

SCREENS TO WINDOWS

INSTALL CORROSION RESISTANT STEEL, BRONZE OR ALUMINIUM MESH OR PERFORATED METAL SHEET WITH MAXIMUM APERTURE OF 2mm TO COMPLY WITH BAL REQUIREMENTS. REFER AS3959 FOR ADDITIONAL DETAILS AND REQUIREMENTS

ALL GLAZED WINDOW & DOOR ASSEMBLIES IN EXTERNAL WALLS TO COMPLY WITH AS 2047. ALL OTHER GLASS TO COMPLY WITH AS 1288.

NOTE: REFER TO STRUCTURAL ENGINEERS DOCUMENTATION FOR ULTIMATE (ULS), SERVICEABILITY (SLS) AND WATER PENETRATION RESISTANCE (WPR) LIMIT STATE WIND PRESSURES. WINDOWS AND DOORS TO COMPLY WITH REQUIREMENTS AND INSTALLED TO MANUFACTURERS SPECIFICATION

WINDOW & DOOR SCHEDULE

SCALE 1:100

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GOVERNMENT OF WESTERN AUSTRALIA
Department of Mines, Industry Regulation and Safety

OWNER / CLIENT: **BUILDING AND ENERGY**
PROJECT: CLASS 1a (TWO STOREY) EXAMPLE
1 EXAMPLE STREET, WESTERN AUSTRALIA

DWG TITLE: **WINDOW AND DOOR SCHEDULE**

DATE: JULY 2022
SCALE: 1:100 AT A3
DRAWN: SFM
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ISSUE: PERMIT SUBMISSION
DRAWING No: **A26** (26 OF 27)
REV: 0

NATURAL LIGHT & VENTILATION

PART 3.8.4 LIGHT

MINIMUM 10% OF THE FLOOR AREA OF A HABITABLE ROOM REQUIRED (NATURAL LIGHT)

PART 3.8.5 VENTILATION

MINIMUM 10% OF THE FLOOR AREA OF A HABITABLE ROOM REQUIRED (REFER TABLE 3.12.4.1).
(AN EXHAUST FAN MAY BE USED FOR A SANITARY COMPARTMENT, LAUNDRY OR BATHROOM PROVIDED CONTAMINATED AIR DISCHARGES DIRECTLY TO THE OUTSIDE OF THE BUILDING BY WAY OF DUCTS).

Room	Area	Window no.	Door no.	Light Required	Light Achieved	Ventilation Required	Ventilation Achieved
OFFICE	10.72m²	W3		1.07m²	2.02m²	1.07m²	1.08m²
THEATRE & BAR	31.67m²	W1 & W2		3.17m²	4.04m²	3.17m²	4.04m²
DINING, LIVING & KITCHEN	72.20m²	W5, W21 & W22	D4 & D5	7.22m²	19.85m²	7.22m²	8.32m²
BED 1	21.74m²	W9, W10 & W11	D6	2.17m²	9.89m²	2.17m²	4.41m²
BED 2	11.48m²	W15 & W16		1.15m²	3.16m²	1.15m²	1.58m²
BED 3	11.48m²	W17		1.15m²	1.88m²	1.15m²	1.58m²
BED 4	12.41m²	W18 & W19		1.24m²	2.88m²	1.24m²	1.44m²

WATER USE

ITEMS TO COMPLY WITH NCC/BCA WESTERN AUSTRALIA ADDITIONS PART WA 2.3, "ACCEPTABLE CONSTRUCTION PRACTICE" INCLUDING, BUT NOT LIMITED TO:

WA 2.3.1 WATER USE EFFICIENCY

a. ALL TAPS TO BE MINIMUM 4 STARS 'WELS' RATED
b. ALL SHOWERHEADS TO BE MINIMUM 3 STARS 'WELS' RATED
c. ALL SANITARY FLUSHING SYSTEMS TO BE MINIMUM 4 STARS 'WELS' RATED DUAL FLUSH.

WA 2.3.3 HEATED WATER USE EFFICIENCY

ALL INTERNAL HEATED WATER OUTLETS (SUCH AS TAPS, SHOWERS AND WASHING MACHINE WATER SUPPLY FITTINGS) MUST BE CONNECTED TO A HEATED WATER SYSTEM OR A RE-CIRCULATING HEATED WATER SYSTEM WITH PIPES INSTALLED AND INSULATED IN ACCORDANCE WITH AS/NZS 3500: PLUMBING AND DRAINAGE, PART 4 HEATED WATER SERVICES, THE PIPE FROM THE HEATED WATER SYSTEM OR RE-CIRCULATING HEATED WATER SYSTEM TO THE FURTHEST HEATED WATER OUTLET MUST NOT BE MORE THAN 20m IN LENGTH OR 2 LITRES OF INTERNAL VOLUME.

ENERGY EFFICIENCY REQUIREMENTS (REFER NCC/BCA 3.12)

CLIMATE ZONE: 1

A BUILDING MUST ACHIEVE AN ENERGY RATING OF 6 STARS

BUILDING FABRIC

INSULATION, WHERE REQUIRED, MUST COMPLY WITH AS/NZS 4859.1 AND SHALL FORM A CONTINUOUS BARRIER WITH CEILINGS, WALLS, BULKHEADS, FLOORS OR THE LIKE THAT INHERENTLY CONTRIBUTE TO THE THERMAL BARRIER.

ROOFS (3.12.1.2)

A ROOF MUST ACHIEVE A TOTAL R-VALUE OF R4.1 (DOWN) FOR A ROOF WITH A SOLAR ABSORPTANCE VALUE >0.4 BUT ≤0.6 (REFER NCC/BCA TABLE 3.12.1.1a)
METAL ROOF SHEETING SHALL HAVE A THERMAL BREAK WITH AN R-VALUE GREATER OR EQUAL TO 0.2 INSTALLED BETWEEN THE METAL ROOF SHEETING AND ITS SUPPORTING METAL PURLINS, METAL RAFTERS OR METAL BATTENS.
NOTE: A REDUCTION OF R0.5 CAN BE APPLIED SUBJECT TO PART 3.12.1.2 (B)(i) & (ii)
FIGURE 3.12.1.1(d) NOMINATES A VENTED METAL PITCHED ROOF WITH FLAT CEILING HAS AN DOWNWARD HEAT FLOW - TOTAL R-VALUE OF 0.72
REFLECTIVE SARKING/THERMAL BREAK UNDER ROOF SHEETING PROVIDES ADDITIONAL R-VALUE 0.20
SPECIFIED INSULATION TO BE ADDED ABOVE CEILING = R4.0.
THERMAL PERFORMANCE OF ROOF WITH INSULATION COMPLIES WITH REQUIREMENTS NOMINATED

ROOF LIGHTS (3.12.1.3)

NOT APPLICABLE

EXTERNAL WALLS (3.12.1.4)

EACH PART OF AN EXTERNAL WALL TO ACHIEVE MINIMUM TOTAL R-VALUE OF R2.8.
FIGURE 3.12.1.3(b) INDICATES FIBRE CEMENT SHEET EXTERNAL WALL CONSTRUCTION PROVIDING TOTAL R-VALUE OF R0.42.
INSULATION TO CAVITY R-VALUE TO BE ADDED IS 2.38

FIGURE 3.12.1.3(g) INDICATES CONCRETE MASONRY EXTERNAL WALL CONSTRUCTION PROVIDING TOTAL R-VALUE OF R0.46.
INSULATION TO CAVITY R-VALUE TO BE ADDED IS 2.34

EXTERNAL GLAZING TO COMPLY WITH TABLE 3.12.2.1

FLOORS (3.12.1.5)

SUSPENDED FLOOR TO ACHIEVE R-VALUE OF R1.5 (UP) REFER TABLE 3.12.1.4
R1.5 RIGID INSULATION INSTALLED TO SOFFIT OF SUSPENDED FLOOR

EXTERNAL GLAZING (3.12.2.1)

GLAZING TO COMPLY WITH TABLES 3.12.2.1b TO 3.12.2.1h AS APPROPRIATE AND CALCULATED IN ACCORDANCE WITH PART 3.12.2.1 (a)(ii)(B)
HABITABLE ROOMS TO HAVE STANDARD AIR MOVEMENT IN COMPLIANCE WITH NCC/BCA PART 3.12.4

BUILDING SEALING (3.12.3)

RESIDENCE IS AIR CONDITIONED AND THEREFORE MUST COMPLY WITH THE FOLLOWING:
- CHIMNEY AND FLUES MUST BE FITTED WITH A DAMPER OR FLAP THAT CAN BE CLOSED TO SEAL THE CHIMNEY OR FLUE.
- ROOF/SKY LIGHTS, WHERE FITTED, MUST BE SEALED.
- WINDOWS AND DOORS TO BE FITTED WITH SEALS WHERE SERVING A HABITABLE ROOM WITH CONDITIONED SPACE.
- EXHAUST FANS TO BE FITTED WITH A SEALING DEVICE SUCH AS A SELF-CLOSING DAMPER WHEN SERVING:
  - A CONDITIONED SPACE OR A HABITABLE ROOM
- CEILINGS, WALLS, FLOORS AND ANY OPENING SUCH AS WINDOW FRAME, DOOR FRAME, ROOF LIGHT FRAME OR THE LIKE MUST BE CONSTRUCTED TO MINIMISE AIR LEAKAGE WHEN FORMING PART OF:
  - A CONDITIONED SPACE OR A HABITABLE ROOM
- DOORS TO BE CLOSE FITTING

AIR MOVEMENT (3.12.4)

HABITABLE ROOMS TO BE PROVIDE VENTILATION AND AIR MOVEMENT IN ACCORDANCE WITH TABLE 3.12.4.1 (NOM 10% OF ROOM AREA, 7.5% WHERE ROOM IS FITTED WITH A CEILING FAN)
REFER DRAWING A24 FOR VENTILATION OPENING CALCULATIONS TO HABITABLE ROOMS.

ENERGY EFFICIENCY REQUIRMENTS

SCALE 1:100

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DATE	SCALE	DRAWN	CHECKED	ISSUE	DRAWING No	REV
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Attachment C

Draft Building Commissioner Direction for residential building inspections.

Building Commissioner's Direction (or Standard) for notifiable stage inspections of new residential buildings (Class 1)

Every inspection is to be conducted to ascertain compliance with approved plans/specifications and applicable building standards (including the BCA).

Stage 1 Footings (excavation, foundation, reinforcement)

Notification requirement
After the excavation of the foundation material but before footings poured.

Inspection to occur
Before the concrete pour.

Items to be checked	Elements to be inspected	Informative Notes: The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
1. Boundary clearances (including easements)	• Building set out • Setbacks to all relevant allotment boundaries and other buildings and structures • Distances from easements and local government infrastructure	➢ Check building is located within correct setbacks and on correct lot ➢ Check approved plans for any easements. Conduct a visual check to determine easement locations and boundaries. ➢ If easements present are they affected by, or affecting, the building work or structural design. ➢ Check if building work is encroaching on/over easements or boundaries and not specified on approved documentation – BA20 may be required by Permit Authority.	Section 36 of the Building Act 2011 Building Regulations r.31A BCA – Volume 2 part 3.2
2. Excavation of foundation material	• Location/dimensions of footing excavations, including reduced levels. • Footing thickenings • Thickenings for penetrations for services • Profile of soil excavated • Bearing surfaces of excavations	➢ Check against any requirements on approved plans including localised footing thickenings. Penetrations installed as per approved plans and requirements in AS 2870. ➢ Pipes through footing may need to be wrapped as bond breaker, as per approved plans (i.e. clay sites). ➢ Check soil compaction in base of footing. ➢ Excavation to be consistent with engineering assumptions and geotechnical report ➢ For clay soils, check that dry loose material and/or water has been removed from trenches.	AS 2870-2011 Residential Slabs and Footings (details the tests to be carried out) BCA part 3.1.1 Earthworks

Items to be checked	Elements to be inspected	Informative Notes: The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
3. Compaction of fill material (if necessary)	• Compaction test results • Level of compaction • Retention of compacted fill	➢ Compaction of the soil is typically tested by the builder. Inspector does not need to test compaction but only verify compaction test results. ➢ Check compaction results from test certificate comply with specifications and ensure there are sufficient and appropriate test point locations. ➢ Test results to be consistent with plans and engineering assumptions.	BCA - Volume 2 Part 3.1.3 Drainage AS 3600 – 2018 Concrete Structures Code AS3660 Part 1 – 2014 Termite management , Part 1:New building work
4. Sub-soil drainage	• Size and location	➢ Applicable where drainage is required for the site to ensure water is diverted away from footings or from behind retaining walls. ➢ Where drainage is required, it is the correct size and in the correct location ➢ Drainage is to be in accordance with civil/geotechnical report, where applicable.	
5. Cut and fill batters	• Location of cut and fill batters • Construction and location of retaining walls	➢ Where applicable, for separate footing and slab pour ➢ Ensure there is adequate retention so that no earth slipping will occur in surrounding ground levels ➢ Excavations not to affect adjoining land or buildings.	
6. Piers and/or piles	• Location of piers/piles through compacted fill • Depth of piers/piles • End bearing of piers/piles	➢ Piles normally taken through layers of fill to natural ground level unless specified otherwise ➢ Piers/piles may be provided adjacent to easements to allow for future excavations ➢ Piers/piles may be required in P Class soils to account for problem soils ➢ Piers/piles to comply with engineers design and normally subject to inspection by engineer	
7. Reinforcement of footing system	• Type and placement of steel reinforcement • Size and gauge of reinforcing steel • Location and dimension of laps in steel reinforcement. • Type, size and spacing of bar chairs	➢ Check the correct type of reinforcement has been installed in correct position is of the correct size. ➢ Inspector to confirm that appropriate bar chairs or other reinforcement spacers or supports are in place and are of the correct size/height. ➢ Inspector to check appropriate concrete cover to reinforcement will be provided.	
8. Termite management system	• Location and type of physical and chemical barriers;	➢ Unlikely that termite management is applicable at this stage although there are many different methods of protection available. ➢ Where applicable, confirm system is in place prior to concrete pour.	

Items to be checked	Elements to be inspected	**Informative Notes:** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
	• Protection of penetrations through footing or slab elements.		
9. Floor levels	• Finished footing / slab levels	➢ Finished slab levels to establish heights above flood levels, building height or to accommodate drainage requirements. ➢ Finished Floor Level in accordance with Part 3.1.3.3 Surface water drainage ➢ Inspector can confirm the height measurements with the builder as determined by the builders land surveyor.	

Stage 2 Slab (reinforcement)

Notification requirement
After the placement of the formwork and reinforcing but before the concrete slab is poured.

Inspection to occur
Before the concrete pour.

2a – Single Storey slab on ground

Items to be checked	Elements to be inspected	Informative Notes The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
1. Cut and fill batters	• Location of cut and fill batters • Construction and location of retaining walls • Provision for drainage of cut and fill batters and retaining walls • Falls to external finished areas	➢ Ensure there is adequate retention so that no earth slipping will occur in surrounding ground levels ➢ Excavations not to affect adjoining land or buildings.	Building Regulations r.31A BCA - Volume 2 Part 3.1.3 Drainage BCA – Volume 2 part 3.2
2. Slab dimensions and thickness	• Depth and width dimensions of slab and any included beams • No soil disturbance (thinning or thickening) in sub-grade of slab.	➢ Check thickenings to all penetrations for services (electrical, plumbing etc). ➢ Penetrations to be installed as per the approved plans and AS 2870.	AS 2870-2011 Residential Slabs and Footings provides details for penetrations through the slab.
3. Wet areas	• Set-downs into wet areas	➢ Visual check that there are adequate set-downs. ➢ Provisions of 20-30mm to allow for falls to waste outlets, where specified in approval documentation.	
4. Floor levels	• Height of finished floor level (FFL)	➢ Finished slab levels to establish heights above flood levels, building height, or to accommodate drainage requirements. ➢ Finished Floor Level in accordance with Part 3.1.3.3 Surface water drainage ➢ Check of FFL can be difficult if a surveyor's level is not available on site – as a minimum a visual check is required. ➢ Inspector can confirm the height measurements with the builder as determined by the builders land surveyor. Inspector to record builder confirmation of levels.	BCA – Volume 2 3.1.1. Earthworks AS 3600 – 2018 Concrete Structures Code

2a – Single Storey slab on ground			
Items to be checked	**Elements to be inspected**	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	**Building standards**
5. Reinforcement of slab system	• Reinforcement type and placement • Size and gauge of reinforcement • Location and dimension of laps • Size and spacing of bar chairs	➢ Check the correct type of reinforcement has been installed in correct position is of the correct size ➢ Inspector to confirm that appropriate bar chairs or other reinforcement spacers or supports are in place and are of the correct size/height	AS 3660 Part 1 – 2014
6. Termite management	• Location and type of physical and chemical barrier • Protection of penetrations through slab elements.	➢ Confirm system is in place prior to concrete pour.	Termite management , Part 1 :New building work
7. Vapour/ moisture barrier	• Type, thickness and placement of vapour barrier • Taping, type and location of joint overlaps to vapour barrier • Treatment to penetrations through vapour barrier	➢ Ensure no holes in barrier which are not correctly treated. ➢ Check for AS 2870 compliance stamp.	BCA – Volume 2 part 3.3.5.8 Damp proof courses and flashings – installation
8. Services and slab penetrations	• Plumbing, sanitary drainage, and electrical services • Location and dimensions	➢ Ensure correct location and dimensions of services and slab penetrations	
9. Damp proofing	• Slab edge damp-proofing (if applicable)	➢ Check damp-proofing has been completed, where applicable	

2b – Multi-storey suspended slab - Additional inspection for multi-storey construction. To be carried out once supporting walls and formwork in position. Slab to comply with engineers design and building surveyor can rely upon certificate issued by "competent person" (engineer).			
Items to be checked	**Elements to be inspected**	**Informative Notes**	**Building standards**
1. Slab dimensions and thickness	• Depth and width	➢ Depth and width dimensions of slab and any included beams comply with approved plans	AS 3600 – 2018 Concrete Structures Code
2. Wet areas	• Set-downs into wet areas	➢ As a minimum, a visual check of compliance with approved plans is required	

2b – Multi-storey suspended slab - Additional inspection for multi-storey construction. To be carried out once supporting walls and formwork in position. Slab to comply with engineers design and building surveyor can rely upon certificate issued by "competent person" (engineer).			
Items to be checked	**Elements to be inspected**	**Informative Notes**	**Building standards**
		➢ Provision of a minimum of 20 to 30mm into wet areas to allow for falls to waste outlets, where specified.	
3. Finished floor level	• Height of finished floor level (FFL) complies		
4. Reinforcement	• Reinforcement type, position, size, laps and gauge	➢ Check the correct type of reinforcement has been installed in correct position is of the correct size.	
5. Services and slab penetrations	• Location of plumbing, sanitary drainage, and electrical services • Location and dimensions of slab penetrations	➢ Ensure correct location and dimensions of services and slab penetrations ➢ Check lagging applied to pipework where necessary.	
6. Slip joints	• Slip joints where applicable over walls and other restraints		

Stage 3 Frame (sub-floor, wall and roof framing)

Notification requirement

- After completion of the wall and roof framing but before the structure is covered up by cladding or linings.
- For masonry construction (if the wall cavities are to be filled) before the wall cavities are filled.

Inspection to occur

- Before non-structural linings or coverings are applied to the framing.
- Where applicable, during the construction or after completion of the masonry work.
- Where applicable, during or at completion of construction of the relevant fire separation and sound insulation.

3a Masonry walls (where applicable) – including masonry veneer

Items to be checked	Elements to be inspected	Informative Notes The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
1. Reinforcement	• Location, size, spacing and cover	➢ Check the correct type of reinforcement has been installed in correct position is of the correct size.	Building Regulations r.31A
2. Block/bricks	• Width and depth	➢ Check that alignment and bonding is within tolerance.	BCA – Volume 2, parts 3.3 and 3.4 - Framing, 3.7.1 Fire safety and 3.8.6 (class 1a attached) Sound insulation.
3. Lintels	• Size, position, orientation, bearing length, corrosion resistance, support width	➢ Check all elements are satisfactory	
4. Tie downs	• Connection, location, spacing	➢ Check all elements are appropriate	
5. Masonry cavity	• Cavity size • Unobstructed • Wall ties	➢ Check cavity is within size tolerance, clean and unobstructed ➢ Wall ties are of correct type, spacing and corrosion protection	AS3700-2018 Masonry Structures AS 3660 Part 1 – 2014
6. Damp proofing and weather proofing	• Slab edge and cavity walls	➢ Check that damp-proofing and weather proofing have been completed	Termite management , Part 1 New building work
7. Wall cavity	• Ventilation of wall cavity	➢ Check wall cavity for adequate/appropriate ventilation	
8. Structural members	• Location and fixing of built in structural members	➢ Check location and fixing is suitable	NASH Standard – Residential and Low-Rise Steel Framing
9. Flashings	• Size and material	➢ Check for appropriate size and materials ➢ Check flashings are installed in corrected locations	

3a Masonry walls (where applicable) – including masonry veneer			
Items to be checked	**Elements to be inspected**	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	**Building standards**
	• Locations		AS4100- 1998 Steel Structures
10. Weep holes	• Size • Locations	➢ Check for appropriate size and materials ➢ Check weep holes are installed in corrected locations ➢ Or weep holes omitted subject to an approved and appropriate performance solution.	
11. Termite management	• Approved termite management system installed • Exposed slab edges	➢ Check termite management to exposed slab edges, where applicable ➢ Check physical barriers are installed correctly – i.e. exposed edge visible	
12. Corrosion protection	• All embedded metal components.	➢ Check corrosion protection for metal items (including masonry steel reinforcement and wall ties) is appropriate and compliant. ➢ May require confirmation from the builder and production of purchase receipts etc.	

3b Steel/timber wall/sub-floor framing			
Items to be checked	**Elements to be inspected**	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	**Building standards**
Subfloor framing (where applicable) - Wall and sub-floor framing to be in accordance with approved plans and relevant standards. Check to ensure it is fixed correctly and appropriate materials used.			
1. Clearance	• Provisions for sub floor ventilation • Ground grading	➢ Check minimum clearance to ground level is sufficient	

3b Steel/timber wall/sub-floor framing

Items to be checked	Elements to be inspected	Informative Notes The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
2. Structural Members Steel/Timber	• Member sizes and spacing • Timber grading, strength and durability	➢ Check there has been no substitution for different sizing of members and no widening of spacings	
3. Bracing and fixing	• Location and type of bracing and/shear blocking • Diaphragm bracing • Subfloor bracing	➢ Check correct type, size, number, and location of fixings. ➢ Check correct number and type of fixings to all bracing and connections.	
4. Floor framing and flooring	• Member sizes and spacings • Fixed correctly/adequately • Materials	➢ Flooring is to be satisfactory and in accordance with approved plans ➢ Check that appropriate materials have been used	
5. Termite management	• Termite barrier • Sub-floor termite shields and other elements of physical and chemical barriers	➢ Check barrier is in place and is appropriate.	
Wall framing (where applicable) - Wall framing elements to slab or upper levels of multi-storey construction should be checked to ensure member sizes and spacings, bracing, tie-down and point load requirements comply with approval.			
1. Members	• Member sizes and spacing	➢ Check there has been no substitution for different sizing of members and no widening of spacings	
2. Bracing and fixing	• Location and type of fixings • Shear bolts • Diaphragm bracing and blocking where required	➢ Check correct type, size, number, and location of fixings ➢ Check there are no missing fixing/bracing straps	

3b Steel/timber wall/sub-floor framing

Items to be checked	Elements to be inspected	Informative Notes The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
3. Thermal insulation	• Insulation for energy efficiency requirements (if applicable) • R value and installation • Roof/ceiling insulation • Insulation or sarking to external wall framing	➢ Check abutment, overlapping and taping of insulation. ➢ Check insulation maintains position and thickness over all areas in accordance with building standards and manufacturer's requirements. ➢ May require to check manufacturers/ builders certification for insulation	

3c Roof framing

Items to be checked	Elements to be inspected	Informative Notes The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
1. Members	• Member sizes and spacings	➢ Check there has been no substitution for different sizing of members and no widening of spacings	AS 4440 – 2004 Installation of nail plated timber roof trusses. (secondary reference)
2. Timber/steel	• Timber/steel grading, strength, treatment and durability		
3. Trusses	• Location and fixing of trusses/truss binders • Seating and fixing of trusses • Member sizes and spacing	➢ Check roof truss member sizes, connections, layout, bracing and tie down as specified in the engineering truss report ➢ Check if in accordance with design details and/or manufacturers requirements for installation ➢ Check that the imposed construction loads from heating units, air con, hot water services and the like have been accounted for in the design or are located so that they are directly supported on internal walls.	AS 1684.2-2010 Residential timber framed construction (non-cyclonic areas) AS 1684.3-2010 Residential timber

3c Roof framing

Items to be checked	Elements to be inspected	Informative Notes The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	Building standards
4. Cross bracing	• Cross bracing for roof and any trusses	➢ Installed in correct locations ➢ In accordance with manufacturers recommendations.	framed construction (cyclonic areas)
5. Tie downs	• Type, number and location of fixings • Corrosion resistance	➢ Check tie downs are secure and are of the correct type, correct number, and in the correct locations ➢ Check correct number and type of connections in the chain of tie downs and wall to floor fixings. ➢ Check appropriate and compliant corrosion resistant materials have been used.	
6. Beams and struts	• Tie-down, fixing, connection, adequate support	➢ Check members sizes, orientation, bearing and locations ➢ Check for adequate support, fixing tie-down and connection	
7. Point loads	• Point loads for trusses and framed roof systems	➢ Check location, fixings and connections. ➢ Ensure adequately supported	
8. Battens	• Batten fixings connections and details	➢ ensure required sufficient connection ➢ batten fixing and joint location (sheet roofs) ➢ In accordance with manufactures requirements for installation (if applicable).	
9. Materials	• Treatment and durability, including termite resistance.	➢ Check materials used conform to the approved treatment and durability requirements. ➢ Exposure class for nail plates	

3d Fire and Sound Separation			
Items to be checked	**Elements to be inspected**	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	**Building standards**
Fire separation (where applicable) - Particularly relevant for Class 1a (attached) buildings; fire separation is to be appropriate for the type of construction and distance from boundary.			BCA – Volume 1 Part 3.7
1. Fire separation	• Fire separation between fire walls, including shared eaves and verandas • Materials and systems	➢ Fire walls located in accordance with approved plans ➢ Non-combustible barrier in shared verandahs or eaves in attached dwellings ➢ Fire separation walls completed and continuous to underside of roof (or are otherwise completed in accordance with plans) ➢ Correct use of materials and systems in accordance with manufacturers details and specifications	BCA Volume 2 - 3.7.3.2 Separating Walls
2. Materials	• Fire resistance level (FRL) and system requirements	➢ Check fire rated materials used comply with the required FRL/approved plans and installed in accordance with tested prototype systems	
3. Boundary	• Fire resistant materials	➢ Check that materials used are appropriate for the distance from the boundary	
4. Penetrations	• Penetrations through fire separation (where permitted) • Fire collars and other approved systems	➢ Check service penetrations chases into concrete/masonry separating fire resistant walls ➢ Check there are no deviations that may compromise the integrity of the fire separation	
Sound insulation (where applicable)			
1. Walls	• Thickness of walls, • Insulation system and materials used	➢ Check insulation and discontinuous construction in party separating walls	

3d Fire and Sound Separation			
Items to be checked	**Elements to be inspected**	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply.	**Building standards**
2. Penetrations	• Any penetrations or services (where permitted)	➢ No deviations to approved plans that may compromise the integrity of the sound separation ➢ No penetrations unless as per approved plans, ➢ No services chased and no penetrations into concrete/ masonry separating walls unless on approved plans. ➢ In accordance with manufacturers system and specifications	

3e Wet Areas - Builder to inspect/confirm compliance. Building surveyor can rely upon Inspection Certificate issued by builder.			
Items to be checked	**Elements to be inspected**	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply	**Building standards**
1. Construction of wet areas (prior to tiling/covering of wet areas)	• 1800mm high corner water proofing to shower • Floor, wall joints and penetrations seal • Shower tray installation (where required) • Adequate falls to waste • Angle water stop to shower screen and entry door, • Flashings • Bath area • Laundry/WC	➢ Builder to complete a declaration form confirming compliance of wet areas – see separate checklist and prescribed form to be submitted to inspector at the final inspection stage, along with the wet area seal certification. ➢ Water resistant and waterproof construction to wet areas to be in accordance with NCC Vol 2. ➢ Refer table 3.8.1.1 Waterproofing and water resistance requirements for building elements in wet areas.	BCA – Volume 2 part 3.8.1 Wet areas and external waterproofing AS3740 Waterproofing of domestic wet areas

Stage 4 Final

Notification requirement

- once the building work is complete, (including bushfire compliance where applicable) but before notice of completion is submitted

Inspection to occur

- At the completion of the building work and prior to occupancy.

Items to be checked	**Elements to be inspected**	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply	**Building standards**
1. Building permit conditions	• Building permit conditions of approval. • Outstanding or non-compliance certificates from previous inspections	➢ Check any conditions have been complied with ➢ Check any non-compliance matters have been rectified	Building Regulations r.31A and 31BA BCA – Volume 2, parts 3.5, 3.6, 3.7,3.8 and 3.9 3.7.1 and 3.8.6 (class 1a attached) BCA – Volume 2 part 3.1.3.3 Surface Water Drainage BCA - Volume 2 Part 3.5 Roof and Wall Cladding AS 2049-2002 Roof tiles AS 1562.1-2018 Design and installation of sheet
2. Certification provided	• Certification of finished floor levels and finished ground levels • Concrete test reports • Prefabricated frames and/trusses certification • Structural engineering certification • Retaining walls (incidental structures) • Plumbing, electrical, gas compliance • Wet area seal certification • Builder certification of compliance of wet areas • Energy efficiency/rating certification • Window and Glazing certification/ wind classification/energy rating/ bushfire rating • Balustrade structural adequacy • Fire rating and insulation	➢ Certificates to be submitted by builder at completion of the building work ➢ Test certificates required for both sound and fire insulation where verification of compliance with the BCA is required. ➢ Test certificates as required by approved plans, specifications, NCC or manufacturer.	

Items to be checked	Elements to be inspected	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply	Building standards
	• Smoke detection and alarm (hard wired to AS 3000) • Sound insulation • Door and window flashings • Soil compaction • Bushfire provisions • Any test certificate required for the use of specific materials		roof and wall cladding AS 2047-2014 - Windows and external glazed doors in buildings AS 3740-2010 Waterproofing of domestic wet areas.
3. Site works and drainage	• Site facilities drain away from the dwelling and protect adjoining properties from stormwater run-off • Location and number of soak-wells • Drainage of retained earth, or other retaining walls including batters, do not impact on dwelling or adjoining properties • Surface and roof water discharges to an approved discharge point, • Gutter and downpipe sizing and spacing • Overflow provisions to gutters • Finished ground levels adjacent to the dwelling are graded away, • Finished slab heights above external ground level.	➢ Ensure water from roof or balconies will be conveyed to outfall without entering the building.	AS 3959-2018 Construction of buildings in bush-fire prone areas. NASH – Steel Framed Construction in Bushfire Area. AS 3786-2014 Smoke alarms Could also include AS1670.1 - Fire detection, warning,
4. Termite management	• Location of system notices • Minimum clearance to FFL's • Exposed slab edges	➢ Check system is in place and no damage or change has occurred during construction ➢ For physical barriers, ensure visibility	control and intercom systems - System design, installation and

Items to be checked	Elements to be inspected	Informative Notes The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply	Building standards
	• Sub-floor termite shields and other elements of physical and chemical barriers	➢ Termite management system permanent notices in required locations, as per AS3660 ➢ Notice to be of durable material	commissioning, Part 1: Fire
5. Damp and weatherproofing	• Weather proof coating to external face of single-leaf masonry walls (where required) • Flashings to wall/roof junctions • Flashings to roof penetrations • Location, height above FGL and spacing of weepholes to cavity masonry walls • Flashing to door and window openings	➢ Check weatherproofing has been completed ➢ Flashings are appropriate and installed	AS 3660.1 Termite Management
6. Fire safety	• Concession for encroachments within 900mm from lot boundary comply in regard to use of non-combustible materials • Operation and location of smoke detectors • Hardwired and interconnected SD • Hearth and flue construction around free-standing or open fire place • Termination height of chimney • Fire rated construction • Non-combustible material in eaves for fire separation • Non-combustible barrier in shared verandahs or eaves in attached dwellings	➢ Encroachment concession complied with in terms of non-combustible materials ➢ Check correct number and location of smoke alarms ➢ On site test of detection and alarm system for compliance with AS3786 required	
7. Bushfire construction	• Construction requirements for bushfire prone areas	➢ Refer to separate checklist	

Items to be checked	Elements to be inspected	**Informative Notes** The items in this column are some of the aspects of each element that should be checked to ascertain compliance with the approved plans and relevant building standards. These are not exhaustive lists and may not always apply	Building standards
8. Health and amenity	• Ceiling heights to stairs, habitable and non-habitable spaces • Natural light/windows of appropriate size • Natural ventilation adequate. • Mechanical ventilation/exhaust fans installed and operational. • Construction of sanitary compartments	➢ Openable windows, where required ➢ Check door swing requirements, lift off hinges installed where required	
9. Safe movement and access	• Balustrades to stairs, balconies, decks, windows and paths of access • Stair risers and goings • Non-slip goings • Landings and thresholds	➢ Check balustrades/handrails are present where required ➢ Check fixings to balcony balustrades ➢ Check dimensions are correct for landings, stair risers and goings ➢ Check for compliant max 125mm apertures to balustrades and open risers	
10. Glazing	• Location and type of glass • Safety glass as appropriate • Wind classification • Window restriction requirements for multi-storey.	➢ Check glazing is appropriate to the wind classification requirements ➢ Check for correct distance measurements	
11. Sub-floor ventilation	• Location and spacing • Area of ventilation • Ventilation openings to sub floor internal walls	➢ Ventilation is provided where required	

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Attachment D

Report by DevCert on estimated costs of inspections for Class 2-to-9 buildings.

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MANDATORY INSPECTIONS – CLASS 2 – 9 BUILDINGS

Perth, Western Australia (Drost, 2018)

Client:	Department of Mines, Industry Regulations And Safety, State Government of Western Australia
Authors:	Wayne Drost and Greg Dempster
Report Date:	17 May 2022
Revision:	003
Devcert Ref:	200032

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PURPOSE OF THE REPORT

Devcert is a Queensland based building certification business issuing building development permits under the Qld Planning Act 2016. Devcert has been engaged to provide comment to WA Department of Mines, Industry Regulation and Safety with respect to the implementation of a legislated mandatory inspection process associated with building approval works in Western Australia. Devcert understand the intent of implementing the mandatory inspection process forms part of the WA government's response to the Building Confidence Report (BCR) 2018 (Refer BCR Recommendation 18) for the purpose of enhancing the public's trust in Australian building stocks through greater third party oversite of the construction phase (Shergold & Weir 2018, pp.3, 5).

The WA Government have provided Devcert with a number of questions for comment. These questions have been detailed in the following tables along with Devcert's response.

In line with the Building Confidence Report, the term *building surveyor* is used in preference to the term *building certifier* (Shergold & Weir 2018, p.7) except where referenced legislation specifically used the term *building certifier*.

BACKGROUND

High rise and high occupant load complexes provide a higher occupant risk profile compared with low-rise buildings. The National Construction Code - Building Code of Australia (BCA) recognises this increased risk profile through a number means including the allocation of design parameters such as the *Type of Construction* and *Building Classification.* Within the Australian context, these risk profiles were made manifest in building developments such as Lacrosse Apartment tower cladding fire (2014), and the Opal (2018), Elara (2012), Catalyst (2017), and Mascot (2019) apartments' structural failures (Australian Broadcasting Corporation 2017, 2019). The Riverside Golf Club roof collapse in 2002 resulted in the deaths of two people. These events have had a significant direct financial and emotional impact on the owners and occupants of these buildings (Australian Broadcasting Corporation 2019; Malone 2021), the cost burdens have also spread to the wider Australian community as retroactive investigations and modification are implementing to bring the existing building stock into legislative compliance. Queensland safer buildings program is an example of this (Queensland Department of Energy and Public Works 2022). While Australia has suffered tragedies resulting from building system failures (Australian Broadcasting Corporation 2005), overseas developments have seen catastrophes at levels not yet experienced in Australia (dev_admin 2021; Moore-Bick M. The Right Hon Sir 2019; National Geographic 1981; National Institute of Standards and Technology 2021).

The BCA responds to the risk profile by specifying the inclusion of systems intended to mitigate those risks. Ensuring those systems achieve their intended function requires:

1. sound legislative drafting, and
2. competent design development,
3. material and product selection,
4. manufacture,
5. installation,
6. commissioning, and
7. maintenance.

With the market's tendency toward medium and high rise construction, appropriate levels of third party oversight are required throughout the building development process (Shergold & Weir 2018, pp.3, 10). The systems specified by the BCA tend to become more stringent as the building's risk profile increases. As a result, the technical competence of the persons involved in the project's design, construction, and oversight also needs to increase. To date, Western Australia does not have a legislated requirement for building works to be inspected during the construction process.

Shergold and Weir (2018, p.13) notes independent inspections of building work have merit for achieving compliant outcomes. However, Shergold and Weir (2018, p.13) also state "Mandatory inspections are limited in their ability to detect non-compliance. Some of the most important safety elements are hidden from view and a point-in-time inspection cannot properly assess essential construction process". Building construction compliance relies heavily on builder competence and integrity (David Chandler OAM in Australian Broadcasting Corporation 2019, @ 09:34-09:46; Shergold & Weir 2018, p.13). This need for competence and integrity applies to all building practitioners from designers through to installers (Australian Broadcasting Corporation 2019). In this light, it is understood the WA Government is seeking to establish a system of building practitioner registration for purposes of responding to the Shergold and Weir (2018, p.15) BCR Recommendation 1.

CONSIDERATIONS OF THE QUEENSLAND PROCESS FOR BUILDING INSPECTIONS

The *Qld Building Regulation* 2021, s.44) establishes a set of mandatory inspections for single detached class 1A, class 10 buildings and swimming pools (class 10B). For Class 1A buildings, the mandatory inspections stages are foundations/footings, slabs, framing, blockwork reinforcement, and building completion. The regulation does not specify a set of mandatory inspection stages for Class 1a attached, Class 1b, or Class 2 to 9 buildings. Instead, the regulation provides that the building development approval may identify stages of work subject to a mandatory inspection (*Qld Building Regulation* 2021, s.44(1)(a)). In this way, the regulation establishes a risk based model for the determination of required stage inspections by the building surveyor.

The legislation allows for the government to establish inspection guidelines (*Qld Building Regulation* 2021, s.47) and requires the building surveyor and any inspecting person to have regard to those guidelines in the excise of their duties (*Qld Building Act* 1975, s.133A; *Qld Building Regulation* 2021, s.47). For the building surveyor, the guidelines establish a risk based methodology for the determination of required inspections to be undertaken on Class 2 to 9 and the inspection regime is developed with respect to key building parameters.

Figure 1: Risk level matrix to guide development of inspection regime. (Queensland Government 2020, pp.13-14)

Risk factor	Risk level		
	Low risk	Medium risk	High risk
Building classification	Building is a class 2, 3, 4 (part of a building), 5, 6, 7 or 8 and has a rise in storeys of less than three storeys.	Building is class 2, 3, 4 (part of a building), 5, 6, 7 or 8 and has a rise in storeys of more than three storeys.	Building is class 9 or of any class determined to be of importance level 3 or 4 in accordance with the BCA.
Height/floor area	Not greater than three storeys above the ground. Fire compartments do not exceed the provisions of BCA Table C2.2.	More than three storeys above ground but no more than 25 metres in height.	Contains fire compartments exceeding the provisions of BCA Table C2.2. More than 25 metres in height.
Performance solutions	No performance solution – proposal meets deemed-to-satisfy provisions of BCA.	Incorporates performance solution not involving fire safety systems.	Incorporates performance solution involving fire safety systems.
Experience of the design and building team	Practitioners designing and constructing the building have been involved with more than three buildings of the same classification.	Practitioners designing and constructing the building have been involved with, and completed, fewer than three buildings of the same classification.	Practitioners designing and constructing the building have no previous experience relating to the proposed classification or building type.
Climatic conditions	Area is not impacted upon by known risks e.g. flood, bushfire, earthquake, cyclone, landslip.	Area has known risks e.g. flood, bushfire, earthquake, landslip, contaminated land. Building is not a class 9.	Area has known risks e.g. flood, bushfire, earthquake, landslip, contaminated land. Building is a class 9.

The language of the *Qld Building Regulation* 2021) and the Qld Government Class 2 to 9 inspection guidelines discusses the concept of stage inspections and that following each stage inspection the building certifier (or competent person) must issue a (1) stage certificate (where the work is found to be completed and compliant) or (2) a non-compliance notice (where the work is found to be not complete or non-compliant) (*Qld Building Regulation* 2021, s.53(1) & S.54(1)). The guidelines identify "Building certifiers are responsible for ensuring specific compliance is achieved" (Queensland Government 2020, p.6). However, the guidelines also state, "The size, complexity, and nature of some class 2 to 9 buildings means it is not practical for a building certifier to inspect every element of a building for compliance with the building assessment provisions of the BA" and "A realistic level of random auditing by the building certifier (or competent person inspecting on their behalf) should form part of a reasonable inspection schedule (Queensland Government 2020, pp.4, 6). For example, a building may require systems of smoke detection, sprinkler protection, fire collars, fire hydrants, and various other fire safety systems. A reasonable level of auditing inspection may involve at each inspection random checking of some matters of compliance for each system on a number of levels of the building while those systems are incomplete" (Queensland Government 2020, pp.4, 6). In the same vain, the ABCB's Discussion paper on mandatory inspections discusses mandatory stage inspections and the concept of inspection sample size (Australian Building Codes Board 2020, pp.6-18). The ABCB model guidance on BCR recommendation identifies inspection of 100% of all building work is preferable but may not be possible for Class 2 to 9 work (Australian Building Codes Board 2021, p.14).

How can a building surveyor or competent person inspect only some matters of large and complex Class 2 to 9 buildings and then issue a compliance certificate which states that a stage of the work is complete and compliant with the BCA? Refer Figure 2 & Figure 3. The concept of stage inspections and auditing inspections conflict. As noted by Jonathan Duler in Australian Broadcasting Corporation (2019, @ 25:52 - 26:10) all buildings have defects.

Figure 2: Qld Form 16 for a stage inspection – purpose under the Qld Building Regulation 2021.

Form 16 **Inspection certificate**

Queensland Government

This form is to be used for the purposes of section 10 of the *Building Act 1975* and section 53 of the Building Regulation 2021. The relevant building certifier, another building certifier or a appointed competent person is stating a stage of work is compliant with the building development approval.

Explanatory information relevant to completion of this form is in the Appendix at the end of this form.

Figure 3: Qld Form 12 for an aspect inspection - purpose under the Qld Building Regulation 2021.

Form 12 **Aspect Inspection Certificate (Appointed Competent Person)**

Queensland Government

This form is to be used for the purposes of sections 74 and 77 of the Building Regulation 2021 (appointed competent person statement that an aspect of work has been completed and complies with the building development approval).

Information about how to complete this form is in the Appendix at the end of the form.

For Class 1A buildings, given their limited size and complexity, the system of mandatory inspections is eminently sensible. However, a building surveyor cannot inspect 100% of every system that goes into Class 2 to 9 buildings especially as those buildings increase in size and system complexity (Robert Marinelli in Australian Broadcasting Corporation 2017, @ 37:28-38:30; David Blackett in Australian Broadcasting Corporation 2019, @ 28:30-30:43; Australian Building Codes Board 2021, p.14; Queensland Government 2020, p.3). The building surveyor is necessarily limited to undertaking a series of sampling inspections (David Blackett in Australian Broadcasting Corporation 2019) with respect to the building systems and to have a general site/project awareness of building works in progress. Whereas a stage inspection infers a hold point in the project past which the builder may not progress without being in possession of a satisfactory inspection certificate for the stage of works from the building surveyor (*Qld Building Regulation* 2021, s.49 & 55; Queensland Government 2020, p.7). Beyond small Class 2 to 9 buildings, the stage inspection concept is not workable and does not scale appropriately to larger and more complex buildings. The concept of a stage inspection should be restricted when considering Class 2 to 9 buildings exceeding building geometries akin to Class 1A buildings.

As highlighted by David Blackett in Australian Broadcasting Corporation (2019, @ 29:03-29:13), a key issue with building non-compliance is the system. It is important for buildings of all scales and complexities to be suitably contained within the legislative framework.

For Class 2 to 9 buildings exceeding Class 1A geometries and scale, mandatory <u>stage</u> inspections ought to be limited to;

1. Fire service's witness and interface testing (with or without brigade involvement)
2. Final inspection
3. Other stages of the work identified as a stage to be inspected within the building approval.

Devcert recommend the concept of a stage inspection apart from those listed above not be embodied into legislation for Class 2-9 buildings. Instead, the concept of building surveyor mandatory sampling or mandatory audit inspections should be paramount during the project's main construction phase with development of a suitable report documenting the progressive auditing of the project. The recently published Mandatory inspections – Model Guidance on BCR Recommendation 18 by the ABCB identifies a list of mandatory inspection for buildings of different risk profiles (Refer Table 1). Interestingly, many of the key building safety systems are identified in the line items after the "Final" highlighting the fact many of these systems do not achieve operational status until the closing days of the build. Again, how can these systems and parts of systems be allocated to a stage inspection, and be issued with compliance certificate prior to the system achieving operational status?

Table 1: ABCB Model Mandatory Inspection (Australian Building Codes Board 2021, pp.7, 8)

Building does not fall under a BC level	Low or medium BC	High or very high BC
foundations	**foundations**	**foundations**
reinforcement in situ reinforcement in footings/slabs and other structural elements	**reinforcement** in situ reinforcement in footings/slabs and other structural elements	**reinforcement** in situ reinforcement in footings/slabs and other structural elements
framing structural frames, including roof construction	**framing** structural frames, including roof construction	**framing** structural frames, including roof construction
N/A	**lightweight fire rated walls** pre-plastering including where applicable: - thermal and acoustic insulation - sarking, cavities and other weatherproofing and condensation mitigating measures - attachment of non-combustible elements	**lightweight fire rated walls** pre-plastering including where applicable: - thermal and acoustic insulation - sarking, cavities and other weatherproofing and condensation mitigating measures - attachment of non-combustible elements
waterproofing of wet areas	**waterproofing** of wet areas	**waterproofing** of wet areas
pools pool barriers including in situ reinforcement for pools	**pools** pool barriers including in situ reinforcement for pools	**pools** pool barriers including in situ reinforcement for pools
final post-completion of all building work	**final** post-completion of all building work	**final** post-completion of all building work
	External cladding façade and cladding installations – fire, energy efficiency (insulation) and weather proofing	**External cladding** façade and cladding installations – fire, energy efficiency (insulation) and weather proofing
	fire detection and suppression systems including fire alarms, fire sprinklers, occupant warning systems, emergency lighting, fire hydrant and hose reels, and smoke hazard management system	**fire detection and suppression systems** including fire alarms, fire sprinklers, occupant warning systems, emergency lighting, fire hydrant and hose reels, and smoke hazard management system
	Penetrations of fire rated construction including external/internal walls, floors and shafts	**Penetrations of fire rated construction** including external/internal walls, floors and shafts
		Operation of fire systems witness testing of fire safety systems and emergency evacuation systems in operation

The focus ought to be on building audit reporting involving inspections of each storey or building space as BCA systems are incorporated into the building. An audit report may record issues in the following table format.

Table 2: Inspection auditing report example (Reference withheld).

Item	Requirement	Date included to report.	Location	Legislative Reference / Extract from NCC-BCA / Australian Standard/ Drawing	Photograph	Action - NB. When responding to an action via email – Record the "Item Number" X in the subject line.	Status
1.	Fire Protection	20/05/20	All smoke doors Level 1 to 8.	BCA Part A2.2, C2.14, Spec C2.5 Clause 2.3 Installed frame indicates the smoke door will not swing in both directions. In this instance, one directional door permitted by Spec C3.4 Clause 3.2 (a)(i) is not suitable. **3.2 Construction deemed-to-satisfy** A smoke door of one or two leaves satisfies Clause 3.1 if it is constructed as follows: (a) The leaves are side-hung to swing— (i) in the direction of egress; or (ii) in both directions. (b) (i) The leaves are capable of resisting smoke at 200°C for 30 minutes. (ii) Solid-core leaves at least 35 mm thick satisfy (i).	 Photo Level 2	Smoke doors are required to swing in both directions Inspected 21/07/2020 – Work in progress. WD Inspected 18/08/2020. Resolved. WD.	Closed

These mandatory audit/sampling inspections are directed towards the building's systems during construction and recording any findings of non-compliant work identified during each site visit and the subsequent resolution of those non-compliances. The items documented as system non-compliance matters become instructions for the builder for rectification throughout the building. The audit/sampling report will form part of the building permit public record.

Sampling of building systems should include categories identified in Appendix A spreadsheet. Again, it is not possible for the building surveyor to inspect 100% of the work. In this light, it becomes difficult for a building surveyor to issue a stage certificate stating that the whole of any one system achieves 100% compliance with the BCA. The building surveyor and the State need to have faith in the trade contractors licenced and regulated by the State to undertake the building works and the critical sub-systems of that work in accordance with legislative requirements. The final compliance and occupancy certificate needs to be backed by certifications from relevant State licenced specialists and State licenced trade contractors/installers. The responsibility of achieving building compliance needs to fall to all parties in the delivery chain in the same manner as expressed in *Disability (Access to Premises - Buildings) Standard 2010*) and Queensland's non-compliant products legislation and not just the building surveyor (Australian Broadcasting Corporation 2019, @ 25:20-36:09).

Figure 4: Access Code duties on certifiers, developers, and building managers. (Disability (Access to Premises - Buildings) Standard 2010, p.8)

Part 3 Requirements of Standards

3.1 Building certifiers, developers and managers to ensure buildings comply with the Access Code

(1) A building certifier, building developer or building manager of a relevant building (other than an existing public transport building) must ensure that the building complies with the Access Code.

RESPONSES TO QUESTIONS

Table 3

Client Question	We'd like to contract a building surveyor who's had experience with mandatory inspections to estimate the likely time and cost to undertake our proposed inspection regime for class 2-9 buildings.
Client Discussion / Comment	• All class 2-9: ◦ after the commencement of the excavation for, and before the placement of any membranes or concrete for any footing; ◦ 30% of reinforcing steelwork for footings/slabs and other structural elements before pouring of concrete; ◦ 30% of each other type of structural framework or structural joint prior to enclosing, covering or otherwise concealing from inspection; ◦ fire protection at service penetrations and openings to building elements that are required to resist fire or smoke spread at least one (1) type of protection method for each type of service per storey of the building; ◦ prior to covering any underground service connections (e.g. stormwater drainage, sewer etc.); ◦ final, post completion of all building work but prior to the giving of any NoC or CCC; and ◦ fire safety system testing (as per existing requirement in the Building Regulations). • Additional minimum notifiable stages for all Class 2, 3 or 4 commercial buildings: ◦ Prior to enclosing, covering, or otherwise concealing from inspection, the junction of any internal fire-resisting construction that forms part of the construction bounding a sole occupancy unit, and any other building element required to resist internal fire spread, inspection of rated elements in 30% of sole occupancy units on each storey of the building. ◦ Prior to enclosing, covering or otherwise concealing from inspection, 20% of all required external waterproofing membranes, flashings, sarking or like materials forming part of the weatherproofing elements of a building; ◦ Prior to enclosing, covering or otherwise concealing 20% of rooms with sanitary fixtures requiring waterproofing membranes and water resistant substrates on each storey of the building.
Devcert Response/ Comment	General Discussion Where Class 2 -9 projects <u>align with the geometry of Class 1A buildings</u> (i.e. single or double storey) the inspection staging will generally be the same. That is footings, slab, frame, blockwork, fire safety system witness test, and final along with other systems required by the BCA such as fire stopping of service penetrations. Time allocation for inspection of these building may be similar to Class 1A structures ranging from an average of 1 to 2 hours on site. Travel times and report preparation times are also to be allocated with report preparation times being at least equal to the inspection time. Depending on the building surveyor's charge out rates, inspection costs may range on average from $550 to $750 per inspection. Other persons may need to attend the inspection to attest to the works' compliance where the building surveyor's skills are insufficient (i.e. the structural engineer).

Buildings exceeding the scale and geometries of Class 1A buildings do not fall neatly into the concept of mandatory stage inspection. Using a slab as an example, for one site a single slab of 5000m^2 may be cast in a single day. While on another site, much smaller slabs need to be cast due to logistics (manpower, pump availability, site access and vehicle movements, street access and traffic flow, placement of slab control joints, temperature, humidity) associated with the site. This can result in the need for multiple inspections as portions of the whole storey are prepared and cast each day. The inspection costs will escalate by multiples of a single inspection as the number of site attendances increase.

As discussed above, given the variance in size and complexity of Class 2 – 9 buildings allocating a singular time and cost value to each item in the proposed inspection regime is not possible. Attendances at site will span from 4 to 8 hours not including travel, documentation of results, subsequent client discussions or re-inspections. Inspection fees may range from $1,250 to $2,250. A recently completed moderately sized twin tower mixed use residential/retail development was allocated a regime of some 75 inspections. The building surveying inspections were primarily focused on BCA Parts C, D, E, F2 to F5 systems. Structural engineers oversaw BCA Part B systems.

Unlike Class 1A and 10 buildings and structures, which fall within a limited size bracket, Class 2 to 9 buildings may occupy a broad size and complexity distribution. Indeed, it is this complexity that has led to the establishment of the performance based BCA as the ABCB recognized it was no longer viable to write code which would cover every form of modern building (Savery 2018, @ 00:00 - 01:40). This same complexity has led to the Queensland introduction of a risk-based inspection guideline whereby the building certifier has the responsibility for determine the number of inspections necessary for each project and to document those inspections requirements within each development building approval (Queensland Government 2020). The difficulty is that the developer/builder will be under commercial pressure to select the building certifier tender proposing the least number of inspections. This risk based system is also utilized for Defence Force building projects under the Defence Building Works Manual (Department of Defence 2021, s.3.26 & 3.27) (See Figure 5 & Figure 6) and is reflected in ABCB's discussion paper on mandatory inspections (Australian Building Codes Board 2020, p.8). The Defence Force's Building Works Manual has been subjected reviews for purposes of confirming, *inter alia*, the Defence Force inspection regime aligns with the BCR Recommendation 18 (Weir 2020, p.1).

Figure 5: Department of Defence Building Work's Inspection Requirements

Required inspections

3.26 The *building surveyor* shall determine the required inspections of *building work* including for *demolition work* and shall list the required inspections in the *building approval*.

The Building Works Manual s.3.27 then identifies BCA systems which must be inspected and confirms the unbounded scope of s.3.26. See Figure 6.

Figure 6: Department of Defence Building Work's Inspection Requirements

3.27 The required inspections of *building work* must include, but are not limited to the following measures required by the *building approval*:

a. any stage or element required under the relevant State or Territory *building approval* legislation;

b. any inspections requested by any person other than the *building surveyor* who will be expected to certify that any part of the *building work* complies with the *building approval* including persons that prepared a *performance solution* report or *dispensation* report;

c. structural stages/milestones;

d. fire/smoke separation construction;

e. sound rated construction;

f. witness testing of fire safety systems;

g. witness testing of emergency evacuation lighting systems;

h. any other stages/inspections nominated within the *building approval*; and final inspection.

To obtain representative numbers for these factors, market sampling would be required across a range of model projects followed by appropriate statistical analysis.

The inspection auditing/sampling percentages indicated in the client discussion above are consistent with values proposed by the ABCB model (Australian Building Codes Board 2021, p.14).

Legislative semantics will be important for purposes of achieving the government's intent. For example, in the above client discussion about footings the statement is made "30% of reinforcing steelwork for footings/slabs before pouring of concrete". What does this mean, exactly? Does this mean 30% of the reinforcing steel has been placed in the whole footing system before inspection, or does it mean 30% of the footing system has been prepared with 100% of the reinforcing steel in place and is ready to be cast? Devcert contend a best option is for 30% of the footings to be 100% complete prior to the inspection being undertaken ahead of casting. If the portion of the work is not complete, then a full assessment of the work cannot be achieved. This is not to say that the whole of the work is completed but the portion of the work available for inspection must be 100% complete.

Where non-masonry fire rated walls are involved, additional inspections will be involved due to multi-faceted systems which involve framing, 1st and 2nd layer plasterboards, fixings and connections, and interface fire sealing with roof sheeting, external cladding, and flooring. Due to the number of proprietary fire rated / sound insulated wall systems and the importance of getting these correct, these inspections can have higher time allocation onsite and including system research pre-, or post-inspection. For a building storey incorporating numerous residential units along with public corridors, 3 hours can be allocated to attend an inspection.

	Fire compartmentation is required in many Class 5 to 9 buildings depending on the exact building design parameters and may utilize the same construction materials and techniques as Class 2 & 3 buildings. The key differences between Class 2 and 3 buildings to Class 5 to 9 being Class 2 and 3 are occupied by sleeping occupants and the size of the sole-occupancy units results in more fire rated wall length per unit floor area. Class 2 and 3 buildings can as a result pose higher risks to life and be more politically sensitive when the building does not perform as intended and fire/smoke spread beyond the compartment of origin. While it is possible to specify the percentage of building works and their systems to be inspected, cost determination for the application of such an inspection regime must be undertake on a project-by-project basis. While storm water systems are captured by the BCA, these are not generally inspected by the building surveyor and are instead self-certified by the licensed competent person installer or designer. Generally, these are seen as low risk compared to other building systems. Sanitary sewer and water supply reticulation systems do not form part of the BCA provisions and instead are part of the National Construction Code – Plumbing Code of Australia provisions. These systems have higher risk profiles than stormwater systems due to presence of vector-borne disease and cross-connection contamination risk. These systems are generally the purview of compliance pathways established under the Western Australia Plumbers Licensing Act 1995 and subordinate regulation. The building surveyor and engineer will be interested in the installation of sub-soil flexible slip-joint couplings in the drainage systems when expansive or problem soils are present. Inspection of external water proofing membranes are generally visible during an auditing inspection. However, the building surveyor is unable to determine material compliance, application thickness, number of applications etc (David Blackett in Australian Broadcasting Corporation 2019) from the visual inspection. All the building surveyor can determine is a material has been applied, the extent to which it has been applied, and gradients to outfall. In terms of internal wet areas, value can be added where the building surveyor inspects the tile bed before tiles are laid where wet areas require falls to floor waste under BCA, AS3740, or AS1428.1 requirements. Flat wet area floors are a significant compliance issue in Class 2 & 3 buildings. If government is seeking 'best practice' and cannot rely on its State licensed contractors, then determining system compliance requires significantly more inspection points. As an example, the following minimum wet area inspections would be necessary to determine compliance with BCA F1.7 and AS3740-2010; 1. Inspection of substrate preparation, water-stop, and drainage flange installation before membrane application. 2. Inspection of membrane post application. 3. Inspection of tile bed for falls to floor waste 4. Inspection of tiled floor fall to floor waste. 5. Inspection of finished space post-grouting and caulking. For a single detached Class 1A dwelling, this will add 4 inspections to the project with a cost ranging between $450 to $660 depending on the building surveyor's charge out rate. For commercial projects this value may likely be $1200 to $2,250 per site attendance.

	External weather proofing complexity again depends on the size and complexity of the building. Builder and subcontractor self- certification is needed as part of the compliance process. NB. All Class 2 to 9 building are subject to the development of a performance-based design solution by the design team in respect of external wall weatherproofing[1]. The legislative framework must be capable of adapting and scaling to all buildings. Possible bracketing of inspection regimes for purposes of the legislative framework (Refer Appendix A). • Class 1 dwellings • Class 10 buildings and structures appurtenant to Class 1 dwellings. • Other Class 10 building and structures • Class 2 – 9 - ≤3 storeys and not exceeding 25m • Class 2 – 9 - > 3 storeys and not exceeding 25m • Class 2 – 9 - >25m Failure of competent arm's length oversight is known to result in poor building practices.

[1] BCA F1.0 and A2.2(4)

Table 4

Client Question	Who will do each of these inspections? I.e. building surveyor and/or engineer(s).
Client Discussion / Comment	The building surveyor that certifies the design compliance will be in charge of inspections, but it's expected that they will call on engineers to undertake some inspection points.
Response	There are numerous elements of the work which are better served through inspections being undertaken by specialist consultants and sub-contractors. Not all of these specialist consultants and sub-contractors will be classed as engineers. The level of involvement of these competent persons depends heavily on 1. Scale and complexity of the project 2. Building surveyor skill set. 3. Building surveyor availability. For example, where the element of concern is a structural element, the involvement of competent licensed structural engineers is critical. A building surveyor will generally have little ability to determine construction errors against the design drawings. The critical nature of structural design has been highlighted to the Australian public with recent events such as the Opal (2018), Elara (2012), Catalyst (2017), and Mascot (2019) apartments' structural failures, and now Champlain Towers, Miami, USA' (2021) (National Institute of Standards and Technology 2021) catastrophic structural failure. For other aspects of the work and with the building surveyor's acceptance, a licensed and competent person with the appropriate skill set can be engaged by the developer/builder to stand in the building surveyor's shoes for a particular, or class of, inspection/s. Examples include: 4. Building work involving fire engineering performance solution – the licensed fire engineer; 5. Stormwater drainage – the licensed hydraulic engineer or licensed plumber/drainer; 6. Water proofing – the licensed water proofer/tiler or licensed builder. 7. Smoke hazard management system – licensed mechanical engineer or licensed installer. This is not to alleviate the building surveyor's duty to attend the site, inspect the works, and form their own opinion of the building's compliance. However, the building surveyor is a generalist and not the expert in all things building (*Owner's Corporation No 1 of PS613436T v LU Simon Builders Pty Ltd (Building and Property) [2019] VCAT 286*, @ [520]). In the same way an expert witness is determined to be an officer of the court with a duty to properly inform the court on a matter and not adopt a partisan view, a competent person (consultant or installer) should have the same duty imposed to inform the building surveyor. Competent persons undertaking inspections and issuing inspection/installation certificates should clearly understand they act on the building surveyor's behalf and not the client or builder's behalf with whom they are contracted and have a duty to always act in the public's interest.

	Despite comments in the ABCB Mandatory Inspection Discussion paper, the building surveyor should not be required to "engage an appropriate practitioner" where the inspection work exceeds the skills and competency of the building surveyor (Australian Building Codes Board 2020, p.13). The building surveyor should not be required to contract to expend the private funds of the building surveyor in the course of serving in the public interest. Where an appropriate practitioner is to be engaged to advise the building surveyor, this person should be contracted to the client or a relevant government body. Management of Inspection Schedules It is understood the building surveyor has the responsibility of managing the building approval process, however, at some point the builder needs to be considered qualified, competent, and a fit and proper person to hold a builder's licence and to manage the building project. If they are judged not suitable against these criteria, they should not be permitted to hold a licence. Where a person is granted a builder's licence, they need to be trusted to manage the project and be responsible for notifying both the building surveyor and any relevant competent person that relevant aspects of the work are now ready and available for inspection. It ought not be the role of the building surveyor to establish and maintain administrative processes for arranging, managing, and confirming third party competent person inspection requirements. Similarly, competent persons also need to be considered qualified, competent, and a fit and proper person to hold their respective license and to manage and administer their inspection processes. Where the competent person determines inspected work is not compliant, the competent person should issue a relevant non-compliance notice to the builder and carbon copy to the building surveyor. The building surveyor then supports the non-compliance notice or overrides the non-compliance notice by issuing an inspection certificate. The competent person should be specifically excluded from 8. Issuing a site instruction which is not taken to be non-compliance notice. 9. Issuing an inspection certificate which relies on, by reference, a. specified work being completed in accordance with a site instruction, or b. a compliance statement issued by the builder or other person for work it was the duty on the competent person to inspect. Where a non-compliance notice has been issued, the legislation should allow for the competent person to return to site and re-inspect the work and issue an inspection certificate. The building surveyor needs to monitor this process for purposes of notifying the appropriate governmental bodies that required rectification works are not being completed and for enforcement action to commence.

	The structure of compliance and non-compliance certificates needs to be a clearly defined for each relevant entity[2]. For example: 10. Building surveyor's certificates and non-compliance notice, 11. Competent Person's certificates and non-compliance notice, and 12. Installer's certificates.

Table 5

Client Question	If there are any inspection points that require multiple inspectors to complete, what is each person inspecting?
Client Discussion / Comment	E.g. foundation inspection may require an engineer to inspect the foundation, and a building surveyor to check that it's in the right place?
Response	Yes, this is correct, multiple persons are required to provide input into what may be called an inspection point. This is especially true as building complexity increases. Queensland legislation uses the term "aspect" for the component parts that go into making up a "stage" inspection. As intimated above, the aspects that may be component parts of a foundation/footing stage include as an example 1. Correct allotment 2. Excavations of foundation material 3. Size and geometry of the piers and footings 4. Location and load capacities of installed piles 5. Steel reinforcement 6. Siting as applicable to allotment boundaries, relevant infrastructure assets (sewers and connection points), other buildings on the site (fire source features), 7. General site drainage away from footings 8. Termite management systems. Each of these aspects could be further broken down to other sub-elements. For example, 9. excavation for foundation material – dimensions of excavations, founding depth and material, accuracy of the soil profile across the excavations to the results of the bore logs including bearing capacity, identification of rock floaters; and 10. steel reinforcement – type, size, arrangement, spacing, concrete cover.

[2] Where the State initiates a licensing regime for various aspects of construction work, questions to be resolved will include (1) In addition to individuals, will companies be licensed? (2) Which licensed entity (company or individual) can issue inspection certificates however they may be called (stage or aspect or installation / work done)? Within Queensland only a natural person can issue a certificate associated with building work not being a single detached Class 1A building and associated Class 10 buildings and structures. The ability to license both individuals and companies as trade contractors results in significant building surveyor effort to check the appropriate individual licence has been nominated on the inspection certificates. Building surveyors experience significant resistance from the trade contractors for use of the individual's licence even to this day. This may result from some building surveyors not undertaking proper checks of each licence through QBCC's web portal to confirm the licence type.

	For the foundation/footing stage, persons other than the building surveyor may be required to confirm compliance across all aspects of the stage. For example, a cadastral surveyor may be required to confirm positioning of the works on the allotment relevant to adjacent allotment boundaries and fire source features, and relevant infrastructure services. Alternatively, the cadastral surveyor may need to confirm the placement of survey pegs which properly identify the metes and bounds of the site such that the building surveyor can inspect the siting of the work (*Qld Building Act* 1975, s.58 & s.78). Without the cadastral surveyor's involvement immediately prior to the casting of the concrete, a building surveyor cannot be certain of the building's location. It is understood, siting with respect to allotment boundaries for issues affecting property rights may fall outside Western Australia's building surveyor jurisdiction and may be the responsibility of the entity issuing the building development approval. However, positioning of the building relative to boundaries for natural light, *fire source feature* and building *effective height* issues (Australian Building Codes Board 2019, p.649) are most definitely part of the building surveyor's purview. Building heights can also impact other issues outside building code matters such as Obstacle Limitation Surfaces (OLS) surrounding airports (Perth Airport 2022). Each inspection point will have its own "aspects" which may require additional inspection personnel acting to verify compliance with the BCA is being achieved. It is self-evident that inspection points are centered on building systems as enunciated in the BCA. However, unlike Class 1A and 10 buildings and structures, Class 2 to 9 systems are not all complete at any inspection point other than at the final stage. It is only when the systems are complete, commissioned, and suitably interfaced with each other the intent of the legislation is achieved. It is necessary therefore to provide legislative flexibility to permit the undertaking of progressive or periodic inspections of the work. The difficulty will be in how to construct an inspection compliance certificate for partially completed systems being inspected across the whole of the project. Hence the advocacy for sampling or audit reports associated with the progressive or periodic inspection regime to be undertaken by the building surveyor with input from associated competent persons and installers. These sampling / audit reports become the foundation for compliance and occupancy certificates issued towards project close. Where the building surveyor is required to finalise each inspection point with a compliance certificate, the certificate will necessarily be circumscribed by exactly what work was inspected and found to be compliance. For example, where building surveyor is required to inspect 30% of wet area membranes, the building surveyor will construct the certificate to identify only the wet areas that has been inspected. Where the inspection point includes fire stopping of services penetrations and fire dampers, the same caveats will be imposed on the certificate. In addition, what is to prevent the builder offering a "golden sample" for inspection? Figure 7 shows 3# suitably tested fire dampers – which of these has been installed to achieve the requirements of the BCA?

<table>
<tr><td></td><td>Figure 7: Examples of fire dampers required to protect penetrations through a fire rated wall. (Drost, 2019)

Generally, multiple “aspects” of work will need to come together for a “stage” of work to be complete. The exact legislative nomenclature for an inspection point will need to be resolved as part of the State policy and legislative framing for these processes. Where possible and appropriate, harmonization of terminology and taxonomy across State jurisdictions is recommended.</td></tr>
</table>

Table 6

<table>
<tr><td>Client Question</td><td>Approximately how long is each inspection likely to take?</td></tr>
<tr><td>Client Discussion / Comment</td><td>This may be a range, to accommodate different building classes and sizes, or specific estimates based on one or more example buildings</td></tr>
<tr><td>Response</td><td>Inspection duration needs to include allowances for travel to/from site, site safety induction and/or sign-in processes, report response preparation and subsequent client queries and responses. Given Class 2-9 work is not homogeneous, inspection duration will vary significantly and is a key part of the crystal ball tendering process. Individual attendance at site for an inspection will range from 2 to 3 hours through to 10 hours for larger projects.

Preparation times for the inspection reports is also a key factor and will often be equivalent to or exceed the inspection time. The report preparation time needs to include for photo and site record storage, documentation of non-compliant matters, research and document regulatory requirements, documentation of client action requirements for resolution of the non-compliant matter.

For small ‘6 pack’ two story class 2 buildings, the project can involve 11 inspections being
Foundation/ footing/site drainage
Ground floor slab reinforcing
Ground level blockwork/bond beam
First floor slab reinforcing
First floor blockwork/bond beam
Roof trusses, wall framing, bracing, tie-down,
Fire rated wall – first layer plasterboard and sounding rating insulation
Fire rated wall – second layer plasterboard, fire rated wall sealing against roof</td></tr>
</table>

	• Fire rating of services penetrations (First floor slab) and services sound rating systems (Ground Floor) • External wall cladding systems and fire rated cavity sealing. • Final In addition to the inspections, a building surveyor should also undertake a significant document review of product evidence of suitability (i.e test reports – fire rating and hazard properties, sound insulation, slip resistance) relating to materials and systems used within the building.

Table 7

Client Question	An estimate of what these inspections will cost?
Client Discussion / Comment	
Response	• Lower end market is expected to be in the flat $150 to $250 range. • Mid-market is expected to be in the range of $250 per hour. Inspection costs being quoted in the $550 to $1500 per inspection. • Upper market is expected to be in the range of $350 per hour. Inspection costs being quoted in the $1250 to $2450. • Inspection costs also need to account for administrative work by the building surveyor. This includes the preparation of inspection reports and review of competent person certificates and material evidence of suitability documents. This administrative work is often equal to or exceeding the time value of the inspection itself. Except for air travel, experience indicates little, if any dollar value is attributed to this element of the work by the building certifier. • Inspection values will depend on market participants and size and complexity of the project.

Table 8

Client Question	Also, it would be good to get advice on how you think these inspection points measure up against the requirements in Queensland, for risk-based inspections. Is there anything that you'd add or amend?
Client Discussion / Comment	
Response	• Refer to section on Considerations of the Queensland Inspection System. • While the noted inspection points provide a level below which the building surveyor cannot progress, the inspection points also establish a ceiling past which the building surveyor is unable to progress given the economic realities associated with inspection regimes which consume significant amounts of time. The ABCB model identifies the building surveyor may undertake such other inspection as deemed appropriate (Australian Building Codes Board 2021, pp.5, 6), however the building surveyor will have no contractual mechanism by which they will be able to invoice for the work. • As previously noted in the Qld section, Class 2-9 buildings do not have legislated stages other that what is determined to be a stage by the building certifier and provided for in the building approval. • An area of key difficulty is the development of suitable stages for all parts of the work and for this to be completed at the tender stage. For example, how does the building surveyor, at the tender stage and before any structural engineer, builder, or services consultant have been appointed to the project, consult with this team for purposes of identifying the required number of additional inspections for the project (Australian Building Codes Board 2021, p.5)? • Establishing dedicated inspection stages outside of the fire system witness test and final inspection tends to be extremely difficult given the broad scope of works associated with Class 2 to 9 buildings. For a dwelling, each aspect of the work does not tend to commence until the other aspects are completed. For example, framing work does not start until the ground slab is complete and installation of wall lining does not commence until all framing and services are complete. This allows for the proper discrete identification of stages. Class 2 to 9 buildings, given their size, are not bound to these discrete stages unless they reflect domestic scale buildings in their geometry (i.e. Single or two storeys). • As previously noted, it would be preferable to limit the use of the stage inspection concept and instead focus on BCA system inspections utilising the building surveyor audit inspection report with competent person (structural inspections) inspection certificates for elements of the work completed in discrete portions (i.e. instu-concrete castings). This would still provide for structural system (BCA Part B) inspections prior to pouring of concrete but also facilitate the inspection of systems which extend

throughout the building on both small and large projects (i.e. mechanical, wet and dry fire systems).

- Considerations – how does WA propose to manage inspection process for prefabricated components and off-site construction, remote building work and virtual inspections (Australian Building Codes Board 2021, pp.5, 6, 17)?
- Ensure the State provides proper instruction to those practitioners serving as competent persons as to their legal and administrative duties when undertaking inspections on behalf of the building surveyor. It should not be the duty of the building surveyor to ensure competent persons and installers are cognisant of their role and duty under the legislation.
- The licensing boards for each profession and trade contractor should be encumbered with the duty of determining the competence of the candidate to work on each form of building. For example, the work between Class 1A and Class 2-9 wet areas is not significantly different and has limited impact on other building systems. By contrast, Class 1A smoke detection systems and Class 2 to 9 detection systems are significantly different and impacts on other major building fire safety systems and, as a result, whole of building fire safety. Appropriate grading of licences should be considered with the candidate demonstrating appropriate qualifications, understanding, and capabilities relevant to occupation and risk profiles of the building work.
- Within Appendix A, a bracket of hours has been provided for relevant building systems and ranges from small projects to large projects. For small projects these will involve discrete inspections, while large projects will start to involve inspection of parts of the work which are being incrementally completed across the development.

Please contact Greg Dempster in relation to any matters raised in this report.

Regards

Greg Dempster
Building Certifier
QBCC A461735

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APPENDIX A – SCHEDULE OF BUILDING SURVEYOR INSPECTION TIMES

In addition to the building height risk profile, many factors will enter into the time allocation for building certification inspections during the tender process including building classifications, building complexity, building systems, and floor area of each storey. Inspection items and time values provided have been considered against a variety of project classifications with which the authors have experience. The intent of the Building Confidence Report Recommendation 11, 18 and 19 for greater oversight of building works and critical safety systems (Shergold & Weir 2018, p.5) have also been a top-of-mind issue for the authors. It should also be noted that "inspection" processes often extend beyond site attendance and can include complex document review of system design and test reports and development of associated inspection reports providing compliance instructions to the building team.

Table 9: Building surveyor inspection time allocations.

Estimated hours to inspect Class 2 - 9 buildings				
Inspection Item	**Building height / risk profile**			**Frequency**
Inspector class	≤ 3 storeys	> 3 storeys < 25m	> 25m	
Foundations / Piers				
Building Surveyor	3	4	4	Per Inspection
Structural Engineer / Civil Engineer	3	5	6	
Foundations / Footings				
Building Surveyor	3	4	4	Per Inspection
Structural Engineer / Civil Engineer	3	5	6	
Ground Slab				
Building Surveyor	3	4	4	Per Inspection
Structural Engineer / Civil Engineer	3	5	6	
Pool shells				
Building Surveyor	2	3	4	Per Inspection
Structural Engineer / Civil Engineer	2	3	4	
Pool Barriers				
Building Surveyor	2	3	4	Per Inspection
Pool disabled persons access				
Building Surveyor	2	2	4	Per Inspection
Insitu-concrete columns				
Building Surveyor	3	3	3	Per Storey
Structural Engineer / Civil Engineer	4	6	6	
Blockwork - reinforced				
Building Surveyor	3	3	3	Per Storey
Structural Engineer / Civil Engineer	4	5	6	
Structural steel				
Building Surveyor	2	3	3	Per Storey
Structural Engineer / Civil Engineer	4	6	8	
Suspended floor slab				
Building Surveyor	2	3	3	Per Storey
Structural Engineer / Civil Engineer	4	6	8	

Sound Insulation				
Building Surveyor	2	3	3	Per Storey
Passive fire safety systems (Walls/Fame)				
Building Surveyor	2	3	3	Per Storey
Fire protection installer*	-	-	-	
Passive fire safety systems (Walls) - 1st layer plasterboard - per storey				
Building Surveyor	2	3	3	Per Storey
Fire protection installer*	-	-	-	
Passive fire safety systems (Walls) - 2nd layer plasterboard - per storey				
Building Surveyor	2	3	3	Per Storey
Fire protection installer*	-	-	-	
Passive fire safety systems - other fire compartments - per storey				
Building Surveyor	1	2	2	Per Storey
Fire protection installer*	-	-	-	
Passive fire safety systems (Penetrations)				
Building Surveyor	2	5	5	Per Storey
Fire protection installer*	-	-	-	
External wall - weather resistance - sarking - condensation - energy efficiency				
Building Surveyor	2	3	3	Per Storey
External wall - non-combustibility				
Building Surveyor	2	3	3	Per Storey
External cladding - non-combustibility				
Building Surveyor	2	3	3	Per Storey
Roof framing				
Building Surveyor	2	4	4	Once
Structural Engineer / Civil Engineer	4	6	6	
Active fire safety systems (hydraulic)				
Building Surveyor	2	4	4	Per Storey
Fire Systems Designer / Water-based fire systems installer*	4	6	6	
Active fire safety systems (mechanical vent)				
Building Surveyor	2	2	4	Per Storey
Mechanical Engineer	4	4	6	
Emergency Lighting				
Building Surveyor	0.5	1	1	Per Storey
Electrical Engineer	2	3	3	
Fire detection systems				
Building Surveyor	2	3	4	Per Storey
Electrical Engineer / Fire Systems Designer / Fire systems installer*	4	5	6	
Wet area Waterproofing - substrate				
Building Surveyor	2	2	2	Per Storey
Waterproofer Installer*	-	-	-	

Wet area Waterproofing - membrane / puddle flange				
Building Surveyor	2	2	2	Per Storey
Waterproofer Installer*	-	-	-	
Wet area Waterproofing - tile bed				
Building Surveyor	2	2	2	Per Storey
Tile Installer or Waterproofer Installer*	-	-	-	
Wet area Waterproofing - tiles - fall to waste				
Building Surveyor	2	2	2	Per Storey
Tile Installer or Waterproofer Installer*	-	-	-	
Fire stairs cores - Goings and risers / handrails / exit widths				
Building Surveyor	2	3	4	Per Storey
Non-fire isolated stairs - Goings and Risers / Handrails				
Building Surveyor	2	4	4	Per Storey
Disabled persons access				
Building Surveyor	3	4	4	Per Storey
Mechanical Vent (non-smoke hazard management)				
Building Surveyor	2	4	4	Per Storey
Mechanical Engineer	4	6	6	
Bin chute				
Building Surveyor	2	2	2	Per Storey
Balustrading				
Building Surveyor	2	3	3	Per Storey
Structural Engineer / Civil Engineer	2	3	3	
AS1657 plant space - platforms, access ladders, gantries				
Building Surveyor	0	0.25	0.25	Per Storey
General inspection - per storey above the third storey				
Building Surveyor	-	4	5	Per Storey
Structural Engineer	-	3	4	
Mechanical Engineer	-	3	3	
Electrical Engineer	-	3	3	
Fire Systems Designer	-	3	3	
Special fire service witness and interface testing				
Building Surveyor	2	4	8	Once
Fire Systems Designer	2	4	8	
Final				
Building Surveyor	2	3	4	Per Storey
Structural Engineer	2	3	4	
Mechanical Engineer	2	3	4	
Fire Safety Engineer	2	3	4	
Electrical Engineer	2	3	4	

* This may be the licenced installer of the system and not a third party and so not result in additional time component of the inspection regime.

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Attachment E

Western Australia Building Surveyors Code of Conduct 2022.

Government of Western Australia
Department of Mines, Industry Regulation and Safety

Building and Energy Western Australia

WA Building Surveyors'

Code of Conduct

APRIL 2022

Contents

This Code is issued by the Building Commissioner under section 96(1)(b) of the *Building Services (Complaint Resolution and Administration) Act 2011* (WA)

This Code does not affect or displace obligations under any written law.

A breach of this Code does not constitute a disciplinary matter, but may be taken into account by the Building Commissioner in assessing a disciplinary complaint.

WA Building Surveyors' Code of Conduct

1. Comply with the law and act in the public interest

1.1. A building surveyor, undertaking building surveying work must comply with laws relevant to their work, conduct and organisation.

1.2. A building surveyor must act in the public interest when providing advice or making decisions relating to their statutory functions.

1.3. A building surveyor must not perform a statutory function in relation to building work they have assisted to:

- design, or
- develop a performance solution for.

1.4. A building surveyor must notify the appropriate authority where they have become aware of, or hold a reasonable suspicion of a matter that may create an immediate or imminent risk to health and safety, in relation to building work.

2. Professionalism

2.1. A building surveyor must only perform building surveying work that is permitted under their registration and within their professional competency.

2.2. A building surveyor must exercise due skill, care and diligence in undertaking building surveying work.

2.3. A building surveyor should maintain their professional competency to ensure their knowledge and skills are current for the work they undertake.

2.4. A building surveyor should take reasonable steps to ensure the quality of their work by obtaining and assessing the suitability of all relevant information when carrying out a statutory function.

2.5. A building surveyor should work cooperatively with others in the building industry, and regulators.

2.6. A building surveyor must ensure that any building surveying work carried out under their supervision is supervised appropriately to ensure the quality of work undertaken.

3. Honesty and integrity

3.1. A building surveyor must not engage, whether by act or omission, in misleading or deceptive conduct in connection with the performance of a statutory function.

3.2. A building surveyor should take all reasonable steps to avoid actual or potential conflicts of interest.

3.3. A building surveyor should not use their statutory function role for the purpose of obtaining, either directly or indirectly, any preferential treatment or other improper advantage for themselves or for any other person.

3.4. A building surveyor should not disclose confidential information obtained in the course of performing statutory functions except where the relevant person has granted consent, or there is a legal or professional duty to disclose the confidential information.

3.5. A registered building surveyor must notify the Building Commissioner if they have:

- been found to have breached a relevant code of conduct in another Australian state or territory,
- had registration or another type of authorisation as a building industry practitioner suspended or cancelled in another Australian state or territory,
- been found to have breached laws related to planning, building, or development in WA or another Australian state or territory, or
- had a professional indemnity insurance policy refused, cancelled or conditions applied that are inconsistent with registration requirements in WA.

4. Transparency and accountability

4.1. A building surveyor must ensure any agreement or contract for performing statutory functions is consistent with this Code and any requirements set by the Building Commissioner.

4.2. A building surveyor must provide reasons for decisions on statutory functions.

4.3. A building surveyor must respond in a timely and professional manner to enquiries or complaints about decisions made when carrying out statutory functions, including any requests made by the Building Commissioner or permit authorities.

Explanatory Notes

Introduction

This Code of Conduct for Building Surveyors (the Code) sets out minimum expectations of registered building surveyors undertaking building surveying work in Western Australia (WA).

It applies to building surveyors who are registered under the *Building Services (Registration) Act 2011* (WA) to perform statutory functions of assessing compliance and approving building designs and building work under the *Building Act 2011* (WA) and associated legislation. This can involve assessing and certifying that the design demonstrates how the building work, if built, will meet the applicable building standards and, when inspecting building work during and post construction, certifying that the building work meets applicable standards and any conditions on the applicable building permit.

Professional associations or the Building Commissioner may set standards that apply to other services provided by building surveyors, however, these must not reduce the minimum obligations in the Code. It is acknowledged individuals may choose to comply with a higher standard, for example through membership of an organisation that has an approved professional standards scheme.

The Code establishes a consistent basis for education, audit and compliance activities undertaken by regulators. It also assists registered building surveyors to meet their obligations, and manage the expectations of others.

Application

This Code of Conduct applies to all building surveying practitioners registered under the *Building Services (Registration) Act 2011*. All mentions of building surveyor in the Code means registered building surveying practitioner.

Structure

The Code contains obligations and explanatory information. Numbered paragraphs are the obligations, and the unnumbered paragraphs are explanatory and non-binding. The Code, without explanatory text, is listed above.

Guidance on implementing a compliance regime to support the Code is in the section “Building surveyor obligations under the Code”. A glossary of terms used in the Code is in Appendix C.

Adoption of the Code

WA is adopting the National Model Code of Conduct for Building Surveyors, as prepared by the Australian Building Codes Board (ABCB) in 2020,[1] but amended as appropriate for WA’s legislative framework. The purpose of this adoption is to provide regulatory oversight to building surveyors in a more nationally consistent manner.

[1] ABCB, *Code of conduct for building surveyors: Model guidance on BCR recommendation 10* (2021)

The Code is issued under the *Building Services (Complaints Resolution and Administration) Act 2011*, section 96(1)(b)(ii). A breach of this Code does not constitute a breach of the Act or a disciplinary matter in itself, but may be asserted, and may be taken into account in determining a disciplinary complaint.

Because the Code sets out minimum expectations, it is likely that most building surveyors will already comply. Others may find some of their practices will need to change. Building and Energy will allow a 12-month transition period, from the date of issue, to enable building surveyors to introduce new or modified processes if necessary.

Building surveyor obligations under the Code

1. Comply with the law and act in the public interest

Building surveyors performing statutory functions are to comply with relevant legislation and regulations, and act in the public interest.

1.1. A registered building surveyor must comply with laws relevant to their work, conduct and organisation.

Laws enacted in WA govern the licensing, functions and powers of building surveyors. Building surveyors must carry out their work in accordance with these laws. For example, a building surveyor must not issue certification unless the building work complies with relevant WA laws and the National Construction Code (NCC).

Building surveyors, like most professionals, are subject to a range of other laws that govern their conduct and that of their business. These include, but are not limited to, consumer protection, work health and safety, anti-discrimination and privacy laws.

Building surveyors will meet their obligation by being aware of the Commonwealth and WA laws applicable to their work and taking proactive steps to ensure they comply with these.

1.2. A registered building surveyor must act in the public interest when providing advice or making decisions relating to their statutory functions.

Building laws and the NCC have a number of objectives such as health and safety, amenity, accessibility, cost effectiveness, efficiency of the industry and sustainability in the design, construction, performance and liveability of buildings. Building surveyors must balance and apply these objectives when performing statutory functions.

Building surveyors are required to give greater weight to objectives considered to be of higher concern to the public, those being health, safety and amenity of buildings. A building surveyor undertaking a statutory function must put the public interest before their responsibility to clients and employers.

For example, project documentation may appear to be sufficient to demonstrate a design complies, but a building surveyor is concerned an assumption made in structural design may have an unintended impact on another part of the building. In this situation the building surveyor should take steps to investigate the potential issue and ensure that it is resolved rather than defer to the client's interest in getting earlier authorisation for construction.

1.3. A registered building surveyor must not perform a statutory function in relation to building work they have assisted to:

- **design, or**
- **develop a performance solution for.**

Building surveyors must not accept roles where they are required to certify their own work as this is inconsistent with the independent nature expected of statutory functions. For example, a building surveyor engaged to certify a design is asked to indicate where exit signs and fire doors should be placed on an incomplete plan. The building surveyor may direct the designer to what is required to meet the applicable building standards, but should not indicate or decide on placement, either alone or working with the designer, before assessing it.

A building surveyor employed by a permit authority must not undertake design work for a building located within the boundary of their employer's jurisdiction.

A building surveyor working for a permit authority as a contractor must not undertake design work for a building that they are, or are likely to be, engaged to undertake a statutory role.

This obligation does not prevent a building surveyor from being engaged early, or from being involved during the design process. During the design process, the certifying building surveyor may:

- provide preliminary or routine advice on NCC deemed to satisfy (DtS) requirements and solutions;
- discuss the concept of performance solutions, and which performance requirements are relevant to a specific DtS deviation; and
- provide input into a performance-based design brief (PBDB) as an Appropriate Authority stakeholder consulted as part of the development of the brief, under NCC A2.2(4).

Building surveyors can be engaged during the design stage where that engagement is limited to providing compliance advice on requirements only, leaving the design team to make decisions about how to comply. No conflict arises when the same building surveyor is subsequently engaged in a statutory role. Where practicable, a written record of the advice provided should be kept by the building surveyor.

The building surveyor may not, however, suggest a specific solution or way to achieve compliance and then certify the solution as compliant, as this will see them reviewing their own work.

For example, a building surveyor performing statutory functions identifies that a habitable room does not contain adequate natural light, in accordance with the DtS provisions of the NCC. The building surveyor can advise what the DtS requirements are, and why they have not been satisfied. The building surveyor can also discuss the concept of performance solutions, advise which performance requirements apply, and provide input to the PBDB as the Appropriate Authority. However, it is the building designer's responsibility to determine how to resolve the non-compliance.

Should the designer require assistance to do this, the building surveyor must either direct the person to an independent practitioner to obtain assistance, or resign from their statutory role before providing advice on how to resolve the non-compliance by amending the design to meet DtS requirements, or designing a performance solution to meet the relevant performance requirements.

Building surveyors may be contacted by owners for advice on an order or other notice applied to a building. The building surveyor may help the owner to understand the order, or to negotiate with the permit authority on the validity of the notice. However, if changes to the building are necessary, the building surveyor should not advise the owners on how to comply, then assess and certify the subsequent work.

For the avoidance of doubt, assessing and approving both a design and the building work using that design will not breach this obligation.

1.4. A registered building surveyor must notify the appropriate authority where they have become aware of, or hold a reasonable suspicion of, a matter that creates a risk to health and safety, in relation to a building or building work.

The building surveyor should report activities they become aware of in the course of performing statutory functions where they hold a reasonable suspicion of the activity creating a risk to health and safety. Any such report should detail the building surveyor's reason(s) for their suspicion, and including attaching any evidence that their suspicion may be based on. The building surveyor is not required to proactively seek out these activities.

The appropriate authority will vary depending on the nature of the issue to be reported. In general, issues relating to buildings are to be reported to the permit authority, while issues relating to building service providers are to be reported to the Building Commissioner. There may be issues that relate to both a building and a building service provider, which should be reported to both the permit authority and the Building Commissioner.

For example, during an inspection a building surveyor becomes aware that a lower quality concrete, not in accordance with the approved structural design, has been used in a building and has created an imminent risk to health and safety for workers, building occupants or the public. If the building surveyor is unable to get the non-compliance rectified through consultation with the builder or building owner, then (and only then) the building surveyor should report the matter to the permit authority and the Building Commissioner.

2. Professionalism

Performing the statutory functions of a building surveyor in a professional manner involves, at a minimum:

- ensuring all work undertaken is within registration conditions and professional competence,
- taking reasonable steps to ensure accuracy of work, and
- collaborating with other professionals to provide a timely and efficient service.

Additional attributes may enhance professionalism, including those listed under the subsequent obligations for honesty, integrity and transparency.

2.1. A building surveyor must only perform building surveying work that is permitted under their registration and within their professional competency.

Building surveyors must only perform functions that are within:

- their registration conditions in WA, and
- their professional competency, that is their qualifications, skills and experience.

Laws govern what work each class of building surveyor is permitted to do. Conditions may be applied to the registration by the regulator. The building surveyor must work within the scope of work for their registration.

In addition, building surveyors must critically self-assess their knowledge, skills and experience for work within their registration. For example, if a building surveyor holds an unrestricted registration, but has never worked on a Class 9a building or has not done so for many years, then the certification would generally be considered to be outside their experience and would therefore be beyond their professional competency.

If a building surveyor is unsure as to whether they have the competencies required to perform a statutory function they should refuse the engagement. This does not prevent a building surveyor from working to gain experience for future projects, for example, by assisting a colleague whose professional competency is appropriate for the work (see obligations 2.2 and 2.3)

2.2. A building surveyor must exercise due skill, care and diligence in undertaking building surveying work.

Building surveyors must not be negligent or incompetent in undertaking building surveying work.

2.3. A building surveyor should maintain their professional competency to ensure their knowledge and skills are current for the work they undertake.

Building surveyors work in a complex and dynamic environment, often interpreting and applying multiple laws to building processes and products, all of which change over time. Because of this, building surveyors must continually work to maintain the currency of their professional competency to perform statutory functions effectively. This extends to claims of specialisation linked to statutory functions, such as accessibility or cladding.

Participating in Continuing Professional Development (CPD) courses either voluntarily or as required under legislation will assist to meet this obligation, as will assisting more experienced building surveyors on projects to extend or maintain the currency of experience and skills. Membership of an organisation that has an approved professional standards scheme will also meet this obligation.

Where a building surveyor has not maintained a professional competency, they should cease to personally perform related statutory functions and cease any promotional activities or advertising.

2.4. A building surveyor should take reasonable steps to ensure the quality of their work by obtaining and assessing the suitability of all relevant information before carrying out a statutory function.

Building surveyors must assure themselves that a design demonstrates compliance or building work is compliant as part of their statutory function. Any demonstration of compliance should be in accordance with the NCC's evidence of suitability requirements.[2]

If a building surveyor is unsure whether a product or building solution is compliant, they should seek out information, such as test reports or expert opinion they need to be satisfied the product or building solution is compliant. The building surveyor should be confident that any information obtained is accurate, complete and from a reliable source.

For example, if a building surveyor wishes to rely on the opinion of an independent structural engineer as to whether a structural design is appropriate, they should first seek assurances that the structural engineer is competent, appropriately qualified and, if required, registered. They should also, as far as their skillset allows, check the appropriateness and sufficiency of the design, for example that the correct design parameters have been used, and that the documentation appears to be sufficient to demonstrate how the building work will comply with the applicable standards.

Building surveyors should seek out information available on products and building methods necessary to ensure compliance. For example, if a building surveyor is told that a new or unfamiliar product has been tested to an Australian Standard, they could request a copy of the test report to confirm that the product was tested by an appropriate testing facility, and conforms to the Australian Standard relevant to the intended use of the product.

2.5. A building surveyor should work cooperatively with other building practitioners and regulators.

The obligation for building surveyors to be professional extends to their interactions with fellow practitioners and regulators.

Building surveyors should ensure that their work causes only as much disruption and inconvenience to others as is necessary for them to perform their statutory functions. They must not make unnecessary or unreasonable demands on others. Agreed timeframes should be met or parties advised of delay and new timeframes negotiated and agreed.

Building surveyors must also be responsive to requests and instructions from regulators related to their statutory functions, including audits.

[2] National Construction Code vols 1-3 part A5, and Australian Building Codes Board *Handbook: Evidence of suitability*

2.6. A building surveyor must ensure that any building surveying work carried out under their supervision is supervised appropriately to ensure the quality of work undertaken.

The statutory functions of a building surveyor cannot be delegated. However, building surveyors may rely on unregistered employees and contractors to help them to perform statutory functions. Indeed, this is necessary, for graduate building surveyors to gain the experience they require to be registered.

Building surveyors must ensure that anyone who assists them is properly instructed, competent and supervised to the level necessary for them to provide this assistance to the standard expected of the building surveyor themselves. The building surveyor remains solely responsible for any building surveying work undertaken.

3. Honesty and integrity

Building surveyors registered to perform statutory functions hold a position of trust. Registration conditions generally require the applicant to be of good standing and a fit and proper person. This is usually demonstrated by an absence of findings, convictions or other penalties for offences related to behaviours expected of those performing statutory functions.

3.1. A building surveyor must not engage, whether by act or omission, in misleading or deceptive conduct in connection with the performance of a statutory function.

Building surveyors must be honest at all times when carrying out statutory functions or in connection with those functions. Examples of misleading of deceptive conduct by a building surveyor include:

- authorising designs for construction or occupation of buildings that are known not to be compliant with relevant laws,
- falsifying records of their decisions or the supporting evidence,
- misrepresenting the requirements for compliance under the NCC and relevant WA laws,
- misleading other building practitioners as to their role in the certification process, and
- seeking to deceive regulators and auditors.

Conduct is considered to be misleading or deceptive if the overall impression created by the conduct is false or inaccurate. This means that conduct can be misleading and deceptive even if it was not intended to be. Any misunderstanding that creates a false impression that someone may rely upon must be corrected. For example, a building surveyor realises during discussions on an upcoming project that a person who may hire them has over-estimated the registration they hold. It would be misleading for the building surveyor to allow the person to decide whether or not to hire them without providing their correct registration details.

The phrase ‘in connection with’ captures misleading acts and omissions that occur before or about exercising a statutory function. For instance, a building surveyor who has an unrestricted registration, but has never worked on high-rise residential building must not claim they are experienced in assessing the compliance of high-rise buildings with the NCC and relevant WA laws, even if the purpose of this representation is to consult on the design, rather than performing a statutory function.

3.2. A building surveyor should take all reasonable steps to avoid actual or potential conflicts of interest.

A conflict of interest is a situation where the private interests of a person, or their immediate friends and family, conflict with their obligations or affects their ability to carry out their work impartially and without bias. Because of this, conflicts of interest need to be judged objectively, that is, by what a reasonable person observing the situation would consider to be a conflict.

There are two aspects to this obligation. The first is to actively avoid situations that could give rise to a real or potential conflict of interest. The second is to stop acting if a conflict arises, that is resign or transfer their work to another building surveyor.

'Interest' generally involves some form of financial gain or benefit to the building surveyor, their family or friends. For example, building surveyors should:

- refuse offers that could be seen as influencing their decisions, such as accepting invitations from a developer to attend a Christmas party, watch a sporting event from a corporate box for free, or attend an industry conference for free,
- refuse to provide statutory functions where the building surveyor has a personal or family interest in the project, including a business they hold shares in,[3] and
- resign when an unexpected or unanticipated conflict of interest arises, such as, if their child has bought an apartment off the plan in a building they are engaged to certify.

For the avoidance of doubt, the engagement of a building surveyor to provide a private certification does not, in and of itself, constitute a conflict of interest.

Building surveyors employed by a permit authority, and acting in accordance with their employer's conflict of interest policy, are taken to comply with this clause.

3.3. A building surveyor should not use their statutory functions for the purpose of obtaining, either directly or indirectly, any preferential treatment or other improper advantage for themselves or for any other person.

An improper advantage would generally be one that goes beyond the normal commercial compensation (i.e. fee for service) associated with the performance of a statutory function.

An important distinction exists between a building surveyor who benefits inappropriately from providing a statutory function, and one who benefits appropriately from their professional skills and experience. For example, a building surveyor who withholds certification to pressure a person into offering them another job is inappropriately using their statutory function to gain a benefit. However, a building surveyor who is offered a position advising on compliance for a future project by a former colleague who was impressed by their professionalism is not breaching this obligation.

Building surveyors should also note that accepting preferential treatment or any advantage beyond normal commercial compensation would generally indicate they had failed to actively avoid a potential conflict of interest (see obligation 3.2).

[3] Shares held through a superannuation fund do not apply in this scenario, unless the building surveyor has direct input into the investment such as through a self-managed super fund.

3.4. A building surveyor should not disclose confidential information obtained in the course of performing statutory functions except where the relevant person has granted consent, or there is a legal or professional duty to disclose the confidential information.

Information can become confidential in a number of ways. For example, a building surveyor's contract may specify that certain information is confidential.

Alternatively, information may become confidential due to its content and the context in which it is provided. For example, if a building surveyor is provided, by a supplier, with product specifications labelled "confidential" it would be reasonable to assume this is confidential information. If a building surveyor is unsure whether information is confidential, they should check with the owner of the information.

Confidential information can be disclosed with consent. Consent may be explicit or implicit. Implicit consent can arise when it is obvious the owner expected it to be passed on to others. For example, if a building surveyor is provided with a confidential test report to demonstrate compliance it is reasonable to assume that test report may be provided to a permit authority as evidence that the relevant building element complies.

Confidential information can also be disclosed when it is ordered by a court or required as part of a building surveyors professional duties, such as when being audited. This also includes the obligation under the Code to disclose reasonable suspicions of unlawful activities or risks to health and safety to regulators (see obligation 1.4).

3.5. A building surveyor must notify the Building Services Board if they have:

- **been found to have breached the code of conduct in another Australian state or territory,**
- **had registration or another type of authorisation as a building practitioner suspended or cancelled in another Australian state or territory,**
- **been found to have breached laws related to planning, building, or development in WA or in another Australian state or territory, or**
- **had a professional indemnity insurance policy refused, cancelled, or had conditions applied that are inconsistent with registration requirements in WA.**

This obligation requires building practitioners to notify the Building Services Board when they no longer meet criteria associated with their registration.[4] It applies to other Australian states and territories where a building surveyor is currently registered, including any suspended registration.

In most other Australian states and territories, registration as a building surveyor is contingent upon proof that the applicant is of good standing in addition to other criteria.

[4] Notification of insurance refusal or cancellation only applies to insurance that is required as a condition of registration.

As mentioned previously, this is usually determined by the absence of findings, convictions or other penalties for offences related to their statutory functions.

Audit or investigation in one jurisdiction does not need to be reported to other regulators. However, if the audit or investigation finds a breach, and a sanction is applied, this would need to be reported to the other regulators. Cautions do not need to be reported.

4. Transparency and accountability

Transparency and accountability are tenets of public office directly linked to positions of trust involving decisions and exercise of statutory functions that affect members of the public. This group of obligations requires transparency about terms of engagement and fees, sharing information with other building surveyors, and reasons for decisions when performing statutory functions.

4.1. A building surveyor must ensure any agreement or contract for performing statutory functions is consistent with this Code and any requirements set by the Building Commissioner.

Provisions in the Code are intended to provide for and protect the independence, integrity, professionalism and transparency of building surveyors performing statutory functions. This obligation requires those protections are not compromised in contracts or agreements entered for building surveying services. For example, contracts and agreements should:

- uphold the independence of the building surveyor, including by setting out the pre-payment terms for performing statutory functions that may include payment ahead of commencing work where legislation requires this,
- excluding services that would see the building surveyor assessing and certifying their own work,
- clearly state the services that will be provided, ensuring these are within the scope of their registration and professional competency, the costs and possible additional costs, and
- allow the building surveyor, if replaced before completion of the contracted work, to provide copies of records related to the contracted work to any replacement building surveyor.

4.2. A building surveyor must provide reasons for decisions on statutory functions.

In order to transparently exercise a statutory function, a building surveyor must provide reasons for their decisions to exercise or not to exercise a power or function. This goes beyond statements that a design or building does or does not comply. It is necessary to include why the building surveyor has arrived at a particular conclusion. This includes deciding whether or not to issue certification, orders, notices, or other authorisation provided for within their statutory functions and powers.

For example, if a building surveyor assesses the footings of a Class 10 building and determines it does not meet the design documentation and relevant technical requirements but other aspects of the build are compliant, the building surveyor should report what they observed which both did and did not comply with the applicable building standards and approved plans when reporting. This will provide the reasons for the decision to not issue a certificate and make the matters requiring remedy clear.

Best practice is to record the reasoning along with the decision. At a minimum, records (including photographs, videos, electronic or handwritten notes), should be legible, stored in an accessible format and have sufficient detail to enable another building surveyor or regulator to understand reasoning and replicate conclusions.

It is expected that records maintained by permit authorities, in compliance with the requirements of WA laws, will already meet this requirement. Building surveyors working in the private sector will need to ensure that their records of statutory decisions are also suitable.

4.3. A building surveyor must respond in a timely and professional manner to enquiries or complaints about decisions made when carrying out statutory functions, including any requests made by the Building Commissioner, permit authorities.

A building surveyor must have a system that enables them to respond to enquires or complaints from people such as owners, other building practitioners, permit authorities and the Building Services Board. An enquiry handling process helps manage unexpected issues and resolve misunderstandings before they develop into a formal complaint to the Building Commissioner.

Having documentation that sets out reasons for a decision on a statutory function will assist with developing accurate and timely responses (see obligation 4.2).

The obligation for transparency does not mean that building surveyors need to accept frivolous, vexatious or querulous complaints, or tolerate abuse. It does mean they must try to resolve enquiries and complaints in a fair and timely manner.

Compliance Policy

Introduction

The main objective in adopting the Code is to improve regulatory oversight of building surveyors in a nationally consistent manner. The Code also acts as a tool for the profession to compete effectively on a level playing field.

Priorities

The majority of building surveyors are conscientious professionals who can be trusted to act in a professional manner. However, some building surveyors may, from time to time, act unprofessionally, including when under pressure from owners, other building industry practitioners and competitors. Overall, it is likely only a small proportion of building surveyors may knowingly act unlawfully or unprofessionally unless they are held accountable.

Consistent with the above, the compliance priorities for the Code are:

- *Education and outreach*

  The Building Commissioner will communicate the obligations in the Code to ensure building surveyors and industry participants are aware of and understand the role and standards expected of building surveyors performing statutory functions. This could include holding training sessions on the Code as part of training to become a building surveyor or as part of any future CPD requirements for building surveyors and others practitioners.

- *Tools to assist with compliance*

  Building and Energy will develop practical tools to assist building surveyors to meet the obligations in the Code. This may include developing model clauses for contracts, a template policy for receiving and managing enquiries or complaints, further guidance on documenting reasons for decisions, or aligning registration application and renewal documentation to assist with reporting. The Code itself will act as a tool for the industry as a whole.

- *Auditing*

  Building and Energy has an auditing regime to monitor compliance with the Code. The auditing sets out the process for conducting audits both proactively and in response to complaints received.

Response to non-compliance

Where the Building Services Board (or the State Administrative Tribunal depending on the circumstances) determines that a building surveyor has breached the Code, a tiered approach is applied to determine the appropriate sanction. The sanction is proportionate to the breach.

High impact sanctions such as fines and suspension or cancellation of registration are reserved for deliberate, repetitive or serious non-compliance.

Suspensions and cancellation can also only be imposed where the disciplinary matter is referred to the State Administrative Tribunal. In contrast, isolated, low consequence or opportunistic non-compliance are, depending on its seriousness, dealt with by enforceable undertakings, such as agreements to undertake additional training, operate under supervision or to accept and pay for additional oversight or audits. Inadvertent and unintentional noncompliance that has minimal consequences is dealt with through enforceable undertakings, a finding of non-compliance without further penalty (admonishment) and the provision of information and advice. This tiered approach is set out in Figure 1 below.

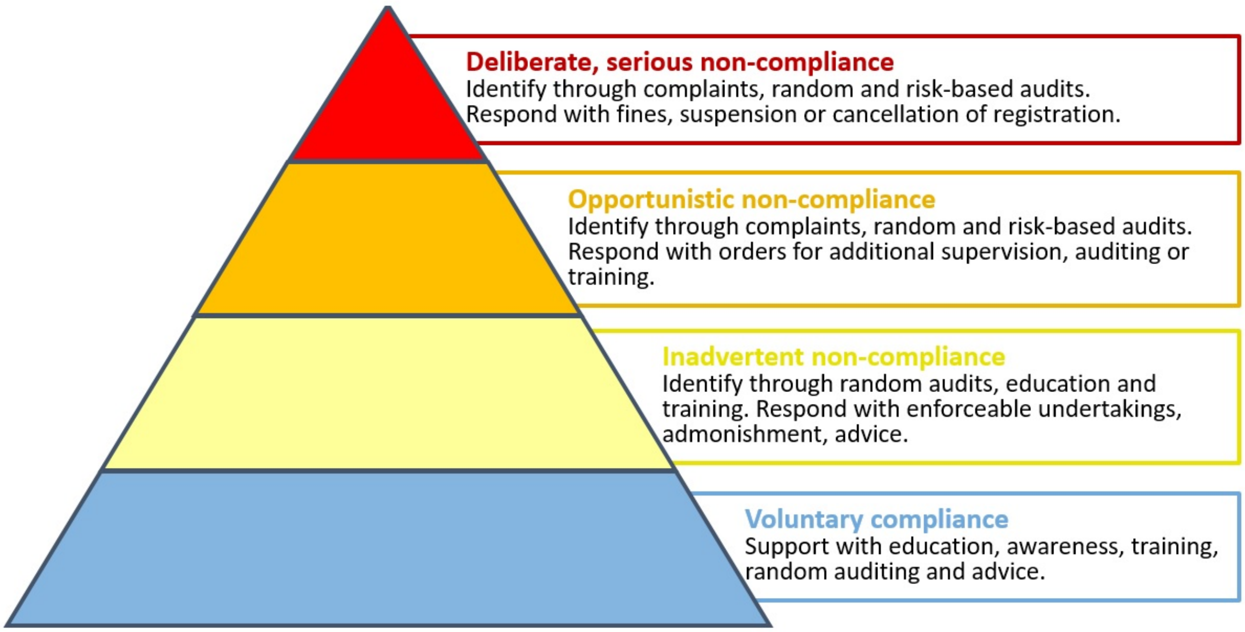

Figure 1: Compliance model

Serious non-compliance is any behaviour, action or omission that results in, or has a high probability of resulting in, substantive harm to the public interest. It includes actions such as:

- certifying a building as compliant when a building surveyor knows (or ought to know) that it does not comply and it could be unsafe,
- accepting gifts or special treatment when a reasonable person would assume these were intended to influence the building surveyor's decisions, and
- deliberately frustrating the performance of an audit or the work of Building and Energy.

Ultimately, the correct sanction will be determined in light of all the relevant facts, by the Building Services Board for instances of minor non-compliances, and by the State Administrative Tribunal for instances of serious non-compliance.

Building surveyors have the opportunity to seek administrative or judicial review of the decisions and sanctions as appropriate. However, while awaiting judicial review, a building surveyor subject to a serious administrative penalty such as suspension or cancellation of registration should not practice until such time as the decision of sanction is overturned. This is essential to ensure public confidence in the enforceability of the Code, and in the profession.

Appendix A Glossary

Building and Energy means the Department of Mines, Industry Regulation and Safety – Building and Energy Division or its equivalents from time-to-time.

Building Commissioner means the statutory office under section 85 of the *Building Services (Complaint Resolution and Administration) Act 2011*.

Building surveyor means an individual registered under the *Building Services (Registration) Act 2011* to perform the statutory functions of statutory building surveying assessment work and statutory building surveying approval work.

Certification means forming an opinion or giving a certificate required under building approval legislation that a building meets the performance requirements of the NCC and other relevant state or territory legislation.

Design(s) includes plans and specifications for a building.

Reasonable steps mean an action or series of actions an objective person would consider sensible and fair to address an issue or achieve a desired outcome in the circumstances. This includes decisions, omissions and inaction.

Registered means authorised by a state or territory government to perform defined functions and exercise powers in that state or territory.

Serious non-compliance means any behaviour, action or omission that results in, or has a high probability of resulting in, substantive harm to the public interest.

Statutory building surveying assessment work means forming an opinion or giving a certificate that a building meets the requirements of the NCC and other relevant Western Australian legislation, where building approval legislation requires a registered building surveyor to form an opinion or give a certificate as a condition of granting a building approval. Statutory building surveying assessment work includes checking, verifying and peer-reviewing building proposals and inspecting and testing installation and construction work.

Statutory building surveying approval work means authorising construction or occupation of a building under building approval legislation that requires or allows a registered building surveyor to authorise construction or occupation.

Statutory building surveying work means assessment and certifying which building approval legislation requires to be done by a registered building surveyor, and approval work undertaken by an authorised delegate of a permit authority.

Statutory functions of a building surveyor, mean statutory building surveying assessment work and statutory building surveying approval work.

Supervision means overseeing, monitoring and directing the activities of a person or people to make sure they are working effectively, and being accountable for their work.

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Attachment F

Overview of buildings and structures that can be built under the two-tiered registration model.

Overview of buildings and structures that can be built under the two-tiered builder registration model

NCC Classes (an overview)			Level 1- Open	Level 2- Low rise
Class 1	**Class 1a**	A single dwelling (home) being a detached house, or one of a group of two or more attached dwellings, each being a building, separated by a fire-resistant wall, including a row house, terrace house, town house or villa	✓ Any size	✓ Any size
	Class 1b	A boarding house, guest house, hostel or the like with a total area of all floors not exceeding 300m^2, and where not more than 12 people reside, and is not located above or below another dwelling or another Class of building other than a private garage	✓ Any size	✓ Any size
Class 2	-	A building containing two or more sole-occupancy units (apartments) each being a separate dwelling	✓ Any size	✓Max 2,000m^2 and one storey
Class 3	-	A residential building, other than a Class 1 or 2 building, which is a common place of long term or transient living for a number of unrelated people. Examples: boarding-house, hostel, backpackers accommodation or residential part of a hotel, motel, school or detention centre	✓ Any size	✓ Max 2,000m^2 and one storey
Class 4	-	Part of a building that is a dwelling or residence with a building of a non-residential nature, such as a caretaker's residence in a storage facility. A dwelling in a building that is Class 5, 6, 7, 8 or 9 if it is the only dwelling in the building	✓ Any size	✓ Max 2,000m^2 and two storeys

	NCC Classes (an overview)		Level 1- Open	Level 2- Low rise
Class 5	-	An office building used for professional or commercial purposes, excluding buildings of Class 6, 7, 8 or 9. Examples: offices for lawyers, accountants, general medical practitioners, government agencies and architects.	✓ Any size	✓Max 2,000m^2 and two storeys
Class 6	-	A shop or other building for the sale of goods by retail or the supply of services direct to the public. Example: café, restaurant, kiosk, hairdressers, shopping centre, showroom or service station.	✓ Any size	✓ Max 2,000m^2 and two storeys
Class 7	**Class 7a**	A building which is a car park	✓ Any size	✓Max 2,000m^2 and two storeys
	Class 7b	A building which is for storage or display of goods or produce for sale by wholesale. Examples: warehouses, storage buildings.	✓ Any size	✓Max 2,000m^2 and two storeys
Class 8	-	A laboratory, or a building which a handicraft or process for the production, assembling, alternating repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, gain or sale. Examples: factory, laboratory, mechanic's workshop, abattoir.	✓ Any size	✓Max 2,000m^2 and two storeys
Class 9	A building of a public nature			
	Class 9a	A health care building, including those parts of the building set aside as a laboratory	✓ Any size	✓ Max 2,000m^2 and one storey
	Class 9b	An assembly building, including a trade workshop, laboratory or the like, in a primary or secondary school, but excluding any other parts of the building that are of another class. Examples: theatre, schools, universities, childcare centres, sporting facilities.	✓ Any size	✓Max 2,000m^2 and one storey

NCC Classes (an overview)			Level 1- Open	Level 2- Low rise
	Class 9c	An aged care building	✓ Any size	✓Max 2,000m² and one storey
Class 10	A non-habitable building or structure			
	Class 10a	A private garage, carport, shed or the like	✓ Any size	✓ Any size
	Class 10b	A structure being a fence, mast, antenna, retaining or free standing wall, swimming pool or the like	✓ Any size	✓ Any size
	Class 10c	A private bushfire shelter	✓ Any size	✓ Any size

Note:

1. Prior to the commencement of the registration amendments, building practitioners and contractors holding registration will be grandfathered (automatically transferred) into the Open tier, subject to any existing restrictive conditions on their registration.

2. The above table does not identify all types of work that requires, or does not require, builder registration (refer to the definition of 'builder work' in clause 3, Building Services (Registration) Regulations 2011).

3. The definition of 'storey' in the above table will be taken from the NCC, BCA Volumes 1 and 2:

> *Storey means a space within a building which is situated between one floor level and the 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 not intended for not more than 3 vehicles; or (iv) a combination of the above; or*
>
> *(b) a mezzanine.*

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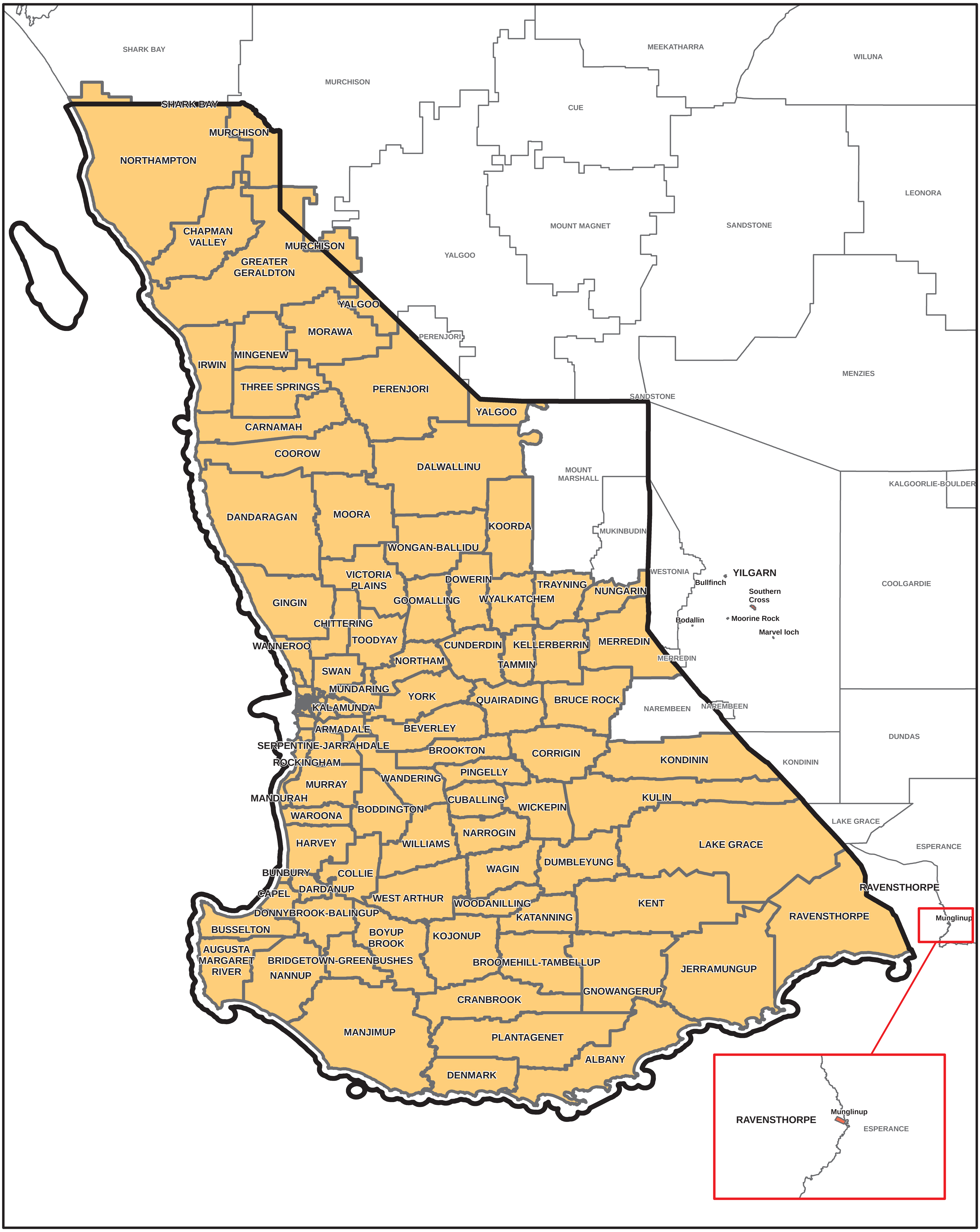
Attachment G

Component of Schedule 3, Building Services (Registration) Regulations Geographical Builder Registration Requirements.



Component of Schedule 3, Building Services (Registration) Regulations 2011

Legend

- BSR Local Government Authorities (includes Metropolitan LGA's)
- BSR Townsites
- South West Land Division

0 50 100 200 km

1:3,000,000
(at A3 size)

Job: 0084072
Produced: 27/09/2022
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WESTERN AUSTRALIA

Building and Energy
Western Australia