REPORT

Building Confidence Report

A case for intervention

Prepared for
The Australian Building Codes Board

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THE CENTRE FOR INTERNATIONAL ECONOMICS
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Background and introduction

Over the past decade or so, weaknesses in building regulatory systems, both within Australia and overseas, have become increasingly apparent. 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.[1] The resulting Building Confidence Report (BCR) was released in April 2018. The BCR made 24 recommendations aimed at improving state and territory compliance and enforcement systems.

Although compliance and enforcement systems are the responsibility of state and territory governments, the BCR Implementation Team was established within the Australian Building Codes Board (ABCB) to develop and report on the consistent implementation of the BCR recommendations, as well as the design, construction and certification of complex buildings.

The Centre for International Economics (CIE) has been commissioned by the ABCB to conduct a high-level assessment of implementing the recommendations raised by the BCR.[2] The scope of this analysis is to assess the potential impacts of the national implementation for the BCR (allowing for different starting points across states and territories in terms of building reform) against the baseline where states and territories remain at their current point.

To inform the high-level analysis, we have:

- consulted extensively with:
  - relevant industry stakeholders
  - state and territory policymakers and regulators
- reviewed available (albeit limited) evidence
- conducted surveys of:
  - a random sample of homeowners to assess the prevalence of defects and the cost of rectifying them
  - a survey of commercial building owners and managers (albeit with small number of respondents), and
  - building practitioners to understand the extent to which the BCR recommendations are likely to reduce the problem.

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1 ABCB, Statement of Requirements, p. 2.

2 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.

Limitations of this analysis

While a comprehensive approach has been adopted (as detailed above), it should be noted that this study is intended to be a high-level analysis. Some aspects may need to be investigated further when the details of the proposals have been finalised. Although this study has followed the Principles of Best Practice Regulation agreed by Council of Australian Governments (COAG)[3] as closely as possible, it is not intended to be a Regulation Impact Statement (RIS). State-based RISs may still be required for proposed changes to the regulatory arrangements once agreed by states and territories.

Statement of the problem

Despite a lack of comprehensive data, there is a widespread perception and growing anecdotal evidence of unacceptably high levels of non-compliance with the National Construction Code (NCC). Compliance failures can lead to:

- unnecessarily high rectification costs including assessment, inspection and legal costs associated with high number of defects
- increased safety risks (or adverse safety outcomes) for building users
- costs associated with building evacuations
- a loss of confidence in the construction industry
- loss of value for affected buildings (which could be due to damages to the building or reputation even after the defects are fixed) or income where it is an investment
- loss of accommodation provided by buildings (either temporarily or permanently)
- higher than necessary insurance premiums (or inability to obtain insurance) for some industry practitioners and some owners of affected buildings[4]
- reduced thermal comfort for occupants
- increased energy running costs and associated release of greenhouse gas emissions
- increased maintenance costs.

There was a general acknowledgement among the stakeholders consulted that there are compliance issues within the building industry that need to be addressed. That said, some stakeholders felt that these problems can be overstated. Some factors that these stakeholders felt had contributed to perceptions that compliance problems within the industry could be more significant than they are include:

- there are a small number of high-profile cases where rectification costs are estimated to be very high
- reporting of the Grenfell Tower disaster in London (which stakeholders felt was not relevant to the Australian context)

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3 Council of Australian Governments 2007, *Best Practice Regulations: A Guide for Ministerial Councils and National Standards Setting Bodies*, October 2007.

4 Bleby, M. 2020, "Opal residents battle Icon over $1m insurance premium", *Australian Financial Review*, 2 June 2020, https://www.afr.com/property/residential/opal-residents-battle-icon-over-1m-insurance-premium-20200601-p54yfy

- alarmist reporting/misreporting of the studies that are available
- failure to distinguish between defects that compromise the safety and/or performance of the building and superficial/cosmetic issues
- a lack of reliable data on the extent of the problem in Australia can lead to speculation.

Compliance failures imply that there are weaknesses in current state and territory government compliance and enforcement frameworks. The BCR is seeking to improve compliance with the NCC by addressing these weaknesses.

Size of the problem

Drawing from the survey results, consultation and literature review, we estimated that the costs associated with building defects that could be potentially addressed by implementing BCR recommendations are in the order of $2.5 billion per year (table 1).

- This cost covers a wide range of defect types, from structural, fire protection and cladding to waterproofing/weatherproofing and entry/exit problems, which do not only compromise the safety but also impact the quality of living of the occupants and the functioning of the building.
- It includes two types of costs that these defects create: (1) costs that would be avoided when the defect is discovered and dealt with (including: rectification costs, other costs: lost tenant income, legal costs, expert reports, etc., and the cost of time used up achieving these outcomes) and (2) costs of fatalities and property damage that would be avoided because the defects is not discovered, remains in the building and this results in fires causing more fatalities and property damage.

1 Estimated size of the problem

Type of building	Type of cost	Total size of problem (per year)
		$m
Domestic building [a]		
Class 1: Detached houses	Rectification cost	422
	Other cost	28
	Time cost	86
Class 1: Townhouses	Rectification cost	125
	Other cost	22
	Time cost	13
Class 1 buildings	Fatalities/property damage	18
Sub-total: Domestic building	**All cost**	**714**
Commercial building		
Class 2: Apartments [a]	Rectification cost	980
	Other cost	208
	Time cost	95

Type of building	Type of cost	Total size of problem (per year)
		$m
	Fatalities/property damage	7
Class 3-9 (other commercial use buildings)	Rectification, other. Time costs,	447
	Fatalities/property damage	23
Sub-total: Commercial building	**All costs**	**1 761**
Total	**All costs**	**2 475**

[a] Class 10 buildings are implicitly included as our estimates are based on total residential building activities

Note: Costs are estimated for 2022 based on the CIE's survey of residential building owners (see chapter 2 and Appendix A). Time costs are the costs of time building owners spend on getting a defect repaired. Other costs include lost rental income, temporary accommodation costs, extra travel/transport, legal costs, technical/engineering reports, legal costs, extra health care costs, and other costs

Source: CIE.

The size of the problem for Domestic buildings (mainly for Classes 1 and implicitly including Class 10 as our estimates are populated according to total building activities) is about $714 million, while that for Commercial buildings (Classes 2 and 3 to 9) is around $1.8 billion per year (table 1). At an annual cost of $1.3 billion, Class 2 Apartment buildings account for 52 per cent of the total size of the problem.

Rectification costs are the largest component for the total cost, accounting for over three quarters of the total cost.

While being consistent with the classification of buildings in the BCR where Classes 1 and 10 buildings are referred to 'domestic buildings' and Classes 2 to 9 buildings as 'commercial buildings', this report also refers to Classes 1 and 2 buildings as *residential (use) buildings* and Classes 3 to 9 buildings as *other commercial (use) buildings* in accordance with their major uses. More details about the classifications are provided in Appendix A.

For residential use (Class 1 and Class 2) buildings, the largest component for costs is waterproofing/weatherproofing defects (28 per cent of rectification costs), followed by and roof/rainwater disposal defects (16 per cent), structural (15 per cent), plumbing and drainage (14 per cent) and flammable cladding (12 per cent) (table 2).

2 Share of total rectification costs for Classes 1 and 2 buildings

	Class 1: Detached	Class 1: Townhouse	Class 2: Apartment	Total
	%	%	%	%
Waterproofing/weatherproofing	11	10	38	28
Roof and rainwater disposal	13	26	16	16
Structural	24	31	10	15
Plumbing and drainage	16	18	13	14
Flammable cladding	1	2	17	12
Other	11	0	0	3
Natural light & ventilation	10	1	0	3
Swimming pools, gyms, playgrounds	3	2	3	3
Building fabric and cladding	6	5	1	2

	Class 1: Detached	Class 1: Townhouse	Class 2: Apartment	Total
Electrical, lighting and data	3	1	0	1
Safety	2	2	0	1
Lift/elevator, gas supply, garbage chute	0	0	1	1
Fire protection	0	0	1	1
Entry/exit from building	1	1	0	0
Total	**100**	**100**	**100**	**100**

Source: CIE.

For other commercial use buildings (Classes 3 to 9), the most common types of defects are waterproofing/weatherproofing, roof and rainwater disposal, safety, fire protection and plumbing and drainage, according to limited responses to our commercial building owner and manager survey (table 3).

3 Most common types of major defect for Classes 3 to 9 buildings

Defect	Responses	Share
	No	%
Waterproofing/weatherproofing	8	21.1
Roof and rainwater disposal	6	15.8
Safety	5	13.2
Fire protection	4	10.5
Plumbing and drainage	4	10.5
Structural	3	7.9
Building fabric and cladding (excluding flammable cladding)	2	5.3
Electrical, lighting and data	2	5.3
Natural light and ventilation	2	5.3
Flammable cladding	1	2.6
Other	1	2.6
Total	**38**	**100**

Note: answer to question: in your experience, what are the most common types of major building defect?
Source: CIE survey of commercial building owners/managers.

Potential impacts of implementing the BCR recommendations

The benefits and costs of implementing the BCR recommendations are assessed against a baseline scenario under which the regulatory arrangements that existed when the BCR was commissioned in 2017 continue. This baseline therefore abstracts from recent reforms implemented by state and territory governments, but may include the proposed reforms already agreed since, for example the Performance Solutions.

Although the BCR recommendations are likely to be implemented gradually over time, the costs and benefits have been estimated on the basis that the BCR recommendations are implemented across all jurisdictions in 2022. As the majority of benefits and costs will

happen in the same year, changing the starting year will affect the net present value of net benefit and will have minimum impact on the benefit-cost ratio.

Costs and benefits are estimated over a 10-year regulatory period, using a real discount rate of 7 per cent, as required by the Office of Best Practice Regulation (OBPR).

Estimated costs

The types of costs that would be incurred if the BCR recommendations are implemented (together with a mapping to the recommendations that would impose these costs) are summarised in table 4.

4 Costs resultant from relevant BCR recommendations

Cost	Most relevant BCR recommendations
Administrative costs	R2 – R8, R9, R 11, R21
Registration	R1, R2, R4
Training	R2, R3
Data and information	R12 (database), R20 (building manual), R22 (dictionary of terminology)
Documentation	R8, R9, R11, R12, R13 – R16, R17, R18, R19, R20
Inspection	R6, R9 – R11, R18, R19
Auditing and reviewing	R5, R6, R7, R9, R10, R17
Legal cost	R6 – R10
Equipment, material and construction cost	Almost all BCR recommendations are relevant (except those that are separately costed)
Delay	R5 – R11; R13 – R20

Source: CIE.

Based on the available evidence, we estimate that:

- initial one-off costs of implementing the BCR recommendations would be around $121 million; and
- ongoing annual costs are around $712 million (table 5).

Increased construction cost is the largest cost item, accounting for about 54 per cent of additional compliance costs against the baseline. Additional mandatory inspection cost (around 16 per cent), independent third-party review cost (15 per cent) and training cost for practitioners (9 per cent), also make significant contributions to the total.

5 Summary of cost estimates to implement BCR

	Initial upfront cost	Ongoing annual cost
	$m	$m
Administration		8
Registration	66	4
Training		62
Independent review		100
Mandatory inspection		115
Building database	55	0.24
Dictionary of terminology	0.1	0.004
Building manual		16
Documentation		21
Increase in construction cost		385
Total	**121**	**712**

Source: CIE estimates.

Estimated benefits

The main benefits of implementing the BCR recommendations are:

- reducing the size of the problems arising from non-compliance with the NCC; and
- benefits associated with greater national consistency.

As the impacts of implementing the BCR cannot be observed, we rely on expert opinion, via stakeholder consultations and a survey of practitioners, on the extent to which implementing the BCR recommendations will reduce the problems associated with building defects.

Furthermore, the BCR recommendations were designed as a holistic package of reforms to improve NCC compliance. We therefore estimate the overall impacts as a package, rather than each recommendation separately.

Based on this approach, the impacts of implementing the BCR are estimated as follows:

- Implementing the BCR recommendations are estimated to reduce the costs associated with defects by around:
  - 53 per cent for Class 1 buildings (Detached houses and Townhouses)
  - 57.8 per cent for Class 2 buildings (Apartment buildings)
  - 57.5 per cent for other commercial buildings (Class 3-9 buildings)
- Total avoided costs of defects are estimated at around $1 021 million per year; and
- Time savings associated with greater national consistency across regulatory frameworks are estimated at around $375 million annually.

It is estimated that total benefits of implementing BCR will be in the order of $1.4 billion each year, with the avoided defect costs being the largest component of benefits ($1 021 million or 73 per cent of total benefits) (table 6). Victoria will have the highest benefits because its projected building activities are the highest.

6 Summary of annual benefit estimates to implement BCR ($m, 2022)

	Avoided cost of defects	Time savings from national consistency	Total benefits
NSW	267	111	378
VIC	385	119	504
QLD	136	76	212
SA	47	17	64
WA	161	39	200
TAS	4	6	9
NT	5	3	8
ACT	16	5	21
Total	**1 021**	**375**	**1 395**

Source: CIE.

Net benefits

Over the 10-year regulatory period (starting from 2022), we estimate that implementing the BCR recommendations could deliver a net benefit of around $4.3 billion in net present value terms (using a discount rate of 7 per cent). The benefit-cost ratio is around 1.9 nationally (table 7).

7 Cost-benefit analysis results

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Benefits									
Avoided costs of defects	1 732	2 434	891	299	1 054	24	35	101	6 570
Time savings from national consistency	729	763	495	111	255	35	20	31	2 439
Total benefits	**2 461**	**3 197**	**1 386**	**410**	**1 309**	**59**	**55**	**132**	**9 009**
Costs									
Administration	9	9	9	9	9	4	4	4	55
Registration	42	11	5	4	9	5	4	1	81
Training	119	114	69	22	57	8	6	8	402
Independent review	125	268	132	41	81	1	7	21	676
Mandatory inspection	166	72	131	101	242	3	2	26	742
Building database	6	13	5	7	8	6	3	1	50
Dictionary of terminology	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.1
Building manual	34	36	18	6	11	2	1	3	110
Documentation	40	45	26	6	16	2	1	3	138
Construction	653	915	336	112	397	9	13	38	2 474
Total costs	**1 194**	**1 482**	**730**	**307**	**829**	**40**	**42**	**105**	**4 729**

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Net benefit	**1 267**	**1 715**	**656**	**103**	**480**	**19**	**13**	**27**	**4 281**
Benefit-cost ratio	**2.06**	**2.16**	**1.90**	**1.34**	**1.58**	**1.47**	**1.31**	**1.26**	**1.91**

Note: All values are present value over 2022 to 2031 with a discount of 7 per cent

Source: CIE.

All jurisdictions are estimated to benefit from implementing the BCR recommendations. Victoria and NSW have the highest net benefit, while the net benefits in Northern Territory, ACT and Tasmania are the smallest. The magnitude of net benefits depends on the size of the building industry as well as each state or territory's starting point (i.e. the extent to which each state or territory's pre-existing regulatory framework already incorporates the BCR recommendations). Further, because of the different starting points as indicated by the self-reporting progress of implementing BCR recommendations, the proportion of benefits from time savings and benefits from avoided costs of defects is not the same for each state and territory.

In the long term, consumers (homeowners, building owners and tenants) will receive these net benefits. Specifically, they may pay slightly higher costs to buy or rent a building or a property, but the quality of the building (via fewer defects) will more than offset it. Moreover, some of the benefits from national consistency, in terms of reduced cost to building industry, will pass to consumers in terms of reduced price or less increment in price.

Given the uncertainty around these estimates we tested several scenarios as part of the sensitivity analysis (table 8).

8 Net benefit of BCR: sensitivity analysis under alternative assumptions

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Net benefit ($m)									
Central case	**1 267**	**1 715**	**656**	**103**	**480**	**19**	**13**	**27**	**4 281**
More defects (60 percent) are picked up in design phase	1 572	2 142	813	156	665	23	19	45	**5 435**
Less progress in baseline	1 365	1 715	802	114	489	22	16	40	**4 562**
Lower fees for training	1 297	1 743	673	109	494	21	15	29	**4 381**
Low-case scenario for BCR impact	380	465	200	- 50	- 60	7	- 5	- 25	**912**
High case for size of problem	1 362	1 826	684	120	514	21	15	34	**4 575**
Low case for size of problem	1 173	1 604	628	87	446	17	11	20	**3 986**
Upper bound of net benefits	1 859	2 312	1 063	196	735	32	28	74	**6 299**
Lower bound of net benefits	363	446	195	- 53	- 66	6	- 5	- 26	**861**
Benefit-cost ratio									
Central case	**2.06**	**2.16**	**1.90**	**1.34**	**1.58**	**1.47**	**1.31**	**1.26**	**1.91**

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
More defects (60 percent) are picked up in design phase	2.77	3.03	2.42	1.61	2.03	1.64	1.53	1.51	**2.52**
Less progress in baseline	2.09	2.16	1.98	1.36	1.59	1.52	1.37	1.35	**1.93**
Lower fees for training	2.11	2.20	1.94	1.36	1.61	1.55	1.36	1.28	**1.95**
Low-case scenario for BCR impact	1.58	1.64	1.44	0.77	0.88	1.20	0.85	0.66	**1.34**
High case for size of problem	2.09	2.18	1.92	1.38	1.60	1.51	1.35	1.31	**1.93**
Low case for size of problem	2.03	2.13	1.88	1.29	1.55	1.43	1.26	1.20	**1.88**
Upper bound of net benefits	3.01	3.18	2.73	1.76	2.14	1.90	1.77	1.80	**2.72**
Lower bound of net benefits	1.56	1.62	1.43	0.75	0.87	1.19	0.83	0.64	**1.32**

Note: All values are present value over 2022 to 2031 with a discount of 7 per cent

Source: CIE.

A key finding is that the CBA results depend critically on the extent to which implementing the BCR recommendations will address the non-compliance issues. Under a lower assumption where the BCR recommendations reduces non-compliance issues by only around 10 per cent (as suggested by some of the most conservative stakeholders), the benefits are significantly reduced and for some jurisdictions small net costs may result, although nationally benefits outweigh the costs by $912 million in NPV terms (table 8).

If more defects (60 per cent of total) are picked up in the design phase, additional construction cost to rectify these defects during construction phase would be much lower, resulting in around $1.15 billion higher net benefit than the central case (table 8).

Further, if less progress is assumed in the baseline scenario (specifically, where states and territories reported partial implementation of recommendations, we assume 25 per cent progress instead of 50 per cent), this adds around $280 million to net benefits over the central case, because there is more scope for the BCR to have an impact, despite extra construction costs to achieve this outcome, bringing the total net benefit to $4.6 billion over 10 years.

Assuming a larger (smaller) problem to begin with adds (reduces) to net benefits created by the BCR.

Combining the assumptions for each element, our ‘lower bound’ estimate (assumes the BCR only fixes 10 per cent of defects and the low case scenario for the size of the problem in Classes 3-9 buildings) for the net benefits created by the BCR is $861 million with a benefit-cost ratio of 1.3. The BCR creates net costs in some states under these assumptions. Our ‘upper bound’ estimate (assuming lower training fees, 60 per cent of defects picked up in the design phase, less progress in the baseline and the high case scenario for the size of the problem in Classes 3-9 buildings) for the net benefits created by the BCR is about $6.3 billion with a benefit-cost ratio of 2.7.

In sum, implementing all the BCR recommendations is most likely to generate a net benefit for society.

1 Introduction

Background

Under Australia's federal system, building regulation is primarily the responsibility of state and territory governments. A key reform to building regulation in the early 1990s was the development of a nationally consistent technical code, the Building Code of Australia (BCA), which now forms part of the National Construction Code (NCC). The NCC is an example of how model provisions, when adopted by the states and territories, can deliver significant economic and life safety benefits to society.

The NCC is a nationally consistent code that is given regulatory effect through state and territory government legislation (although some state or territory-based variations remain). The supporting regulatory systems (including compliance and enforcement) are also state and territory based.

The Building Confidence Report

Over the past decade or so, weaknesses in building regulatory systems, both within Australia and overseas, have become increasingly apparent.

- There have been a series of Australian state-based reviews 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 combustible cladding on a significant 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 need to take action on the unsafe use of products became clear following incidents, such as:
  - a fire in the Lacrosse building in Melbourne's docklands in which over 400 occupants were evacuated
  - the Grenfell Tower fire in London, in which 72 residents lost their lives.
- Major structural defects have emerged in a number of apartment buildings in Sydney, including the Opal Tower and Mascot Tower, resulting in the evacuation of residents and the potential for substantial rectification costs.

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.[5] The resulting Building Confidence Report (BCR) was released in April 2018. The 24 recommendations are summarised in table 1.1.

1.1 BCR recommendations

Recommendation	Details
Registration and training of practitioners	
Recommendation 1: Registration of building practitioners	That each jurisdiction requires the registration of the following categories of building practitioners involved in the design, construction and maintenance of buildings: ▪ Builder ▪ Site or Project Manager ▪ Building Surveyor ▪ Building Inspector ▪ Architect ▪ Engineer ▪ Designer/Draftsperson ▪ Plumber ▪ Fire Safety Practitioner
Recommendation 2: Consistent requirements for registration	That each jurisdiction prescribes consistent requirements for the registration of building practitioners, including: ▪ Certificated training which includes compulsory training on the operation and use of the NCC as it applies to each category of registration ▪ Additional competency and experience requirements ▪ Where it is available, compulsory insurance in the form of professional indemnity and/or warranty insurance together with financial viability requirements where appropriate; and ▪ Evidence of practitioner integrity, based on an assessment of fit-and-proper person requirements,
Recommendation 3: Continuing Professional Development	That each jurisdiction requires all practitioners to undertake compulsory Continuing Professional Development on the National Construction Code.
Recommendation 4: Career paths for building surveyors	That each jurisdiction establishes a supervised training scheme which provides a defined pathway for becoming a registered building surveyor.
Roles and responsibilities of regulators	
Recommendation 5: Improving collaboration between regulators	That each jurisdiction establishes formal mechanisms for a more collaborative and effective partnership between those with responsibilities for regulatory oversight, including relevant jurisdiction government bodies, local government and private building surveyors (if they have an enforcement role).
Recommendation 6: Effective regulatory powers	That each jurisdiction gives regulators a broad suite of powers to monitor buildings and building work so that, as necessary, they can take strong compliance action.

[5] ABCB, Statement of Requirements, p. 2.

Recommendation	Details
Recommendation 7: Strategy for the proactive regulation of Commercial buildings	That each jurisdiction makes public its audit strategy for regulatory oversight of the construction of Commercial buildings, with annual reporting on audit findings and outcomes.
Role of fire authorities	
Recommendation 8: Collaboration with fire authorities in the development of fire safety design	That, consistent with the International Fire Engineering Guidelines, each jurisdiction requires developers, architects, builders, engineers and building surveyors to engage with fire authorities as part of the design process.
Integrity of private building surveyors	
Recommendation 9: Integrity of private building surveyors	That each jurisdiction establishes minimum statutory controls to mitigate conflicts of interest and increase transparency of the engagement and responsibilities of private building surveyors.
Recommendation 10: Codes of conduct for building surveyors	That each jurisdiction put in place a code of conduct for building surveyors which addresses the key matters which, if contravened, would be a ground for a disciplinary inquiry.
Recommendation 11: Role of building surveyors in enforcement	That each jurisdiction provides private building surveyors with enhanced supervisory powers and mandatory reporting obligations.
Collecting and sharing building information and intelligence	
Recommendation 12: Collecting and sharing data and intelligence	That each jurisdiction establishes a building information database that provides a centralised source of building design and construction documentation.
Adequacy of documentation and record keeping	
Recommendation 13: Responsibility of design practitioners	That each jurisdiction requires building approval documentation to be prepared by appropriate categories of registered practitioners, demonstrating that the proposed building complies with the National Construction Code.
Recommendation 14: Adequate documentation for performance solutions	That each jurisdiction sets out the information which must be included in performance solutions, specifying in occupancy certificates the circumstances in which performance solutions have been used and for what purpose.
Recommendation 15: Approval of performance solutions for constructed building work	That each jurisdiction provides a transparent and robust process for the approval of performance solutions for constructed building work.
Recommendation 16: Approval of documentation throughout the construction process	That each jurisdiction provides for a building compliance process which incorporates clear obligations for the approval of amended documentation by the appointed building surveyor throughout a project.
Recommendation 17: Independent third-party review	That each jurisdiction requires genuine independent third-party review for specified components of designs and/ or certain types of buildings.
Inspection regimes	
Recommendation 18: Mandatory inspections	That each jurisdiction requires on-site inspections of building work at identified notification stages.
Recommendation 19: Inspection and certification of fire safety system installation	That each jurisdiction requires registered fire safety practitioners to design, install and certify the fire safety systems necessary in Commercial buildings.

Recommendation	Details
Post-construction information management	
Recommendation 20: A building manual for Commercial buildings	That each jurisdiction requires that there be a comprehensive building manual for Commercial buildings that should be lodged with the building owners and made available to successive purchasers of the buildings.
Building product safety	
Recommendation 21: Building product safety	That the Building Ministers' Forum agrees its position on the establishment of a compulsory product certification system for high-risk building products.
Implementation and recommendations	
Recommendation 22: Dictionary of terminology	That the Building Ministers' Forum develop a national dictionary of terminology to assist jurisdictions, industry and consumers to understand the range of terminology used to describe the same or similar terms and processes in different jurisdictions.
Recommendation 23: Implementation of recommendations	That the Building Ministers' Forum acknowledges that the above recommendations are designed to form a coherent package and that they be implemented by all jurisdictions progressively over the next three years.
Recommendations 24: Implementation plan	That the Building Ministers' Forum prioritise the preparation of a plan for the implementation of the recommendations against which each jurisdiction will report annually.

Source: 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, pp. 15-38.

Implementing the BCR recommendations

Although the Australian Building Codes Board's (ABCB's) main responsibility is setting standards (through maintaining the NCC and providing associated education), the BCR Implementation Team was established within the ABCB to develop and report on the consistent implementation of the BCR recommendations, as well as the design, construction and certification of complex buildings.

High-level impact analysis

ABCB has engaged the Centre of International Economics (CIE) to prepare a high-level analysis of the potential impacts of implementing the BCR recommendations to ensure that building reform is based on the best available evidence.[6]

General approach

The report will not be a formal Regulation Impact Statement (RIS), as would be required for proposed changes to the NCC. However, the intention is for the high-level analysis to be consistent with principles of best practice regulation (box 1.2).

6 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.

1.2 Principles of Best Practice Regulation[7]

COAG has agreed that all governments will ensure that regulatory processes in their jurisdiction are consistent with the following principles:

1 establishing a case for action before addressing a problem

2 a range of feasible policy options must be considered, including self-regulatory, co-regulatory and non-regulatory approaches, and their benefits and costs assessed

3 adopting the option that generates the greatest net benefit for the community

4 in accordance with the Competition Principles Agreement, legislation should not restrict competition unless it can be demonstrated that:-

   a) the benefits of the restrictions to the community as a whole outweigh the costs, and

   b) the objectives of the regulation can only be achieved by restricting competition

5 providing effective guidance to relevant regulators and regulated parties in order to ensure that the policy intent and expected compliance requirements of the regulation are clear

6 ensuring that regulation remains relevant and effective over time

7 consulting effectively with affected key stakeholders at all stages of the regulatory cycle, and

8 government action should be effective and proportional to the issue being addressed.

To inform the analysis, we have:

- consulted extensively with:
  - relevant industry stakeholders
  - state and territory policymakers and regulators
- reviewed the available (albeit limited) evidence
- conducted surveys of
  - a random sample of homeowners (both Classes 1 and 2) to assess the prevalence of defects and the cost of rectifying them
  - a survey of commercial building owners and managers on the prevalence of defects and rectification costs of commercial buildings (albeit the number of respondents is small)
  - building practitioners to understand the extent to which the BCR recommendations are likely to reduce the problem.

7 Council of Australian Governments 2007, *Best Practice Regulations, A Guide for Ministerial Councils and National Standards Setting Bodies*, October 2007, p. 4.

The BCR refers to Classes 1 and 10 buildings as 'domestic buildings' and Class 2-9 buildings as 'commercial buildings'.[8] While being consistent with the classification in the BCR, this report also 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. Appendix A provides more details on the building classification by NCC, the BCR and this report.

This report

The remainder of this report is structured as follows.

- Chapter 2 sets out the nature of the problem and estimates the size of the problems the BCR recommendations is seeking to address;
- Chapter 3 sets out the overarching objectives of the details of the BCR;
- Chapter 4 sets out the baseline and the potential impacts of the BCR relative to the chosen baseline;
- Chapter 5 estimates the costs associated with implementing the BCR recommendations;
- Chapter 6 estimates the benefits of the BCR recommendations;
- Chapter 7 brings together the cost and benefit estimates in a cost-benefit analysis framework;
- Appendices A provides the details for building classifications in the NCC, the BCR and this report; and
- Appendices B through F provide more detailed discussions on the analysis and results of residential and commercial building surveys as well as the practitioner survey conducted by the CIE.

8 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., p.7

2 Statement of the problem

Nature of the problem

Fundamentally, the problem that the BCR is seeking to address is non-compliance with the NCC. Non-compliance with the NCC is currently leading to the following inter-related outcomes according to the literature, our surveys and stakeholder consultations:

- unnecessarily high rectification costs associated with higher rate of defects; for example, we estimate that the average cost to rectify a defect in Class 1 Detached houses, Class 1 Townhouses and Class 2 apartments costs $3 440, $2 842 and $9 349 respectively according to our surveys
- increased safety risks (or adverse safety outcomes) for building users
- costs associated with building evacuations
- a loss of confidence in the construction industry
- loss of value for affected buildings (which could be due to damages to the building or reputation even after the defects are fixed) or income where it is an investment
- loss of accommodation provided by buildings (either temporarily or permanently)
- higher than necessary insurance premiums (or inability to obtain insurance) for some industry practitioners and affected owners.
- reduced thermal comfort for occupants
- increased energy running costs and associated release of greenhouse gas emissions
- increased maintenance costs
- increased anxiety, stress and emotional impacts.

Defects by type of building

It is again important to note some difference of building classification between BCR and this report. In BCR, 'commercial buildings' refer to Class 2 to 9 buildings as opposed to 'domestic buildings' which refer to Classes 1 and 10 buildings.[9] In this report we follow the BCR classification in presenting the results, while in some cases also refer Classes 1 and 2 as *residential (use) buildings* and Classes 3 to 9 as *other commercial (use) buildings* in accordance with their major use.

Various studies suggest that the prevalence of defects varies across building types.

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9 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., p.7

- Studies report lower prevalence rates (fewer defects per dwelling) for defects in detached houses than in townhouses and apartments. This is consistent with data collected in this study (a survey of residential owners and stakeholder views).
- In contrast, while building inspectors note that Class 2 apartments and commercial buildings can exhibit these problems[10] the CIE is not aware of any study that includes estimates or data on the prevalence and/or cost of defects in apartments and commercial buildings (NCC Class 2-9).

There are several factors that could help to explain the apparent prevalence of defects in multi-residential buildings (including apartment buildings and townhouse complexes), compared to other building types.

- In a multi-residential development, the initial owner has less incentive to ensure that the building complies with the NCC.
  - The initial owners (i.e. the developer) of multi-residential developments generally do not intend to maintain ongoing ownership of the building. Consequently, the developer's main incentives are usually to engage a builder that provides the lowest quote and can meet project timeframes. The builder's compliance with the NCC is a lesser incentive, usually driven by what is necessary to meet approval milestones than overall build quality.
  - By contrast, owners of commercial buildings and separate dwellings are more likely to retain ownership of the building after completion and therefore have a stronger incentive to hire knowledgeable and experienced builders and ensure they comply with the NCC to build a quality building.
- Commercial building owners are generally a better-informed owner, meaning there is a stronger incentive for builders of commercial buildings to comply with the NCC.
  - Apartment owners are not experienced in identifying building defects so are often left to be identified beyond the end of the warranty periods. Individual unit owners are also generally not responsible for identifying defects in common areas and the façade of a building.
  - By contrast, owners/purchasers of commercial buildings are professionals and therefore better informed about construction issues, which means they can more effectively identify and understand defects.
- Related to the above, commercial building owners may be more likely to pursue the builder for breaches of contract in the event of a defect. By contrast, owners' corporations are not always run by professionals and obtaining agreement across members to engage lawyers and pursue the builder may be difficult. In addition, 'phoenixing' (whereby companies are created for specific projects, then dissolved) may mean there is no builder or developer to pursue.

10 For example: cracking, essential safety features not maintained, leaks and roof defects (see: https://www.spipropertyinspections.com.au/blog/commercial-buildings-common-defects/, accessed April 2020)

Types of defects

The costs associated with defects will vary depending on type. For example, structural defects, which account for around 7 per cent of defects in multi-residential buildings (table 2.1), tend to be more costly than defects in other locations.

2.1 Prevalence of defects in multi-residential buildings by type

Type of defect	Share
	Per cent
Building fabric and cladding	40
Fire protection	13
Water proofing	11
Roof and rainwater disposal	9
Structural	7
Hydraulics	5.3
Safety[a]	5.1
Electrical, lighting and data	2.7
Mechanical and ventilation	2.6
Access and egress	2.1
Non-essential elements	1.1
In motion equipment and utility	0.2

[a] For example: non-compliant access for occupants with disability, incomplete balustrade, inadequate height for handrail, handrail missing fixings, riser heights that are inconsistent with stairs)

Source: Johnston N. and S. Reid 2019, *An examination of building defects in residential multi-owned properties*, available at https://www.griffith.edu.au/__data/assets/pdf_file/0030/831279/Examining-Building-Defects-Research-Report.pdf

Defects relevant to the NCC and the BCR

Johnston and Reid (2019) note there is no consistent definition for 'building defect' in the literature.[11] Not all 'defects' are relevant to the NCC or the BCR recommendations.

- Reflecting the primary focus of the NCC, defects that compromise safety and health objectives are the key focus of the proposed reforms.
  - The NCC also aims to ensure that buildings have adequate features relating to amenity and accessibility, sustainability in design, and the performance and liveability. A building has a defect where a particular aspect of it does not comply with the NCC, and these goals are compromised.
- The BCR aims to achieve these goals by improving compliance with and enforcement of the NCC.
- Building defects could also potentially occur at any phase of a building's lifecycle.
  - The NCC is primarily relevant to the design and construction phase. The BCR also focuses mostly on compliance with the NCC at the design and construction phases

11 Johnston N. and S. Reid 2019, *An examination of building defects in residential multi-owned properties*, available at https://www.griffith.edu.au/__data/assets/pdf_file/0030/831279/Examining-Building-Defects-Research-Report.pdf

of a building's life. These defects are therefore the primary focus of this study. Defects that occur at the design or construction phase implies the defect is the fault of one or more building practitioners.

– Building defects could also occur during the operation phase (such as due to poor maintenance). While some of these defects will be caused by individuals that are not the focus of the BCR (for example, poor maintenance by a property owner), some defects that arise during operation may be reduced by BCR measures. For example, according to several stakeholders, key building information (such as maintenance schedules, compliance requirements for Performance Solutions and related information) is frequently not passed on when the building changes ownership or management. Further, in addition to creating the need for rectification costs, many defects caused by non-compliance with NCC will add to future maintenance costs and other costs, which we try to measure in this study.

Defects due to non-compliant designs or poor construction practices can take some time to emerge. In some cases, it can be difficult to determine whether a defect has occurred due to non-compliant designs or construction or poor maintenance practices.

Identification of defects by stage of a building's lifecycle

As noted above, defects can occur at any stage of a building's lifecycle. Anecdotally, the earlier a defect is detected, the less costly it is to rectify. For example, if non-compliant designs are identified prior to construction, the rectification costs incurred may be minimal. By contrast, if non-compliant designs or construction practices are not identified until after a building has been completed, the rectification costs could be very large. For example, a study in Singapore found that installing protections on the edges of walls in locations with high traffic can prevent chipping and in the long run, the cost of this protection can be significantly lower than the cost to repair damaged wall edges.[12] Although the specific practice mentioned in the study is not regulated in the NCC, it illustrates that early detection and action help to reduce costs later. Further, UK research has found that selecting a building façade that does not meet project and engineering requirements can increase costs and create delays, which only become apparent in the late construction phase.[13]

It is therefore important that non-compliant designs and construction practices are identified and rectified as early as possible in the process. We have not found any systematic data in Australia. Although the relevance to the Australian context is unclear, a study of 18 704 defects in 74 buildings in Singapore found that:[14]

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12 Chong, Wai-Kiong and Sui-Pheng Low 2006, "Latent Building Defects: Causes and Design Strategies to Prevent Them", *Journal of Performance of Constructed Facilities*, 20(3), p.220

13 Kassem M., Mitchell D., 2015, "Bridging the Gap between selection decisions of façade systems at the early stage of design phase: issues, challenges and solutions*", Journal of Façade Design and Engineering*, 3(2), pp.165-183

14 Chong, Wai-Kiong and Sui-Pheng Low 2006, "Latent Building Defects: Causes and Design Strategies to Prevent Them", *Journal of Performance of Construction Facilities*, 20(3), pp.213-221, 215. The shares sum to more than 100 per cent because some defects can be solved at multiple stages.

- 60 per cent of defects were preventable with better design
- 33 per cent with better workmanship
- 24 per cent with better materials, and
- 4 per cent with better maintenance.

Who bears the cost of building defects?

Related to the above, the cost of any works to rectify a defect could be borne by either:

- the owner (when the defect emerges) or their insurer
- the builder/developer/designer (or other practitioners) or their insurers
- the building surveyor or their insurer.

Who bears the cost of any rectification works depends on a range of factors, including:

- who is at fault for the defect
- whether the defect emerges during the mandatory warranty period
- the outcome of any litigation (including where settled out of court).

In some cases, the costs can be shared across multiple parties, implying multiple parties are at fault. For example, the Victorian Administrative Tribunal ordered the builder of the Lacrosse Building to pay $5.7 million to owners, but further ordered the building surveyor, the fire engineer and the architect to compensate the builder. Overall, the financial liability was split among fire engineer (39 per cent), building surveyor (33 per cent), architect (25 per cent) and the builder (3 per cent).[15]

Evidence from a UNSW Survey of strata owners in NSW found that most defects are rectified (table 2.2); however, there are many cases where the owners' corporation (or their insurance) bears the cost or the matter goes to court. This might be due to the fact that defects were found after the warranty expired and/or that defects were due to poor maintenance. It may however also imply that there is a financial incentive for phoenix activities as only a small proportion of rectification costs were paid by builders and/or developers.

2.2 Who is expected to cover the cost of defects

Who covers the cost to rectify defects	Per cent of defects
Defects that are expected to be rectified	**97**
... where the cost is covered by the owners' corporation or owners corporation insurance	*43*
... where the cost will be covered by the builder or developer (or home warranty insurance)	*30*
... where the owners are taking the builder/developer to court	*24*
Defect not fixed	**3**
Total	**100**

Source: CIE calculation based on UNSW (2009).

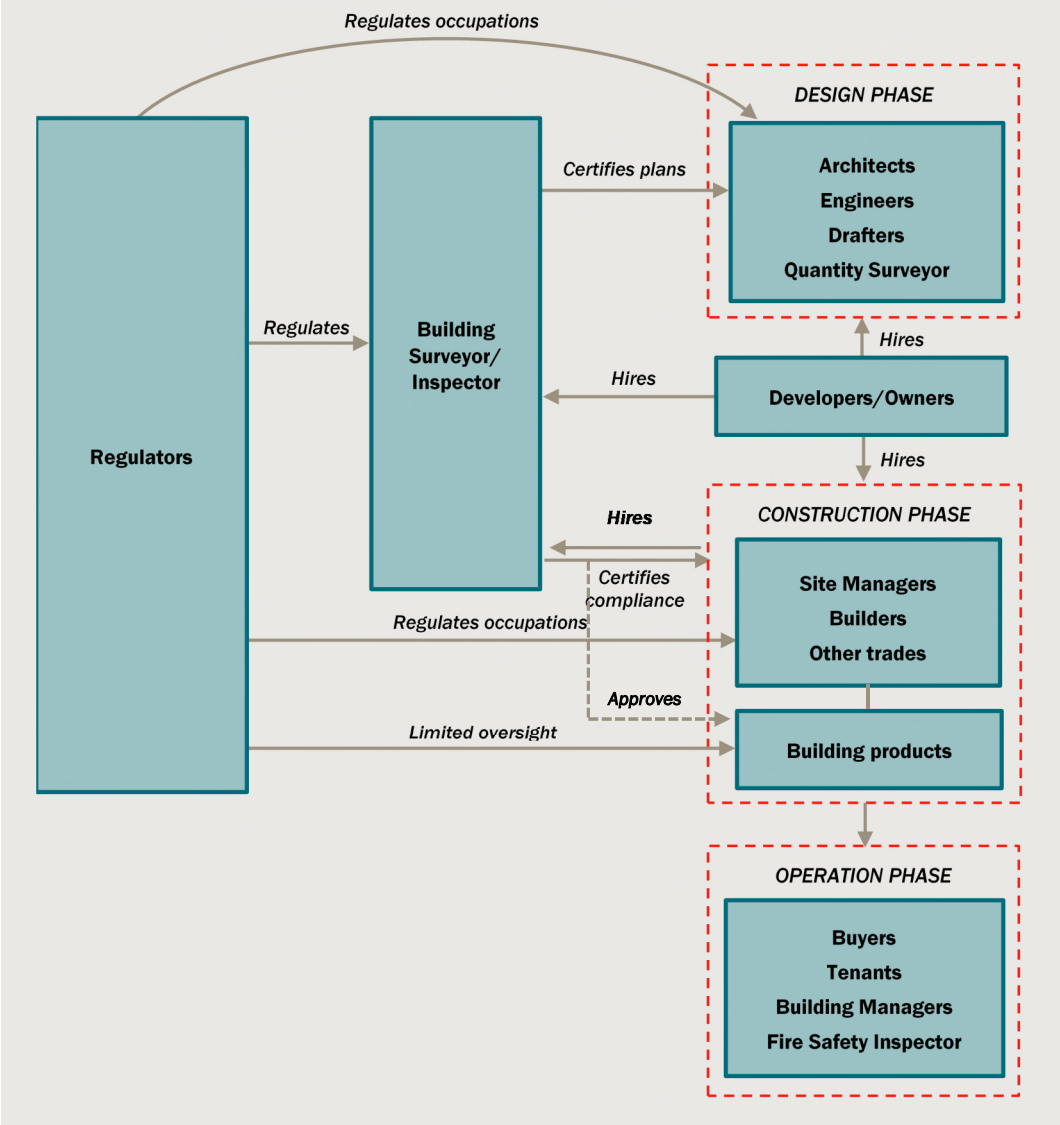
15 Knob, Simon 2019 "Apartment tower residents awarded in millions in damages after cladding fire", *The Age,* 28 February 2019, see: https://www.theage.com.au/national/victoria/apartment-tower-residents-awarded-millions-in-damages-after-cladding-fire-20190228-p5110n.html (accessed April 2020)

Existing policy measures to address the problem

Although the regulatory framework to ensure compliance with the NCC varies across states and territories, key compliance and enforcement mechanisms may include the following (see chart 2.3).

- Building surveyors— which may be private or employed by a council, and may also be called certifiers — play a key role in ensuring that buildings comply with the NCC. Building surveyors typically:
  - certify that a building's plans comply with the NCC
  - certify that the building has been built in accordance with the plans (and therefore complies with the NCC).
- Various regulators are responsible for regulating building practitioners (although the arrangements vary across states and territories). This often involves licensing/registration and other requirements aimed at ensuring that practitioners are competent.
- Responsibility for enforcement of building regulations varies across states and territories and may be the responsibility of state and territory government regulators, local councils, or building surveyors (through the building approval process and only for the building that they have been engaged to assess).

2.3 Key elements of existing compliance and enforcement measures



Note: As noted here, some jurisdictions allow the builder to hire the building surveyor, which contributes to the risk of poor outcomes that result from inherent conflicts of interest

Data source: CIE.

Other measures include:

- compulsory insurance for some practitioners including building surveyors, fire engineers, architects and builders (see table 2.32).
- mandatory warranties, which can vary across states and territories (see table 2.4).

2.4 Mandatory warranty periods

State/Territory	Warranty period
NSW	▪ Major defects (eg structural) are covered for six years ▪ Other defects for two years.
Victoria	▪ Structural defects are covered for six years ▪ Non-structural defects for two years.

State/Territory	Warranty period
Queensland	▪ All work is covered by statutory warranties for – 6 years 6 months for structural defects and 12 months for non-structural defects. ▪ In addition, Home warranty insurance for residential construction up to 3 storeys.
Western Australia	Defects are covered for six years following the building's completion.
South Australia	Claims can usually be made up to five years following the building's completion.
Tasmania	Statutory warranties last for six years from the building's completion.
ACT	The statutory warranty operates for: ▪ 6 years for structural elements of a building. ▪ 2 years for non-structural elements of a building.
Northern Territory	Claims for defective building work can be made for up to 10 years. However, issues that sit outside the NCC such as poor workmanship and minor cracks are not covered.

Source: Mozo website, https://mozo.com.au/home-loans/articles/property-pain-building-defects-report-2019, accessed 21 April 2020, Queensland Building and Construction Commission website, https://www.qbcc.qld.gov.au/timeframes-could-affect-your-complaint, accessed 13 July 2020, Expert feedback

Estimates of the size of the problem

Previous studies

There are several studies that have attempted to estimate the cost to the community of building defects (see table 2.5). The scope of these studies varies, so the estimates are not directly comparable.

2.5 Estimates of the cost of building defects

Study	What they measure	Key finding
Equity economics 2019	▪ Cost to rectify all defects in apartments constructed over the past 10 years in Australia. ▪ Assumptions based on a range of published estimates and media reports (see below).	▪ Total rectification cost of $6.6 billion, Australia wide, over 10 years covering NCC Class 2
Mozo 2019	▪ Cost to rectify all defects in apartments and houses	▪ Total rectification cost of $10.5 billion, Australia wide, over 10 years, houses and apartments (treatment of townhouses is unclear)
ACIL-Allen 2016	▪ Focused on NSW only. ▪ The cost of building defects based on claims to the Home Building Compensation Fund (HBCF), which covers residential construction excluding multi-residential construction of 4 or more storeys (it therefore covers NCC Class 1 and a component of Class 2) ▪ Rectification costs are measured with claims from Home Warranty Insurance	▪ Rectification costs estimated at $65 million per year on average, covering NCC Class 1 and part of Class 2
CIE (2014)	▪ Based on NSW only. ▪ Extrapolated from UNSW (2009) survey.	▪ Total cost of defects in NSW was estimated at around $100-$200 million per year.

Source: The CIE.

The cost of building defects depends on:

- The prevalence of building defects (and type) caused by failures at the design, approval and construction phase
- The impact of these defects, including the impact on:
  - rectification costs
  - safety risks
  - evacuation costs
  - loss of property value, rental income and revenue for commercial tenants
  - legal costs
  - increase in insurance premium, excess and exclusion clauses, and
  - emotional impacts such as stress although they are difficult to quantify.

Prevalence of defects in new buildings

There are several studies that estimate the prevalence of defects in new residential buildings (see table 2.6). These studies suggest that the prevalence of defects tend to be significantly higher in multi-dwelling residential buildings, though the nature of the data collection in these studies make comparison across building types difficult (for example: data on multi-residential defects is drawn from surveys, while data on detached houses is drawn from government inspections (WA) and a government insurance scheme (VIC).

The NSW Home Building Compensation Fund covers defects in detached houses and 'low-rise' multi-residential developments (3 storeys or less). The government reports that that while defects relating to low-rise multi-residential development make-up only 17 per cent of all finalised claims, they account for 36 per cent of all costs.[16] This result is consistent with defects in multi-residential development being more problematic than detached houses (via either a higher prevalence rate or higher defect costs per dwelling).

We are however not aware of any data or systematic study on the prevalence of defects in commercial buildings.

2.6 Share of new residential buildings that contain defects

Study	Notes	Share of new dwellings
Multi-unit residential		
UNSW 2012	▪ A 2011 survey of property owners in strata schemes (owners of townhouses and apartments) in NSW.	▪ 72 per cent of all respondents reported defects ▪ 85 per cent of respondents in building built since 2000 reported defects

16 NSW Fair Trading, *Reform of the Home Building Compensation Fund,* Discussion Paper – December 2015, p.28, see: https://www.parliament.nsw.gov.au/lcdocs/other/12420/Ms%20Carmel%20Donnelly,%20Chief%20Executive,%20State%20Insurance%20Regulatory%20Authority%20-%20Tab%20J.pdf, accessed 13 July 2020

Study	Notes	Share of new dwellings
Griffith/Deakin study (2019)	▪ Review of 212 audit reports in NSW, Victoria and Queensland ▪ As buildings with defects are more likely to get an audit report, this methodology could possibly bias the sample and overstate the share of apartment buildings with defects.	▪ In NSW, 97 per cent of buildings had defects ▪ In Victoria, 74 per cent of buildings had defects ▪ In Queensland, 71 per cent of buildings had defects
Houses		
WA 2019	▪ WA: study provides estimates on the share of detached houses under construction, which would be revealed to have a defect, if inspections were introduced a different point during construction. ▪ Estimates range from 10 per cent to 42 per cent, depending on the stage of construction where the inspections were introduced (straight average is 31 per cent).	31.0 per cent of new houses
Mills 2009	12.5 per cent of new houses constructed between 1982 and 1997 in Victoria were estimated to contain defects based on data from the Housing Guarantee Fund.	12.5 per cent of new houses

Note: Data on the number of new builds with defects may understate the size of the problem, because some buildings with defects will likely contain more than one defect. We address this issue in our survey (see discussion below and Appendix A).

Source: UNSW 2012, *Governing the compact city: the role and effectiveness of strata management,* pg. 3;.WA 2019 *Reforms to the building approval process for single residential dwellings in Western Australia,* September 2019; Mills et al 2009, *Defect Costs in Residential Construction*, see: https://www.researchgate.net/publication/228657716_Defect_Costs_in_Residential_Construction; This study is based on the Housing Guarantee Fund, which was a first-resort fund for building defects; WA Government 2019, *Reforms to the building approvals process for single residential buildings in Western Australia*

In recent years, there has been a spate of fire safety defects in residential apartment buildings and some commercial buildings from the widespread non-compliant use of flammable cladding. Some state and territory governments have undertaken an audit program to identify affected buildings. For example, the Victorian Building Authority identified more than 1 000 private residential buildings with combustible cladding and a $550 million Cladding Safety Victoria program was established to reduce the risk associated with combustible cladding on residential apartment buildings.[17]

While states and territories have begun to ban flammable cladding, the size of cladding problem may be an indication of the size of 'the next problem' or problems of similar nature (non-compliant use and installation of building materials) that implementation of the BCR might avoid.

Rectification costs

A key cost associated with defects is the cost of the rectification works. Rectification costs will depend on the type of defect. Some previous estimates of average rectification costs are shown in table 2.7.

17 Victorian Cladding Taskforce 2019, *Report from the Co-Chairs*, July 2019, Victorian Department of Environment, Land, Water and Planning, Table 2, p.21
Cladding Safety Victoria 2020, *About Cladding Safety Victoria*, https://www.vic.gov.au/cladding-safety

Structural defects tend to have higher rectification costs than non-structural defects. According to claim data from the Victorian Managed Insurance Agency (VMIA), the average cost per claim was $51 024 for structural defects and $33 798 for non-structural defects.[18]

In some cases, the cost of rectification works may be a relatively small proportion of the total costs. For example, it has been reported that fixing the structural defects in the Opal Tower cost around $1 million, while total costs were at $27 million including "allowances and reimbursements made to residents", plus consultants, security, legal fees and public relations expenses.[19]

18 Essential Services Commission 2019, *Victoria's domestic building insurance scheme: Performance report 2018-19*, 29 November 2019, https://www.esc.vic.gov.au/sites/default/files/documents/Victoria%27s%20domestic%20building%20insurnace%20scheme%20-%20performance%20report%202018-19_0.pdf

19 Dye, Josh 2019, "Remaining Opal Tower residents to return home by Christmas", *The Sydney Morning Herald*, 22 September 2019, https://www.smh.com.au/national/nsw/remaining-opal-tower-residents-to-return-home-by-christmas-20190920-p52ser.html

2.7 Estimated rectification costs (per dwelling)

Study	Description of estimate	Cost estimate per dwelling
Apartments and townhouses		
Mozo 2019	Nationwide: respondents to survey report an average cost to rectify defects in newly constructed and newly renovated apartments	$6 434 per dwelling
UNSW 2009	▪ NSW: 4 examples for repairs to buildings that are 6 years old or less ▪ Straight average for cost per apartment is calculated; PPI is used to scale data to 2018-19	$6 400 per dwelling
WA Government 2019	▪ WA: straight average for rectification cost rate for commercial buildings [a]: 8.5 per cent of building value (across 4 scenarios) ▪ Rectification cost rate is applied to average unit value of other residential dwelling approvals (new dwellings) in WA for 2018-19	$23 239 per dwelling
Equity Economics 2019	▪ Buildings affected by combustible cladding. ▪ Cost assumptions based on a combination of estimates from a range of studies and rectification cost estimates from a sample of buildings reported in the media.	▪ $40 000 per dwelling for substantially affected buildings ▪ $8 750 per dwelling for moderately affected buildings
	▪ Buildings affected by water leaks ▪ Cost assumptions based on a combination of estimates from a range of studies and rectification cost estimates from a sample of buildings reported in the media.	▪ $25 000 per dwelling for substantially affected buildings ▪ $5 000 per dwelling for moderately affected buildings
	▪ Buildings (moderately) affected by fire safety defects ▪ Cost assumptions based on a combination of estimates from a range of studies and rectification cost estimates from a sample of buildings reported in the media.	▪ $9 000 per dwelling
	▪ Building affected by structural defects ▪ Cost assumptions based on a combination of estimates from a range of studies and rectification cost estimates from a sample of buildings reported in the media.	▪ 60 000 per dwelling for substantially affected buildings ▪ $5 000 per dwelling for moderately affected buildings
	▪ Summary of Equity Economics: total rectification problem of $6.2 billion, for apartments built over the 10 years from FY 2009 to FY 2018, which is around 540 000 apartments	▪ $11 439 per apartment
Summary of apartments	▪ Average cost across reports that focus on apartments: Mozo 2019, UNSW 2009 and Equity Economics 2019	▪ $8 091 per dwelling
Detached houses		
Mozo 2019	Nationwide: respondents to survey report an average cost to rectify defects in newly constructed and newly renovated houses	$5 839 per dwelling
WA Government 2019	▪ Western Australia: cost to remediate defects after construction, for most likely damages caused at critical stages of construction	$6 465 per dwelling

Study	Description of estimate	Cost estimate per dwelling
	▪ 5 examples of likely damages presented; we calculate a straight average of the cost of each example	
Mills et al 2009 [a]	▪ Victoria: defects in houses constructed between 1982 and 1997 cost around 4 per cent of construction value to rectify ▪	$14 000 per dwelling (4 per cent of the average unit value of development approvals for detached houses in Vic, $356 000)
Summary of detached dwellings	▪ Average cost across Mozo 2019, WA Government 2019 and Mills et al 2019	$8 768 per dwelling

Source: Mozo et al see: https://mozo.com.au/home-loans/articles/property-pain-building-defects-report-2019 (accessed March 2020); Mills et al 2009, *Defect Costs in Residential Construction*, see: https://www.researchgate.net/publication/228657716_Defect_Costs_in_Residential_Construction; This study is based on the Housing Guarantee Fund, which was a first-resort fund for building defects; WA Government 2019, *Reforms to the building approvals process for single residential buildings in Western Australia*

The size of the problem for Class 1 and Class 2 buildings

The size of the problem for Classes 1 and 2 (residential use) buildings is estimated using the results from the CIE survey of residential buildings owners, and supplementary analysis of available data on non-compliant flammable cladding.

CIE survey of residential building owners

Our survey of owners of residential dwellings received 1 606 complete responses (referring to 1 606 dwellings) with 2 574 defects reported across these dwellings. After removal of outliers and respondents who reported flammable cladding defects,[20] we are left with information on 1 605 dwellings, which contain 2 566 defects. Table 2.8 shows the breakdown of respondents by state and territory.

2.8 Survey responses by state and territory

	Respondents	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Metro	Regional
NSW	260	67%	12%	21%	65%	35%
VIC	258	72%	15%	13%	77%	23%
QLD	257	76%	11%	13%	52%	48%
SA	252	79%	15%	6%	85%	15%
WA	252	81%	11%	8%	86%	14%
TAS	104	94%	6%	0%	40%	60%
NT	120	92%	1%	8%	67%	33%

20 From the total responses, we have elected to remove 4 'outlier' defects, where the reported costs appear to be implausible. Due to the very low number of respondents reporting flammable cladding problem for apartments, we have also removed these data in the initial analysis. Flammable cladding defects and costs are analysed with supplementary estimates based on published data from state based audits, and incorporated this into our analysis. This is discussed below.

	Respondents	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Metro	Regional
ACT	102	63%	22%	16%	98%	2%
Total	**1605**	**77%**	**12%**	**11%**	**72%**	**28%**

Note: Excludes outliers.

Source: CIE.

Defects relevant to NCC compliance

We define defects that arise during steps that contribute to the initial build (design, engineering, approval and construction), that are potentially avoided if the BCR is implemented. For each reported defect, survey respondents provide an assessment, via a scale, of the underlying cause of the defect. We apply weightings to estimate the effective number of defects caused by the initial build (table 2.9).

2.9 Questions about the causes of defects and assumed weightings

Question	Assumed weighting
	%
Entirely due to the initial build	100
Mostly due to the initial build	75
Partly due to the initial build, partly due to damage, maintenance or the way it was altered	50
Mostly due to damage, maintenance or the way it was altered	25
Entirely due to damage, maintenance or the way it was altered	0
Unsure	0

Source: CIE.

With these weightings, ignoring outliers, it is estimated there are 1 341 defects caused by the initial build across all 1 604 survey responses (table 2.10).

2.10 Defects by cause and dwellings

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Total
Total defects	1 969	300	297	2 566
Cause: initial build	1 024	176	153	1 353
Cause: maintenance & other	946	124	144	1 214
Total dwellings	1 231	193	181	1 605

Note: excludes flammable cladding defects)

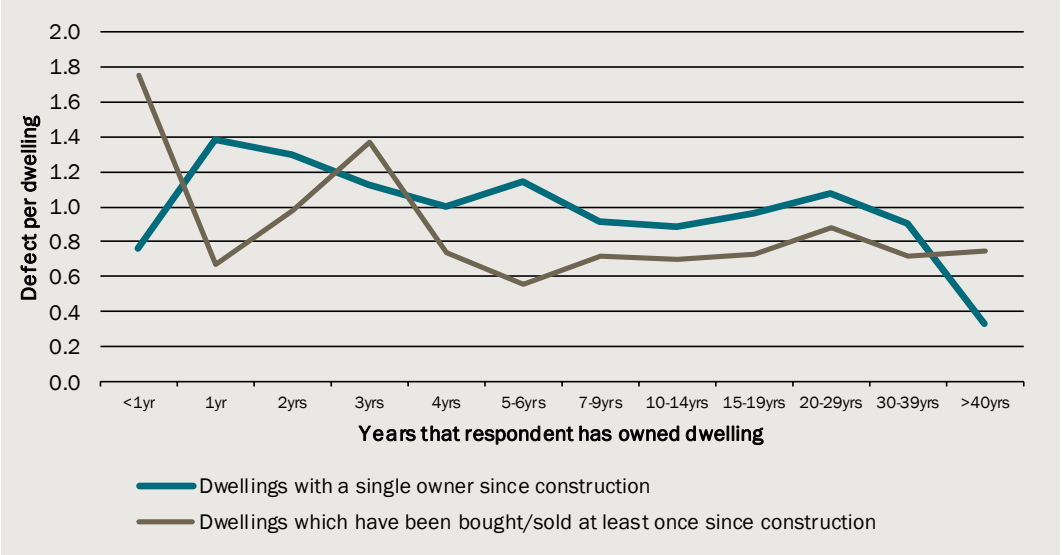
Source: CIE.

The prevalence of defects

Two issues have to be taken into consideration when estimating the prevalence of defects (the number of defects per newly built dwelling).

Survey respondents who have owned their dwelling since it was built report a significantly higher rate for defects that arise during steps that contribute to the initial build than other respondents (chart 2.11). A plausible explanation for this discrepancy is that respondents who have not owned their dwelling for its entire life may not be aware of defects that were rectified before they took ownership. Therefore, to estimate the prevalence or rate of defects that arise during steps that contribute to the initial build, we use only use data from respondents who have owned their dwelling since it was built. While this reduces the size of the sample we use, it results in a more accurate estimate of the rate of defects that arise during steps that contribute to the initial build of new dwellings. As noted, using all data would likely underestimate this rate.

2.11 Defect rates that arise during steps that contribute to the initial build, owners since new versus others

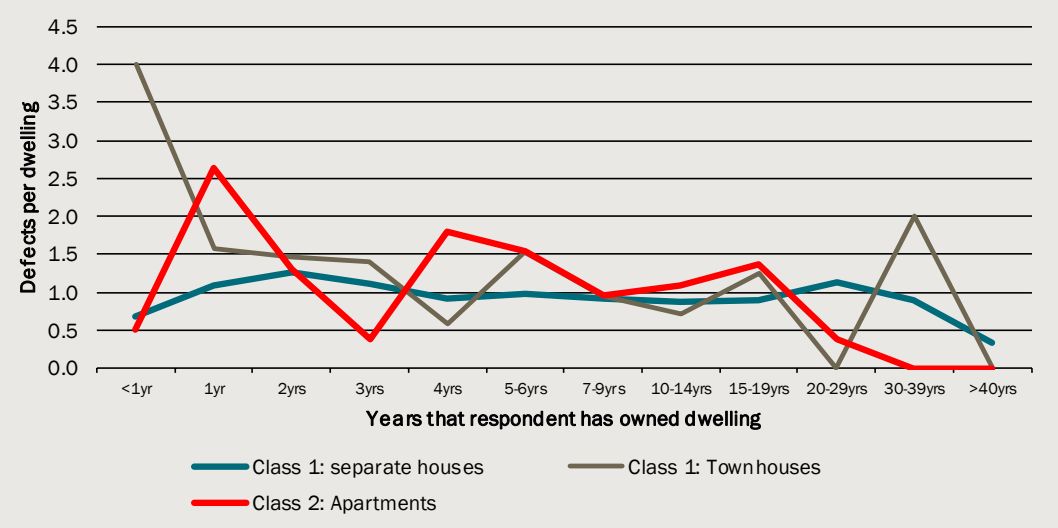


Data source: The CIE

Within survey respondents who have owned their building for its entire life, for separate houses and apartments, respondents who own dwellings that are less than one year old report a much lower defect rate than dwellings that 1 year or 2 years old. This is true for both detached and apartment dwellings, but not for townhouses[21] (chart 2.12). This is likely because defects in new dwellings have not yet become apparent. Therefore, these samples are excluded from the calculation to make estimate of the rate of defects that contribute to the initial build more accurate.

21 For Townhouses there was only one respondent who owned a dwelling that was less than a year old, who reported 4 defects, comparing to 59 townhouses that are more than one year old.

2.12 Defect rates caused by initial build, attached versus detached dwellings



Note: Data are from respondents who have owned their dwelling since it was built

Data source: CIE.

For all defect types, Australia-wide, amongst respondents who have owned their dwelling for its entire life, excluding respondents who own dwellings that are less than a year old, the average number of reported defects that arise during steps that contribute to the initial build is 0.95 per dwelling for detached dwellings 1.03 per dwelling for townhouses. This rate is 1.55 per dwelling for apartments, excluding flammable cladding defects.

We use published data from state based audits of flammable cladding on Class 2 buildings and other buildings (Victoria, NSW, SA, WA plus preliminary notes from QLD) to estimate the share of apartments built annually that may have non-compliant flammable cladding. This share is 13 per cent in Victoria, and is lower in other states and territories, see following table. The key assumptions in this analysis are:

- Only buildings where rectification work is required, or buildings with flammable cladding assessed as 'extreme' or 'high' fire risk, are assumed to be potentially non-compliant. This is consistent with outcomes from the SA Audit. It is also consistent with Victorian Cladding Taskforce reports (data in interim report implies that around 44 per cent of buildings with flammable cladding are not compliant; the updated report notes 481 buildings with flammable cladding, out of 1 069, that have cladding that is classed as high or extreme).[22] In NSW, as at 26 February 2021, 91 per cent of referred buildings (3 755 out of 4 127 inspections) have been cleared. Among the 372 under review, assessment or remediation, 154 have remediation under way or it has been ordered or approved.[23]

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22 Victorian Cladding Taskforce 2017, *Interim Report,* pg 13, see: https://www.planning.vic.gov.au/__data/assets/pdf_file/0016/90412/Victorian-Cladding-Taskforce-Interim-Report-November-2017.pdf, Victorian Cladding Taskforce 2019, *Report from Co-Chairs,* , see: https://www.planning.vic.gov.au/__data/assets/pdf_file/0019/426034/DELWP0124_Victorian_Cladding_Taskforce_Final_Report_July_2019_v9.pdf, accessed August 2020

23 https://www.nsw.gov.au/nsw-cladding-taskforce

- Where states report data on 'private buildings' with flammable cladding we assume 80 per cent of them are apartment buildings. In NSW around 90 per cent of all buildings under assessment (338 out of 372) are 4 storeys or over while 97 per cent of Class 2 buildings under assessment (208 out of 214) are 4 storeys or over.[24]
- We assume that all buildings that may have non-compliant cladding were constructed between 1997-2017, reflecting the scope of the Victorian Cladding Audit. Total apartment buildings constructed over this time equals the number of apartment approvals, divided by the average number of apartments per building reported by respondents to our survey (66 apartments per building).
- We use an unpublished estimate provided by NT government to estimate the number of buildings that may have non-compliant cladding.

2.13 Share of apartments that may have non-compliant flammable cladding

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
Apartment buildings that may have non-compliant, flammable cladding	163	385	144	22	42	0	7	29
Estimated number of apartment buildings built between 1997-2017	4701	2937	2147	196	538	6	124	402
Possible non-compliant buildings, share of total (also: possible non-compliant apartments, share of total)	3%	13%	7%	11%	8%	7%	6%	7%

Source: The CIE; NT Government.

For apartments, summing the prevalence rate for defects (excluding flammable cladding) plus the defect rate for flammable cladding, and then calculating the national average parameter using Census weights, yields 1.62 defects per apartment.

To estimate the size of the problem the BCR could fix, we use these national level parameters to estimate the number of defects contained in new dwellings, except for apartments, we make an adjustment to the size of the problem in each state to reflect different prevalence of flammable cladding defects and consistent with published audits (table 2.14).

2.14 Rate of defects caused by the initial build across states and territories

Defect rate	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total [a]
Defects that arise during steps that contribute to the initial build, per dwelling (average across respondents who have owned in their dwelling since it was built, excluding owners of dwellings that are less than 1-yr old)									
Detached (all defects)	1.00	1.04	0.81	0.98	1.04	0.33	0.37	1.56	**0.95**
Townhouse (all defects)	0.72	0.90	1.33	1.00	1.48	1.38	-	1.88	**1.03**
Apartment (excl. flammable cladding)	1.69	2.00	0.70	-	1.50	-	-	1.06	**1.55**

24 https://www.nsw.gov.au/nsw-cladding-taskforce

Defect rate	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total [a]
Apartment (flammable cladding)	0.03	0.13	0.07	-	0.08	-	-	0.07	
Apartment (all defects)	1.72	2.13	0.77	-	1.58	-	-	1.13	**1.62**
Census weights									
Detached	28%	26%	21%	8%	12%	3%	1%	2%	**100%**
Townhouse	30%	28%	17%	9%	12%	1%	-	2%	**100%**
Apartment	49%	24%	19%	-	6%	-	-	2%	**100%**

[a] Census weighted, national average; note states with no or very low respondents in the relevant dwelling type are excluded from the weighting calculation, with adjustments to weights.

Source: The CIE; Census

The mostly common defects are related to plumbing and drainage, roof and rainwater disposal, structural and waterproofing and weatherproofing (table 2.15).

2.15 Defects per 100 dwellings for Classes 1 and 2 buildings

	Class 1: Detached houses	Class 1a: Townhouses	Class 2: Apartments
Waterproofing/weatherproofing	10	16	30
Plumbing and drainage	17	13	26
Roof and rainwater disposal	15	13	21
Structural	14	14	19
Natural light & ventilation	8	9	9
Flammable cladding	1	2	8
Safety	5	5	8
Lift/elevator, gas supply, garbage chute	1	1	7
Swimming pools, gyms, playgrounds	2	2	7
Electrical, lighting and data	8	8	6
Fire protection	1	2	6
Entry/exit from building	5	5	6
Building fabric and cladding	6	7	4
Other	3	4	3
Total	**95**	**103**	**162**

Source: CIE.

Cost of defects

Defect costs are estimated around three items: rectification cost, time cost and other costs (table 2.16). Costs are estimated on a per dwelling basis. Responses without answering any cost questions are excluded from the estimation. Responses where '$0' is reported for cost, but the matter is reported as unresolved, are also excluded, as costs may not yet have become apparent.

2.16 Components of the cost of defects

Component	Definition/explanation
Rectification cost	Rectification and repair costs, 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
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.

Rectification cost

Survey respondents provide estimates of their personal cost for rectification and for the total cost (to all parties) for rectification. Because of the different nature of detached dwellings and of townhouses and apartments, we use these survey results slightly differently.

For detached dwellings, 'total cost' (to all parties including owner, builder, insurer and others) to rectify defects is estimated to be $3 440 per dwelling on average. The ratio of total cost to personal cost is 1.10.

For townhouses and apartments, there is a confusion for respondents who may report 'total cost (to all parties)' as the cost to other unit owners in the building. In other words, these respondents report 'total cost' as the rectification cost for the whole building rather than for their own units. This is determined from carefully examining the reported costs and the nature of the defect for a number of individual responses.

Due to this confusion, the 'total cost' answers cannot be directly used for attached dwellings. We use respondents' personal cost ($2 582 for townhouses and $8 494 for apartments), multiplied by the ratio between total costs and personal costs for detached dwellings. This gives average rectification cost for townhouses of $2 842 and apartments of $9 349.

Table 2.17 reports the rectification costs for different defect types and dwelling types.

2.17 Average cost of rectifying defects

	Class 1: Detached houses ($/defect)	Class 1: Townhouses ($/defect)	Class 2: Apartments ($/defect)
Waterproofing/weatherproofing	3 721	1 802	19 648
Plumbing and drainage	3 150	3 884	7 505
Roof and rainwater disposal	2 810	5 681	12 221
Structural	5 709	6 483	8 391
Natural light & ventilation	3 856	401	752
Flammable cladding	3 418	2 274	34 375

	Class 1: Detached houses ($/defect)	Class 1: Townhouses ($/defect)	Class 2: Apartments ($/defect)
Safety	1 738	1 323	250
Lift/elevator, gas supply, garbage chute	1 200	869	2 061
Swimming pools, gyms, playgrounds	5 155	2 495	5 915
Electrical, lighting and data	1 034	425	509
Fire protection	1 157	48	2 172
Entry/exit from building	549	668	665
Building fabric and cladding	3 002	2 284	2 414
Other	14 867	242	574
Average	**3 440**	**2 842**	**9 349**

Note: The very high 'other' defect cost for Class 1a 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.

The cost of flammable cladding for apartment buildings is derived from the judgement regarding the Lacrosse Tower by Judge Woodward of VCAT noting that around $6 million of 'compliance costs' is reasonable,[25] and further adjusted by the number of storeys in Lacrosse Tower and the average number of storeys in a typical apartment building.[26] This implies an average cost per impacted building of around $3 million, or an average cost of $44 996 per apartment (assuming 66 apartments per building according to our survey results). It is noted that estimating costs based on one building may not be ideal because the cost rectification may vary considerably depending on the nature of the cladding, the building and the proposed solutions. That said, this cost estimate is consistent with the cost range of $30 000 to $40 000 per apartment assumed by Equity Economics for substantially effected buildings.[27] This is further split into rectification ($34 375), other costs ($7 297) and time costs ($3 324) using the shares for other types of defects from the survey results.

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.

These parameters imply rectification costs *per dwelling* of $3 285 per detached house and $15 108 per apartment (defect per dwelling multiplied by rectification cost). These per

25 Dunstan, J., 2019, "Lacrosse Apartment Owners Awarded $5.7 million in damages after flammable cladding blaze", *ABC News*, 28 February 2019, see: https://www.abc.net.au/news/2019-02-28/lacrosse-apartment-owners-win-5.7-million-cladding-fire-damages/10857060#:~:text=The%20owners%20of%20apartments%20at,the%20building%20in%20November%202014., accessed August 2020

26 See data here: https://www.nsw.gov.au/projects/nsw-cladding-taskforce#:~:text=The%20NSW%20Cladding%20Taskforce%20was,Not%20all%20cladding%20is%20dangerous (accessed August 2020)

27 Equity Economics 2019, *The Cost of Apartment Building Defects*, available at https://www.ocn.org.au/sites/ocn.org.au/files/APARTMENTDEFECTS_Equity%2BEconomics%2BModeling%2Bof%2BCost.pdf, Tables 2 and 3.

dwelling costs are lower than the average cost in the literature (see table 2.7 above) for detached houses ($8 768), but higher for apartments ($11 439).

Time costs

Respondents provide an estimate of the amount of time they spend on getting a defect repaired. On average detached houses, townhouses and apartment owners spend 36 hours, 15 hours and 46 hours respectively (including an adjustment for flammable cladding for apartments). Using a rate of $19.55 per hour, which is half of the average hourly earnings for all employees in Australia, and also aligns with the minimum wage (another metric which can be used to value time costs in cross-population studies), it is estimated that the time cost is $701 per defect on average for detached dwellings, $299 per defect for townhouses and $904 per defect for apartments (table 2.18).

2.18 The time cost associated with defects

	Unit	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments
Time	Hours	36	16	46
Hourly rate	$/hour	19.55	19.55	19.55
Cost per defect	$/defect	701	299	904

Source: CIE.

Other costs

With the survey responses, it is estimated that other costs associated with defects are $225 per defect for detached dwellings, $503 per defect for townhouses and $1 985 per defect for apartments.

Total size of problem for residential buildings

As discussed above, the total cost (including rectification, time and other costs) per defect is $4 366 for detached houses, $3 643 for townhouses and $12 238 for apartments.

With the above parameters derived from the survey, together with new residential dwelling completion projection data by the CIE (table 2.19), it is estimated that total size of the problem (total costs associated with defects caused by initial build) in Class 1 and Class 2 buildings is about $2 billion per year (table 2.20).

2.19 Projected Class 1 and Class 2 building completion, by state, 2022

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments
	No of dwellings	No of dwellings	No of dwellings
NSW	34 406	11 431	17 379
VIC	40 908	13 591	20 663
QLD	27 325	9 078	13 802
SA	5 296	1 760	2 675

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments
	No of dwellings	No of dwellings	No of dwellings
WA	16 529	5 491	8 349
TAS	973	323	492
NT	713	237	360
ACT	2 348	780	1 186
Total	**128 497**	**42 692**	**64 905**

Note: projected number of dwellings has been adjusted upwards to account for components of residential building activity that are not captured with new builds (e.g. alterations and additions)

Source: The CIE

2.20 Annual size of the problem for new Classes 1 and 2 buildings in Australia, 2022

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Total
Annual completions (000)	128	43	65	236
Defects per completion	0.95	1.03	1.62	
Total defects (000)	123	44	105	
Costs per defect (per dwelling basis)				
Rectification ($)	3 440	2 842	9 349	
Other ($)	225	503	1 985	
Time ($)	701	299	904	
Total cost per defect ($)	4 366	3 643	12 238	
Total costs of defects				
Rectification ($m)	**422**	**125**	**980**	
Other ($m)	**28**	**22**	**208**	
Time ($m)	**86**	**13**	**95**	
Total defects ($m)	**536**	**160**	**1 283**	**1 979**

Source: The CIE

Victoria, NSW, Queensland and Western Australia are the top jurisdictions in terms of the size of the problem (table 2.21). This is mainly due to the size of the residential building industry in these states.

2.21 Annual size of the problem for Class 1 and Class 2 buildings, by state and territory, 2022

	Detached houses	Townhouses	Apartments	Total
	$m	$m	$m	$m
NSW	143	43	307	494
VIC	171	51	453	675
QLD	114	34	264	412
SA	22	7	57	85
WA	69	21	163	253

	Detached houses	Townhouses	Apartments	Total
	$m	$m	$m	$m
TAS	4	1	9	15
NT	3	1	7	11
ACT	10	3	23	36
Total	**536**	**160**	**1 283**	**1 979**

Source: The CIE

Table 2.22 reports the share of total cost associated with defects for residential use (Classes 1 and 2) buildings. The defects that contribute most to the problem are waterproofing/weatherproofing (28 per cent), roof and rainwater disposal (16 per cent), structural defects (15 per cent), plumbing and drainage (14 per cent) and flammable cladding (12 per cent).

2.22 Share of costs for Classes 1 and 2 buildings

	Class 1: Detached houses	Class 1: Townhouses	Class 2 Apartments	Total residential building
	%	%	%	%
Waterproofing/weatherproofing	11	10	38	28
Roof and rainwater disposal	13	26	16	16
Structural	24	31	10	15
Plumbing and drainage	16	18	13	14
Flammable cladding	1	2	17	12
Other	11	0	0	3
Natural light & ventilation	10	1	0	3
Swimming pools, gyms, playgrounds	3	2	3	3
Building fabric and cladding	6	5	1	2
Electrical, lighting and data	3	1	0	1
Safety	2	2	0	1
Lift/elevator, gas supply, garbage chute	0	0	1	1
Fire protection	0	0	1	1
Entry/exit from building	1	1	0	0
Total	**100**	**100**	**100**	**100**

Source: CIE.

The size of the problem for other commercial (Classes 3-9) buildings

The 'size of the problem' of defects in commercial buildings is highly uncertain as there is very little publicly available information on this issue to start our analysis with. Reflecting this uncertainty, we estimate the size of the problem as a range with the mid-point reported in the summary, using information from the commercial building manager/owner survey and other sources.

We received 11 responses to the survey of other commercial use (Classes 3 to 9) building managers/owners. These respondents own or manage 291 buildings in total. Their responses suggest 41 per cent of new-build Classes 3 to 9 buildings contain a 'major defect, while responses to our practitioners survey suggest around 53 per cent of buildings contain a defect. Accounting for all costs, our managers/owners survey suggest these defects create costs ranging from $260 000 to $437 000 per defect per building.

We estimate there were approximately 2 422 new-build Classes 3 to 9 buildings constructed in 2019. We grow this number in-line with projections for commercial floor space prepared by CIE for ABCB's Commercial Energy Efficiency RIS.[28] This yields an estimate of 2 635 new build commercial buildings in 2022.

Combined, these parameters and estimates suggest the annual size of the problem in commercial buildings ranges from $284 million to $611 million, with a mid-point of $447 million in 2022 (table 2.23).

2.23 Annual size of the problem for other commercial buildings (Classes 3 to 9), 2022

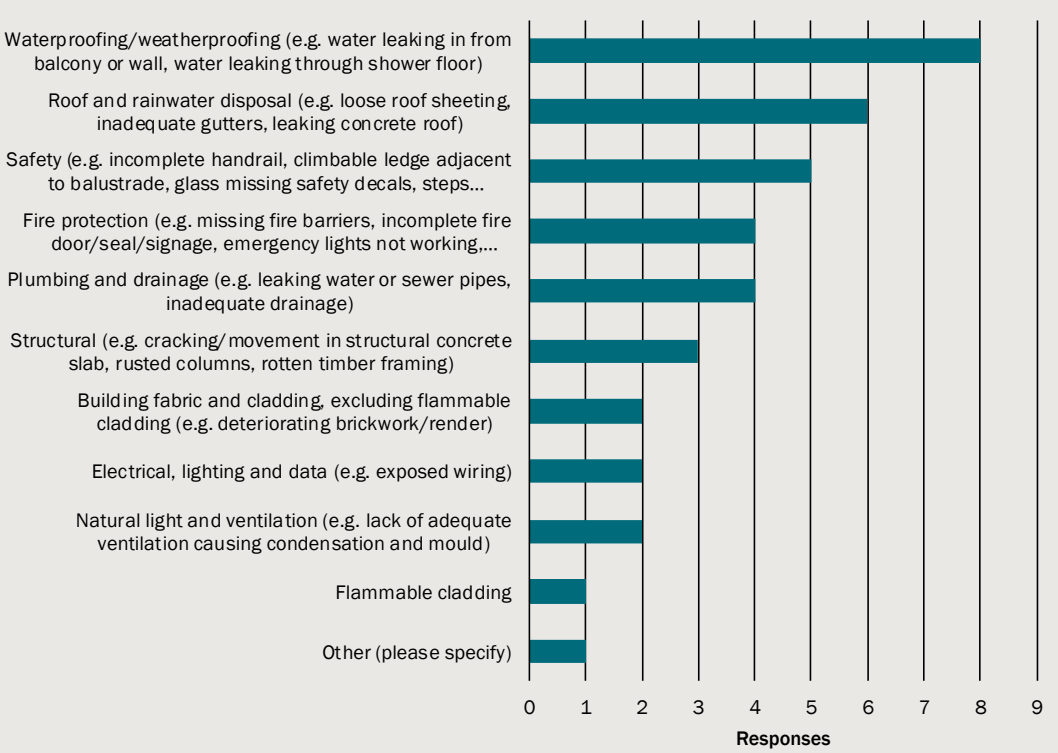
	Low	Central	High
New builds (no)	2 635	2 635	2 635
Prevalence of defects	53%	49%	41%
Cost per defect ($)	437 500	348 788	260 077
Size of the problem ($m)	**284**	**447**	**611**

Source: The CIE

According to the survey of other commercial building managers/owners, the most common types of defects are waterproofing/weatherproofing, roof and rainwater disposal, safety, fire protection and plumbing and drainage (chart 2.24 below).

28 CIE 2018, *Energy Efficiency of commercial buildings: Regulation Impact Statement for decision,* available at https://www.abcb.gov.au/Resources/Publications/Consultation/Energy-efficiency-of-commercial-buildings, accessed August 2020

2.24 Most common types of major building defect

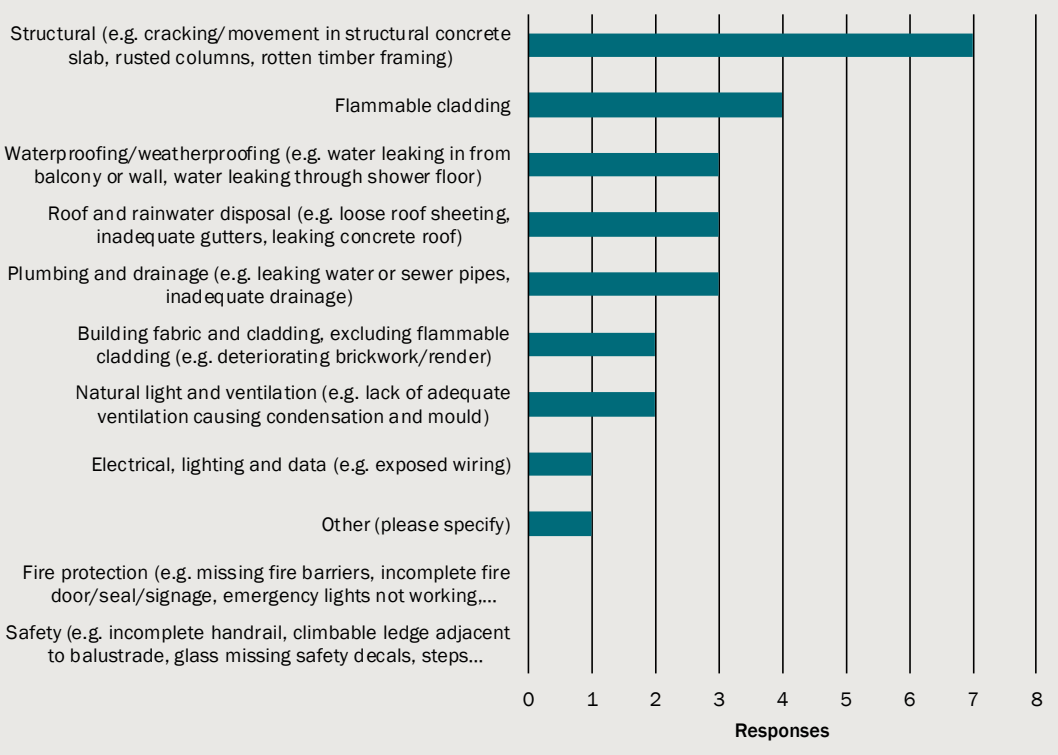


Q/ In your experience, what are the most common types of major building defect?

Data source: CIE survey of commercial building owners/managers.

According to the survey, structural defects and flammable cladding defects are the most expensive to fix (see chart 2.25 below).

2.25 Most expensive type of defects to fix



Q/ In your experience, what are the most common types of major building defect?

Data source: CIE survey of commercial building owners/managers

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 (see table 2.2 above).
- 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 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.

The Productivity Commission Report on Government Services reports that there were more than 17 700 structure fires attended by fire service organisations in 2018-19. 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 (table 2.26).

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

	Number over period	Average per year
	No.	No.
Flat, Apartments, Terrace House	39	2.5
Boarding House, Hotel, Backpackers Hotel	5	0.3
Motel, Hotel	1	0.1
Nursing Home	1	0.1
Total	**46**	**3.0**

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.[29] Over the 3-year period to June 2017, there was an average of around 48 preventable deaths per year in residential buildings (we average over a shorter time period to account of the downward trend in fatalities when normalised for population).

- Not all fire-related fatalities are due to building defects. 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).[30] Extrapolating these NSW estimates to the national level implies an average of around 2.4 preventable fatalities per year 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

29 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.

30 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 $4.9 million (in 2019 dollar terms) based on international and Australian research.[31]

This information suggests that the cost of human lives lost due to non-compliance with the NCC fire safety provisions could be around $11.8 million per year (table 2.27).

2.27 Estimated annual cost of lives lost due to building defects

	Number of preventable fatalities[a]	Number of Lives lost due to building defects[b]	Cost of lives lost due to building defects[c]
	No.	No.	$ million
NSW	14.3	0.7	3.5
Victoria	13.3	0.7	3.3
Queensland	8.3	0.4	2.0
SA	4.2	0.2	1.0
WA	4.7	0.2	1.2
Tasmania	1.8	0.1	0.4
NT	0.9	0.0	0.2
ACT	0.3	0.0	0.1
Australia	**48.3**	**2.4**	**11.8**

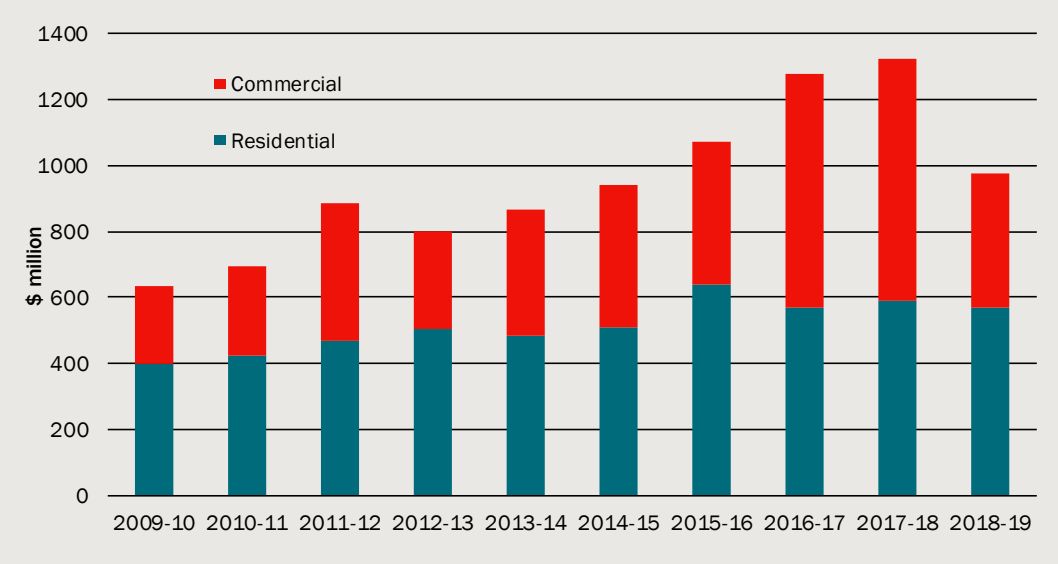
[a] Coates et. al. 2019, p. 37. [b] Assumes 5 per cent of fatalities are related to non-compliance with the NCC based on ACIL-Allen, 2015, p. A-15. [c] Based on a VSL of $4.9 million as recommended by OBPR (August 2019).

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 (chart 2.28). 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.

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

2.28 Building and contents insurance claims relating to fires — 2018-19 dollar terms



Data source: Productivity Commission.

Based on the Productivity Commission data, we estimate that the cost of property damage due to fire safety defects could be around $35.8 million per year (table 2.29). 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 $1.2 billion 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.[32]
- It has previously been estimated that residential sprinklers required as of NCC 2019 in Classes 2 and 3 buildings above 4-storeys have the potential to halve property loss from fire.[33] However, it is unclear from the Productivity Commission data what proportion of property damage relates to apartment buildings higher than 4 storeys.

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32 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.

33 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

2.29 Estimated annual property damage due to fire safety defects

	Total property damage			Estimated property damage related to defects[a]		
	Residential	Commercial	Total	Residential	Commercial	Total
	$ million	$ million	$ million	$ million	$ million	$ million
NSW	187.5	201.6	389.1	5.6	6.0	11.7
Victoria	165.0	177.3	342.3	5.0	5.3	10.3
Queensland	109.3	117.5	226.8	3.3	3.5	6.8
WA	47.0	50.5	97.5	1.4	1.5	2.9
SA	36.6	39.3	75.9	1.1	1.2	2.3
Tasmania	27.0	29.0	56.0	0.8	0.9	1.7
NT	5.9	6.4	12.3	0.2	0.2	0.4
ACT	4.2	4.5	8.6	0.1	0.1	0.3
Total	**575.6**	**618.6**	**1 194.2**	**17.3**	**18.6**	**35.8**

[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.

Other safety risks

Other safety risks primarily relate to a building's structural integrity. We are not aware of any systematic data sources that report fatalities or injuries due to this type of defect. However, there have been some fatalities and injuries due to structural defects reported.

- Two people were killed and 17 were injured after a deck collapsed in a private rental home in Doncaster East, Victoria on 16 December 2017.[34] Three building experts found the collapse was caused by the failed Oregon bearer and the weight carried. The bearer was weathered, rotted and had pre-existing cracking. A municipal building surveyor believed the deck was not built to original approved plans and was larger than approved.
- In 2002, 2 people died when the roof of a golf club collapsed. [35]

Total size of the problem

Table 2.30 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).

34 Iaria, Melissa and Ulises Izquierdo 2019, "Crack heard as deck collapsed, killing two", *news.com.au*, 29 October 2019, https://www.news.com.au/national/victoria/courts-law/crack-heard-as-deck-collapsed-killing-two/news-story/79bcddbabe6df56beb9ad53b1c7d1c51

35 See, for example: The Age 2002, *Golf club roof collapse crushes two*, 3 April 2002 https://www.theage.com.au/national/golf-club-roof-collapse-crushes-two-20020403-gdu3ja.html, accessed 14 July 2020

2.30 Estimated size of the problem

Type of building	Type of cost	Total size of problem (per year)
		$m
Domestic building a		
Class 1: Detached houses	Rectification cost	422
	Other cost	28
	Time cost	86
Class 1: Townhouses	Rectification cost	125
	Other cost	22
	Time cost	13
Class 1 buildings	Fatalities/property damage	18
Sub-total: Domestic building	**All cost**	**714**
Commercial building		
Class 2: Apartments [a]	Rectification cost	980
	Other cost	208
	Time cost	95
	Fatalities/property damage	7
Class 3-9 (other commercial use buildings)	Rectification, other and time costs	447
	Fatalities/property damage	23
Sub-total: Commercial building	**All costs**	**1 761**
Total	**All costs**	**2 475**

[a] Class 10 buildings are implicitly included as our estimates are based on total residential building activities

Note: Costs are estimated for 2022 based on the CIE's survey of residential building owners (see chapter 2 and Appendix A). Time costs are the costs of time building owners spend on getting a defect repaired. Other costs include lost rental income, temporary accommodation costs, extra travel/transport, legal costs, technical/engineering reports, legal costs, extra health care costs, and other costs.

Source: CIE.

Other costs

There are the other costs arising from NCC non-compliance which are not separately quantified either because they have been included in the other costs associated with defects (for example evacuation costs) or because there are not enough reliable data.

Evacuation costs

There are costs associated with the need to find alternative accommodation in the event that 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 this need for alternative accommodation is costly.

We are not aware of any systematic data on the evacuation costs; however, some anecdotal evidence may shed light on the size of evacuation costs (table 2.31).

Our survey asked owners of residential dwellings how much they spent on temporary accommodations as a result of defects. So the evacuation costs in principle have been included in the other cost item associated with defects discussed in the previous section.

2.31 Anecdotal evidence of building evacuations

Building	Reported details of evacuation
Opal Tower (Sydney)	▪ Building evacuated on 24 December 2018 due to a structural defect. ▪ The length of evacuation appears to have varied. – Around two-thirds of the building's 392 apartments were evacuated for 1 night – Around 80 apartments were evacuated for 2 nights,[a] – Around 20 apartments were evacuated for 1 year. ▪ The builder reportedly reimbursed residents. – Nevertheless one tenant claimed that he had to pay more than $20,000 for alternative accommodation after the builder stopped paying his hotel expenses after April 2019. – At least one business (Mint Bar) was affected with a compensation of $150,000 for erecting scaffolding in front of the business.[b]
Mascot Tower (Sydney)	▪ Mascot Tower in Sydney was evacuated on 14 June 2019 after a structural defect was discovered in the car park. [b] ▪ It was expected this evacuation would last at least 6.5 months.[c] ▪ After 8 months, it appeared that: – around 30 per cent of residents in the building's 132 apartments had returned – 70 per cent of residents had not with new defects being identified in the facade masonry.[d]
Lacrosse Building (Melbourne)	▪ A fire caused by a cigarette butt spread quickly in the Lacrosse Building in Melbourne on 25 November 2014 due to combustible aluminium composite panels on the façade.[e] – Residents in around half of the apartments returned within two weeks; – The remaining residents were forced to wait a longer period of time for significant repair and reconstruction.[f]

[a] Zhou, Naaman 2018, "Sydney Opal Tower cracks: developer defends 'high-quality' building at Olympic Park", *The Guardian*, 26 December 2018, https://www.theguardian.com/australia-news/2018/dec/26/opal-tower-cracks-nsw-government-urgent-investigation. [b] Reynolds, Emma and Megan Palin 2019, "Apartment Residents evacuated and engineers called over 'concerns with movement' after a 'large crack appeared", *news.com.au*, 15 June 2019, https://www.news.com.au/national/nsw-act/news/apartment-residents-evacuated-and-engineers-called-after-concerns-over-movement/news-story/720c8577af7d14455c631e942b581fc5; Boucher, Dinah Lewis 2019, "Sydney's Mascot Towers: Cracks Put Focus on Building Reform", *The Urban Developer*, 17 June 2019, https://theurbandeveloper.com/articles/what-we-know-about-sydneys-mascot-towers. [c] Goorey, Megan 2019, "Mascot residents told they will not return home this year", *Sydney Morning Herald*, 22 August 2019, https://www.smh.com.au/national/nsw/mascot-towers-residents-told-they-will-not-return-home-this-year-20190822-p52job.html.. [d] Dick, Samantha 2020, "Cracking brickwork signals no end in sight for Mascot Towers nightmare", *The New Daily*, 7 February 2020, https://thenewdaily.com.au/finance/property/2020/02/07/cracking-brickwork-mascot-towers/. [e] 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. [f] Spooner, Rania 2014, "Hundreds still homeless weeks after Docklands apartment fire", *The Sydney Morning Herald*, 5 December 2014, https://www.smh.com.au/national/hundreds-still-homeless-weeks-after-docklands-apartment-fire-20141205-1210sq.html.

Source: See above.

Loss in property value

Loss in property value is also possible especially when a serious defect is found. For example, facing a huge repair bill, some owners in the Mascot Towers are considering a collective sale but the building would likely only sell for its land value.[36]

To a large extent, the loss of property value in buildings with major defects would reflect future rectification costs. This means these costs could not be added together, as the problem would be double-counted. In essence, the drop in sale value of a building/property with previously found defects which have been fixed represents a transfer from the previous owner to new owner and does not incur a cost to society.

That said, other buildings developed/built by the same developer/builder may also lose value due to deteriorated reputation of builders/developers, even though these buildings may not have identified defects. For example, the developer of the Opal Tower was also the developer of the apartment building at 1 Australia Avenue in Olympic Park. In the months prior to the Opal Tower evacuation, apartments at 1 Australia Avenue were selling at a premium of 11 per cent relative to their off-the-plan price (from 2013). However, in the months after the evacuation, the frequency of sales slowed and, where sales went ahead, apartments at 1 Australia Avenue sold at an average discount of 2 per cent relative to their off-the-plan price. Some of this 13 per cent reverse in apartment values may be explained by reputational damage to the developer causing potential buyers to avoid 1 Australia Avenue, as the property market more generally softened by only 5 per cent over this time.

Insurance

Practitioners in the building industry are required by law or industry codes of conduct to hold professional indemnity insurance to cover claims against the professional services they provide.[37] Table 2.32 summarises the insurance requirement for selected practitioners.

2.32 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	Until recently, building surveyors in NSW, QLD and Victoria were required to have exclusion free insurance
Fire engineers	▪ Not required to hold insurance, though many choose to	Exclusions are permitted

36 Greenbank, Amy 2020, "Mascot Towers repair bill to hit $53 million prompting owners to consider selling", 16 April 2020, https://www.abc.net.au/news/2020-04-16/mascot-towers-repair-bill-from-cracks-hits-53-million-dollars/12153368

37 PwC 2019, *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

Practitioner	Government requirements, intervention	Exclusions permitted/ strictness of requirement
	▪ If they register with Institute of Fire Engineers, this body requires them to hold adequate privately provided insurance	
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. 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.

News reports suggest that premiums paid by building surveyors would increase from $10 000 per year to $100 000 per year (with similar increase in excess) in Melbourne[38] and from $24 000 to $108 000 per year (with excess increasing from $10 000 to $20 000 and $175 000 for any claims involving combustible cladding) in Canberra.[39]

Fire engineers and valuers (along with building surveyors) have reportedly incurred professional indemnity premium increase by 100 per cent or more, while lawyers and construction workers by 30 per cent and 26 per cent respectively.[40]

These changes in the insurance market are impacting the viability of building surveyors. A survey by AIBS in 2019 indicates that 11 per cent of building surveyors have ceased providing services (including 5 per cent who have left the profession, 4.3 per cent who were unable to obtain insurance cover and 1.9 per cent whose cover was not renewed),

38 Kinsella, Elise 2019, "Building projects halted as surveyors face rocketing insurance costs due to cladding crisis", *ABC News*, 13 December 2019, https://www.abc.net.au/news/2019-12-13/building-surveyors-insurance-costs-increase-flammable-cladding/11771668

39 Lawson, Kirsten 2019, "Insurance crisis and new liabilities to hit cost of building a home", *The Canberra Times*, 17 July 2019, https://www.canberratimes.com.au/story/6277647/insurance-crisis-to-hit-cost-of-building-a-home/

40 Aon 2019, *Professional Indemnity Insurance Market Insights*, Q3 2019, https://aoninsights.com.au/wp-content/uploads/Professional-Indemnity-Insurance-Market-Insights-Brochure-FINAL-1.pdf?utm_source=slipcase&utm_medium=affiliate&utm_campaign=slipcase

while nearly 9 per cent have reduced the scope of services they provide due to restrictions on their professional indemnity insurance.[41]

If any building surveyors have been denied insurance because they approved building work which did not comply with the NCC, then (to some extent) these developments may be welcome. However, because sign-off from building surveyors is required before construction can proceed, difficulties faced by building surveyors in getting insurance have reportedly caused construction activity to be delayed/halted.[42] To help construction activity proceed, some state and territory governments have relaxed the requirement that building surveyors hold exclusion free insurance.[43] If fewer building surveyors are able to practice, competition in the market will also reduce, ultimately pushing up construction costs.

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 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 the increase in insurance premium should not be added to the avoided rectification costs to avoid double counting.

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.[44]

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.

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41 AIBS 2019, *Member Communique*, 19 December 2019, https://aibs.com.au/Public/News/2019/Member-Communique-19-December.aspx

42 Kinsella, Elise 2019, "Building projects halted as surveyors face rocking insurance costs due to cladding crisis", *ABC News*, 13 December 2019, https://www.abc.net.au/news/2019-12-13/building-surveyors-insurance-costs-increase-flammable-cladding/11771668

43 VBA 2019, *Professional indemnity insurance changes ease restrictions on building surveyors, inspectors*, 14 August 2019, https://www.vba.vic.gov.au/news/news/2019/professional-indemnity-insurance-changes-ease-restrictions-on-building-surveyors-and-inspectors;
McCullough 2019, *Building certifier insurance crisis – current status and responses*, 10 July 2019, see: https://www.mccullough.com.au/2019/07/10/building-certifier-insurance-crisis-current-status-and-responses/.

44 PwC 2009, *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.

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.[45] This issue was also raised in consultations, with anecdotal evidence that these impacts are significant.

There is some quantitative evidence from the UK that building defects in apartment buildings can take a significant toll on the physical and mental health of residents.

Following the Grenfell Tower tragedy, hundreds of buildings were found to be covered in the same cladding or were found to have other equally dangerous materials or internal fire safety defects present. A group representing leaseholders, the UK Cladding Action Group (UKCAG), has completed two mental health surveys to highlight these issues have had on those affected.[46] Key findings from the most recent survey included the following:

- Around 90 per cent of respondents indicated their mental health had got worse as a result of cladding issues, with 78 per cent indicating their mental health and social wellbeing had been 'hugely affected'.
- Around 85 per cent of respondents had felt excessive worrying or anxiety as a direct result of cladding and/or fire safety related issues, with around 15 per cent reporting having had suicidal thoughts.
- Around 27 per cent had been formally diagnosed with a stress-related illness, including anxiety disorder (20 per cent) and depression (18 per cent).

The situation in the UK may not be directly comparable to the issues that have emerged in Australia. Nevertheless, this survey suggests that building defects can take a significant toll on those affected.

As highlighted in UKCAG mental health survey results, the stress associated with building defects can manifest as a mental disorder, such as depression or an anxiety disorder. Depending on the severity, these disorders can have a significant impact on quality of life.

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 on a scale from 0 (perfect health) to 1 (equivalent to death).[47] 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 2.33).

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

46 UK Cladding Action Group, Cladding and Internal Fire Safety, Mental Health Report 2020, p. 5.

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

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 $213 000 (in 2019 dollar terms) in regulatory impact analysis.[48]

As building defects can sometimes take several years to resolve, we also calculate the cost of these mental disorders over 3 years (using a discount rate of 3 per cent).[49] This analysis suggests that the mental health impacts associated with resolving building defects could be significant, ranging between: $18 617 over 3 years for someone suffering from mild anxiety disorder to more than $400 000 over 3 years for someone suffering from severe depression. This suggests that for some people, the mental health costs could exceed the rectification costs.

2.33 Indicative cost of mental disorders

	Disability weight[a]	Annual cost[b]	Total cost[c]
		$ per incidence	$ per incidence
Mild major depressive disorder[d]	0.145	30 885	89 983
Moderate major depressive disorder[e]	0.396	84 348	245 745
Severe major depressive disorder	0.658	140 154	408 334
Mild anxiety disorder[g]	0.030	6 390	18 617
Moderate anxiety disorder[h]	0.133	28 329	82 536
Severe anxiety disorder[i]	0.523	111 399	324 558

[a] From Global Burden of Disease study 2017. [b] Based on a Value of a Life Year of $213 000, as recommended by OBPR. [c] Assumes disorder lasts for 3 years (using a 3 per cent discount rate), as per OBPR recommendations. [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). [f] A person with a **severe major depressive disorder** has overwhelming, constant sadness and cannot function in daily life. The person sometimes loses touch with reality and wants to harm or kill 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. [i] A person with a **severe anxiety disorder** constantly feels very anxious and worried, which makes it difficult to concentrate, remember things and sleep. The person has lost pleasure in life and thinks about suicide.

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.

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, as there is limited quantitative information on the incidence of mental health issues associated with building defects in an Australian context, we have not included these costs in our estimate of the size of the problem.

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

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

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.[50] Essentially, it is difficult for many buyers to ascertain or understand key safety characteristics of buildings, such as structural integrity and fire safety.

As noted above, regulations that aim to ensure compliance with the NCC are already in place in all Australian states and territories. 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.

The BCR implies that a lack of compliance with the NCC has multiple causes, including:

- a lack of competence of some building practitioners
- a lack of effective compliance and enforcement systems
- a lack of integrity of some private building surveyors
- a lack of rigorous approval processes (primarily for Performance Solutions)
- a lack of effective regulation of building products. [51]

In general, all of the underlying causes were seen as making some contribution to defect problems, highlighting the importance of a holistic approach to reform envisaged in the BCR.

Views from stakeholder consultations

During consultations we asked stakeholders the extent to which each issue contributed to defects in the relevant type of buildings. The response options were:

- not at all (assigned a score of 0)
- a small contribution (assigned a score of 1)
- a moderate contribution (assigned a score of 2)
- a large contribution (assigned a score of 3).

The average score given by stakeholders to each of the underlying reasons is shown in table 2.34 (note that not all stakeholders provided answers on all building types). Responses varied across building types.

- For apartment buildings:
  - The largest contributors to defects (making a moderate to large contribution) were:
    - A lack of effective compliance and enforcement systems
    - Inadequate maintenance practices
    - A lack of competence of some building practitioners
    - A lack of effective post-construction information management.

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

51 Problems with the NCC itself were beyond the scope of the BCR.

  - A lack of integrity of some private building surveyors was seen as the least important factor (albeit still making a small to moderate contribution to defects)
- For commercial buildings:
  - The largest contributors to defects (making a moderate to large contribution were:
    - Lack of effective post-construction information management
    - A lack of effective compliance and enforcement systems
  - The remaining factors were all considered to make a small to moderate contribution to defects.
    - A lack of competence of some building practitioners was seen as significantly less important for commercial buildings (relative to apartment buildings).
    - The integrity of some private building surveyors was also seen as less important.
- For separate houses, the most significant issue was the lack of competence of some building practitioners.

2.34 Average score for the causes of problem

		Separate houses	Apartment buildings	Commercial buildings
		Average score	Average score	Average score
1	A lack of competence of some building practitioners	2.2	2.2	1.5
2	A lack of effective compliance and enforcement systems	2.0	2.4	2.1
3	A lack of integrity of some private building surveyors	1.7	1.5	1.5
4	A lack of rigorous approval processes for performance solutions	0.8	1.8	1.9
5	A lack of effective post-construction information management	n.a.	2.1	2.2
6	A lack of effective regulation of building products	1.3	1.9	1.7
7	A lack of an effective regime for the installation, inspection and certification of fire safety systems	n.a.	2.0	1.7
8	Inadequate maintenance practices	1.8	2.3	1.8

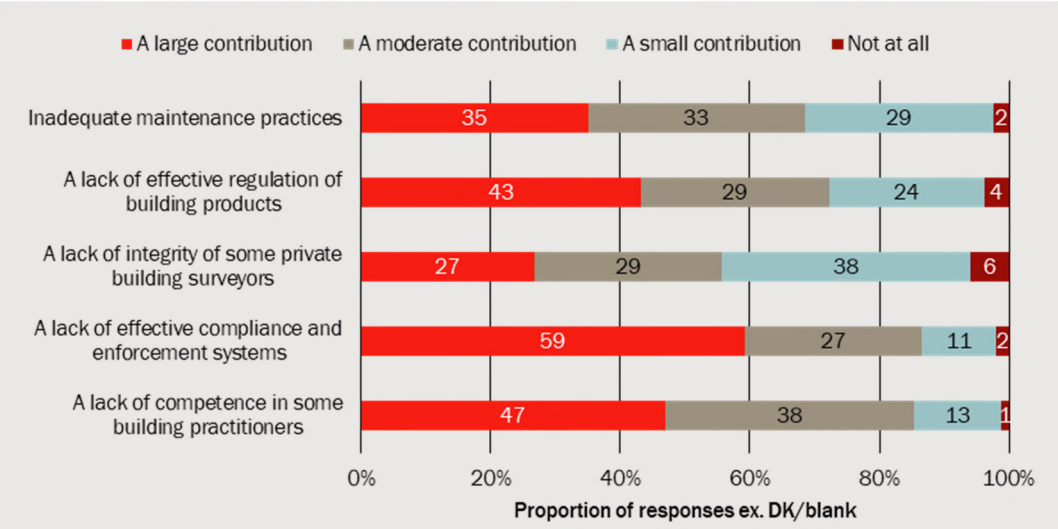
Note: Q/ Stakeholders were asked the extent to which each of the issues contributed to building defects in the relevant type of building: Not at all (0); a small contribution (1); a moderate contribution (2); a large contribution (3).

Source: CIE summary of stakeholder responses.

Survey of practitioners

Our survey of practitioners found that a lack of effective compliance and enforcement systems was the underlying cause that was most-commonly cited. Specifically, for separate houses, apartments and commercial buildings, the proportion of respondents that think a lack of effective compliance and enforcement mechanisms makes a large contribution to the problem of defects is: 59 per cent, 55 per cent and 46 per cent, respectively. Of the options offered to respondents, a lack of integrity of some private building surveyors was least-commonly seen as a large contributor to the problem (see charts 2.35, 2.36 and 2.37).

2.35 Contribution of issues to defects in separate houses excluding respondents perceiving few or almost no defects

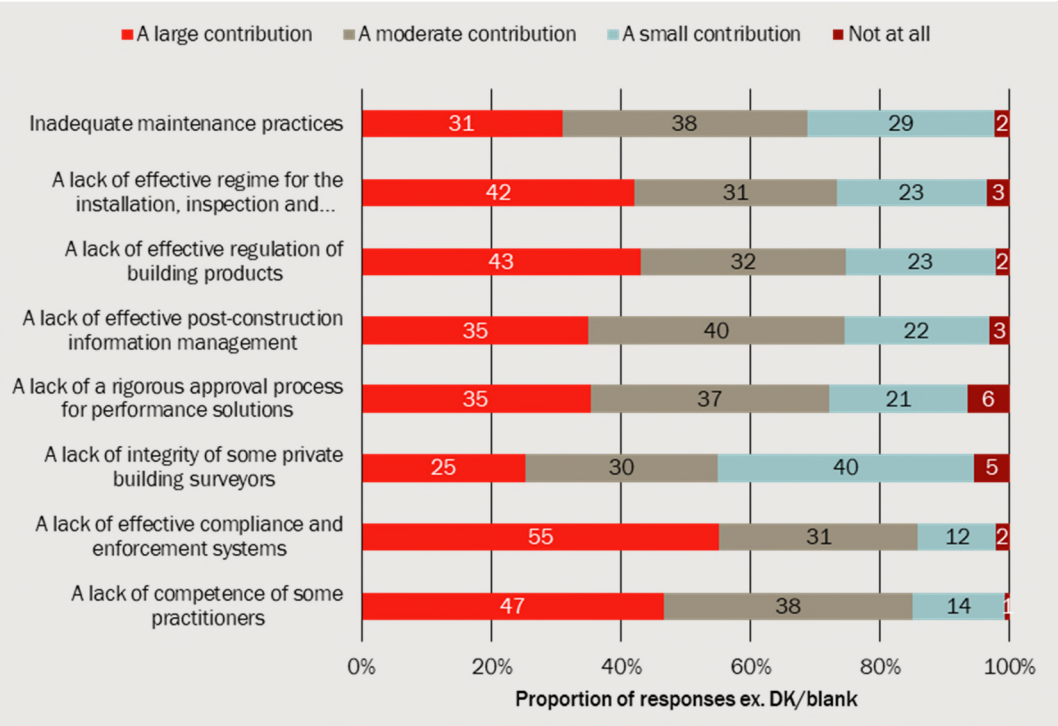


Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in separate houses.

Base: Excludes respondents indicating the prevalence of defects in separate houses is 'Almost no buildings' or 'A few buildings'. Inadequate maintenance... n=488 (171 indicate a large contribution); A lack of effective regulation... n=491 (212 indicate a large contribution); A lack of integrity... n=481 (129 indicate a large contribution); A lack of effective... n=500 (296 indicate a large contribution); A lack of competence... n=497 (233 indicate a large contribution)

Data source: CIE survey of practitioners.

2.36 Contribution of issues to defects in apartment buildings excluding respondents perceiving few or almost no defects

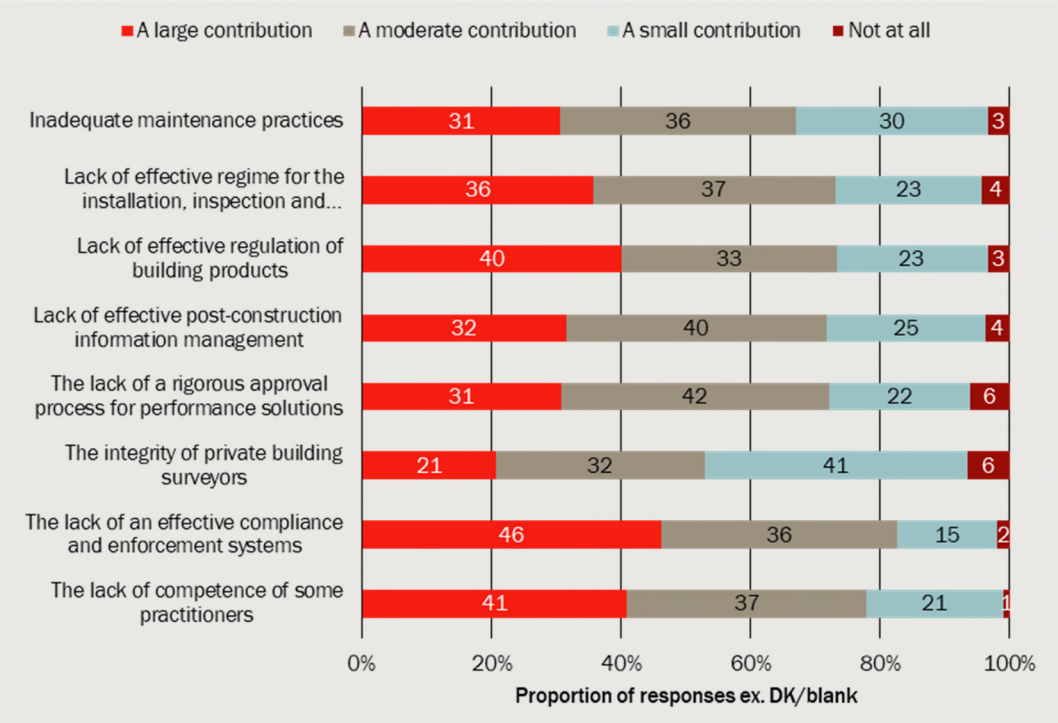


Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in apartment buildings.

Base: Excludes respondents indicating the prevalence of defects in apartment buildings is 'Almost no buildings' or 'A few buildings'. Inadequate maintenance... n=565 (175 indicate a large contribution); A lack of effective regime... n=550 (232 indicate a large contribution); A lack of effective regulation... n=580 (250 indicate a large contribution); A lack of effective post-construction... n=574 (201 indicate a large contribution); A lack of a rigorous... n=572 (202 indicate a large contribution); A lack of integrity... n=576 (146 indicate a large contribution); A lack of effective... n=587 (324 indicate a large contribution); A lack of competence... n=585 (273 indicate a large contribution)

Data source: CIE survey of practitioners

2.37 Contribution of issues to defects in commercial buildings excluding respondents perceiving few or almost no defects



Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in commercial buildings

Base: Excludes respondents indicating the prevalence of defects in commercial buildings is 'Almost no buildings' or 'A few buildings'. Inadequate maintenance... n=495 (152 indicate a large contribution); A lack of effective regime... n=483 (173 indicate a large contribution); A lack of effective regulation... n=505 (203 indicate a large contribution); A lack of effective post-construction... n=500 (158 indicate a large contribution); A lack of a rigorous... n=501 (154 indicate a large contribution); A lack of integrity... n=495 (103 indicate a large contribution); A lack of an effective... n=508 (235 indicate a large contribution); A lack of competence... n=508 (208 indicate a large contribution)

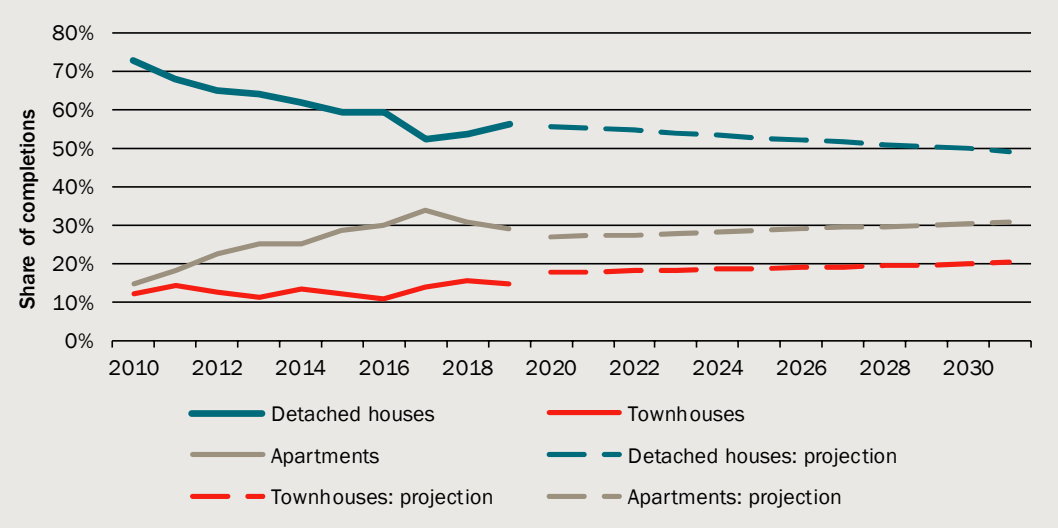
Data source: CIE survey of practitioners.

Trends over time

There is some evidence to suggest that issues relating to non-compliance with the NCC have been getting worse over time.

Responses to our survey of owners of Class 1 and Class 2 buildings suggest that buildings built in the last 1-4 years have a higher prevalence of defects than older buildings (see Chart 2.12, above). In addition, a shift towards apartments, where defects are more prevalent and more costly, implies the problem will be bigger than it otherwise would be. This is incorporated in our projections and calculations (chart 2.38).

2.38 Share of completions by dwelling type



Data source: ABS Cat 8752; The CIE projections.

One of the underlying factors that has contributed to the recent disruptions in the professional indemnity insurance market for building surveyors has been rising claims. According to APRA data, the trend increase in claims against professional indemnity insurance held by surveying occupations has been around 39 per cent per year over the period from 2003 to 2018 (albeit from a low base) (chart 2.39). Under pre-existing regulatory frameworks, building surveyors are a key point of accountability and are the only practitioners that are required to have professional indemnity insurance. As such, the rapid increase in claims against the professional indemnity insurance of surveyors may be an indicator that the problem is increasing over time.

2.39 Professional indemnity insurance for surveying occupations – gross claim payments

Data source: APRA.

The data on building and contents insurance claims from fire events, reported by the Productivity Commission also indicates a strong upward trend (see discussion on page 43). The trend rate of growth in claims has been around 7 per cent per year in real terms over the period from 2009-10 to 2018-19. This has largely been driven by

commercial claims, which have increased at a rate of around 10 per cent per year, while household claims have increased at a trend rate of around 4.5 per cent per year. That said, building and contents insurance claims may not necessarily relate to fire safety defects.

Although all of the above indicators are imperfect and in some cases there may be other factors unrelated to non-compliance with the NCC that are contributing to the upward trend, together these indicators suggest it is plausible that the problem has been increasing over time.

3 Objectives and BCR recommendations

Objectives

To be consistent with best practice and OBPR guidelines high-level analysis needs to clearly articulate the objectives, intended outcomes, goals and targets of government actions. [52]

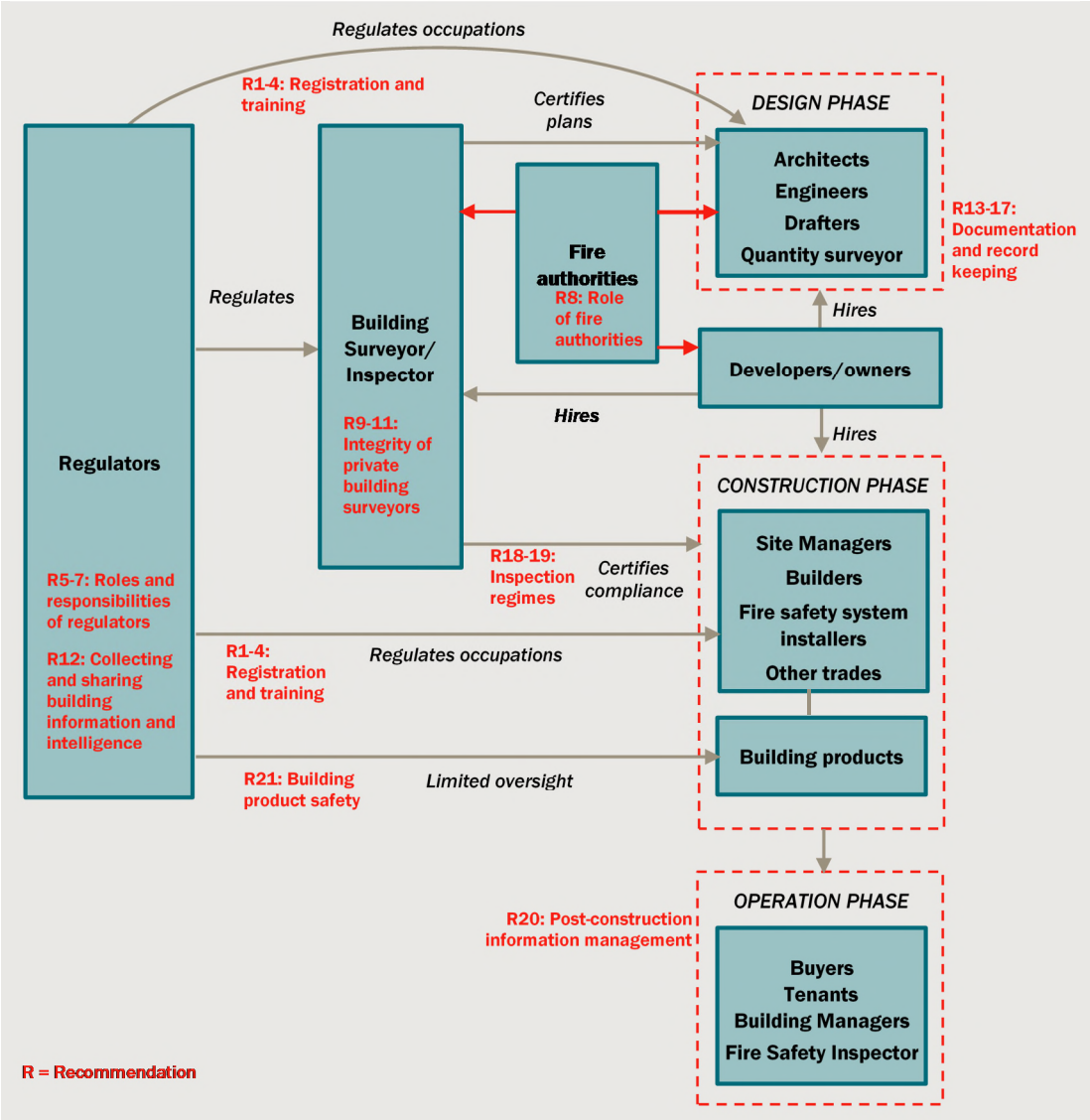
- **The primary objective of the BCR's recommendations is to improve compliance with the NCC, which means the avoidance of defects in buildings that are not consistent with the NCC.**
- **As the NCC's requirements are the minimum necessary agreed requirements for health and safety, amenity, sustainability and liveability of buildings, implementing the BCR recommendations should reduce defects in buildings, which in turn will:**
  - **reduce future rectification costs (delivery of minimum standards)**
  - **reduce safety risks (or adverse safety outcomes)**
  - **restore confidence in the construction industry.**
- **Secondary objectives include:**
  - **ensuring that affordable insurance is available to relevant practitioners (this is because insurance is a condition for their operation)**
  - **more consistency in regulatory systems across jurisdictions**
  - **ensuring an ongoing supply of competent building surveyors.**

BCR recommendations

As shown in the chart, the various BCR recommendations seek to strengthen multiple aspects of the regulatory framework throughout the building's lifecycle.

52 OBPR 2014, *The Australian Government Guide to Regulation,* March 2014, see: https://www.pmc.gov.au/sites/default/files/publications/Australian_Government_Guide_to_Regulation.pdf, accessed 14 July 2020

3.1 Summary of compliance and enforcement mechanisms through the building life-cycle



Note: As noted here, some jurisdictions allow the builder to hire the surveyor, which contributes to the risk that conflicts of interest may arise

Data source: CIE.

The BCR recommendations aim to improve compliance with the NCC through:

- ensuring the competence of practitioners
- more effective compliance and enforcement systems including stronger documentation requirements to ensure flow of accurate and complete information to relevant parties (which also aims to create a culture of compliance)
- ensuring the integrity of private building surveyors
- more rigorous approval processes, including better documentation and record-keeping (mainly in relation to Performance Solutions).

Most recommendations are general in the sense that they aim to improve compliance with all aspects of the NCC. However, some specifically relate to compliance with the

fire safety provisions. This is a useful distinction, given that the 'size of the problem' relating to fire safety and other issues could potentially be estimated separately.

The proposed grouping of recommendations under each of these themes is set out in table 3.2.

3.2 Groupings of BCR recommendations for benefit estimation

Objectives/intended outcomes	Relevant recommendations
Improved compliance with the NCC (general ex fire safety)	
Ensuring the competence of practitioners	▪ Recommendations relating to the registration and training of practitioners **(Recommendations 1-4)** ▪ **Recommendation 13:** Responsibility of design practitioners
More effective compliance and enforcement systems	▪ Recommendations relating to the roles and responsibilities of regulators **(Recommendations 5-7)** ▪ **Recommendation 12:** Collecting and sharing data and intelligence
Ensuring the integrity of private building surveyors	▪ Recommendations relating to the integrity of private building surveyors **(Recommendations 9-11)**
More rigorous approval processes (especially relating to performance solutions)	▪ Recommendations relating to the adequacy of documentation and record-keeping **(Recommendation 13-17)** ▪ **Recommendation 18:** Mandatory inspections
Ensuring that buildings remain safe for occupation in the operation phase	▪ **Recommendation 20:** Post-construction information management
More effective regulation of building products	▪ **Recommendation 21:** Building product safety
Improved compliance with NCC (fire safety)	
Ensuring the competence of practitioners	▪ Recommendations relating to the registration and training of practitioners **(Recommendation 1-4)** ▪ **Recommendation 13:** Responsibility of design practitioners ▪ **Recommendation 19:** Inspection and certification of fire safety system installation
More effective compliance and enforcement systems	▪ Recommendations relating to the roles and responsibilities of regulators **(Recommendations 5-7)** ▪ **Recommendation 12:** Collecting and sharing data and intelligence
Ensuring the integrity of private building surveyors	▪ Recommendations relating to the integrity of private building surveyors **(Recommendations 9-11)**
More rigorous approval processes (especially relating to performance solutions)	▪ Recommendations relating to the adequacy of documentation and record-keeping **(Recommendation 13-17)** ▪ **Recommendation 18:** Mandatory inspections ▪ **Recommendation 8:** Collaboration with fire authorities in the development of fire safe design

Objectives/intended outcomes	Relevant recommendations
Ensuring that fire safety systems are correctly installed	▪ **Recommendation 19:** Inspection and certification of fire safety system installation
Ensuring that buildings remain safe for occupation in the operation phase	▪ **Recommendation 20:** Post-construction information management
More effective regulation of building products	▪ **Recommendation 21:** Building product safety
Other objectives	
More consistent regulatory requirements across jurisdictions	▪ All recommendations contribute to greater consistency/harmonisation and labour mobility (including mutual recognition improvements) across jurisdictions. ▪ Recommendations that are specifically aimed at greater national consistency include: – Recommendations relating to the registration and training of practitioners **(Recommendation 1-4)** – **Recommendation 22:** Dictionary of terminology
Ensuring the future supply of competent private building surveyors	▪ **Recommendation 4:** Career paths for building surveyors

Source: CIE analysis of Building Confidence Report.

4 The impacts of the BCR recommendations

Consistent with best practice regulatory principles, the potential impacts of the BCR recommendations will be explored through a cost-benefit analysis (CBA). [53]

Baseline

A key step in a CBA is establishing a baseline, against which the impacts of a policy proposal (in this case the BCR recommendations) 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.

Establishing the baseline against which the impacts of the BCR recommendations are assessed is not straightforward for several reasons.

- Each state/territory has a different regulatory regime and is therefore at a different 'starting point'.
- Some states/territories were at different stages of separate reform processes at the time the BCR was commissioned, implying that existing regulatory regimes would have changed (in some cases significantly) even without the BCR. Some of the reforms that were being pursued independently of the BCR were broadly consistent with some BCR recommendations.
- There were different views among states and territories on the extent to which the BCR had (or will) influence the final reform package.
  - Some states and territory policymakers/regulators (particularly those that were less advanced with their own reform process) variously found the BCR helpful in:
    - making the case for reform (to Ministers and industry);
    - engaging industry and building a consensus;
    - clarifying their thinking (or highlighting a way forward) on the reforms necessary to fix the problem.
  - Other states and territories (particularly those that were further advanced with their own reform process) argued that the BCR will have less influence on the final reform package.

Although unlikely to be a realistic scenario (i.e. it effectively implies that no state/territory would have proceeded with their own reforms), the most appropriate

53 OBPR 2014, *The Australian Government Guide to Regulation,* March 2014, see: https://www.pmc.gov.au/sites/default/files/publications/Australian_Government_Guide_to_Regulation.pdf, accessed 14 July 2020

baseline for the purposes of the high-level analysis is to assume a continuation of the regulatory regimes that applied when the BCR was commissioned (in 2017).

- This baseline is conceptually appropriate because under this baseline, the CBA measures the impacts of the reforms themselves (rather than a subjective assessment of whether the reforms were influenced by the BCR). This aligns with the purpose of the high-level analysis, to help build the case for reform.
- From a practical perspective it also avoids the need to make subjective judgements on the extent to which the BCR influenced the reforms pursued by various state/territory governments.

Cost-benefit analysis framework

We use a 10-year regulatory period for the CBA. 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.

As mentioned in the BCR report, 'the recommendations should be implemented over a three year period'.[54] However, as a high-level analysis, we avoid this complexity by assuming that the proposed changes (subject to the development of options) will start at the beginning of the 10-year evaluation period. Given the current progress of developing options for implementation, we assume evaluation period will start from 2022.

As recommended by the OBPR we will use a discount rate of 7 per cent for the central estimates of CBA analysis. [55] The benefits and costs are discounted back to 2022 value.

Sensitivity analysis will also be conducted to test the impact of benefit and cost assumptions on the CBA results.

The impacts of BCR recommendations

The benefits of implementing BCR recommendations include:

- reducing the defects and associated costs through better compliance and enforcement;
- improving productivity and efficiency of the building industry through a nationally consistent regulatory framework; and
- improving productivity through a well-functioning building information system.

The likely costs of implementing BCR may include:

- administrative costs for regulators in establishing new regulatory systems and any ongoing costs in administering them; and

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54 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, p.4

55 This is consistent with the Office for Best Practice Regulation (OBPR) guidelines for cost benefit analysis, see: https://www.pmc.gov.au/ria-mooc/extra-detail/cba/major-steps-cost-benefit-analysis (accessed July 2020)

- any additional costs imposed on industry, including
  - cost associated with registration
  - training cost
  - more time spent on documentation, testing of product, system and design solutions
  - more resource cost incurred to achieve higher quality work as a result of higher scrutiny and enforcement
  - more cost associated with more frequent inspection and checks;
  - legal costs, and
  - potential delay in going through the certification and approving procedure.

Stakeholder views

We have consulted with a range of stakeholders, including key industry groups and state and territory government regulators/policymakers. In general, we encountered a wide diversity of views and the views were not necessarily consistent within stakeholder groups, making it difficult to provide a general summary of stakeholder views. Nevertheless, some key points from the stakeholder consultations include the following.

- There was a general acknowledgement that there are problems within the industry that need to be addressed. That said, some stakeholders felt that these problems can be overstated. Some factors that some stakeholders felt had contributed to perceptions of greater compliance problems within the industry than exist include:
  - there are a small number of high-profile cases, where rectification costs are estimated to be very high
  - reporting of the Grenfell Tower disaster in London (which stakeholders believed to be not relevant to the Australian context)
  - alarmist reporting/misreporting of the studies that are available
  - failure to distinguish between defects that compromise the safety and/or performance of the building and superficial/cosmetic issues
  - a lack of reliable data on the extent of the problem in Australia can lead to speculation.
- A majority of stakeholders (but not all) were generally supportive of the BCR recommendations.
  - Some stakeholders noted that the 'devil is in the detail' (i.e. it is not possible to either support or not support a recommendation until the detail has been provided).
  - Support from state/territory governments tended to depend on progress in implementing their own building reforms.
    - States/territories that had already made significant progressed their own reform package tended to find the BCR less helpful.
    - States/territories that had made less progress on their own building reforms tended to be more supportive of the national process.

- As the BCR recommendations are generally high-level (i.e. not highly specific), there were different interpretations among stakeholder on what implementation looks like.
    - Some stakeholders argued that implementation should involve tweaking existing regulatory regimes.
    - Other stakeholders were more supportive of moving towards greater national consistency.

5 Potential costs to implement the BCR

The main costs of the proposed options 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
  - costs associated with registration
  - training costs
  - more time spent on developing and preparing design documentation
  - more resource costs incurred to achieve higher quality work as a result of higher scrutiny and enforcement; this includes lost savings from the erosion of commercial relationships and arrangements that are no longer viable under the BCR (including, for example, relationships between builders and surveyors that can no longer proceed)
  - more costs associated with more frequent inspection and checks
  - legal costs, and
  - potential delay in going through the certification and approval procedures. These costs should reflect the costs for government authorities and industry to expanding existing roles and/or establishing new roles (such as greater state government involvement, additional inspections and independent third party review) as suggested by the BCR.

Table 5.1 summarises the additional costs likely to incur as a result of implementing relevant BCR recommendations.

5.1 Costs resultant from relevant BCR recommendations

Cost	Most relevant BCR recommendations
Administrative costs	R2 – R8, R9, R11, R21
Registration	R1, R2, R4
Training	R2, R3
Data and information	R12 (database), R20 (building manual), R22 (dictionary of terminology)
Documentation	R8, R9, R11, R12, R13 – R16, R17, R18, R19
Inspection	R6, R9 – R11, R18, R19
Auditing and reviewing	R6, R7, R9, R10, R17
Legal cost	R6 – R10

Cost	Most relevant BCR recommendations
Equipment, material and construction cost	Almost all BCR recommendations are relevant (except those that are separately costed)
Delay	R5 – R11; R13 – R20

Source: CIE.

Administrative costs

These are costs for regulators in establishing new regulatory systems and any ongoing costs in administering them.

The BCR requires comprehensive reform in the regulatory framework of compliance and enforcement, such as enhancing registration and training of building practitioners (Recommendations 1 to 4), improving collaboration between regulators (R5 and R8), proactive regulation of commercial buildings (R7) and building product compliance (R21).

The proposals for Recommendations 9 and 11 indicate that there will be administration costs for regulators if the proposals were adopted. These costs would be associated with maintaining a register of contracts and checking and maintaining a register/database of reports received from building surveyors and actioning reports of non-compliance where necessary.

These all have cost implications for regulators to reform the existing regulatory system or to implement a new system. For example, WA Government Department of Mines, Industry Regulation and Safety estimates that 6 staff members would be required to administer the registration scheme of building engineers in WA with annual cost between $730 210 and $776 168.90, including salaries and a 30 per cent allowance for 'on costs' or non-wage costs relating to staff, such training and equipment.[56] The average package is between $121 702 and $129 360 per person.

The skill sets for administration are diverse. In addition to compliance officers, communication specialists and data analysts may also be needed. For example, the draft Auditing and Compliance Publication Framework which the BCR Implementation Team is currently testing with SOG and BRF recommends that discussing auditing with industry is a regular and ongoing 'conversation' using a variety of channels including social media, better use of websites to include relevant and regular case studies and explanatory materials to educate industry participants, better links with education and training materials development etc. It also recommends engaging people who have the skills to analyse the data from commercial building auditing. Assuming that states and territories already have the capacity to store some level of data about auditing work, this work, if implemented, could potentially require another 1.5 or two staff – one for communications and liaison with education officers etc. and the other 0.5 or one for data analysis.

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56 Government of Western Australia Department of Mines, Industry Regulation and Safety 2020c, *Registration of Building Engineers in WA: Consultation Regulation Impact Statement*, April 2020, Table 1, p.6

Regulators may incur other costs as a result of implementing the BCR, for example higher legal costs due to more powers or more frequent use of the powers.

Some administrative costs are likely to be on a cost recovery basis, for example, those administering the registration system and would be recovered through registration fees. In this case, double counting should be avoided.

As the proposals for implementing BCR recommendations are being developed, the details for administrative requirements are not clear. As a result, we have to draw reference from some previous cost estimates for similar reforms.

For the Lambert Review in 2015, ACIL Allen estimates that setting up an office of building regulation in NSW would cost $3.9 million per year assuming 30 additional staff members employed with an average annual salary of $130 000 per staff.[57]

As the Lambert Review covers broader issues than the BCR, and some of the administrative costs would be recovered through other means (such as registration fees) or estimated separately (such as for information system), it is assumed that additional 10 staff members would be required for NSW, Victoria, Queensland, SA and WA, and 5 staff members for other jurisdictions, with an average annual salary package of $130 000 per person. The average annual salary package of $130 000 is drawn directly from the indicated average salary package from ACIL Allen estimates, and close to the average salary package used by WA Government Department of Mines, Industry Regulation and Safety as discussed above. We assume this average package would reflect a wide range of skills required for administering the implementation of BCR.

With these assumptions, it is estimated that the additional administrative cost is around $8.45 million per year (table 5.2).

5.2 Estimated additional administrative cost

	Additional staff	Annual cost
	person	$m
NSW	10	1.30
VIC	10	1.30
QLD	10	1.30
SA	10	1.30
WA	10	1.30
TAS	5	0.65
NT	5	0.65
ACT	5	0.65
Total	**65**	**8.45**

Note: Average annual salary of $130 000

Source: CIE estimates.

57 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, Table A.10, p.A-18.

Registration costs

The BCR recommends that each jurisdiction requires the registration of the following categories of building practitioners involved in the design, construction and maintenance of buildings (Recommendation 1):

- Builder
- Site or project manager
- Building surveyor
- Building inspector
- Architect
- Engineer
- Designer/draftsperson
- Plumber
- Fire safety practitioner.

It is estimated that there are about 105 650 professionals and about 246 000 trades workers (including 45 700 plumbers) working in the building industry (table 5.3), according to the ABS Census data.

5.3 Number of professionals and trades workers working in the building industry

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUS
	person	person	person	person	person	person	person	person	person
Architects and Draftsperson	1 016	947	434	197	345	14	9	42	3 003
Designer	670	501	290	97	219	0	0	20	1 799
Engineer	2 245	1 328	948	307	740	46	68	100	5 782
Technician	6 922	5 808	4 547	1 318	3 055	237	203	379	22 470
Building surveyor	1 889	1 618	1 254	351	865	59	62	108	6 206
Builder/Construction manager	23 449	17 202	12 739	3 741	5 422	1 858	668	1 304	66 383
Plumber	13 844	15 061	8 158	2 647	4 233	706	344	722	45 717
Other trades worker	60 840	54 531	41 857	12 050	22 576	3 969	1 308	3 194	200 323
Total	**110 875**	**96 998**	**70 226**	**20 707**	**37 455**	**6 888**	**2 663**	**5 870**	**351 683**

Source: CIE estimates based on ABS Census 2016.

Some of the professionals are currently required to have a registration, and therefore only some of the professionals and plumbers in table 5.3 are affected.

The BCR Implementation Team has developed a functional model of categories of building practitioners for the purpose of implementing BCR recommendations about registration (table 5.4). Although the details are yet to be finalised, the BCR Implementation Team currently envisages:

- There will be no change in registration requirement for some disciplines.
- There will be 5 additional registration disciplines for plumbing design, electrical design, fire systems design, energy efficiency design and disability access design.

5.4 Functional categorisation of practitioners for registration

Discipline	Comments
Design	
Building Design (includes architect & draftsperson)	No change
Geotechnical Design	No change
Structural Design	Civil engineer is removed. Structural engineer and other groups will cover different parts of civil engineering.
Plumbing Design	New addition
Electrical Design	New addition
Fire Safety Design	No change
Mechanical Design	No change
Fire Systems Design	New addition
Energy Efficiency Consultant	New addition
Access Consultant	New addition
Compliance	
Building Surveying	No change
Construction	
Building	No change
Plumbing	No change
Fire Systems Installation	No change
Project Coordination	
Project Management	No change

Source: BCR Implementation Team

Different jurisdictions have different requirement for registration (table 5.5).

5.5 Current registration requirement

	Discipline	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
DESIGN	Architect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Building Designer	Partial	Yes	Yes	No	No	Yes	No	No
	Geotechnical designer	Partial	No	Yes	No	Proposed	Yes	No	No
	Structural designer	Partial	Yes	Yes	No	Proposed	Yes	Yes	No
	Electrical designer	Partial	Yes	Yes	No	No	Yes	No	No

	Discipline	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
	Mechanical designer	Partial	Yes	Yes	No	Proposed	Yes	Yes	No
	Fire safety designer	Partial	Yes	Yes	No	Proposed	Yes	No	No
	Energy efficiency designer	Yes	No	Yes	No	No	No	No	No
	Accessibility designer	No	No	No	No	No	No	No	No
COMPLIANCE	Building Surveyor	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Fire systems inspector	No	No	Yes	No	No	Yes	No	No
CONSTRUCTION	Fire systems installers	No	No	Yes	No	No	Yes	No	No
	Builder	Residential builders only	Yes	Yes	Yes	Yes	Yes	Residential builders only	Yes
PLUMBING	Plumber	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: BCR Implementation Team.

Because the ABS Census data does not have detailed data to match each of the disciplines in table 5.5, we group the disciplines into the following categories:

- Architect and draftsperson;
- Designer and engineer including all disciplines of designers in table 5.5 and fire systems installers;
- Building surveyor including building surveyor and building inspector;
- Construction manager including builder and construction manager; and
- Plumber.

We then assume the share of professionals to be impacted by the BCR registration requirement according to the number of disciplines in a category already having a registration requirement currently as shown in table 5.5. The assumed share is presented in table 5.6, and the corresponding number of affected professionals is shown in table 5.7. It is estimated that there are about 16 377 professionals nationwide requiring new registration. In subsequent years, new practitioners in the industry who require registration under BCR (but not under status quo) is estimated from this baseline, using growth in building activity.

5.6 Assumed share of professionals affected by the BCR registration requirement

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
	%	%	%	%	%	%	%	%
Architects & Draftsperson	37	47	56	46	43	0	0	32
Designer/Engineer	59	55	18	100	100	27	73	100
Building surveyor	33	33	33	33	67	33	67	67

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
	%	%	%	%	%	%	%	%
Builder/Construction manager	29	0	0	0	0	50	50	0
Plumber	0	0	0	0	0	0	0	0

Source: CIE assumptions.

5.7 Estimated number of professionals required to have new registration

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUS
	person	person	person	person	person	person	person	person	person
Architects & Draftsperson	379	449	243	91	148			14	1 323
Designer/engineer	1 723	998	225	404	959	12	50	120	4 492
Building surveyor	630	539	418	117	577	20	41	72	2 414
Builder/Construction manager	6 886					929	334		1 263
Total affected	**9 617**	**1 986**	**886**	**612**	**1 683**	**961**	**425**	**206**	**16 377**

Source: CIE estimates.

Practitioners that are not currently registered/licensed will incur the costs of preparing relevant documents for registration and the cost of registration itself (i.e. any registration fee). For the Lambert Review, ACIL-Allen estimated the initial cost of new accreditation at $4 000 per person including seminar attendance, opportunity cost of time for study as well as preparation of documentation and the annual registration fee.[58]

5.8 Average annual renewal fees for individuals

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
	$	$	$	$	$	$	$	$
Average renewal fee	153	308	328	367	179	298	556	181

Note: NSW renewal fees are discounted in response to the COVID-19 pandemic. Pre-pandemic fee schedules were not found on the NSW Fair Trading website.

Source: CIE compilation based on jurisdiction fee schedules.

With these assumptions, it is estimated that there will be an initial cost of $65.5 million to obtain the new registration (including studying for accreditation, opportunity cost of time, application and initial registration fees) and subsequent renewal cost of $3.7 million every year (table 5.9).

5.9 Estimated cost of new registration requirement

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUS
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Initial cost	38.5	7.9	3.5	2.4	6.7	3.8	1.7	0.8	65.5
Renewal cost	1.3	0.6	0.3	0.2	0.4	0.3	0.4	0.0	3.7

Source: CIE estimates.

58 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-10.

As the BCR also recommends consistent registration requirements across jurisdictions (Recommendation 2), there may also be cost changes for some practitioners that are already registered/licensed. Costs for some practitioners may be higher/lower where the nationally consistent requirements are more/less stringent than currently applies, or the frequency of renewal changes. However, it is not possible to estimate these cost changes until the details of the proposal are finalised.

Similarly, as a high level analysis, this study has considered the overlap between existing registration requirements (tables 5.5 through 5.7) and the proposed registration requirement (table 5.4) at a broad level of professional category, but not the detailed impact on individual practitioners within each category.

Responses to the new registration requirements may also vary between practitioners — some may choose to stay in the newly registered profession, some may practice under the umbrella of registered professionals, and some may move to other professions which do not require registration. The responses would be highly dependent on the nature of the individual profession (at sub-category level or even more detailed classification), the stage of individual practitioner's career development, and the required skill sets in the current profession and alternative professions. Without finalising the details of the proposal, it is not possible to estimate these impacts.

BCR Recommendation 4 is that each jurisdiction establishes a supervised training scheme to provide a defined pathway to become a registered building surveyor. Consultation has determined the response to this recommendation should be a guide to assist with registration of building surveyors. The cost of developing and distributing a guide is negligible in comparison to costs which would have been required to establish and administer a cadet scheme.

Training costs

Recommendations 2 and 3 in the BCR require compulsory, continuous and consistent training for all the practitioners as listed above. Recommendation 11 also has a training component for building surveyors to assist them with drafting directions and notices.

Requirements for additional training could include the following.

- Additional training requirements (or qualifications) to become registered/licensed for practitioners that are not currently registered/licensed. It may be difficult to quantify these costs precisely until the specific qualification/experience requirements have been finalised.
- Additional (including new or more stringent) continuous professional development (CPD) requirements for practitioners on the NCC, including:
  - practitioners that are already registered/licensed
  - practitioners that are not currently licensed.

There are mandatory CPD requirements for some building practitioners in some jurisdictions, for example in Tasmania[59], with plans to introduce requirements in other jurisdictions in the near future. However, there are currently no known requirements in any jurisdictions for practitioners to undertake mandatory CPD specifically on the NCC.

Table 5.10 summarises the CPD requirements and provisions by some professional bodies.

5.10 CPD requirement and provision by some professional bodies

Organisation	Delivery partner	Points	Platform	Notes
Australian Institute of Building	PointsBuild	70 points over 3 years	AstaPower Project	Available to non-members
Australian Institute of Building Surveyors		30 points per year		Mandatory to maintain accreditation. Free to members. Explicit requirement to know Building Codes and applications. Delivered through state and territory chapters.
Australian Institute of Architects		Mandatory, minimum 20 points per year		Mandatory 20 hours of CPD every year for A+ registration. Delivered through state and territory chapters
Master Plumbers		Encouraged to complete 12 points each year	WebEx	A range of CPD at PICAC (Plumbing Industry Climate Action Centre) + seminars on different topics around Australia. Some in partnership with other organisations
Design Institute of Australia	Multiple CPD avenues	Yes mandatory		DIA courses and any other courses approved for points. State and territory branches
Institute of Quantity Surveyors	Multiple CPD avenues	Yes, 20 points per year		
Engineers Australia		Yes		150 hours of CPD over three years. However, there is no course directly related to the NCC.

Source: BCR Implementation Team and CIE.

It can be seen from the table that the CPD requirement varies across the professional bodies. The Australian Institute of Building Surveyors (AIBS) requires 30 CPD points per year. Engineers Australia requires 50 hours of CPD per year, but there is no course directly related to the NCC.

In general one hour of CPD activity accrues one CPD point,[60] although there are variations with different professional bodies and government requirements.

59 https://www.cbos.tas.gov.au/__data/assets/pdf_file/0010/405010/Administrators-Determination-Occupational-Licensing-Building-services-work.pdf, accessed 16 June 2021.

60 For example, AIBS (*Revised AIBS CPD Program*, effective 1 July 2018), AIA (https://www.architecture.com.au/cpd/overview/), and AIQS (https://www.aiqs.com.au/sites/default/files/uploaded-content/website-content/cpd_policy.pdf).

It is not clear at this stage the exact requirement for training with the implementation of BCR. Based on feedback from the BCR Implementation Team, for costing purpose, we assume 5 additional points (hours) of CPD are required for all professionals and plumbers as presented in table 5.3. It should be emphasised that this assumption is about additional training required compared to the current situation where some existing training programmes have already included materials on the NCC albeit being provided on voluntary basis.

Training costs include the fees paid to institutions providing the training and the opportunity cost of the timing taken to participate in the training.

CPD course fees may vary. For example, Australian Institute of Building offers a course at $165 for six points. This suggests a cost of $27.5 per point. It is noted that this price is for a bundle which is offered at a discounted price to encourage bulk purchase and not reflective of the standard price. The Australian Institute of Architects (AIA) offers CPD courses at $46 to $50 per point for members and $67 per point for non-members.[61] The Australian Institute of Quantity Surveyors (AIQS) offers 2-point courses at $85,[62] implying a cost of $42.5 per point. We therefore assume training fees charged at $40 per point.

Engineers Australia sets out its policy on CPD and requirements of a minimum of 150 hours of structured CPD over a three-year period.[63] Average weekly earnings (before tax) for people working in the construction and professional, scientific and technical services sectors are $1 581.30 and $1 655.00 respectively.[64] Assuming the required 150 hours of CPD are even distributed over the three year period, and 40 working hours per week for engineers, the opportunity cost of time would be around $2 000 per year for engineers. This suggests the opportunity cost of time is around $40 per point (hour).

There is significant uncertainty around the quantum of course fees that will be charged. One view provided to the CIE is that up to 50 per cent of this training may be no-fee, 'learn at home' or 'unstructured' learning. Therefore, in our sensitivity analysis we include a scenario where course fees are only 50 per cent of what is assumed here.

With these assumptions, it is estimated that total additional annual training cost for professionals and plumbers will be around $62.3 million (table 5.11).

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61 AIA offers 1 point course with $46 for A+ members, $50 for other members, and $67 for non-members, see http://www.continuum.com.au/price_discount.php

62 For example, 2 points course in basic skills, account management, budgetary process, construction change management and construction technology costs $85, see https://www.aiqsacademy.com/aiqs/modules

63 Engineers Australia 2020, *Continuing Professional Development (CPD): An integral element of a successful engineering career*, https://www.engineersaustralia.org.au/Training-And-Development/Continuing-Professional-Development, accessed June 2020

64 ABS 6302.0, *Average Weekly Earnings, Australia*, Table 10I.

5.11 Estimated additional training cost per year

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUS
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Course fees	9.2	9.0	5.3	1.7	4.3	0.7	0.5	0.6	31.2
Opportunity cost of time	9.2	9.0	5.3	1.7	4.3	0.7	0.5	0.6	31.2
Total	**18.3**	**17.9**	**10.6**	**3.4**	**8.7**	**1.3**	**0.9**	**1.2**	**62.3**

Note: Professionals include architects and draftsperson, designer, engineer, technician, building surveyor and construction manager (including builder) as defined in table 5.3.

Source: CIE estimates.

As a comparison, WA Department of Mines, Industry Regulation and Safety estimated that the CPD cost for building surveyors would be $1.6 million per year for single residential buildings reform in WA.[65] As shown in table 5.3, building surveyors in Western Australia account for only 5.8 per cent of all building professionals and plumbers (excluding other trades workers). Our estimates suggest that the additional training costs for building surveyors would be only $0.35 million, less than half of the WA Government estimates.

For the Lambert Review, ACIL-Allen estimates that training course fee would cost $1 000 annually with additional $1 000 of opportunity cost of time.[66] This would be equivalent to an additional 25 points (hours) requirement of CPD, compared to 5 points we assumed for this estimate.

In sum, our estimates of additional training costs are lower compared to existing studies and at the low end of a range suggested by the Industry Working Group. It is therefore possible that the above analysis may understate the true costs.

Costs of data collection and sharing and documentation

Building information database

BCR Recommendation 12 requires each jurisdiction to establish ***a building information database*** that provides a centralised source of building design and construction documentation.

This recommendation is likely to be implemented by stages. At the beginning jurisdictions will reach consensus about the data to be collected at state or territory level. This will be formalised through a data sharing agreement. The data shared and accessed could inform regulatory and policy decisions. Developing the data sharing agreement will incur minimal costs.

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65 Government of Western Australia Department of Mines, Industry Regulation and Safety 2019, *Reforms to the building approval process for single residential buildings in Western Australia: Consultation Regulatory Impact Statement*, September 2019, p.64

66 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

There are significant benefits to jurisdictions of collecting greater amounts of accurate building data at state or territory level (see next chapter for more discussions). For the benefits of data sharing to be fully realised, each state and territory will require a functioning centralised database, and investment will be needed.

For the Lambert Review, ACIL-Allen estimates that developing such state or territory-based IT systems would cost $30 million one-off which was based on the capital funding required to build and implement ePlanning portal, and annual maintenance cost would be around $150,000.[67] NSW government announced on 5 May 2020 that $9.7 million would be invested in the ePlanning platform to ensure all councils can process development approvals online from 1 July 2020 onwards.[68]

It is understood that an ePlanning platform has broader coverage than a building database in the BCR. Further, we understand ePlanning is extended to industry and not just government stakeholders, which is the current considered use of the database for the BCR. Therefore, before scaling for activity across states and territories and making any adjustment for progress in the baseline across states and territories, we assume the initial setup cost of the BCR database would be equivalent to 45 per cent of the ePlanning costs (we apply a fraction of 50 per cent to reflect its smaller scope, and a further fraction of 90 per cent to reflect that it is being accessed by a smaller number of users). As for the ongoing costs of maintaining the database, we assume it would be equivalent to 40 per cent of the ePlanning costs (we apply a fraction of 50 per cent for its smaller scope, and a further fraction of 80 per cent for its smaller pool of users).

We then scale the costs of the ACI-Allen estimate according to the relative new building values of other jurisdictions, further assuming that half of the costs are fixed while the other half are variable.

Jurisdictions have different starting points for implementing the recommendation. Table 5.12 presents the self-reported progress in implementing the building database across states and territories. For jurisdictions that already have such a database, there will be a need to update the database to be consistent with the agreed national protocol for recommendation 12 and thus update costs would be incurred. We assume that 10 per cent of the costs for a new system would be needed to update existing systems.

For those jurisdictions that have partially implemented the recommendation, we assume 50 per cent of the costs for a new system would be needed to further develop the system. We vary this assumption with a sensitivity analysis.

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67 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-18

68 NSW Department of Planning, Industry and Environment 2020, *Nearly $10 million in enhancements for ePlanning*, https://www.planning.nsw.gov.au/News/2020/Nearly-10-million-in-enhancements-for-ePlanning

5.12 Self-reported implementation progress of state and territory building databases

	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
Mar 2019	PI	IPS	PI	IPS	S	S	PI	AI
Dec 2019	PI	IPS	PI	UC	IPS	S	PI	AI

Note: AI – already implemented; PI – partially implemented; IPS – in-principle support; S – support; UC – under consideration.
Source: BCR Implementation Team.

With these assumptions, it is estimated that total initial setup cost of around $55million would be needed, with ongoing cost of $240 000 each year (table 5.13).

5.13 Estimated costs of building information system

	NSW	VIC	QLD	WA	SA	TAS	ACT	NT	Total
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Initial setup	6.75	14.40	5.53	7.84	9.34	7.03	3.46	0.73	55.08
Ongoing	0.03	0.06	0.02	0.03	0.04	0.03	0.02	0.00	0.24

Source: CIE estimates.

Industry may incur additional costs for such a database to be functional, for example, more information may be required to be uploaded to the database. This will be discussed in the documentation cost section below.

Dictionary of terminology

Recommendation 22 recommends the BMF to develop ***a dictionary of terminology*** to assist jurisdictions, industry and consumers to understand the range of terminology used to describe the same or similar terms and processes in different jurisdictions.

It is anticipated that an electronic dictionary would be developed and be free to access. As a result, the cost of developing such a dictionary would include costs involved in preparing the dictionary. The production, publication and maintenance cost of the electronic dictionary would be low.

Another cost associated with the national dictionary of terminology is that required to amend legislation in each jurisdiction to align with the national dictionary when next making other amendments. The magnitude of the cost is dependent on building ministers' expectation and decision.

Based on feedback from the BCR Implementation Team, it is expected that the setup cost of preparing the dictionary is small, probably around $100 000, and it will occur only once. The maintenance cost is assumed to be $3 600 per year.

Building manual

Recommendation 20 requires that a comprehensive ***building manual*** in digital format for Commercial buildings be lodged with the building owners and made available to successive purchasers of the buildings.

Although there are requirements for a building manual in most jurisdictions, the current industry practice is ad-hoc and usually driven by the contract terms and specifications of a particular client.[69] It is expected that the requirement and contents of a building manual will be standardised and harmonised following the implementation of BCR recommendations.

It is therefore expected that all new Commercial buildings will be affected by this recommendation, and incur costs. For the Lambert Review, ACIL-Allen estimates that each new Class 2-9 development would require a building manual each year in NSW and the preparation of a manual would need 15 hours.[70] However this figure might reflect collecting basic information and organising it into a document, and thus be vastly underestimated according to industry feedback. It has also been suggested by industry that builders and their sub-contractors have the majority of responsibility for compiling building manuals, however only comprised 12 per cent of respondents to the ACIL-Allen survey, reducing the average estimate.

BDS 360, a company that assists tier 1 ($10 million projects and above) and tier 2 ($1 million to $10 million projects) builders to produce building manuals, suggests that it takes about 80-100 hours for all trades and professions to capture and review as-built information over the life of a project. The builders' sub-contractors would spend the same amount of time or more as the builder compiling data for their part of the building manual. The BDS 360 model of building manuals goes to a level of detail that is unlikely to eventuate in response to Recommendation 20, according to the BCR Implementation Team, however provides context around the varying levels of detail in current industry-led building manuals.

On balance, we assume the preparation of a building manual would need 30 hours (doubling the assumed hours by ACIL-Allen, and a sixth of the BDS 360 hours). This assumed number of hours allows collecting and collating available information into a reasonably detailed document which is usable by building owners and/or managers. It does not, however, include costs associated with preparing new information such as documenting design changes, which will be covered by the documentation costs.

Building professionals charge between $100 and $250 per hour.[71] It is therefore assumed a hourly rate of $150 on average, which suggests a building manual would cost about $4 500.

It is estimated that there are about 979 new apartment buildings and about 2 635 other commercial buildings each year on average. This suggests that preparing a building manual for these buildings would cost $16.26 million each year, with the above discussed assumptions. We assume that, even where buildings currently do have manuals prepared,

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69 Strata Community Association, Engineers Australia and WebFM 2020, *Australian Building Manual Guideline*, Version 1.2, p.4

70 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.

71 For example, see https://hipages.com.au/article/how_much_do_structural_engineers_cost#:~:text=A%20structural%20engineer's%20hourly%20rate,they%20will%20spend%20on%20it.

these costs are still incurred because it will be more costly to prepare these documents to meet the regulatory requirement.

Costs of documentation

The BCR has set out several requirements relating to the adequacy of project design documentation and record keeping. At least six recommendations are directly related to documentation.

- Recommendation 11 provides building surveyors with power to issue directions to fix or to stop non-compliance work and requires them to report any cases where directions are not complied with, suspicions of fraudulent practices and significant departures from approved documentation to the government.
- As discussed above, Recommendation 12 sets out a building information database. Although developing/updating and maintaining the database would be the responsibility of regulators, industry may incur additional costs in terms of more information being required to be uploaded to the database and/or new format of data consistent with the database to be required.
- Recommendation 13 requires design documentation presented for building approval must adequately demonstrate compliance with NCC, include relevant certificates and declaration by registered practitioners involved.
- Recommendations 14 and 15 set out requirements for documentation for performance solutions. A survey by ABCB in 2019 indicates that 41-43 per cent of processes did not provide adequate documentation and 9-12 per cent did not provide documentation.[72] ABCB assumed the cost of documentation at $500, accounting for 5 per cent of the average fee of preparing Performance Solutions for commercial building.[73]
- Recommendation 16 requires approval of amended project documentation for design development, variations and production substitutes by appointed building surveyor throughout a project. The WA Government estimates that about 8 per cent of new builds of detached houses may incur costs for one variation which costs $455 per variation plus $120 lodgement fee. It also estimates that where plans and performance solutions are documented (where this does not occur otherwise), this also costs $455 per instance of new documentation.[74]

Documentation costs include the additional time and resources spent on preparing and handling documents.

Based on the above discussion, it is assumed that:

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72 ABCB 2020, *Process for the development of Performance Solutions: Consultation Regulation Impact Statement*, March 2020, Tables 3 and 4, p.17-18.

73 ibid, Table 8, p.27

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

- 10 per cent of residential dwellings would need additional documentation preparation with a cost of $550 per document; and
- Similar documentation cost share (around a couple of hundredths of one per cent) would applicable to the construction value of commercial buildings.

With these assumptions, it is estimated that the additional documentation cost will be around $21.4 million each year nationwide (table 5.14).

These costs refer only to the preparation of the new documentation itself, based on examples of documentation costs in the literature. Where this more onerous administrative standard requires other additional work (to meet new standards implicit in new documentation requirements), these costs are not included in the documentation cost and are instead represented by database cost discussed above and increase in construction costs discussed below.

5.14 Estimated documentation costs

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Australia
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Residential	3.48	4.13	2.76	0.54	1.67	0.10	0.07	0.24	12.99
Commercial	2.68	2.87	1.18	0.47	0.71	0.16	0.09	0.25	8.41
Total	**6.16**	**7.00**	**3.94**	**1.01**	**2.38**	**0.26**	**0.16**	**0.48**	**21.40**

Source: CIE estimates.

Inspection, auditing and reviewing costs

The BCR recommendations may introduce additional regulatory processes, including additional audits and/or reviews. These additional processes may result in additional costs.

- Recommendation 6 requires that regulators have adequate powers to perform audits over all registered practitioners including architects.
- Recommendation 7 requires proactive auditing of the construction of commercial buildings by regulatory authorities and reporting on audit findings and outcomes.
- Recommendation 8 requires engagement with the fire authorities for the purpose of design review relating to matters impacting fire fighting operations.
- Recommendation 9 may require additional compliance activities by regulators to enforce the requirement to avoid conflicts of interest for private building surveyors as a priority, or additional legal actions, if certain engagement arrangements are prohibited.
- Recommendation 10 sets out codes of conduct for building surveyors which provide a reference against which any auditing can be carried out and a basis for disciplinary action.
- As part of the design stage of a building project, Recommendation 17 sets out requirement for independent third-party review to be undertaken by a registered professional engaged by the building surveyor.

- Recommendation 18 sets out requirement for mandatory inspections of building work at identified notification stages.
- Recommendation 19 requires registered fire safety practitioners to design, install and certify the fire safety system necessary in commercial buildings.

Independent third-party review

These reforms would imply higher cost of independent review. As shown in table 5.15, most of the jurisdictions have not implemented the third-party review.

5.15 Self-reported implementation progress of third-party review

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
March 2019	IPS&PI	IPS	IPS	IPS	UC	AI	UC	IPS
December 2019	IPS&PI	UC	PI	UC	UC	AI	UC	IPS

Note: AI – already implemented; PI – partially implemented; IPS – in-principle support; S – support; UC – under consideration.
Source: BCR Implementation Team.

The WA Government estimates that third party review of high-risk design elements in commercial buildings may cost 0.5 per cent of total value of buildings under construction.[75]

We use the WA estimates as the base for other states and territories, and further assume that:

- One third of apartment and commercial buildings are subject to third-party independent review; and
- Adjustment factor for implementation progress:
  - already implemented: 10 per cent of full-scale cost;
  - partially implemented: 50 per cent of full-scale cost.

With these assumptions, it is estimated that the third-party independent review for Class 2 apartment buildings and Classes 3-9 commercial buildings would cost around $100 million per year.

5.16 Estimated independent review cost

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Independent review cost	18.34	40.21	19.56	6.14	11.74	0.19	1.06	3.14	100.39

Note: refers to Class 2 Apartment and Classes 3 to 9 Commercial buildings.
Source: CIE estimates.

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

Audit

The additional registration and licencing fees, estimated above, aim to recover costs for new activities that regulators must undertake, including auditing. Including a separate additional cost for auditing would therefore be double counting costs. Therefore, it is not appropriate to make a separate additional cost for this item.

Mandatory inspection

BCR Recommendations 18 and 19 emphasises the importance of inspection regimes. It is recommended that jurisdictions require on-site inspections for all building works and that there be greater oversight of the installation and certification of fire safety systems in Commercial buildings.

WA does not currently have any mandatory inspections whereas most other states and territories do. The WA Government estimates that mandatory inspections would cost $800 per detached house (4 inspections at $200 each) and 0.3 per cent of total value of commercial buildings constructed in WA.[76] Similar assumptions are applied to South Australia where there is no mandatory inspection requirement too.

5.17 Self-reported implementation progress of mandatory inspection

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
March 2019	AI&UC	AI	PI	IPS	IPS	AI	AI	PI
December 2019	AI&UC	AI	PI	UC	IPS	AI	AI	PI

Note: AI – already implemented; PI – partially implemented; IPS – in-principle support; S – support; UC – under consideration.
Source: BCR Implementation Team.

For states and territories that have already implemented the mandatory inspection recommendation, only 10 per cent of the full-scale inspection costs are applicable, while for jurisdictions where the recommendation is partially implemented, 50 per cent of the full-scale cost is applied. In QLD, only 10 per cent of the costs are applicable for Class 1 dwellings (where inspections are mandatory) and 50 per cent of the costs are applicable for Class 2 dwellings (where inspections are subject to guidelines).

With these assumptions, it is estimated that there will be around $114.69 million of additional inspection cost every year nationwide (table 5.18).

76 Government of Western Australia Department of Mines, Industry Regulation and Safety 2019a, *Reforms to the building approval process for single residential buildings in Western Australia: Consultation Regulatory Impact Statement*, September 2019;
Government of Western Australia Department of Mines, Industry Regulation and Safety 2019b, *Reforms to the approval process for commercial buildings in Western Australia: Consultation Regulatory Impact Statement*, December 2019.

5.18 Estimated additional inspection cost

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Inspection cost	25.54	11.29	20.21	15.81	37.08	0.41	0.26	4.10	114.69

Note: additional inspection costs estimated for all buildings

Source: CIE estimates.

Increased construction costs

In addition to the higher costs noted above, the BCR recommendations could potentially lead to higher construction costs. Many defects (through non-compliance with the NCC) are likely to occur as a result 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). A UK study found that up to 21 per cent of total construction costs are related to fixing errors during the construction process.[77] A recent Procore report suggests that rework is still a massive issue for all construction businesses, with an average 18 per cent of time being spent on rework in 2020, compared to the average of 17 per cent in 2019.[78] These are costs created by the BCR as a consequence of preventing defects from occurring in a completed building. They must be netted of the benefits of the BCR which are avoided rectification costs (those from defects discovered in completed buildings).

That said, 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 rectifying them could be high.

The WA Government[79] estimated that the cost of fixing potential defects identified through inspections during the construction phase is between 10-46 per cent (40 per cent on average) of the rectification cost post-construction. In other words, the construction cost would be higher as a result of better compliance and enforcement processes to avoid the defects.

From the cost-benefit analysis perspective, if avoiding a defect through better compliance is included in the benefit side, then associated costs (higher costs to avoid such a defect from happening) should be considered as well.

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77 Expedition Engineering Ltd 2016, *Get It Right Initiative: Improving value by eliminating error*, Research Report, April 2016, p.56-57

78 Procore 2020, *How We Build Now: Tracking Technology in Construction 2020*, June 2020, p.7

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

One way to estimate the increase in construction costs would be to assume a certain percentage of final rectification cost for particular defects when it is detected and fixed. For example, suppose the final rectification cost of a defect five years after the completion of a building is $100,000, the implied additional construction cost to avoid or fixing this defect during construction would be $40,000 if using the above-mentioned average share of 40 per cent. If the defect is detected during the design phase, the percentage could be zero, meaning no additional construction costs involved.

Alternatively, the BCR recommendations could encourage a better culture of compliance throughout the design and construction process. This implies that some defects would be avoided completely, rather than identified earlier in the process. In these circumstances, there may still be some additional construction costs, such as those associated with better quality materials, additional labour costs associated with better designs and fewer 'short-cuts'.

Some case studies presented by the WA building approval CRIS indicate that rectification at an early stage of construction would incur a smaller proportion of rectification cost than after completion. For example, as shown in table 5.19, rectifying incorrect/insufficient sand pad and poor compaction of soil for 10 m^2 prior to concrete being poured costs only 23 per cent of the rectification expenses five years after completion, while rectifying bushfire construction requirement prior to handover costs about 73 per cent of the rectification cost after completion.

5.19 Indicative costs to rectify/remediate damages at critical stages of construction: single dwellings

	At construction	At completion (5+yrs)	Rectify cost at construction as % of cost at completion
	$	$	%
Footing inspection	1 360	5 875	23.1
Roof framing inspection	250	6 250	4.0
Completion/final			
Bushfire construction requirement	1 100	1 500	73.3
Plasterboard installation	315	3 700	8.5
Waterproofing	10 400	15 000	69.3

Note: data is for scenarios for detached dwellings

Source: WA Government 2019a, Table C, p.67

Based on these findings, it is appropriate to assume that:

- four inspection stages from design to completion could detect the same amount of potential defects; and
- the additional construction cost to rectify/remedy defects when detected gradually increase from zero to 75 per cent of the rectification cost after completion.

With these assumptions, and an allowance for the self-reported implementation progress in the baseline, it is estimated that additional construction cost to reduce the $2.4 billion problem by 57 per cent during construction would be around $384.8 million (table 5.20).

5.20 Estimated additional construction cost to rectify defections before completion

	Potential defects being detected	Assumed rectification cost at detection as of rectification cost after completion	Implied increase in construction cost
	%	%	$m
Design	25	0	0.0
Early construction stage	25	25	64.1
Mid construction stage	25	50	128.3
Prior to handover	25	75	192.4
Total	**100**	**37.5**	**384.8**

Note: to rectify 57 per cent of the total defects costing $2.4 billion

Source: CIE assumptions and estimates

Other costs not separately quantified

Cost of potential delay

Measures suggested by BCR recommendations such as more rigorous reviewing and auditing, more structured design development and approval, more frequent inspections and higher scrutiny may extend the whole construction and approval process and result in delays of the completion of buildings even if regulators increase resources for compliance accordingly.

This delay may incur costs to developers, builders and subcontractors in the case where the buildings cannot be sold or occupied by a buyer who purchases a property off the plan or the owner who commissioned the building.

Delay could lead to significant cost for the industry.

There may be the direct costs for time delay known as *preliminary costs* which comprises labour, site equipment hire, administration and insurance costs and so on. Similar to the argument for increased construction costs, the delay at design stage would be cheaper than the delay at construction stage trying to sort the problem out when the building is already under construction as the holding costs are higher.

Building contractors may also be liable to *liquidated damages* which are an amount of money, agreed upon by the parties at the time of the contract signing that establishes the damages that can be recovered in the event a party breaches contract – usually causing the project to be delivered late. Liquidated damages cost could be as high as $435-$735 per day per $1 million construction cost, according to recent case studies by Master Builders on the potential impact of COVID-19 on the construction industry.[80]

In addition, commercial contracts usually require the Head Contractor and Subcontractor to provide security known as *retentions* for the performance under the

80 Master Builders 2020, *Construction Industry Delays*, discussion note, August 2020.

contract. They usually represent 5 per cent of the contract sum.[81] Again if there is a delay under the contract the other party to the contract (Principal and/or Head Contractor) can call upon the security.

It could be argued that some instances where liquidated damages and retentions are called upon could be avoided through revised scheduling to reflect the new norm of industry practice including the length of project delivery after the implementation of BCR recommendations, and thus in these cases would not present additional cost for building contractors. However the delay in delivery may still impose preliminary costs to building contractors, and more broadly to developers, which would mean a net resource cost to society.

However, there is not enough data to quantify the cost of delay separately, for example, how long the delay would be. Moreover, it may be assumed that the above discussed increase in construction cost covers the cost of delay in general.

Legal costs

The BCR recommends more effective powers to regulatory authorities including powers to seize documents and test materials, to evacuate, to take disciplinary actions, and to disqualify company directors (Recommendations 6 and 7). Recommendation 11 requires the building regulator to prioritise matters it receives from building surveyors regarding non-compliance etc. It is anticipated that more legal action may be taken by regulators when these matters can't be resolved through other means.

These recommendations imply there will be more legal costs involved either because regulators initiate legal actions against or are challenged by relevant practitioners. Although the majority of powers listed in recommendations 6 and 7 already exist in most jurisdictions and building regulators are often hesitant to pursue legal action because it is costly and the outcomes are uncertain, enhancement of these powers and tighter compliance enforcement may result in more legal actions and thus more costs in some cases.

In addition, Recommendation 9 provides the owner a right of appeal against decisions of the building surveyor. Recommendation 10 requires each jurisdiction put in place a code of conduct for building surveyors which could be used as a ground for disciplinary inquiry. These may also have legal cost implications.

Summary of cost estimates

Table 5.21 summarises the estimated costs to implement the BCR recommendations. Initial one-off cost is around $121 million, while ongoing annual costs are around $712 million.

81 ibid

5.21 Summary of cost estimates to implement BCR

	Initial setup cost	Ongoing annual cost
	$m	$m
Administration		8
Registration	66	4
Training		62
Independent review		100
Mandatory inspection		115
Building database	55	0.24
Dictionary of terminology	0.1	0.004
Building manual		16
Documentation		21
Increase in construction cost		385
Total	**121**	**712**

Source: CIE estimates

Increase in construction costs is the largest cost item, accounting for about 54 per cent of additional compliance costs. It is followed by mandatory inspection cost (around 16 per cent), independent third-party review cost (around 14 per cent) and additional training cost for professionals (around 9 per cent).

Table 5.22 reports the total additional costs for states and territories in 2022 without including the initial setup costs. Victoria cost is slightly higher than NSW cost because Victoria has higher defect costs (which is due to higher building activity) and thus higher additional construction cost to fix it.

5.22 State and territory breakdown of annual ongoing cost in 2022

State/territory	Total costs	Share
	$m	%
NSW	177	25
VIC	229	32
QLD	110	15
SA	46	7
WA	124	17
TAS	5	1
NT	5	1
ACT	16	2
Total	**712**	**100**

Source: CIE estimates.

6 Potential benefits from implementing the BCR

In this chapter, we quantify three types of benefits:

- avoided costs associated with NCC non-compliance, and
- practitioner time and cost savings from nationally consistent regulation.

Avoided costs associated with NCC non-compliance

The main benefit from implementing the BCR recommendations is to improve compliance with the NCC and therefore reduce the costs associated with non-compliance, as set out in chapter 2.

The avoided costs of NCC non-compliance are estimated by applying to the size of the problem (estimated in chapter 2) the expected extent to which the BCR recommendations, if fully implemented, would reduce the number of major defects in new buildings.

Estimated reduction in NCC non-compliance

A key driver of the benefits is the extent to which the BCR recommendations will reduce non-compliance with the NCC (i.e. the effectiveness of the recommendations). As this is not possible to observe ex-ante, we largely rely on expert opinion gathered through consultations and a survey of practitioners to quantify the benefits.

Stakeholder consultations

During consultations we asked stakeholders the extent to which they thought full implementation of the BCR recommendations would reduce defects. Not all stakeholders felt comfortable quantifying the impact and not all stakeholders were familiar with all building types. Nevertheless, the estimates gathered through stakeholder consultations are summarised in table 6.1.

Views varied significantly across stakeholders, as reflected in a wide range of responses.

Stakeholders generally felt that the BCR recommendations would be more effective in addressing defects in apartment buildings and commercial buildings, compared with separate houses.

6.1 Estimated reduction in defects from stakeholder consultation

	Responses	Average	Low	High
	No.	Per cent	Per cent	Per cent
Separate houses	6	43	5	90
Apartment buildings	14	58	10	90
Commercial buildings	10	60	25	90

Note: Where stakeholders gave a range, we used the mid-point of the range.

Source: CIE based on stakeholder consultations.

Several stakeholders also qualified their response on the effectiveness of the BCR recommendations in reducing building defects. Factors that stakeholders considered would affect the effectiveness of the BCR recommendations included the following.

- Some stakeholders argued that the extent to which the BCR recommendations would reduce defects depends critically on how effectively they are implemented (including proper resourcing).
- Some stakeholders commented that regulators can only do so much, so co-operation and support for the BCR recommendations and a change in industry culture was crucial to realise the full benefits.

Survey of practitioners

In our survey of practitioners, in addition to providing estimates of the *prevalence* of defects in different building types (data noted in chapter 2), respondents were asked to indicate the extent to which defects would be reduced if the BCR recommendations are fully implemented. On average, practitioners indicated defects would be reduced by 53 per cent for separate houses, by 58 per cent for apartment buildings and by 57 per cent for commercial buildings. Practitioners who indicated they are very familiar with the BCR recommendations indicated a slightly lower expected impact, while practitioners who perceived high levels of defect prevalence indicated a slightly higher expected impact.

6.2 Expected reduction in defects if the BCR recommendations are implemented

	Average expected reduction in defects in separate houses	Average expected reduction in defects in apartment buildings	Average expected reduction in defects in commercial buildings
	per cent	per cent	per cent
All respondents	53	58	57
Respondents perceiving defects in most or almost all buildings	54	60	60
Respondents very familiar with BCR	49	57	55
Respondents very or somewhat familiar with BCR	53	58	58

Q/ Please move the sliders below to indicate your best estimate of the extent to which defects (which are caused by non-compliance with the National Construction Code) would be reduced if the BCR recommendations are fully implemented.

Base: All respondents separate houses n=689, apartments n=673, commercial buildings n=675

Source: CIE survey of practitioners.

In a separate survey of practitioners focusing on Recommendation 7 conducted by the ABCB in July 2020:

- 87 per cent of respondents indicated that increased reporting on auditing of the construction of commercial buildings could provide benefits to industry and 86 per cent indicated there would be benefits to owners, tenants and users. Roughly two thirds of respondents indicated there would be "a lot of benefit" (as distinct from some, little or no benefit) to both industry and owners, tenants and users from reduced instances of non-compliance.
- Some 55 per cent of respondents indicated that public reporting on auditing of the areas proposed in the BCR and by regulators could reduce by "a lot" the rate of non-compliance with state and territory legislation, the NCC and/or Australian Standards in commercial buildings. Another 31 per cent indicated public reporting on auditing would reduce non-compliance by a little, while only 14 per cent indicated no change or an increase in non-compliance.
- More than two-thirds of those expecting a reduction in non-compliance attributed the reduction to "knowing that the regulator is auditing the construction of commercial buildings may discourage 'taking shortcuts' by industry participants" and "the regulator may be able to identify a pattern of common instances of inadvertent non-compliance with state and territory legislation, the NCC and/or Australian Standards and could work with stakeholders like the ABCB to provide additional guidance, clarification or training." While this survey data cannot be directly translated to a quantitative estimate of the reduction in non-compliance, it is consistent with the estimate from our survey of practitioners of a reduction in the order of 50 to 60 per cent.

Benefits already achieved in the baseline

State and territory governments self-report that to varying degrees, they have already made progress towards some of the BCR recommendations. Practitioners surveyed may not be aware of this progress. To develop assumptions about the extent to which the reductions identified above would have been achieved in the baseline scenario, we assume that the self-reported progress levels 'already implemented' and 'partially implemented' reported in the March 2019 implementation plan represent achieving 90 per cent and 50 per cent of the benefits, respectively, and all other self-reported progress levels represent achieving none of the benefits. For simplicity, we apply an equal weight to each of the recommendations.

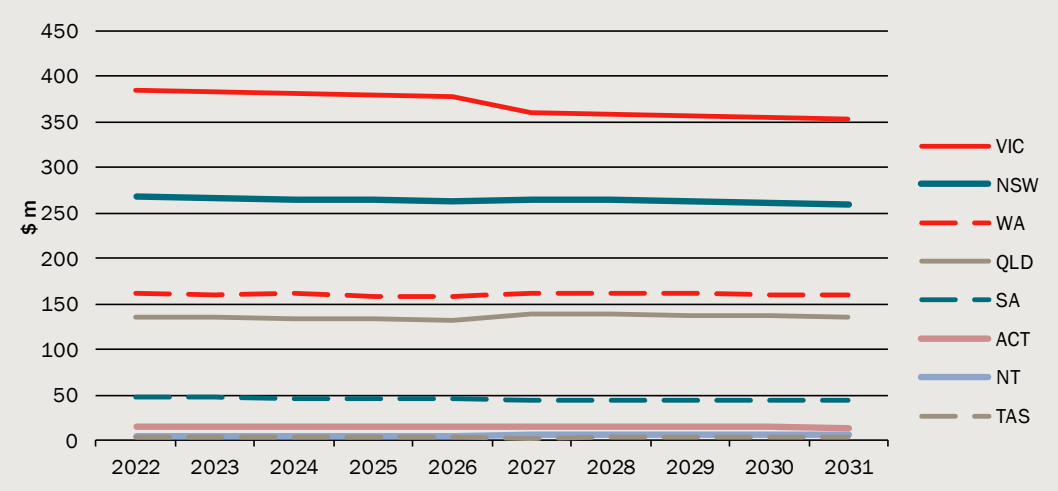
The impact of our assumption that 'partially implemented' corresponds to 50 per cent progress is tested with another assumption in the sensitivity analysis in the next chapter.

The BCR Implementation Team also note they are aware that a number of jurisdictions are in the process of requiring or expanding mandatory CPD within their jurisdiction (which is consistent with our higher level assumptions for progress to date).

Summary of benefits from improved NCC compliance

The estimated benefits from improved NCC compliance as a result of the BCR reforms are around $1 021 million nationally in the first year of implementation. The disaggregation by state and territory is shown in chart 6.3.

6.3 Benefits from improved NCC compliance by state and territory



Data source: CIE.

Additional benefits of national consistency

The BCR explicitly refers to consistent requirements in relation to occupational licensing. However, implementing the BCR recommendations will lead to greater consistency in compliance and enforcement regimes across states and territories more generally, and particularly if implemented through a national approach. Greater national consistency in the compliance and enforcement regimes that support the NCC could potentially deliver additional benefits over and above the estimated reduction in defects.

What are the benefits of national consistency?

The Productivity Commission has previously noted that inconsistencies in the regulatory environments across states and territories can limit interstate and international trade and mobility and constrain business opportunities. Possible benefits from greater national consistency identified in previous studies[82] and during consultations include the following.

- Economies from industry supplying to a national building market — during consultations, supplying to a national market was considered particularly important for:
  - building product suppliers

82 See for example, Productivity Commission 2004, *Reform of Building Regulation*, Productivity Commission Research Report, 17 November 2004, p. 37.

  - insurance providers
  - the provision of training to industry practitioners, including to comply with continuing professional development (CPD) requirements (i.e. it is cheaper to develop training at a national scale, rather than separate training modules for each jurisdiction). As illustrated in box 6.4, around $12 000 could be saved each year for each training module.
- Decreased costs to industry — greater national consistency would reduce the cost for businesses and practitioners to move/work across state and territory borders and therefore increase labour mobility. The Productivity Commission has previously identified occupational licensing as impediment to geographic labour mobility.[83] In its most recent review of mutual recognition schemes, the Commission also found that, although mutual recognition schemes for occupations are generally working well, where standards differ and links between regulators are weak, the benefits of mutual recognition are not being fully realised.[84]
- Enhanced integrity of regulatory regimes — more national consistency in licensing/registration requirements prevents practitioners from becoming registered/licensed in a jurisdiction with relatively low requirements and then transferring to a jurisdiction with higher requirements through mutual recognition (referred to as 'shopping and hopping'). Several stakeholders expressed concern about 'shopping and hopping' during consultations. According to the Productivity Commission, these concerns tend to arise where the regulator perceives that pre-requisite training requirements are not comparable across jurisdictions.[85] That said, the Productivity Commission also found:
  - that the number of people engaging in shopping and hopping in most occupations is relatively small compared to the total number of registered practitioners;
  - little direct evidence or specific examples to suggest that the 'easier' registration pathways have led to inferior outcomes for the public (except in relation to the security industry).[86]
- Increased competitiveness — reducing the costs associated with operating across state and territory borders would increase competition leading to:
  - lower prices to consumers, and
  - increased productivity
- Nationally consistent data collection would also:
  - provide a better evidence base for policy analysis
  - allow regulators to better track poorly performing practitioners that move across state and territory borders

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83 Productivity Commission 2014, *Geographic Labour Mobility*, Productivity Commission Research Report, April 2014, p. 239.

84 Productivity Commission 2015, *Mutual Recognition Schemes*, Productivity Commission Research Report, September 2015, p. 115.

85 ibid, p. 135.

86 Productivity Commission 2015, *Mutual Recognition Schemes*, Productivity Commission Research Report, September 2015, p. 144.

– help regulators to identify national trends and address emerging issues earlier.

An example of the cost savings associated with greater national consistency is shown in box 6.4. Note that these benefits have not been explicitly included in the benefit estimates, but these types of benefits may be reflected in practitioners' responses to the survey (see below).

6.4 Cost savings in the development of training programs

One of the potential benefits of greater national consistency is the cost savings associated with the development of training material (for example, to meet CPD requirements), where the training material can be developed at a national level.

Based on information gathered through consultations, the cost savings could be in the order of $60 000 per training module.

- The cost of developing a single national-level training module was estimated at around $20 000.
- However, the cost of developing separate state or territory-based modules in an environment with varying state or territory-based requirements would cost around $10 000 per state/territory; the total cost of developing a training module that covered all states and territories would therefore by around $80 000.

Training modules are generally updated at least every 5 years, implying a lower bound saving estimate of around $12 000 per year for each training module.

During consultations, most stakeholders tended to agree with the proposition that greater national consistency would be beneficial. However, some stakeholders felt that the benefits of national consistency are often overstated. Reasons given included:

- few practitioners operate across jurisdictions (mainly in border towns)
- mutual recognition means that in most cases it is relatively easy to have qualifications recognised in other jurisdictions
- there is little evidence of 'shopping and hopping' (see Productivity Commission finding cited above)
- the value of nationally-consistent data collection is unclear (i.e. regulators do not need to know what is happening in other states and territories).

Previous estimates of the benefits of national consistency

The perceived benefits of a nationally consistent approach to building administration have led to attempts to achieve greater national consistency across various aspects of building regulation, with associated attempts to quantify these benefits.

These studies have generally found that the benefits of improved national consistency could be significant. That said, the benefits of greater national consistency are difficult to measure and these studies have generally not attempted to measure these benefits directly. Furthermore, the BCR recommendations are substantially different to previous

proposals and would not achieve the same level of national consistency as previous proposals.

The benefits of a National Administration Framework

In the early 1990s, the Building Regulation Review Taskforce (BRRT) — which was established to 'review technical regulations, codes, standards and other requirements affecting the construction and operation of buildings — recommended a Model Administrative Code be developed as a key element of the national building framework.[87]

The Allen Consulting Group (ACG) estimated that a National Administration Framework for the building industry could deliver benefits of between $214 million and $402 million per year. Inflating to 2020 dollar terms, using the national CPI, this would be between around $327 million and $614 million (table 6.5). ACG did not estimate the benefits of a National Administration Framework directly. Rather ACG arrived at this estimate by subtracting the estimated benefits of other key aspects of building reform (performance-based standards and private certification) from an overall estimate of the benefits of building reform.[88]

Although the National Administration Framework would have achieved a greater level of national consistency (and therefore presumably greater associated benefits) than the BCR recommendations, these estimates nevertheless suggest that the benefits of greater nationally consistency in building regulation could be significant.

6.5 Estimated benefits from a National Administration Framework per year

	Lower bound	Upper bound
	$ million	$ million
Total benefits of building reform	1 383	1 571
Less: Benefits of performance-based standards	646	646
Less: Benefits of private certification	523	523
Equals: Unrealised benefit of National Administration Framework ($2002)	**214**	**402**
Unrealised benefit of National Administration Framework ($2020)[a]	**327**	**614**

[a] Inflated to 2020 dollar terms, using the national Consumer Price Index.

Source: Allen Consulting Group, Harmonisation of Building Control Administration: Costs and Benefits of the National Administration Framework, Final Report for the Australian Building Codes Board, December 2002, p. 34.

87 Productivity Commission 2004, *Reform of Building Regulation*, Productivity Commission Research Report, 17 November 2004, p. 187.

88 Allen Consulting Group 2002, *Harmonisation of Building Control Administration: Costs and Benefits of the National Administration Framework*, Final Report for the Australian Building Codes Board, December 2002, p. 34.

National occupational licensing system

In the late 2000s, a national occupational licensing system (NOLS) was proposed for a range of licensed occupations, including several building-related occupations. As part of this proposal, Decision RISs were prepared for the first wave of occupations (property occupations, plumbing and gas-fitting, refrigeration and air-conditioning mechanics and electrical occupations), although this did not include the building-related occupations (building-related occupations were to be considered under wave 2).

The Decision RISs suggested that one of the key benefits from a national occupational licensing system would be improved labour mobility. In the Decision RISs, the benefits of improved labour mobility were measured by pro-rating previous Productivity Commission modelling estimating the benefits of labour mobility between states and territories as follows.[89]

- The Productivity Commission estimated that in the context of a resources boom, labour mobility in occupations subject to mutual recognition schemes could increase GDP by around 0.3 per cent,[90] equivalent to around $4 billion per annum in 2011.[91] This indicative estimate was based on the following approach.
  - The Productivity Commission compared two simulations (using the Monash Multi-Regional Forecasting computable general equilibrium model).[92]
    - In one simulation (the baseline), workers in occupations covered by mutual recognition schemes were assumed to be perfectly immobile between jurisdictions, while workers in all other occupations were assumed to be perfectly mobile.
    - In the second simulation, interjurisdictional labour mobility was assumed to be infinite (perfect) for all occupations.
  - The natural resources boom was modelled as a uniform 10 per cent shock to the export prices of coal, oil, gas, iron ore, non-iron ore and other mining products.
- Using the Productivity Commission estimates as a starting point, the Decision RISs then:
  - assumed that 10 per cent of full labour mobility is attributable to national licensing
  - pro-rated the benefits based on:
    - the proportion of total employed persons that are registered (18 per cent)

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89 See for example, COAG National Licensing Steering Committee, 2013, *Decision Regulation Impact Statement: Proposal for national licensing of the electrical occupations*, https://web.archive.org/web/20140125084453/http://nola.gov.au/2013-decision-riss/, pp. 60-63.

90 Productivity Commission 2009, *Review of Mutual Recognition Schemes*, Productivity Commission Research Report, January 2009, pp. 380-383.

91 See for example, COAG National Licensing Steering Committee, 2013, *Decision Regulation Impact Statement: Proposal for national licensing of the electrical occupations*, https://web.archive.org/web/20140125084453/http://nola.gov.au/2013-decision-riss/, pp. 60-63.

92 Productivity Commission 2009, *Review of Mutual Recognition Schemes*, Productivity Commission Research Report, January 2009, pp. 380-383.

… the relevant occupation as a proportion of total registered workers.

Using this approach, the various Decisions RISs estimated that the benefits of national licensing for the occupations considered were relatively significant (table 6.6).

6.6 Estimated annual benefits from improved labour mobility

	2011 dollar terms	2020 dollar terms[a]
	$ million	$ million
Property occupations	23.0	27.2
Plumbing and gas-fitting	32.1	38.0
Refrigeration and air-conditioning mechanics	16.2	19.1
Electrical occupations	45.2	53.4
Total	**116.4**	**137.6**

[a] Inflated to 2020 dollar terms, using the national Consumer Price Index.

Source: National Occupational Licensing Authority, Decision Regulation Impact Statements.

Estimated time savings from national consistency

Some 41 per cent of practitioners we surveyed indicated that national consistency would reduce the cost of providing some services or activities (including in the base those who skipped the question). The most common driver identified for these cost reductions, aside from improved compliance, was reduced time spent on training and professional development. Other drivers identified by practitioners included reduced time researching regulations, maintaining document templates, and going through regulatory processes including permits, registration/licences, product accreditation, development applications, appeals and certification. Among those 41 per cent who indicated that national consistency would reduce costs, the average estimate of the respondent's own work time that would be saved (after removing one implausible outlier) was 12.5 hours per month. At average weekly earnings in the construction industry, this time saving translates to around $2 470 per practitioner annually (across all practitioners, including those not expecting a cost reduction).

6.7 Time savings from national consistency

Component of time saving	Survey result
Proportion of respondents indicating greater consistency would reduce costs (per cent)	41
For respondents indicating a cost reduction, average work time saved (hours per month)	12.5
Average weekly earnings: construction ($/week)	1 646
Value of time savings per practitioner per year ($)	**2 470**

Q/ Would the greater consistency achieved through implementing the BCR recommendations reduce the cost of providing any services or activities (including regulatory activities)?

Q/ Roughly, how many hours of your own work time would be saved (i.e. freed up for other activities) each month if regulation was nationally consistent?

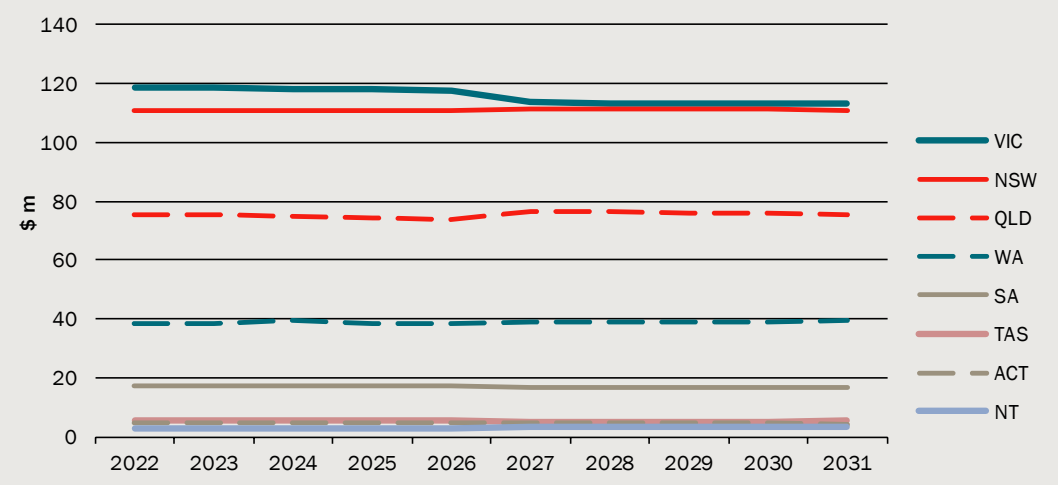
Base: n=708, n=286

Source: CIE survey of practitioners; ABS Cat. No. 6302.0 Table 10G.

We grow this figure by a real wage growth rate of 0.25 per cent per annum and aggregate it over projections of the number of professionals working in the industry in each state and territory.

The estimated benefits from time savings from national consistency are around $375 million nationally in the first year of implementation. These benefits are broadly consistent with previous studies suggesting that greater national consistency across compliance and enforcement frameworks could deliver significant benefits across the economy. The disaggregation by state and territory is shown in chart 6.8.

6.8 Benefits of time savings from national consistency by state and territory



Data source: CIE.

These estimates are designed to capture the sum of benefits from all BCR recommendations that contribute to additional national consistency. They implicitly include, for example, benefits to practitioners that work in multiple jurisdictions, no longer having to do multiple rounds of CPD to retain this work.

Benefits of nationally consistent databases

The benefit of nationally consistent databases as currently envisaged (in particular providing access to regulators) include potentially better or earlier enforcement through improved identification of national trends and problems and is included in our calculations of benefit from a reduction in NCC related defects.

Lack of adequate information on building has been identified as an important issue by stakeholders and a nationally consistent database could enable regulators to identify potential compliance issues more easily and quickly. One of the biggest issues in developing this report has been sourcing accurate and complete data about the size and nature of the problem. If such databases existed, more accurate data for similar work could be more easily sourced.

Moreover, where adequate and accurate data cannot be determined, the quality of decisions made may be impacted.

There are significant benefits to jurisdictions of collecting greater amounts of accurate building data at state or territory level. The BCR Implementation Team believes these may include:

- developing state or territory-based databases that act as 'sources of truth' so that jurisdictions can reliably use building data to inform broader analysis such as distribution of services and economic activity
- increased jurisdictional ability to respond quickly to emerging concerns in the local industry, whether this is in relation to building materials or poor practices by local practitioners. This will assist jurisdictions to limit damage caused and potentially reduce the likelihood the jurisdiction will need to provide assistance to industry or building owners to rectify the issues
- ability to analyse local industry trends to analyse impacts of regulatory or policy changes including education and training interventions and/or programs to incentivise local building activity.

The BCR Implementation Team believes data sharing across states and territories could deliver additional benefits including reduction of non-compliance with the NCC through increased ability for regulators to share intelligence, identification of trends to target compliance activities, and development of additional education and training that addresses these identified trends.

However, as the benefits from nationally consistent database have been included in the avoided costs associated with defects through improving the NCC compliance, they are not separately quantified.

Summary of benefits

It is estimated that the total annual benefit from implementing the BCR recommendations is about $1.4 billion (table 6.9).

6.9 Summary of annual benefit estimates to implement BCR ($m, 2022)

	Avoided cost of defects	Time savings from national consistency	Total benefits
NSW	267	111	378
VIC	385	119	504
QLD	136	76	212
SA	47	17	64
WA	161	39	200
TAS	4	6	9
NT	5	3	8
ACT	16	5	21
Total	**1 021**	**375**	**1 395**

Source: CIE.

The present (2020 financial year) values of the benefits discussed in this chapter over the 10-year regulatory period starting from 2022 are set out for each state and territory in table 6.10.

6.10 Summary of benefits over 10 years

2020 present values	Avoided costs of defects ($m)	Time savings from national consistency ($m)	Total benefits ($m)
NSW	1 732	729	2 461
VIC	2 434	763	3 197
QLD	891	495	1 386
SA	299	111	410
WA	1 054	255	1 309
TAS	24	35	59
NT	35	20	55
ACT	101	31	132
Total	**6 570**	**2 439**	**9 009**

Source: CIE.

7 Cost-benefit analysis

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

Benefits and costs are considered over a period of 10 years from 2022 and 2031.We assume the BCR recommendations will be implemented in 2022 and start having impact from that year. The initial setup costs are assumed to incur in 2022 as well. A discount rate of 7 per cent is used to calculate the present value in 2020.

Central case

Table 7.1 summarises the CBA results for the central case.

7.1 Central case cost-benefit analysis results

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Benefits									
Avoided costs of defects	1 732	2 434	891	299	1 054	24	35	101	6 570
Time savings from national consistency	729	763	495	111	255	35	20	31	2 439
Total benefits	**2 461**	**3 197**	**1 386**	**410**	**1 309**	**59**	**55**	**132**	**9 009**
Costs									
Administration	9	9	9	9	9	4	4	4	55
Registration	42	11	5	4	9	5	4	1	81
Training	119	114	69	22	57	8	6	8	402
Independent review	125	268	132	41	81	1	7	21	676
Mandatory inspection	166	72	131	101	242	3	2	26	742
Building database	6	13	5	7	8	6	3	1	50
Dictionary of terminology	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.1
Building manual	34	36	18	6	11	2	1	3	110
Documentation	40	45	26	6	16	2	1	3	138
Construction	653	915	336	112	397	9	13	38	2 474
Total costs	**1 194**	**1 482**	**730**	**307**	**829**	**40**	**42**	**105**	**4 729**
Net benefit	**1 267**	**1 715**	**656**	**103**	**480**	**19**	**13**	**27**	**4 281**
Benefit-cost ratio	**2.06**	**2.16**	**1.90**	**1.34**	**1.58**	**1.47**	**1.31**	**1.26**	**1.91**

Note: All values are present value over 2022 to 2031 with a discount of 7 per cent

Source: CIE.

The present value of total benefits is $9.0 billion over a period of 10 years, while total costs is $4.7 billion, leading to net benefit of $4.3 billion. The benefit-cost ratio is 1.9.

All jurisdictions will benefit from implementing the BCR recommendations. Victoria and NSW have the highest net benefit while the net benefits in Northern Territory, ACT and Tasmania are fairly small. The magnitude of net benefits depends on the size of the building industry as well as the level of reforms already occurring at the baseline.

Sensitivity analysis

There is significant uncertainty around our results. The appropriate method to illustrate the impact of this uncertainty is sensitivity analysis. Based on insights received during our research and consultations, we create 8 sensitivity analysis scenarios (table 7.2). The first 6 are testing the assumptions for one element while the last two combine the assumption for individual element to form 'upper' and 'lower' bound estimates for the net benefit.

7.2 Sensitivity analysis scenarios

Sensitivity analysis scenario	Specific assumption
More defects are picked up in design phase	Additional construction costs required by the BCR is much lower in this scenario, due to two factors: ▪ Consistent with research from Singapore, we assume 60 per cent defects are created in the design phase of buildings (vs 25 per cent in the central case). ▪ Further, we assume these defects are essentially costless to fix during the design stage
Less progress in the baseline	Where states and territories self-report progress on BCR measures as 'partially implemented', we assume this corresponds to 25 per cent progress rather than 50 per cent
Lower fees for training	Set fees for training at 50 per cent of central case scenario, to capture scenario where 50 per cent of this training is informal home learning where no fees are paid
Low-case scenario for BCR impact	We assume BCR only reduces the prevalence of defects by 10 per cent – consistent with lowest estimate of its impact from stakeholders
High scenario for size of problem	Assume the size of the problem in Classes 3 to 9 buildings is consistent with our high case scenario
Low scenario for size of problem	Assume the size of the problem in Classes 3 to 9 buildings is consistent with our low case scenario
'Upper bound' net benefits	We combine some of the assumptions from above: more defects occur in the design phase, less progress in the baseline, lower training fees, and the high case scenario for the size of the problem in Classes 3 to 9 buildings
'Lower bound' net benefits	We combine some of the assumptions from above: the BCR only fixes 10 per cent of defects and the low case scenario for the size of the problem in Classes 3 to 9 buildings

Source: CIE.

These scenarios have the expected impact on results. For example, assuming the BCR only reduces the prevalence of defects by 10 per cent substantially reduces the net benefits of the BCR, and small net costs may result in some states and territories (table 7.3).

7.3 Sensitivity analysis results

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Net benefit ($m)									
Central case	**1 267**	**1 715**	**656**	**103**	**480**	**19**	**13**	**27**	**4 281**
More defects (60 percent) are picked up in design phase	1 572	2 142	813	156	665	23	19	45	5 435
Less progress in baseline	1 365	1 715	802	114	489	22	16	40	4 562
Lower fees for training	1 297	1 743	673	109	494	21	15	29	4 381
Low-case scenario for BCR impact	380	465	200	- 50	- 60	7	- 5	- 25	912
High case for size of problem	1 362	1 826	684	120	514	21	15	34	4 575
Low case for size of problem	1 173	1 604	628	87	446	17	11	20	3 986
Upper bound of net benefits	1 859	2 312	1 063	196	735	32	28	74	6 299
Lower bound of net benefits	363	446	195	- 53	- 66	6	- 5	- 26	861
Benefit-cost ratio									
Central case	**2.06**	**2.16**	**1.90**	**1.34**	**1.58**	**1.47**	**1.31**	**1.26**	**1.91**
More defects (60 percent) are picked up in design phase	2.77	3.03	2.42	1.61	2.03	1.64	1.53	1.51	2.52
Less progress in baseline	2.09	2.16	1.98	1.36	1.59	1.52	1.37	1.35	1.93
Lower fees for training	2.11	2.20	1.94	1.36	1.61	1.55	1.36	1.28	1.95
Low-case scenario for BCR impact	1.58	1.64	1.44	0.77	0.88	1.20	0.85	0.66	1.34
High case for size of problem	2.09	2.18	1.92	1.38	1.60	1.51	1.35	1.31	1.93
Low case for size of problem	2.03	2.13	1.88	1.29	1.55	1.43	1.26	1.20	1.88
Upper bound of net benefits	3.01	3.18	2.73	1.76	2.14	1.90	1.77	1.80	2.72
Lower bound of net benefits	1.56	1.62	1.43	0.75	0.87	1.19	0.83	0.64	1.32

Note: All values are present value over 2022 to 2031 with a discount of 7 per cent

Source: CIE.

If more defects (60 per cent of total) are picked up in the design phase according to the Singapore study,[93] additional construction cost to rectify these defects during construction phase would be much lower, resulting more than $1.15 billion net benefit higher than the central case.

93 Chong, Wai-Kiong and Sui-Pheng Low 2006, "Latent Building Defects: Causes and Design Strategies to Prevent Them", *Journal of Performance of Construction Facilities*, 20(3), pp.213-221, 215.

Further, if less progress is assumed in the baseline scenario (specifically, where states and territories have reported partial implementation of recommendations, we assume this corresponds to 25 per cent progress instead of 50 per cent as assumed in the central case), this adds around $280 million to net benefits than the central case, as there is more scope for the BCR to create benefits.

There is significant uncertainty as to the size of the problem in commercial buildings that the BCR would solve. Assuming a larger (smaller) problem to begin with adds (reduces) to net benefits created by the BCR.

Combining assumptions, 'upper bound' estimate for the net benefits created by the BCR is $6 299 million, while our 'lower bound' estimate for the net benefits created by the BCR is $861 million.

Although there are significant changes in net benefits and benefit-cost ratio, the sensitivity analysis suggests that implementing the BCR recommendations would generate net benefit at the national level under all cases considered.

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A Building classification

A.1 Building classification in the Building Code of Australia

Class	Sub-class	Description
Class 1	Class 1a	A single dwelling being a detached house, or one of a group of two or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit. It is not located above or below another dwelling or another Class of building other than a private garage.
	Class 1b	A boarding house, guest house, hostel or the like with a total area of all floors not exceeding 300m2, 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.
Class 2		A building containing 2 or more sole-occupancy units each being a separate dwelling.
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 persons. Example: boarding-house, hostel, backpackers accommodation or residential part of a hotel, motel, school or detention centre.
Class 4		A dwelling in a building that is Class 5, 6, 7, 8 or 9 if it is the only dwelling in the building.
Class 5		An office building used for professional or commercial purposes, excluding buildings of Class 6, 7, 8 or 9.
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, showroom or service station.
Class 7	Class 7a	A building which is a car park.
	Class 7b	A building which is for storage or display of goods or produce for sale by wholesale.
Class 8		A laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale or gain.
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.
	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.
	Class 9c	An aged care building.
Class 10		A non-habitable building or structure.
	Class 10a	A private garage, carport, shed or the like.
	Class 10b	A structure being a fence, mast, antenna, retaining or free standing wall, swimming pool or the like.
	Class 10c	A private bushfire shelter.

Source: https://www.qbcc.qld.gov.au/sites/default/files/BCA%20Classes%20of%20Building.pdf

A.2 Building classification/grouping by BCR and this report

NCC	BCR	This report
Class 1	Domestic building	Residential use building
Class 2	Commercial building	Residential use building
Classes 3 to 9	Commercial building	Other commercial use building
Class 10	Domestic building	Residential use building

Source: BCR and CIE.

B Further details of survey of owners of Classes 1 and 2 buildings

The survey

Our survey of owners of Class 1 buildings (detached houses and townhouses) and Class 2 buildings (apartments) was undertaken for the Australian Building Codes Board (ABCB) for the purpose of informing cost benefit analysis (CBA) of the recommendations that make up the Building Confidence Report (BCR).[94] CBA is a systematic approach to weighing up the costs and benefits of a policy option.

Key steps in the CBA of the BCR recommendations include estimating the 'size of the problem' that these recommendations might solve. This 'problem' is the costs created by defects that arise during steps that contribute to the initial build of new buildings (design, engineering and building). It has 2 key components, which our survey provided data and evidence on:

- The rate of defects in new builds (defects per new build)
- The costs these defects create

Limitations of existing studies

In the literature there are existing studies on defects in buildings and their cost, including studies that use surveys of residential dwellings owners. However, these studies have limitations which means it is necessary for us to undertake our own survey. For example, one of these studies notes that its results cannot be extrapolated to the entire population.[95]

The most important limitation of existing studies is that they rarely (or do not) present data on the rate of defects in new dwellings (the number of defects per new dwelling). Instead they tend to focus on the percentage of dwellings with defects. While this limitation can be overcome by calculating an average 'cost per dwelling', which tallies up all defects in a dwelling and their cost, this is likely to be less accurate, because available information on defect costs tends to presented on a per defect basis (for example: a structural defects costs $X, while a water ingress defect costs $Y).

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94 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.

95 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

B.1 Studies that report the percentage of dwellings with a defect

Sutdy	Share of buildings with a defect	Source
UNSW 2009	63%	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
UNSW 2012	72%	Easthope H., Randolph B. and Judd S. 2012, *Governing the Compact City: The role and effectiveness of strata management Final report,* City Futures Research Centre, UNSW, May 2012,
Mozo 2019	100%	Mozo et al see: https://mozo.com.au/home-loans/articles/property-pain-building-defects-report-2019 (accessed March 2020)

Source: CIE.

One study presents data on the share of defect audit reports that report a defect.[96] As defect audit reports are prepared where a defect is suspected, these data are unlikely to provide a reliable estimate of the share of all buildings that contain a defect.

The second important limitation of these studies is that generally, they do not identify the cause of defects. This means, within defects, we cannot isolate defects that would potentially be avoided or reduced with the BCR (we define these to be defects that arise during steps that contribute to the initial build).

An issue within studies in this field (and other similar fields) is 'selection bias' where the share of *respondents* who have a defect is higher than the share of the *population* who have a defect, because the topic of the survey is advertised in advance, and people who have experienced these issues feel more motivated to respond. Most studies in the literature do not provide enough details on the nature of the advertising they use to attract survey respondents for us to confirm this issue has been minimised.

Finally, one study only provided a summary, and not a full report, which means it is difficult for us to dig into its data.[97]

The literature does present data on costs of defects, which we have noted in Chapter 2.

Our survey to address these issues

Noting these limitations of existing studies, the CIE conducted an online survey of owners of residential properties (Classes 1 and 2 buildings) across Australia in April and May, via the Pureprofile online panel. Respondents were compensated for their time through Pureprofile's reward system. A specific advantage of the Pureprofile panel is that respondents are not told about the nature of the survey in advance of their participation,

96 Johnston N. and S. Reid 2019, *An examination of building defects in residential multi-owned properties*, available at https://www.griffith.edu.au/__data/assets/pdf_file/0030/831279/Examining-Building-Defects-Research-Report.pdf

97 Mozo et al see: https://mozo.com.au/home-loans/articles/property-pain-building-defects-report-2019 (accessed March 2020)

which means the selection bias issue, which is explained above, is minimised in our study.

This online survey returned insufficient responses from the Northern Territory. Therefore, the CIE also commissioned Woolcott Research to undertake a phone survey of owners of dwellings there in May. The questions in both cases were the same.

Our survey questions are noted in the following Appendix. We asked 4 types of questions:

- Questions about the dwelling itself (its location, its structure, its age, whether the owner has owned it since it was built, etc.). These questions allow us to, for example, undertake detached analysis of detached houses (Class 1a), townhouses (Class 1a) and apartments (Class 2), and refine our estimates.
- Whether the dwelling has had a defect in one of 13 locations (plus an 'other category)? This allows us to measure and analyse cases where dwellings have multiple defects, and allow us to look at how defects in different locations contribute to the problem.
- For each reported defect, questions on the nature of defect. These include a question on the cause of the defect (see results and discussion below).
- For each reported defect, various questions on the type of costs incurred and the amount of these costs. These questions allow us to distinguish between and measure rectification, time and other costs (see results and discussion below)

Survey samples

Including responses from our online survey and NT phone survey, our survey of owners of residential dwellings received 1 606 complete responses (referring to 1 606 dwellings) with 2 574 defects reported across these dwellings. After removal of outliers,[98] and respondents who reported flammable cladding defects in apartments, we are left with information on 1 605 dwellings, which contain 2 566 defects.

We analyse detached houses, townhouses and apartments separately. In each case, responses from the larger states (NSW, Victoria and Queensland) are underweighted relative to the Census, which we adjust for in our calculations. It is important to use Census data to re-weight our results, as this ensures that subtle differences across states and territories (in terms the problem we are analysing) are included in our analysis.

B.2 Survey responses vs Census for Class 1: Detached houses

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Survey responses	174	186	195	200	204	98	110	64	1 231
Share of responses	14%	15%	16%	16%	17%	8%	9%	5%	100%
Census weights	28%	26%	21%	8%	12%	3%	1%	2%	100%

Source: CIE.

98 From the total responses, we have elected to remove 4 'outlier' defects, where the reported costs appear to be implausible.

B.3 Survey responses vs Census for Class 1: Townhouses

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Survey responses	32	38	29	37	28	6	1	22	193
Share of responses	17%	20%	15%	19%	15%	3%	1%	11%	100%
Census weights	29%	28%	17%	9%	12%	1%	1%	2%	100%

Source: CIE.

B.4 Survey responses vs Census for Class 2: Apartments

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Survey responses	54	34	33	15	20	0	9	16	181
Share of responses	30%	19%	18%	8%	11%	0%	5%	9%	100%
Census weights	46%	23%	18%	4%	5%	1%	1%	2%	100%

Source: CIE.

Within these 1605 responses, we received 530 from individuals who have owned their dwelling since it was built.

B.5 Responses by ownership type

	Responses
Have owned dwelling since it was built	530
Have not owned dwelling since it was built	1 075
Total	**1 605**

Source: CIE.

Builder caused defects

As noted, the 1 605 respondents reported 2 566 defects.

We define defects that arise during steps that contribute to the initial build (design and architecture, engineering and construction), as defects which are potentially avoided if the BCR is implemented. For each reported defect, survey respondents provide an assessment, via a scale, of the underlying cause of the defect. We apply weightings to estimate the effective number of defects that arise in steps that contribute to the initial build (table B.6).

B.6 Responses about the causes of defects and assumed weightings

Response	Assumed weighting
Entirely due to the initial build	100%
Mostly due to the initial build	75%
Partly due to the initial build, partly due to damage, maintenance or the way it was altered	50%
Mostly due to damage, maintenance or the way it was altered	25%
Entirely due to damage, maintenance or the way it was altered	0%
Unsure	0%

Source: CIE.

With these weightings, it is estimated there are 1 353 defects that arose during steps that contribute to the initial build across all 1 605 survey responses (table B.7).

B.7 Defects by cause and dwellings

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Total
Total defects	1 969	300	297	2 566
Cause: initial build	1 024	176	153	1 353
Cause: maintenance & other	946	124	144	1 214
Total dwellings	**1 231**	**193**	**181**	**1 605**

Source: CIE.

Defects by location

These 1 356 builder caused defects are spread across locations in the dwellings, as shown in table B.8. These data are used to calculate the average cost of defects in each type of dwelling, see discussion below.

B.8 Builder caused defects by location in dwellings

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Total
Structural	147	24	18	189
Plumbing and drainage	178	23	27	228
Roof and rainwater disposal	164	23	21	207
Other	28	7	3	37
Waterproofing/weatherproofing	106	28	30	164
Natural light & ventilation	89	15	10	114
Building fabric and cladding	69	12	4	85
Swimming pools, gyms, playgrounds	18	4	7	29
Electrical, lighting and data	91	14	6	111
Safety	49	9	8	65

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Total
Entry/exit from building	56	9	6	71
Fire protection	15	4	7	26
Lift/elevator, gas supply, garbage chute	7	1	8	16
Flammable cladding	8	4	0	12
Total	**1 024**	**176**	**153**	**1 353**

Source: CIE.

Prevalence of defects

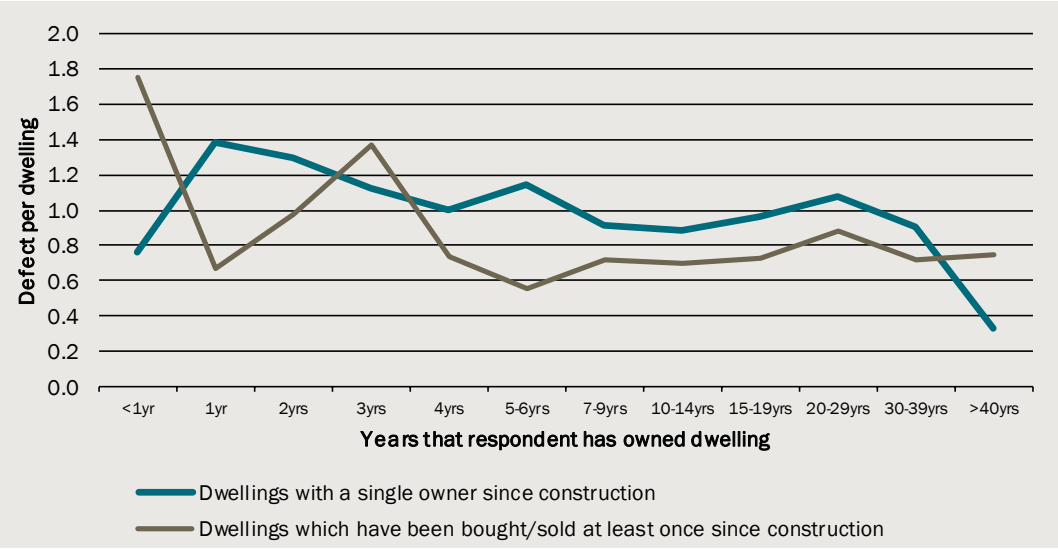
Issues that arise from the survey results

Two issues, the length that a respondent owns a dwelling and the age of a dwelling, have to be taken into consideration when estimating the prevalence of defects (the number of defects per newly built dwelling). Below discussion details our approach to tackle these issues.

Higher reported defect rates for respondents who have owned their dwelling since it was built

Survey respondents who have owned their dwelling since it was built report a higher rate for defects that arise during steps that contribute to the initial build than other respondents (chart B.9).

B.9 Defect rates that arise during steps that contribute to the initial build, by ownership type



Data source: CIE.

This difference is confirmed to be statistically significant, as follows.

Amongst the 1 353 defects which are reported as arising during steps that contribute to the initial build, 527 are reported by dwelling owners who have owned their dwelling since it was built. These 528 defects are reported in 530 dwellings, implying a defect rate (initial build defects per dwelling) of around 1.0 (see table B.10 and table B.11)

The remaining 826 defects, reported by owners who have not owned their dwelling since it was built, were reported in 1 075 dwellings, implying a defect rate of around 0.8.

A standard t-test is used to demonstrate the difference between these reported rates is statistically significant, table B.12.

B.10 Defects that arise in steps that contribute to the initial build, by ownership type

	1-owner	Other	Total
	"I have owned the dwelling since it was built"	*"I have not owned the dwelling since it was built"*	
Total	526	827	1 356

Note: excludes outliers

Source: CIE.

B.11 Dwelling ownership type

	1-owner	Other	Total
Total	530	1 075	1 605

Note: excludes outliers

Source: CIE.

B.12 Student's t-test for difference between two means

	Dwellings owned by 1 owner	Other dwellings
Defects caused by initial build, per dwelling		
Mean	1.00	0.77
Standard deviation	1.22	1.19
Observations	530	1 075
T-test for difference between two means		
Null-hypothesis: there is no difference in the reported rate of defects that arise in steps that contribute to the initial build in dwellings with one owner vs other dwellings		
Alterative: there is a significant difference in these reported rates		
Test statistic	3.50	
T-critical: two-sided:	1.96	
Conclusion: as the test statistic is above the critical value, there is sufficient evidence to reject the null hypothesis and conclude there is a significant difference in the rate of reported defects. As discussed, this has implications for how we estimate the defect rate for new builds.		

Source: CIE.

A plausible explanation for owners who have *not* owned their dwelling since it was built reporting a lower defect rate is that there may have been defects they are simply not aware of. In particular, it is plausible some of these defects were resolved before they took

ownership of the dwelling. Therefore, to estimate the prevalence or rate of defects that arise during steps that contribute to the initial build, we use only use data from respondents who have owned their dwelling since it was built. While this reduces the size of the sample we use, it results in a more accurate estimate of the rate of defects that arise during steps that contribute to the initial build of new dwellings. Using all available data would likely underestimate this rate.

At least a year to discover defects

Within survey respondents who have owned their building since it was built, most respondents who own a dwelling that is less than 1 year old report a much lower defect rate than owners of dwellings that are 1 year or 2 years old. This is true for both detached houses and apartments. We only have one response for townhouses[99] (chart B.13). A plausible explanation of this is that in dwellings that are less than a year old, some defects have not yet become apparent. Therefore, these samples are excluded from the calculation. Again, the purpose of removing these samples is to make our estimate of the rate of defects that arise during steps that contribute to the initial build as accurate as possible.

B.13 Defect rates caused by initial build, attached versus detached dwellings

Note: Data are from respondents who have owned their dwelling since it was built.

Data source: CIE.

Prevalence estimates

For all defect types, Australia-wide, amongst respondents who have owned their dwelling for its entire life, excluding respondents who own dwellings that are less than a year old, the average number of reported defects that arise during steps that contribute to the initial

99 For Townhouses there was one respondent who owned a dwelling that was less than a year old, who reported 4 defects.

build is 0.95 per dwelling for detached dwellings 1.03 per dwelling for townhouses. This rate is 1.55 per dwelling for apartments, excluding flammable cladding defects.

We use published data from state based audits of flammable cladding on Class 2 buildings and other buildings (Victoria, NSW, SA, WA plus preliminary notes from QLD) to estimate the share of apartments built annually that may have non-compliant flammable cladding. This share is 13 per cent in Victoria, and is lower in other states and territories, see following table. The key assumptions in this analysis are:

- Only buildings where rectification work is required, or buildings with flammable cladding assessed as 'extreme' or 'high' fire risk, are assumed to be potentially non-compliant. This is consistent with outcomes from the SA Audit. It is also consistent with Victorian Cladding taskforce reports (data in interim report implies that around 44 per cent of buildings with flammable cladding are not compliant; the updated report notes 481 buildings with flammable cladding, of 1 069, that have cladding that is classed as high or extreme).[100] In NSW, we estimate the number of buildings that may have non-compliant cladding as buildings that require rectification work plus half of those yet to be ruled out.
- Where states report data on 'private buildings' with flammable cladding – we assume 80 per cent of these are apartment buildings. In NSW, which reports data on Class 2/3 buildings with flammable cladding, we assume 90 per cent of these are apartment buildings.
- We assume all buildings that may have non-compliant cladding were constructed between 1997-2017, reflecting the scope of the Victorian Cladding Audit. Total apartment buildings constructed over this time equals the number of apartment approvals, divided by the average number of apartments per building reported by respondents to our survey (66 apartments per building).
- We use an unpublished estimate provided by NT government to estimate the number of buildings that may have non-compliant cladding.

B.14 Share of apartments that may have non-compliant flammable cladding

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
Apartment buildings that may have non-compliant, flammable cladding	163	385	144	22	42	0	7	29
Estimated number of apartment buildings built between 1997-2017	4701	2937	2147	196	538	6	124	402
Possible non-compliant buildings, share of total (also: possible non-compliant apartments, share of total)	3%	13%	7%	11%	8%	7%	6%	7%

Source: CIE.

100 Victorian Cladding Taskforce 2017, *Interim Report,* pg 13, see: https://www.planning.vic.gov.au/__data/assets/pdf_file/0016/90412/Victorian-Cladding-Taskforce-Interim-Report-November-2017.pdf, Victorian Cladding Taskforce 2019, *Report from Co-Chairs,* , see: https://www.planning.vic.gov.au/__data/assets/pdf_file/0019/426034/DELWP0124_Victorian_Cladding_Taskforce_Final_Report_July_2019_v9.pdf, accessed August 2020

For apartments, summing the prevalence rate for defects (excluding flammable cladding) plus the defect rate for flammable cladding, and then calculating the national average parameter using Census weights, yields 1.62 defects per apartment.

To estimate the size of the problem the BCR could fix, we use these national level parameters to estimate the number of defects contained in new dwellings, except for apartments where we make an adjustment to the size of the problem in each state to reflect different potential prevalence of flammable cladding defects.

B.15 Rate of defects caused by the initial build across states and territories (excludes flammable cladding defects)

Defect rate	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total [a]
Defects that arise during steps that contribute to the initial build, per dwelling (average across respondents who have owned in their dwelling since it was built, excluding owners of dwellings that are less than 1-yr old)									
Detached (all defects)	1.00	1.04	0.81	0.98	1.04	0.33	0.37	1.56	0.95
Townhouse (all defects)	0.72	0.90	1.33	1.00	1.48	1.38	-	1.88	1.03
Apartment (ex flammable cladding)	1.69	2.00	0.70	-	1.50	-	-	1.06	1.55
Apartment (flammable cladding)	0.03	0.13	0.07	-	0.08	-	-	0.07	
Apartment (all defects)	1.72	2.13	0.77	-	1.58	-	-	1.13	1.62
Census weights									
Detached	28%	26%	21%	8%	12%	3%	1%	2%	100%
Townhouse	30%	28%	17%	9%	12%	1%	-	2%	100%
Apartment	49%	24%	19%	-	6%	-	-	2%	100%

[a] Census weighted, national average; note states with no or very low respondents in the relevant dwelling type are excluded from the weighting calculation, with adjustments to weights.

Source: The CIE; Census

The mostly common defects are related plumbing and drainage, roof and rainwater disposal, structural and waterproofing and weatherproofing (table B.16).

B.16 Defects per 100 dwellings (

	Class 1: Detached houses	Class 1a: Townhouses	Class 2: Apartments
Waterproofing/weatherproofing	10	16	30
Plumbing and drainage	17	13	26
Roof and rainwater disposal	15	13	21
Structural	14	14	19
Natural light & ventilation	8	9	9
Flammable cladding	1	2	8

	Class 1: Detached houses	Class 1a: Townhouses	Class 2: Apartments
Safety	5	5	8
Lift/elevator, gas supply, garbage chute	1	1	7
Swimming pools, gyms, playgrounds	2	2	7
Electrical, lighting and data	8	8	6
Fire protection	1	2	6
Entry/exit from building	5	5	6
Building fabric and cladding	6	7	4
Other	3	4	3
Total	**95**	**103**	**162**

Source: CIE.

Cost of defects

Types of costs

Discussion in the literature and media implies that is necessary to consider at least 3 kinds of costs created by defects: the rectification costs, time costs and other costs, defined in table B.17. Our survey allows us to separately estimate these costs, for the 3 relevant dwelling types. Costs are estimated on a per dwelling basis. Responses without answering any cost questions are excluded from the estimation.

B.17 Components of the cost of defects

Component	Definition/explanation
Rectification cost	Rectification and repair costs, 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 that the owners could be used to do other things that are valuable to them. This is based on respondents self-estimated time spent dealing with the issue
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.

Issues in estimating rectification costs

Survey respondents provide estimates of their personal cost for rectification and for the total cost (to all parties) for rectification. Because of the different nature of detached houses and of townhouses and apartments, we use these survey results slightly differently.

For detached houses, we use survey respondents reported 'total costs' (see table B.18, below). As defects in detached dwellings are likely to only affect one dwelling, these total costs are likely to be costs to all parties for the relevant defect, on a per dwelling basis. Amongst responses for detached dwellings who provide a personal cost and total cost, the ratio of total cost to personal cost is 1.1.

For townhouses and apartments, The CIE judges there is a confusion for respondents who may report 'total cost (to all parties)', including costs to other unit owners in the building. In other words, these respondents report 'total cost' as the rectification cost for the whole building rather than just the cost that is apportioned to their own units. This judgement is based on carefully examining the reported costs and the nature of the defect for a significant number of individual responses. Due to this confusion, the 'total cost' answers cannot be directly used for attached dwellings. Instead, for townhouses and apartments, we use reported personal costs, multiplied by the ratio between total costs and personal costs for detached houses (see tables B.19 and B.20, below).

Survey results we use to estimate rectification costs

A sub-set of respondents provide data on the cost to rectify defects (from 2 566 defects, 1 820 respondents provide at least some form of cost estimate (either a personal cost or a total cost). While it is important to estimate costs at the state and territory level, and then use Census weights to calculate a national average for costs, our ability to do state and territory level analysis is limited by the amount of data available. Therefore, we follow a 3-step strategy that allows us to bring as much data to bear as possible.

For detached houses, townhouses and apartments, we estimate the weighted average rectification cost for defects to be: $3 440, $2 842 and $9 349. These estimates are derived with 3 key steps:

- At the national level, we estimate the cost of defects by location (tables B.18-B.20). Therefore, we allow for the fact that different types of defects cost different amounts to fix, utilising as many responses as possible. We do not have enough data for this type of analysis at the state and territory level.
- At the state level, we calculate defect by location as a share of total defects (tables B.21-B.23). These shares are derived from all responses (whether or not a cost estimate was provided).
- From these two databases, we calculate the weighted average cost to repair defects in each state and territory, for each type of dwelling. Then we use Census weights to calculate the weighted average repair cost for each type of dwelling at the national level, see table B.24.

B.18 Survey results used to calculate costs for Class 1: Detached houses

Defect location	Responses that provide a total rectification cost	Responses where cost is $0, but issued is unresolved	Responses used	Sum of reported cost	Average cost for type of defect
	Number	Number	Number	$	$
Plumbing and drainage	116	0	116	366214	3150
Roof and rainwater disposal	108	3	105	295770	2810
Structural	81	9	72	409627	5709
Waterproofing/weatherproofing	70	1	69	255832	3721
Electrical, lighting and data	64	1	63	64894	1034
Natural light & ventilation	59	2	57	218836	3856
Building fabric and cladding	38	3	35	104309	3002
Entry/exit from building	35	0	35	19232	549
Safety	36	1	35	59976	1738
Other	19	1	18	263894	14867
Swimming pools, gyms, playgrounds	14	0	14	69590	5155
Fire protection	9	0	9	10125	1157
Flammable cladding	5	0	5	17946	3418
Lift/elevator, gas supply, garbage chute	4	0	4	4500	1200

Note: we exclude responses where a $0 cost is provided, but where the issue is unresolved, because costs may not yet be apparent.

Source: CIE.

B.19 Survey results used to calculate costs for Class 1: Townhouses

	Responses that provide a personal rectification cost	Responses where cost is $0, but issued is unresolved	Responses used	Sum reported cost[a]	Average cost for type of defect
	Number	Number	Number	$	$
Plumbing and drainage	11	0	11	43692	3884
Roof and rainwater disposal	8	0	8	44028	5681
Structural	12	1	11	68076	6483
Waterproofing/weatherproofing	12	1	11	19823	1802
Electrical, lighting and data	7	0	7	2972	425
Natural light & ventilation	6	1	5	2105	401
Building fabric and cladding	6	0	6	13704	2284
Entry/exit from building	4	0	4	2504	668
Safety	4	0	4	5622	1323
Other	1	0	1	242	242
Swimming pools, gyms, playgrounds	2	0	2	3742	2495
Fire protection	1	0	1	24	48

	Responses that provide a personal rectification cost	Responses where cost is $0, but issued is unresolved	Responses used	Sum reported cost[a]	Average cost for type of defect
	Number	Number	Number	$	$
Flammable cladding	3	0	3	5685	2274
Lift/elevator, gas supply, garbage chute	0	0	0	0	869 [b]

Note: we exclude responses where a $0 cost is provided, but where the issue is unresolved, because costs may not yet be apparent.

[a] Multiplied by 1.1, to reflect ratio between total costs and personal costs for detached houses

[b] No responses, so cost estimated from Apartments, including downward adjustment to reflect lower costs in Apartments

Source: CIE.

B.20 Survey results used to calculate costs for Class 2: Apartments

	Responses that provide a personal rectification cost	Responses where cost is $0, but issued is unresolved	Responses used	Sum reported cost [a]	Average cost for type of defect
	Number	Number	Number	$	$
Plumbing and drainage	13	0	13	93817	7505
Roof and rainwater disposal	8	0	8	91660	12221
Structural	8	0	8	67125	8391
Waterproofing/weatherproofing	15	0	15	289811	19648
Electrical, lighting and data	2	0	2	1018	509
Natural light & ventilation	4	0	4	2631	752
Building fabric and cladding	2	0	2	4224	2414
Entry/exit from building	3	0	3	2163	665
Safety	3	0	3	751	250
Other	0	0	0	0	574 [b]
Swimming pools, gyms, playgrounds	0	0	0	0	5915 [b]
Fire protection	5	0	5	9773	2172
Flammable cladding	0	0	0	0	34375 [c]
Lift/elevator, gas supply, garbage chute	2	0	2	4122	2061

Note: we exclude responses where a $0 cost is provided, but where the issue is unresolved, because costs may not yet be apparent.

[a] Multiplied by 1.1, to reflect ratio between total costs and personal costs for detached houses

[b] No responses, so cost estimated from Townhouses, including upward adjustment to reflect higher costs in Apartments

[b] Estimated from various sources, see Chapter 2

Source: CIE.

B.21 Class 1: Detached houses: defects by location, as a share of total defects

	NSW	VIC	QLD	SA	WA	TAS	ACT	NT
Plumbing and drainage	18%	18%	23%	18%	15%	17%	13%	13%
Roof and rainwater disposal	17%	14%	16%	19%	15%	12%	18%	19%
Structural	13%	18%	11%	17%	18%	9%	10%	10%
Waterproofing/weatherproofing	13%	12%	9%	5%	13%	11%	10%	4%
Electrical, lighting and data	6%	8%	9%	11%	7%	13%	12%	10%
Natural light & ventilation	12%	8%	5%	8%	7%	16%	11%	4%
Building fabric and cladding	4%	8%	7%	8%	9%	4%	6%	4%
Entry/exit from building	6%	4%	5%	5%	6%	6%	8%	6%
Safety	5%	5%	7%	2%	3%	9%	6%	6%
Other	1%	1%	2%	3%	5%	0%	3%	14%
Swimming pools, gyms, playgrounds	2%	1%	4%	1%	2%	0%	0%	5%
Fire protection	2%	1%	0%	2%	1%	1%	2%	3%
Flammable cladding	2%	1%	1%	0%	0%	2%	0%	0%
Lift/elevator, gas supply, garbage chute	1%	0%	1%	1%	1%	1%	1%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: CIE.

B.22 Class 1: Townhouses: defects by location, as a share of total defects

	NSW	VIC	QLD	SA	WA	TAS	ACT	NT [a]
Plumbing and drainage	17%	14%	14%	15%	5%	0%	12%	-
Roof and rainwater disposal	18%	6%	15%	17%	16%	0%	7%	-
Structural	7%	14%	10%	18%	16%	53%	11%	-
Waterproofing/weatherproofing	14%	23%	19%	23%	8%	27%	8%	-
Electrical, lighting and data	4%	3%	5%	15%	12%	0%	9%	-
Natural light & ventilation	3%	6%	6%	3%	25%	0%	10%	-
Building fabric and cladding	8%	6%	8%	6%	2%	0%	12%	-
Entry/exit from building	2%	10%	7%	3%	7%	0%	4%	-
Safety	6%	6%	2%	0%	1%	20%	13%	-
Other	7%	8%	0%	0%	0%	0%	7%	-
Swimming pools, gyms, playgrounds	2%	2%	8%	0%	0%	0%	4%	-
Fire protection	5%	0%	4%	2%	4%	0%	0%	-
Flammable cladding	5%	3%	0%	0%	4%	0%	2%	-
Lift/elevator, gas supply, garbage chute	2%	0%	0%	0%	0%	0%	2%	-
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**-**

[a] NT excluded from the analysis due to a low number of defects across locations

Source: CIE.

B.23 Class 2: Apartments: defects by location, as a share of total defects

	NSW	VIC	QLD	SA	WA	TAS	ACT	NT [a]
Plumbing and drainage	14%	17%	22%	-	14%	-	18%	-
Roof and rainwater disposal	12%	6%	24%	-	12%	-	16%	-
Structural	13%	11%	2%	-	21%	-	7%	-
Waterproofing/weatherproofing	18%	16%	17%	-	24%	-	22%	-
Electrical, lighting and data	2%	8%	5%	-	0%	-	7%	-
Natural light & ventilation	7%	6%	6%	-	7%	-	0%	-
Building fabric and cladding	4%	0%	2%	-	0%	-	11%	-
Entry/exit from building	4%	8%	0%	-	2%	-	0%	-
Safety	7%	3%	5%	-	2%	-	7%	-
Other	0%	3%	4%	-	4%	-	0%	-
Swimming pools, gyms, playgrounds	3%	7%	4%	-	3%	-	5%	-
Fire protection	6%	5%	0%	-	4%	-	0%	-
Flammable cladding	2%	6%	9%	-	5%	-	6%	-
Lift/elevator, gas supply, garbage chute	8%	6%	1%	-	2%	-	0%	-
Total	**100%**	**100%**	**100%**	**-**	**100%**	**-**	**100%**	**-**

[a] SA, Tas and NT excluded from due to a low number of defects across locations

Source: CIE

B.24 Weighted average cost of defects

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments
NSW	3 298	2 893	8 424
VIC	3 480	2 622	8 903
QLD	3 373	2 960	11 539
SA	3 434	3 307	
WA	3 893	2 664	11 158
TAS	2 934	4 203	
ACT	3 268	2 471	11 006
NT	4 637	-	
Census weighted average	**3 440**	**2 842**	**9 349**

Source: CIE.

Time costs

Respondents provide an estimate of the amount of time they spend on getting a defect rectified. To calculate average time costs, we use the same sub-set of responses from which rectification costs are derived (1 820 responses who provided either a total rectification cost or a personal rectification cost).

On average respondents who owned detached houses, townhouses and apartments, spent 36 hours, 15 hours and 46 hours respectively getting defects rectified. We are unsure why respondents provided such varying times across dwelling types. Valuing this time at a

rate of $19.55 per hour, which is half of the average hourly earnings for all employees in Australia, and also aligns with the minimum wage (another metric which can be used to value time costs in cross-population studies), it is estimated the time cost is $701 per defect on average for detached dwellings, $299 per defect for townhouses houses and $904 per defect for apartment (table B.25).

B.25 Time costs for defects

	Unit	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments
Time	Hours	36	15	46
Hourly rate	$/hour	19.55	19.55	19.55
Cost per defect	$/defect	701	299	904

Source: CIE.

Other costs

Respondents provide an estimate of various other costs they incur (see table B.17 above). To calculate an average rate for these other costs, we use the sub-set of responses from which rectification costs are derived (1 821 responses who provided either a total rectification cost or a personal rectification cost). Where respondents do not provide a cost, we treat this as zero cost.

We estimate the average rate for other costs to be $225 per defect for detached houses, $503 per defect for townhouses and $1 985 per defect for apartments.

Total cost and size of the problem

The key parameters derived from the survey are:

- For each completion of separate houses, townhouses and apartments, we estimate these dwellings contain 0.95, 1.03 and 1.62 defects that arise in steps that contribute to the initial build, respectively.
- Each defect in these dwellings creates total costs of: $4 366, $3 643 and $12 238, respectively. These cost rates are the sum of rectification, other and time costs per defect.

In 2022, for detached houses, townhouses and apartments, we project around 128 000 effective completions, 43 000 effective completions and 65 000 effective completions, respectively. ‘Effective completions’ are our projection of recorded completions (which are new builds of residential dwellings), adjusted upwards to reflect other parts of residential construction industry, including alternation and additions, which also may be subject to defects.

Our estimates for defect rates, defect costs and projected completions imply a total size of the problem of 1 979 million in 2022, see table B.26.

B.26 Annual size of the problem for Classes 1 and 2 buildings in Australia, 2022

	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Total
Annual completions (000)	128	43	65	236
Defects per completion	0.95	1.03	1.62	-
Total defects (000)	123	44	105	
Costs per defect (per dwelling basis)				
Rectification ($)	3 440	2 842	9 349	
Other ($)	225	503	1 985	
Time ($)	701	299	904	
Total cost per defect ($)	4 366	3 643	12 238	
Total costs of defects				
Rectification ($m)	422	125	980	1 527
Other ($m)	28	22	208	258
Time ($m)	86	13	95	194
Total defects ($m)	**536**	**160**	**1 283**	**1 979**

Source: CIE.

Table B.27 illustrates the size of the problem across states and territories.

B.27 Annual size of the problem for Classes 1 and 2 buildings, by state and territory, 2022

	Projected completion (000)			Size of the problem			
	Class 1: Detached houses	Class 1: Townhjosues1a	Class 2: Apartments	Class 1: Detached houses	Class 1: Townhouses	Class 2: Apartments	Total
NSW	34	11	17	143	43	344	530
VIC	41	14	21	171	51	409	630
QLD	27	9	14	114	34	273	421
SA	5	2	3	22	7	53	82
WA	17	5	8	69	21	165	255
TAS	1	0	0	4	1	10	15
NT	1	0	0	3	1	7	11
ACT	2	1	1	10	3	23	36
Total	**128**	**43**	**65**	**536**	**160**	**1 283**	**1 979**

Source: CIE.

Table B.28 illustrates the contribution of defects in different locations to rectification costs, which is the largest component of costs. These shares are a function of the contribution to the defect problem (table B.15 above) and the cost of defects in different locations (tables B.18-B.20 above)

B.28 Contribution to rectification costs, residential dwellings

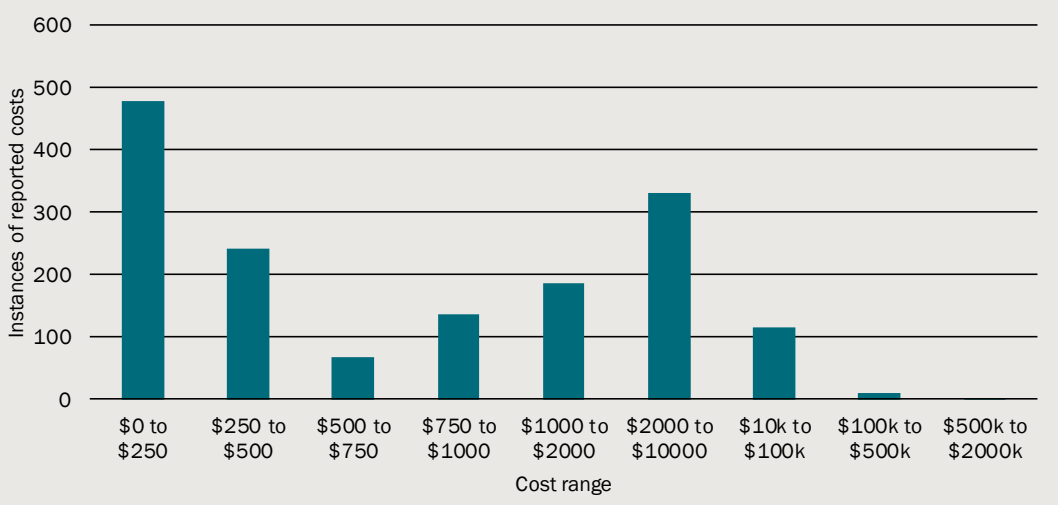
	Class 1: Detached	Class 1: Townhouse	Class 2: Apartment	Total
Waterproofing/weath erproofing	11%	10%	38%	28%
Roof and rainwater disposal	13%	26%	16%	16%
Structural	24%	31%	10%	15%
Plumbing and drainage	16%	18%	13%	14%
Flammable cladding	1%	2%	17%	12%
Other	11%	0%	0%	3%
Natural light & ventilation	10%	1%	0%	3%
Swimming pools, gyms, playgrounds	3%	2%	3%	3%
Building fabric and cladding	6%	5%	1%	2%
Electrical, lighting and data	3%	1%	0%	1%
Safety	2%	2%	0%	1%
Lift/elevator, gas supply, garbage chute	0%	0%	1%	1%
Fire protection	0%	0%	1%	1%
Entry/exit from building	1%	1%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**

Source: CIE.

Skewed cost data

Survey results show that the cost of defects is substantially skewed: there are a large number of defects with a low reported cost and a small number of defects with a very large cost, as shown in chart B.29. This suggests that the BCR could solve a significant share of the problem by avoiding a smaller number of very costly defects.

B.29 Distribution of reported total costs for defects



Note: Defect counts are not weighted by the extent to which they are caused by the initial build.

Data source: CIE.

C Questionnaire for survey of owners of Class 1 and Class 2 dwellings

Welcome…

Thank you for participating in this survey, which is being run by Pureprofile and the Centre for International Economics on behalf of the Australian Building Codes Board.

This survey is about the quality of buildings. Your input is very important and will help to improve buildings constructed in the future.

This questionnaire will take around 15 minutes to complete.

We wish to reassure you that this is genuine market research and, as always, your individual survey responses will remain confidential and anonymous at all times.

In the unlikely event of any technical difficulties please click on the technical support e-mail link.

Please Keep In Mind…

Do not use your Back or Forward browser buttons while you are taking this survey. Once you answer a question, you will not be able to go back and change your answer.

Before we go through to the main study we would like to ask you some questions to make sure we are interviewing a good cross section of people.

1. Do you own one or more residential dwellings in Australia? (This could include your home with a mortgage or an investment property)
    a. Yes
    b. No **TERMINATE**

2. How many residential dwellings do you own in Australia? (including any strata units and dwellings owned with a mortgage)
    a. 0 **TERMINATE**
    b. 1
    c. 2
    d. 3 or more (please specify) _____ **RANGE 3-999**

IF Q2=1

3. What is the postcode of the dwelling you own? **CHECK QUOTAS**

IF Q2>1

4. What is the postcode of the newest (most recently built) dwelling you own? **CHECK QUOTAS**

5. Do you or a member of your household work in the market research industry or for the Australian Building Codes Board?
    a. Yes **TERMINATE**
    b. No

6. Are you…
    a. Male
    b. Female
    c. Non-binary
    d. Prefer not to say

7. What is your age?

    e. Less than 18 years **TERMINATE**

    f. 18-19 years

    g. 20-29 years

    h. 30-39 years

    i. 40-49 years

    j. 50-59 years

    k. 60-69 years

    l. 70-79 years

    m. 80 years or over

TERMINATE PAGE

Thank you for your patience in answering these questions. Unfortunately, we do not need you to participate in our research this time, but we sincerely appreciate your time and assistance today.

This survey is about building defects. We would like to ask you questions about…

if Q2=1 …the dwelling you own

if Q2>1 …the newest (most recently built) dwelling you own

8. Is the dwelling a…
    a. Separate house
    b. Semi-detached, row or terrace house, townhouse etc. with one storey
    c. Semi-detached, row or terrace house, townhouse etc. with two or more storeys
    d. Flat or apartment in a one or two storey block
    e. Flat or apartment in a three storey block
    f. Flat or apartment in a four or more storey block
    g. None of the above **TERMINATE**

If b, c, d, e or f in Q8

9. Approximately how many units are in the building/complex?
   _____ units **RANGE 1-9999**

10. Approximately how many years ago was the dwelling constructed?
    a. Less than one year
    b. 1 year
    c. 2 years
    d. 3 years
    e. 4 years
    f. 5-6 years
    g. 7-9 years
    h. 10-14 years
    i. 15-19 years
    j. 20-29 years
    k. 30-39 years
    l. 40 years or more

11. Were you the owner of the dwelling when it was built?
    a. Yes
    b. No

If (b) in Q11

12. How long have you owned the dwelling?
    a. Less than one year
    b. 1 year
    c. 2 years
    d. 3 years
    e. 4 years
    f. 5-6 years
    g. 7-9 years
    h. 10-14 years
    i. 15-19 years
    j. 20-29 years
    k. 30-39 years
    l. 40 years or more

If (a) in Q11

13. What was your relationship to the builder?
    a. I was an owner-builder
    b. The builder was a friend or family member
    c. The builder had done work for me in the past
    d. I did not know the builder beforehand

If (a) in Q11

14. Did your building surveyor (building certifier) have an existing relationship with the builder?
    a. Yes
    b. No
    c. Don't know

15. Which of the following types of **defects/problems** have been discovered in the building while you have been owner of the dwelling? **MULTIPLE RESPONSE = X, RANDOMISE ORDER EXCEPT 'OTHER'**
    a. Building fabric and cladding, excluding flammable cladding (e.g. cracking plasterboard, deteriorating brickwork/render, defective tiling)
    b. Fire protection (e.g. missing fire barriers, incomplete fire door/seal/signage, emergency lights not working, escape routes blocked)
    c. Waterproofing/weatherproofing (e.g. water leaking in from balcony or wall, water leaking through shower floor)
    d. Roof and rainwater disposal (e.g. loose roof sheeting, inadequate gutters, leaking concrete roof)
    e. Structural (e.g. cracking/movement in structural concrete slab, rusted columns, rotten timber framing)
    f. Plumbing and drainage (e.g. leaking water or sewer pipes, inadequate drainage)
    g. Safety (e.g. incomplete handrail, climbable ledge adjacent to balustrade, glass missing safety decals, steps missing non-slip surface)
    h. Electrical, lighting and data (e.g. wobbly lighting fixtures, exposed wiring)
    i. Natural light and ventilation (e.g. lack of adequate ventilation causing condensation and mould)
    j. Entry to or exit from the building (e.g. defective door)
    k. Swimming pools, gyms, playground equipment (e.g. leaking pool, wobbly fencing)
    l. Flammable cladding
    m. Lift/elevator, gas supply or garbage chute problem
    n. Other (please specify) _____

    or

    o. No defects/problems have been discovered **SKIP TO Q28**

IF X>1 We will now ask you a few questions about each of the problems you have experienced.

IF X=1 We will now ask you a few questions about the problem you have experienced.

IF X>1 First, we want to ask about the problem with [**INSERT PROBLEM i=1 FROM Q0**]

FOR i=1 to X

16. Please describe the problem in one sentence

    _____

17. To what extent do you think this problem was due to the initial build rather than damage or the way it was maintained or altered?
    a. The problem was entirely due to the initial build
    b. The problem was mostly due to the initial build
    c. The problem was partly due to the initial build and partly due to damage/the way it was maintained or altered
    d. The problem was mostly due to damage/the way it was maintained or altered
    e. The problem was entirely due to damage/the way it was maintained or altered
    f. I don't know what caused the problem

18. How long did it take to resolve the problem after it had been discovered?
    a. Less than a week
    b. One week to one month
    c. 2-3 months
    d. 4-6 months
    e. 7-12 months
    f. 1-2 years
    g. More than two years
    h. The problem has not been resolved

19. Did the occupants of the dwelling need to move out due to the problem?
    a. Yes
    b. No

IF a IN Q19

20. For how long did the occupants need to stay out of the dwelling?
    a. Less than a week
    b. One week to one month
    c. 2-3 months
    d. 4-6 months
    e. 7-12 months
    f. More than 12 months

21. Did you or anyone in your household suffer any health issues as a result of the problem?
    a. No
    b. Yes, a minor injury/illness
    c. Yes, a major injury/illness

IF b OR c IN Q21

22. How long did the injury/illness last?
    a. Less than a week
    b. One week to one month
    c. 2-3 months
    d. 4-6 months
    e. 7-12 months
    f. More than 12 months
    g. The injury/illness is permanent

23. How would you describe your emotional response to the problem?
    a. Little or no emotional stress
    b. Moderate emotional stress
    c. Quite a lot of emotional stress
    d. Extreme emotional stress

24. Roughly, how much time did you and other members of your household spend trying to resolve the problem (including any time off work due to injury/illness resulting from the problem)?
    _____ hours **RANGE 0-999**

25. Who paid most of the costs of fixing the problem?
    a. The builder/builder's insurer
    b. Me
    c. Me and other owners via the body corporate
    d. My insurer
    e. My body corporate's insurer
    f. No one - the problem hasn't been fixed

26. Approximately, what financial costs did you incur personally in each of the following categories as a result of this problem? (Please include costs only once. e.g. if you paid extra body corporate levies towards the cost of fixing the problem, include the amount under 'Extra body corporate levies' and not under 'Costs of fixing the problem'). **REQUIRE INPUT A NUMBER IN AT LEAST ONE FIELD OR SELECT 'I INCURRED NO FINANCIAL COSTS'. RANGE FOR INPUT 0-9,999,999.**

    Costs of fixing the problem $_____
    Lost rental income $_____
    Temporary accommodation costs $___
    Extra travel/transport $_____
    Extra body corporate levies $_____
    Legal costs $_____
    Technical/engineer reports $_____
    Extra health care costs $_____
    Other costs $_____
    or
    I incurred no financial costs

27. What was the total cost of fixing the problem, including costs incurred by all parties (insurers, builders, body corporate)?
    a. $_____ **RANGE 0-9,999,999**
    b. I am not sure, but it would be at least $ _____ **RANGE 0-9,999,999**
    c. Don't know

IF i<X Now, we want to ask about the [**INSERT PROBLEM i+1 LISTED IN Q0**]

RETURN TO Q16 FOR NEXT i

Questions about you

Finally, we want to ask a few questions about you, so we understand the mix of people in this survey.

28. I have…
    a. Australian citizenship
    b. an Australian permanent resident visa
    c. a temporary working visa
    d. a visitor/holiday/transit visa
    e. a student/training visa
    f. none of the above

29. Do you speak a language other than English at home?
    a. No, English only
    b. Yes

30. Which best describes your household:
    a. Couple/family without children at home
    b. Couple/family with children at home
    c. One parent family
    d. Group household
    e. Single person household
    f. Other

31. What is your work status?
    a. Working full time
    b. Working part time/casually
    c. Student
    d. Not currently employed
    e. Home duties
    f. Retired
    g. Other

32. **IF ANSWERED *NOT* d in Q30** What is your approximate annual household income before tax?
    a. Less than $41,600 per year (less than $800 per week)
    b. $41,600 - $78,000 per year ($800 - $1,500 per week)
    c. $78,000 - $104,000 per year ($1,500 - $2,000 per week)
    d. $104,000 - $156,000 per year ($2,000 - $3,000 per week)
    e. More than $156,000 per year (more than $3,000 per week)
    f. Do not wish to answer

33. **IF ANSWERED d in Q30** What is your approximate annual personal income before tax?
    a. Less than $41,600 per year (less than $800 per week)
    b. $41,600 - $78,000 per year ($800 - $1,500 per week)
    c. $78,000 - $104,000 per year ($1,500 - $2,000 per week)
    d. $104,000 - $156,000 per year ($2,000 - $3,000 per week)
    e. More than $156,000 per year (more than $3,000 per week)
    f. Do not wish to answer

34. Finally, is there any feedback you would like to provide on this survey?

_____
_____
_____
_____

Thank you for participating in this survey. Your opinions are very important.

D Practitioner survey

The CIE conducted an online survey of practitioners during June 2020. Participants were invited through ABCB's email mailing list.

Sample characteristics

D.1 Sample by occupation

Occupation	Count	Percentage
Architecture and design	158	17
Building certification/surveying	149	16
Engineering	138	15
Building – residential	129	14
Other (please specify)	112	12
Building – commercial	63	7
Specialist - fire safety	56	6
Trades and other construction services	46	5
Compliance, testing and accreditation	31	3
Plumbing	15	2
Building and plumbing products	10	1
Legal and finance	7	1
Specialist - hydraulic/plumbing	6	1
(blank)	2	0
Grand Total	922	100

Q/ What is your occupation?

Base n=922

Source: CIE survey of practitioners

Survey respondents have been working in the building and construction industry in Australia for 26 years, on average.

D.2 Sample by location of operation

	Main location of operation		Other location of operation	
	Count	Per cent	Count	Per cent
New South Wales	285	30.9	269	29.2
Victoria	269	29.2	211	22.9
Queensland	155	16.8	185	20.1
Western Australia	106	11.5	128	13.9
South Australia	41	4.4	113	12.3
Tasmania	29	3.1	93	10.1
Australian Capital Territory	19	2.1	106	11.5
Northern Territory	6	0.7	82	8.9
(blank)	12	1.3		
Grand Total	**922**	**100.0**	**1187**	**128.7**

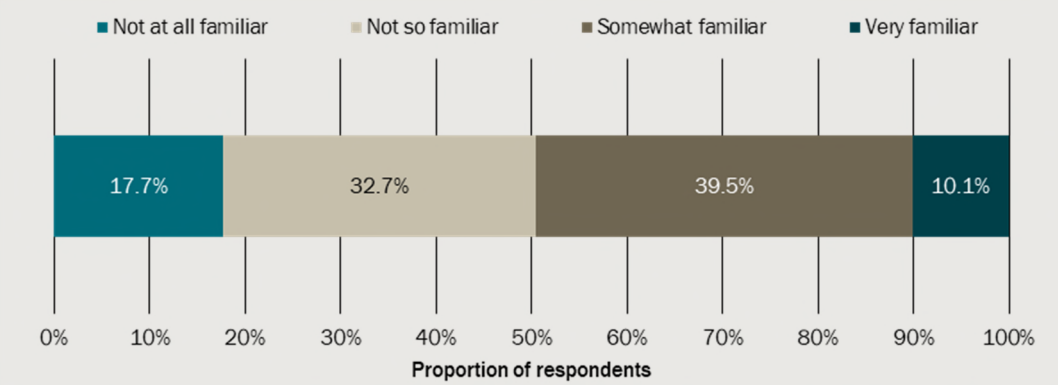
Q/ In which state or territory do you mainly operate?

Q/ In which other states and territories do you operate?

Source: CIE survey of practitioners.

Around half of the practitioners surveyed were at least somewhat familiar with the BCR recommendations prior to undertaking the survey.

D.3 Sample familiarity with the BCR recommendations



Q/ How familiar are you with the recommendations of the Building Confidence Report?

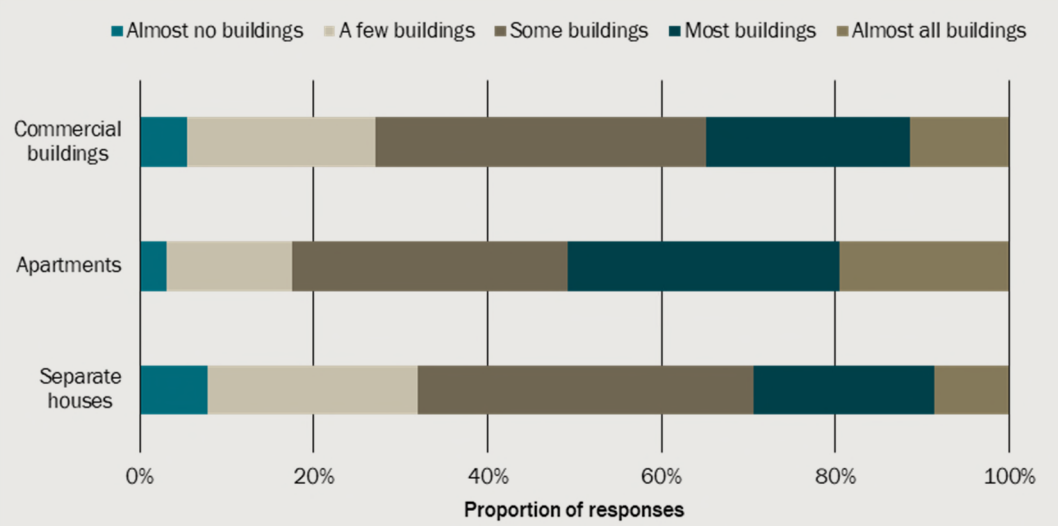
Base n=914

Data source: CIE survey of practitioners.

Survey responses

Perceptions of defect prevalence

D.4 Practitioner perceptions of defect prevalence by building type

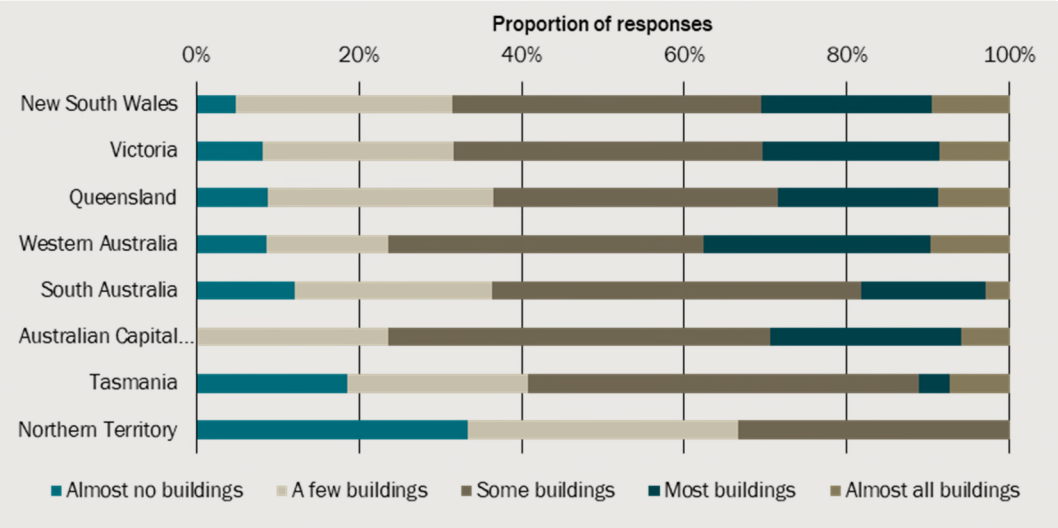


Q/ Based on your perceptions, please indicate the extent to which major defects (i.e. defects due to non-compliance with the National Construction Code (NCC) that compromise the safety and/or performance of the building) are prevalent in new buildings.

Base: excludes N/A and blank; separate houses n=758; apartments n=761, commercial buildings n=780

Data source: Practitioner survey.

D.5 Practitioner perceptions of prevalence of defects in separate houses

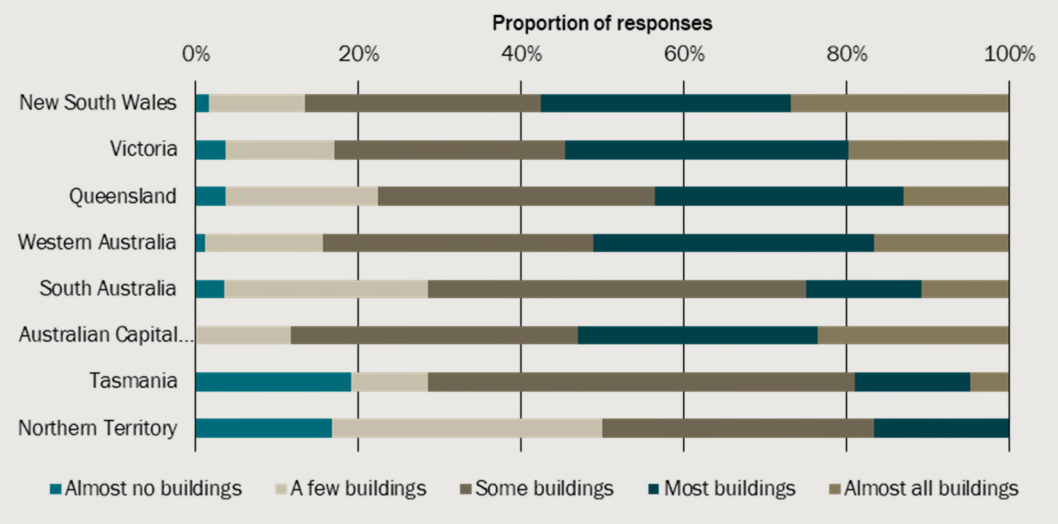


Q/ Based on your perceptions, please indicate the extent to which major defects (i.e. defects due to non-compliance with the National Construction Code (NCC) that compromise the safety and/or performance of the building) are prevalent in new buildings. Defects in separate houses.

Base: excludes N/A and blank; ACT n=19; NSW n=285; NT n=6; Qld n=155; SA n=41; Tas n=29; Vic n=269; WA n=106

Data source: CIE survey of practitioners.

D.6 Practitioner perceptions of prevalence of defects in apartments

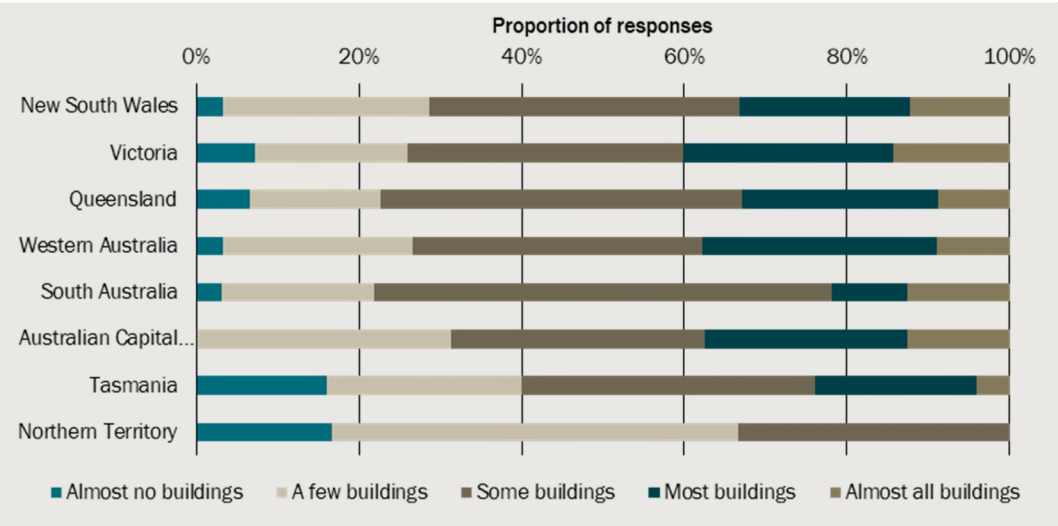


Q/ Based on your perceptions, please indicate the extent to which major defects (i.e. defects due to non-compliance with the National Construction Code (NCC) that compromise the safety and/or performance of the building) are prevalent in new buildings. Defects in apartments.

Base: excludes N/A and blank; ACT n=19; NSW n=285; NT n=6; Qld n=155; SA n=41; Tas n=29; Vic n=269; WA n=106

Data source: CIE survey of practitioners.

D.7 Practitioner perceptions of prevalence of defects in commercial buildings



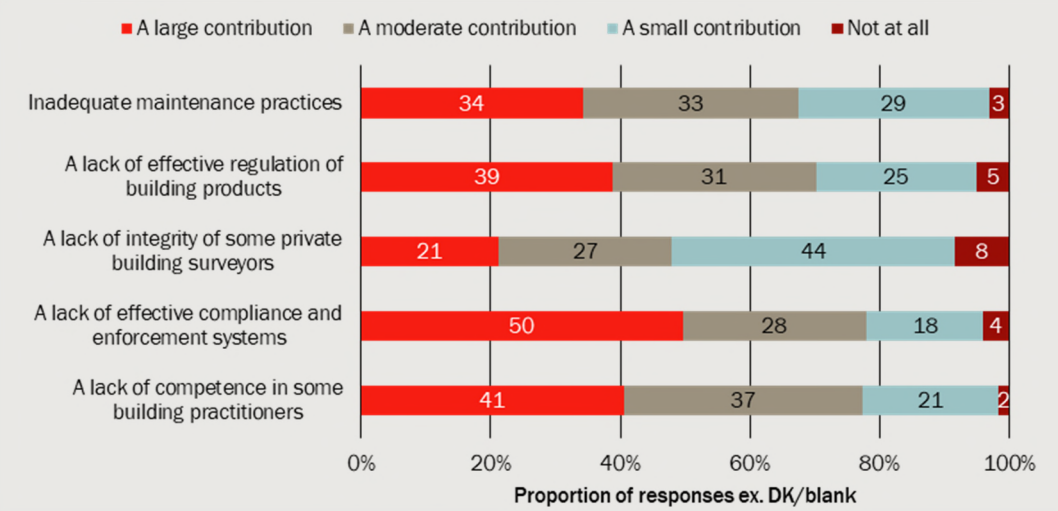
Q/ Based on your perceptions, please indicate the extent to which major defects (i.e. defects due to non-compliance with the National Construction Code (NCC) that compromise the safety and/or performance of the building) are prevalent in new buildings. Defects in commercial buildings.

Base: excludes N/A and blank; ACT n=19; NSW n=285; NT n=6; Qld n=155; SA n=41; Tas n=29; Vic n=269; WA n=106

Data source: CIE survey of practitioners.

Causes of defects

D.8 Contribution of issues to defects in separate houses

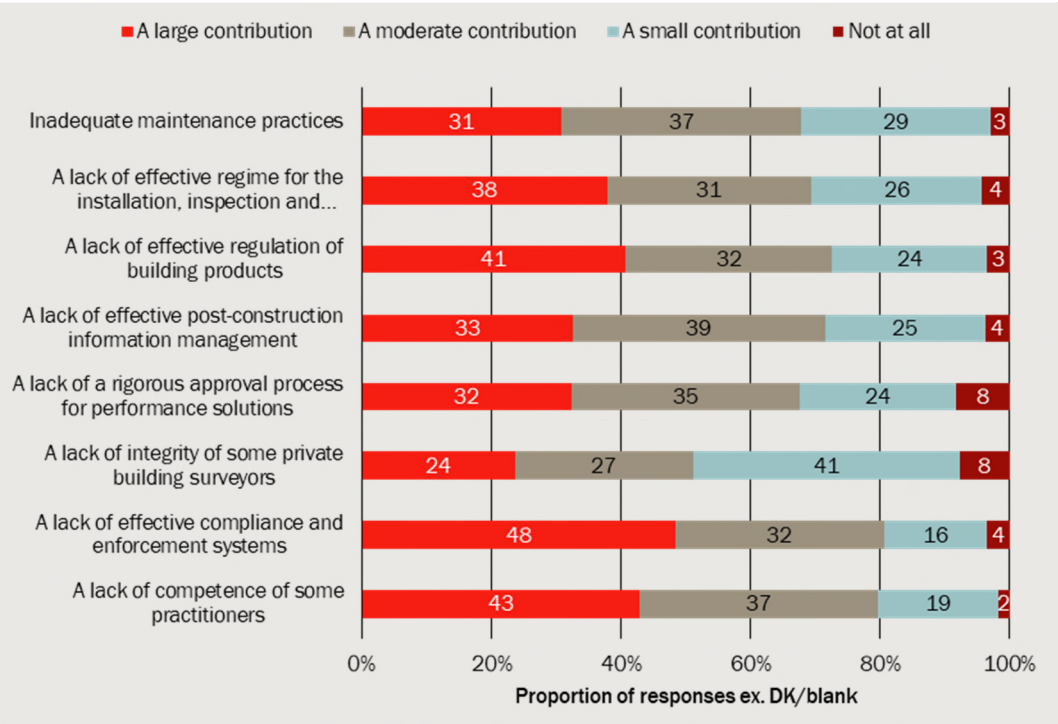


Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in separate houses.

Base: Inadequate maintenance... n=746; A lack of effective regulation... n=751; A lack of integrity... n=740; A lack of effective... n=765; A lack of competence... n=768

Data source: CIE survey of practitioners.

D.9 Contribution of issues to defects in apartment buildings

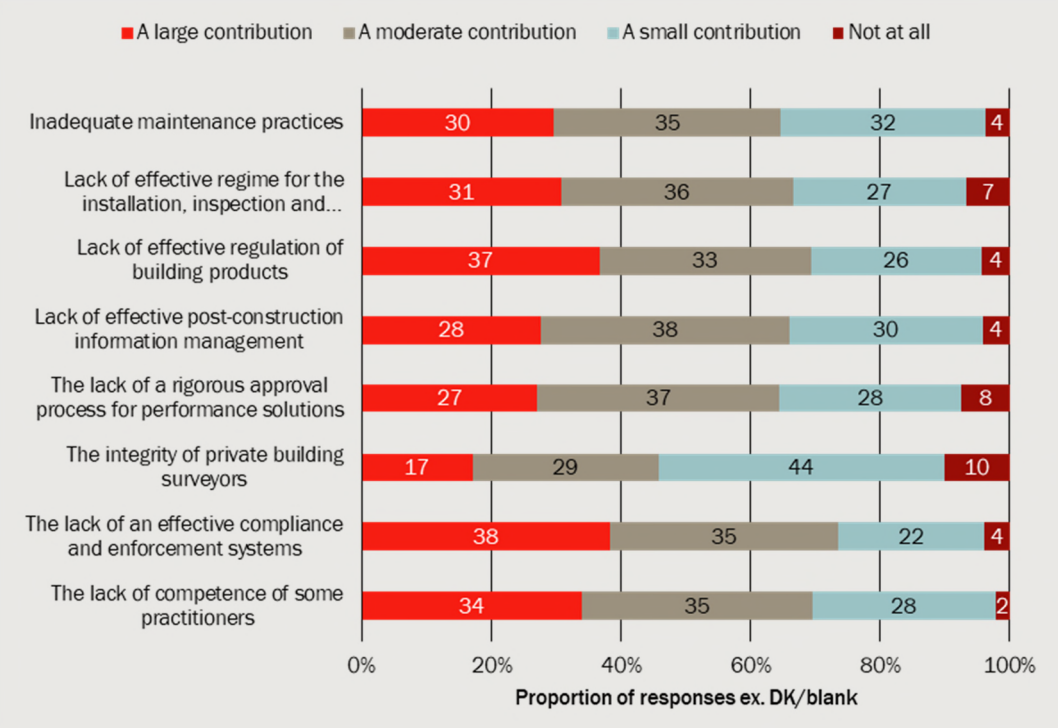


Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in apartment buildings.

Base: Inadequate maintenance... n=706; A lack of effective regime... n=683; A lack of effective regulation... n=722; A lack of effective post-construction... n=709; A lack of a rigorous... n=712; A lack of integrity... n=710; A lack of effective... n=727; A lack of competence... n=725

Data source: CIE survey of practitioners.

D.10 Contribution of issues to defects in commercial buildings

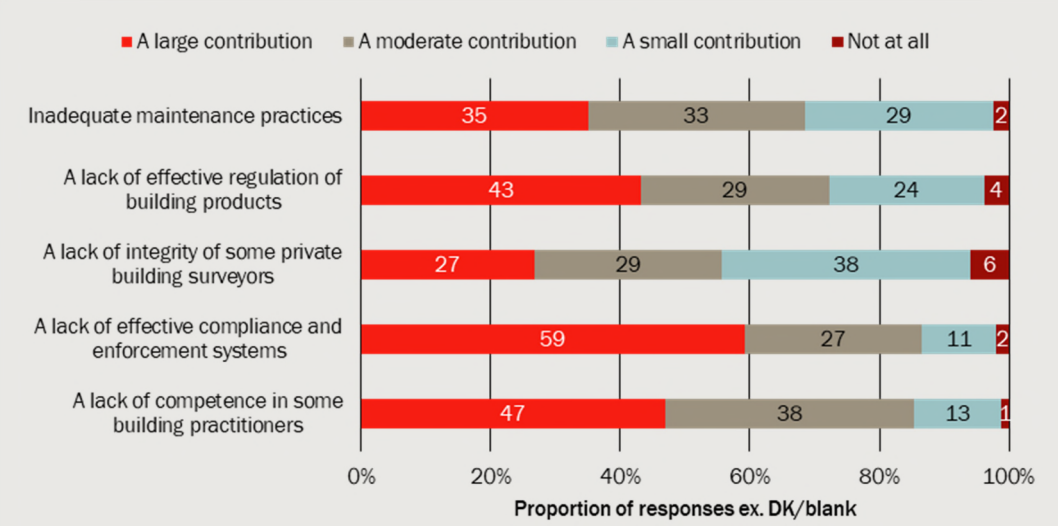


Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in commercial buildings

Base: Inadequate maintenance... n=680; A lack of effective regime... n=667; A lack of effective regulation... n=700; A lack of effective post-construction... n=691; A lack of a rigorous... n=690; A lack of integrity... n=684; A lack of an effective... n=701; A lack of competence... n=702

Data source: CIE survey of practitioners.

D.11 Contribution of issues to defects in separate houses excluding respondents perceiving few or almost no defects

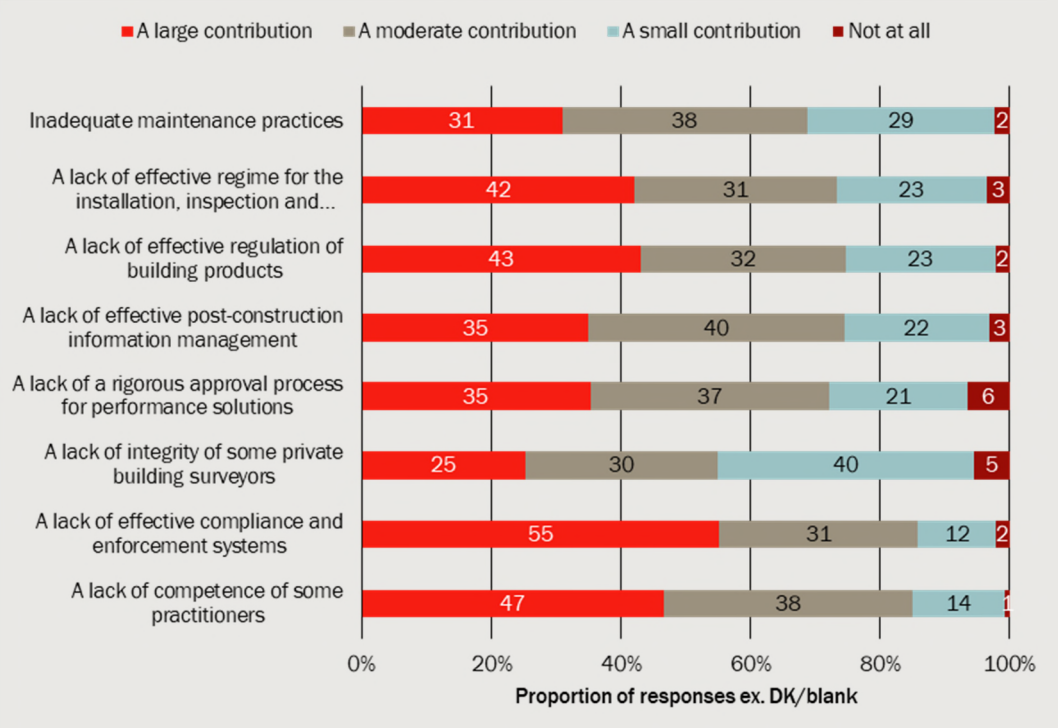


Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in separate houses.

Base: Excludes respondents indicating the prevalence of defects in separate houses is 'Almost no buildings' or 'A few buildings'. Inadequate maintenance... n=488; A lack of effective regulation... n=491; A lack of integrity... n=481; A lack of effective... n=500; A lack of competence... n=497

Data source: CIE survey of practitioners

D.12 Contribution of issues to defects in apartment buildings excluding respondents perceiving few or almost no defects

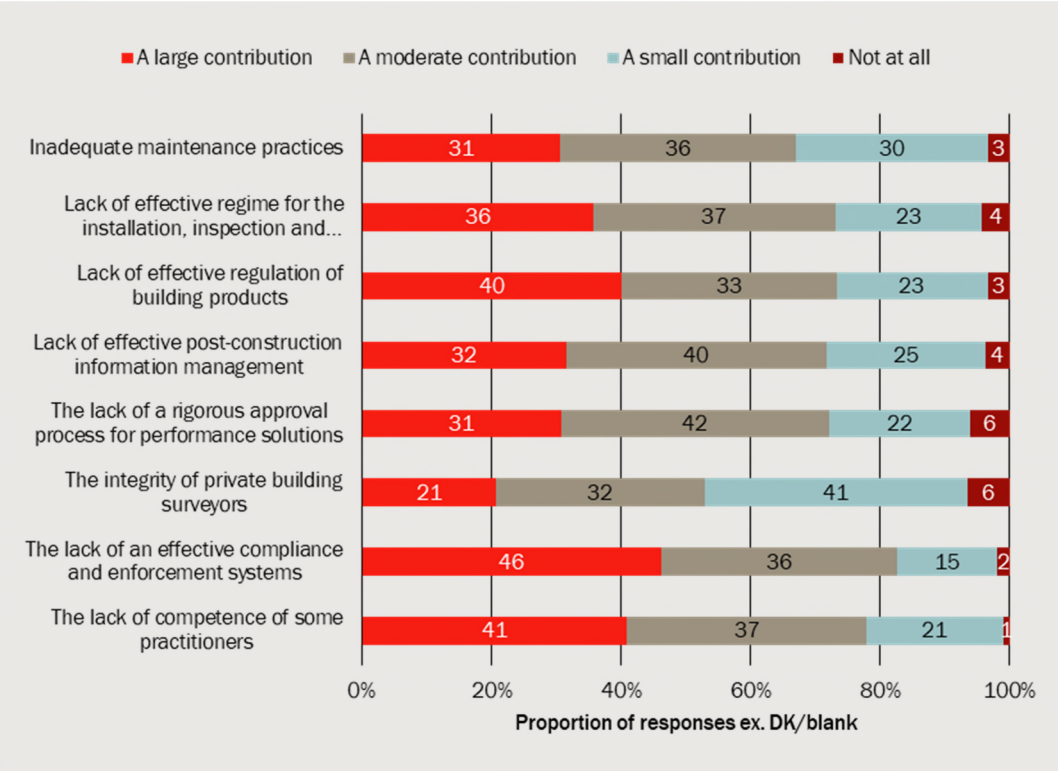


Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in apartment buildings.

Base: Excludes respondents indicating the prevalence of defects in apartment buildings is 'Almost no buildings' or 'A few buildings'. Inadequate maintenance... n=565; A lack of effective regime... n=550; A lack of effective regulation... n=580; A lack of effective post-construction... n=574; A lack of a rigorous... n=572; A lack of integrity... n=576; A lack of effective... n=587; A lack of competence... n=585

Data source: CIE survey of practitioners.

D.13 Contribution of issues to defects in commercial buildings excluding respondents perceiving few or almost no defects



Q/ Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in commercial buildings

Base: Excludes respondents indicating the prevalence of defects in commercial buildings is 'Almost no buildings' or 'A few buildings'. Inadequate maintenance... n=495; A lack of effective regime... n=483; A lack of effective regulation... n=505; A lack of effective post-construction... n=500; A lack of a rigorous... n=501; A lack of integrity... n=495; A lack of an effective... n=508; A lack of competence... n=508

Data source: CIE survey of practitioners

Impacts of BCR

D.14 Average expected reduction in defects due to full implementation of the BCR recommendations

	Separate houses	Apartment buildings	Commercial buildings
	per cent	per cent	per cent
By perception of defect prevalence			
Almost all buildings	52.2	54.4	54.1
Most buildings	55.2	63.1	62.2
Some buildings	53.7	58.7	59.5
A few buildings	51.4	56.8	53.6
Almost no buildings	40.0	48.0	55.6
Grand Total	**53.0**	**57.8**	**57.5**

	Separate houses	Apartment buildings	Commercial buildings
	per cent	per cent	per cent
By familiarity with BCR recommendations			
Not at all familiar	49.5	52.3	53.9
Not so familiar	54.4	59.9	58.9
Somewhat familiar	54.0	58.4	58.3
Very familiar	48.9	56.9	55.1
Grand Total	**53.0**	**57.8**	**57.5**

Q/ Please move the sliders below to indicate your best estimate of the extent to which defects (which are caused by non-compliance with the National Construction Code) would be reduced if the BCR recommendations are fully implemented.

Base: Separate houses n=689, apartments n=673, commercial buildings n=675

Source: CIE survey of practitioners

D.15 Expectations about cost savings from nationally consistent regulation by familiarity with BCR recommendations

	No	Yes	Average time saving[a]
	per cent	per cent	Hours per month
Not at all familiar	56.2	43.8	11.2
Not so familiar	47.4	52.6	11.6
Somewhat familiar	41.6	58.4	12.2
Very familiar	46.3	53.7	21.6
Grand Total	**46.2**	**53.8**	**13.0**

[a] Average across respondents answering 'Yes'

Q/ Would the greater consistency achieved through implementing the BCR recommendations reduce the cost of providing any services or activities (including regulatory activities)?

Q/ Roughly, how many hours of your own work time would be saved (i.e. freed up for other activities) each month if regulation was nationally consistent?

Base: Respondents answering 'Yes' or 'No' (rather than 'blank') n=708; Respondents providing a time saving (including zero) n=286

Source: CIE survey of practitioners

D.16 Expectations about cost savings from a building information database by familiarity with BCR recommendations

	No	Yes	Average time saving[a]
	per cent	per cent	Hours per month
Not at all familiar	53.5	46.5	9.2
Not so familiar	41.5	58.5	10.0
Somewhat familiar	36.7	63.3	16.1
Very familiar	29.1	70.9	14.8
Grand Total	**39.8**	**60.2**	**13.5**

[a] Average across respondents answering 'Yes'

Q/ Would the establishment and use of this database reduce the cost of providing any services or activities (including regulatory activities)?

Q/ Roughly, how many hours of your own work time would be saved (i.e. freed up for other activities) each month if a building information database was established?

Base: Respondents answering 'Yes' or 'No' (rather than 'blank') n=678; Respondents providing a time saving (including zero) n=310

Source: CIE survey of practitioners

E Questionnaire for survey of practitioners

Welcome

Thank you for participating in this survey, which is being run by the Centre for International Economics (CIE) on behalf of the Australian Building Codes Board.

The aim of this survey is to gather evidence on the likely impacts of recommendations in the Building Confidence Report on the number of major defects in new buildings and their associated costs (i.e. defects due to non-compliance with the National Construction Code (NCC) that compromise the safety and/or performance of the building). As a practitioner in the industry, your input is very important and will help shape reform.

This questionnaire should take between 5 and 10 minutes to complete.

We wish to reassure you that this is genuine research and your individual survey responses will remain confidential and anonymous at all times.

About you

1. What is your occupation?
    a. Building - residential
    b. Building - commercial
    c. Building and plumbing products
    d. Building certification/surveying
    e. Architecture and design
    f. Engineering
    g. Plumbing
    h. Compliance, testing and accreditation
    i. Legal and finance
    j. Specialist - fire safety
    k. Specialist - hydraulic/plumbing
    l. Trades and other construction services
    m. Other (please specify)

2. For how many years have you been working in the building and construction industry in Australia?

3. In which state or territory do you mainly operate?
    a. New South Wales
    b. Victoria
    c. Queensland
    d. Western Australia
    e. South Australia
    f. Tasmania
    g. Northern Territory
    h. Australian Capital Territory

4. In which other states and territories do you operate?

    Please select as many as apply or leave blank if you operate in only one state/territory

    a. New South Wales
    b. Victoria
    c. Queensland
    d. Western Australia
    e. South Australia
    f. Tasmania
    g. Northern Territory
    h. Australian Capital Territory

5. How familiar are you with the recommendations of the Building Confidence Report?

    a. Very familiar
    b. Somewhat familiar
    c. Not so familiar
    d. Not at all familiar

Major defects in new buildings

Based on your perceptions, please indicate the extent to which major defects (i.e. defects due to noncompliance with the National Construction Code (NCC) that compromise the safety and/or performance of the building) are prevalent in new buildings.

Please provide an answer for each row

	Almost no buildings	A few buildings	Some buildings	Most buildings	Almost all buildings	N/A
6. Defects in separate houses						
7. Defects in apartments						
8. Defects in commercial buildings						

Underlying causes of defects

The following questions relate to the underlying causes of defects in the Australian construction industry.

Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in separate houses.

Please provide an answer for each row

	Not at all	A small contribution	A moderate contribution	A large contribution	Not applicable/Don't know
9. A lack of competence in some building practitioners					
10. A lack of effective compliance and enforcement systems					
11. A lack of integrity of some private building surveyors					
12. A lack of effective regulation of					

	Not at all	A small contribution	A moderate contribution	A large contribution	Not applicable/Don't know
building products					
13. Inadequate maintenance practices					

Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects in apartment buildings.

Please provide an answer for each row

	Not at all	A small contribution	A moderate contribution	A large contribution	Not applicable/Don't know
14. A lack of competence of some practitioners					
15. A lack of effective compliance and enforcement systems					
16. A lack of integrity of some private building surveyors					
17. A lack of a rigorous approval process for performance solutions					
18. A lack of effective postconstruction					

	Not at all	A small contribution	A moderate contribution	A large contribution	Not applicable/Don't know
information management					
19. A lack of effective regulation of building products					
20. A lack of effective regime for the installation, inspection and certification of fire safety systems					
21. Inadequate maintenance practices					

Based on your opinion, please indicate the extent to which the following issues contribute to the prevalence of defects in commercial buildings.

Please provide an answer for each row

	Not at all	A small contribution	A moderate contribution	A large contribution	Not applicable/Don't know
22. A lack of competence of some practitioners					
23. A lack of effective compliance and enforcement systems					

	Not at all	A small contribution	A moderate contribution	A large contribution	Not applicable/Don't know
24. A lack of integrity of some private building surveyors					
25. A lack of a rigorous approval process for performance solutions					
26. A lack of effective postconstruction information management					
27. A lack of effective regulation of building products					
28. A lack of effective regime for the installation, inspection and certification of fire safety systems					
29. Inadequate maintenance practices					

30. Can you think of any other issues which contribute to the prevalence of defects (due to non-compliance with the National Construction Code) in new buildings?

    a. No

    b. Yes (please specify)

31. To what extent do the issues you just described contribute to the prevalence of defects (due to noncompliance with the National Construction Code) in new buildings?

    a. Not at all

    b. A small contribution

    c. A moderate contribution

    d. A large contribution

    e. Not applicable/Don't know

Recommendations of the Building Confidence Report

There were 24 recommendations from the Building Confidence Report (BCR). If you are not familiar with the recommendations, please read the following summary. For further detail, please refer to the BCR.

Recommendations 1 to 4 focus on the registration and training of practitioners. The BCR recommends a nationally consistent approach to the registration of Builders, Site or Project Managers, Building Surveyors, Building Inspectors, Architects, Engineers, Designers/Draftspersons, Plumbers, and Fire Safety Practitioners. It also recommends compulsory Continuing Professional Development, which includes mandatory hours/units dedicated to training on the National Construction Code and the establishment of supervised training schemes which provide better defined career paths for building surveyors.

Recommendations 5 to 7 address the roles and responsibilities of regulators. The BCR recommends a focus on collaboration between state/territory and local government and (where applicable) private building surveyors to improve regulatory oversight. It also recommends the provision of broad powers to audit building work and take effective compliance and enforcement action. It recommends that each jurisdiction implement a proactive audit strategy for regulatory oversight of the Commercial building sector with annual reporting on audit findings and outcomes.

Recommendation 8 goes to the role of fire authorities in the building design and approvals process. The BCR recommends that, consistent with the International Fire Engineering Guidelines, jurisdictions require early engagement with fire authorities on designs which include performance solutions on fire safety matters.

Recommendations 9 to 11 focus on the integrity of private building surveyors. The BCR recommends minimum statutory requirements for the engagement, and role, of private building surveyors, a code of conduct with legislative status and enhanced supervisory powers and reporting obligations.

Recommendation 12 addresses the issue of collecting and sharing building information and intelligence. The BCR recommends the creation of a central database by each

jurisdiction and collaboration to develop a platform that can provide for information sharing to inform regulatory activities and the work of the Building Ministers Forum. Information in the databases would also be accessible as appropriate, by authorised persons including owners or purchasers of buildings.

Recommendations 13 to 17 focus on the issues of adequacy of documentation and record keeping. The BCR recommends that there be a statutory duty on design practitioners to prepare documentation that demonstrates that proposed buildings will comply with the National Construction Code. It recommends a more robust approach to third party review of designs and to the documentation and approval of performance solutions and variations.

Recommendations 18 to 19 emphasise the importance of inspection regimes. The BCR recommends that jurisdictions require on-site inspections for all building works and that there be greater oversight of the installation and certification of fire safety systems in Commercial buildings.

Recommendation 20 addresses the issue of post-construction information management. The BCR recommends that for Commercial buildings, a comprehensive digital building manual be created for owners which can be passed on to successive owners. This would include all relevant documents for the ongoing management of the building, such as as-built construction documentation, fire safety system details and maintenance requirements.

Recommendation 21 relates to building product safety. The BCR recommends that the Building Ministers' Forum agrees its position on the establishment of a compulsory product certification system for high-risk building products.

Recommendations 22 to 24 deal with the implementation of the recommendations laid out above. The BCR recommends commitment to a three year timetable for the implementation of the recommendations. It recommends that the Building Ministers' Forum establish a plan for implementation which is reported against by each jurisdiction annually. It also recommends that, to deal with the issue of differing terminology across jurisdictions, the Building Ministers' Forum develops a national dictionary of terminology.

Benefits of implementing BCR recommendations

Please move the sliders below to indicate your best estimate of the extent to which defects (which are caused by non-compliance with the National Construction Code) would be reduced if the BCR recommendations are fully implemented.

	Not at all	Reduce by 50%	Reduce by 100%
32. Reduction in defects in			

	Not at all	Reduce by 50%	Reduce by 100%
separate houses			
33. Reduction in defects in apartment buildings			
34. Reduction in defects in commercial buildings			

National consistency

Implementation of the BCR recommendations would increase the consistency of building regulation across states and territories. Examples of potential benefits from nationally consistent regulation include reduced training costs and reduced time spent ensuring compliance for practitioners who work across multiple jurisdictions.

35. Would the greater consistency achieved through implementing the BCR recommendations reduce the cost of providing any services or activities (including regulatory activities)?

    a. Yes

    b. No

36. For which services or activities would cost be reduced?

    _____

37. Roughly, how many hours of your own work time would be saved (i.e. freed up for other activities) each month if regulation was nationally consistent?

    _____ Hours per month

Access to information

Under BCR Recommendation 12, each jurisdiction is to establish a building information database that provides a centralised source of building design and construction documentation. Examples of the potential benefits of such a database include providing more accurate information for building repair and maintenance, enabling more timely identification of responsibility in the event of a defect, and allowing potential buyers of a property to be better informed.

38. Would the establishment and use of this database reduce the cost of providing any services or activities (including regulatory activities)?

a. Yes

b. No

39. For which services or activities would cost be reduced?

_____

40. Roughly, how many hours of your own work time would be saved (i.e. freed up for other activities) each month if a building information database was established?

_____ Hours per month

41. Finally, if you have any further comments to make, please provide them in the box below.

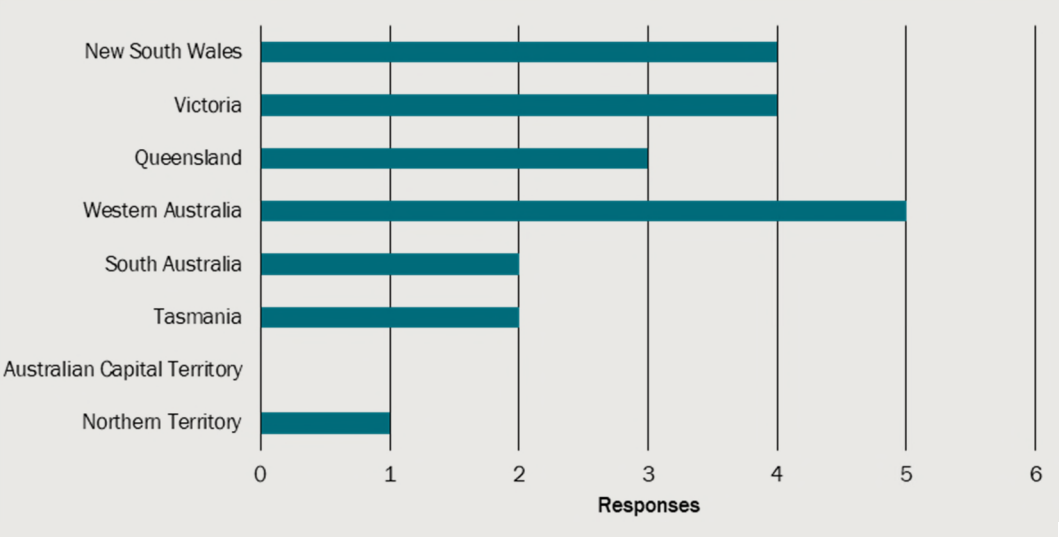
_____

F Survey of Classes 3-9 building owners and managers

The CIE conducted an online survey of Classes 3-9 building owners/managers and facilities managers in June 2020. Invitations to participate in the survey were distributed by the Facilities Management Association of Australia.

There were only 11 responses to this survey prior to the preparation of this draft report. We did not use quantitative estimates from the survey in the analysis in the report due to the small sample size, but the results are presented here for transparency.

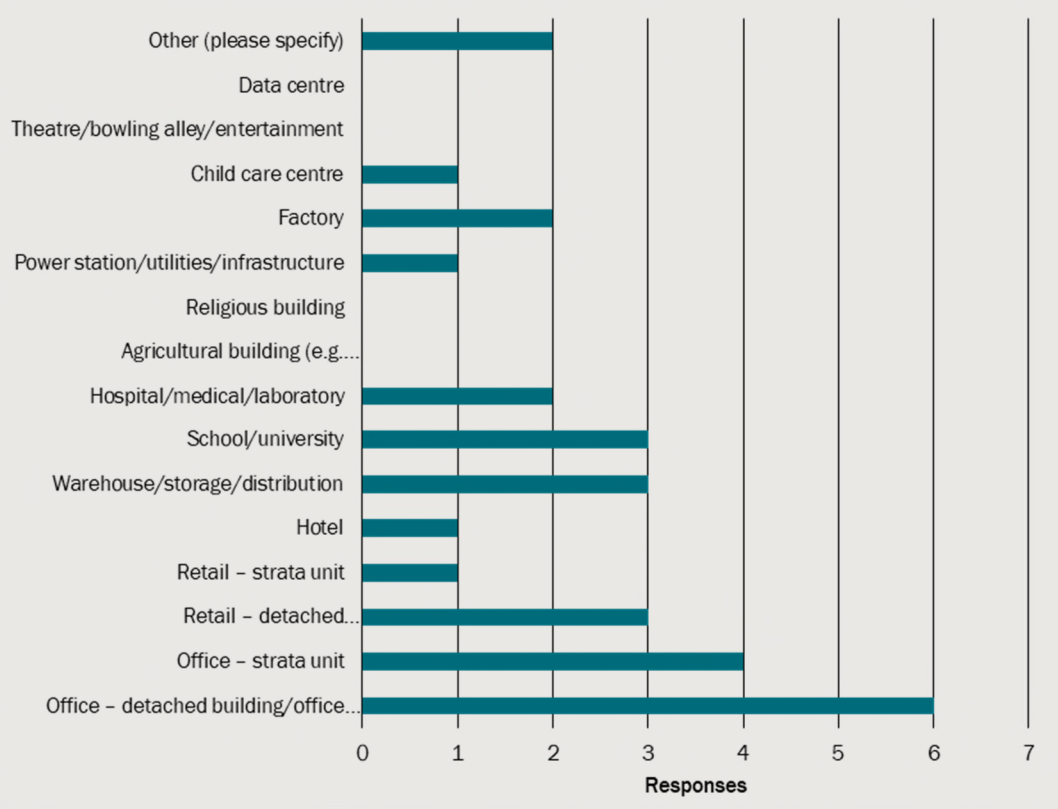
F.1 States and territories of operation



Q/In which states/territories do you own/manage a building?

Data source: CIE survey of commercial building owners/managers.

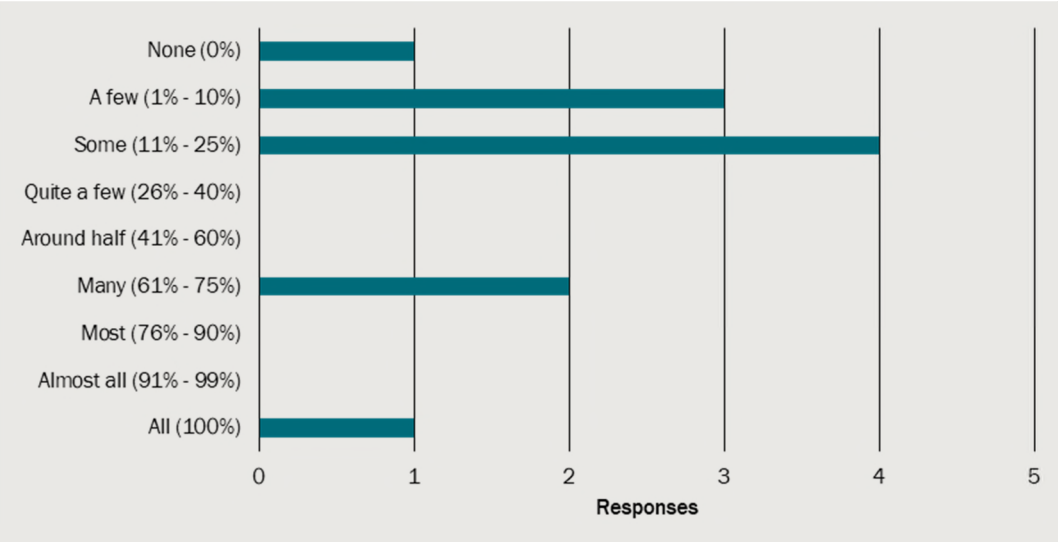
F.2 Types of buildings most familiar to the respondent



Q/ With which types of building are you most familiar?

Data source: CIE survey of commercial building owners/managers.

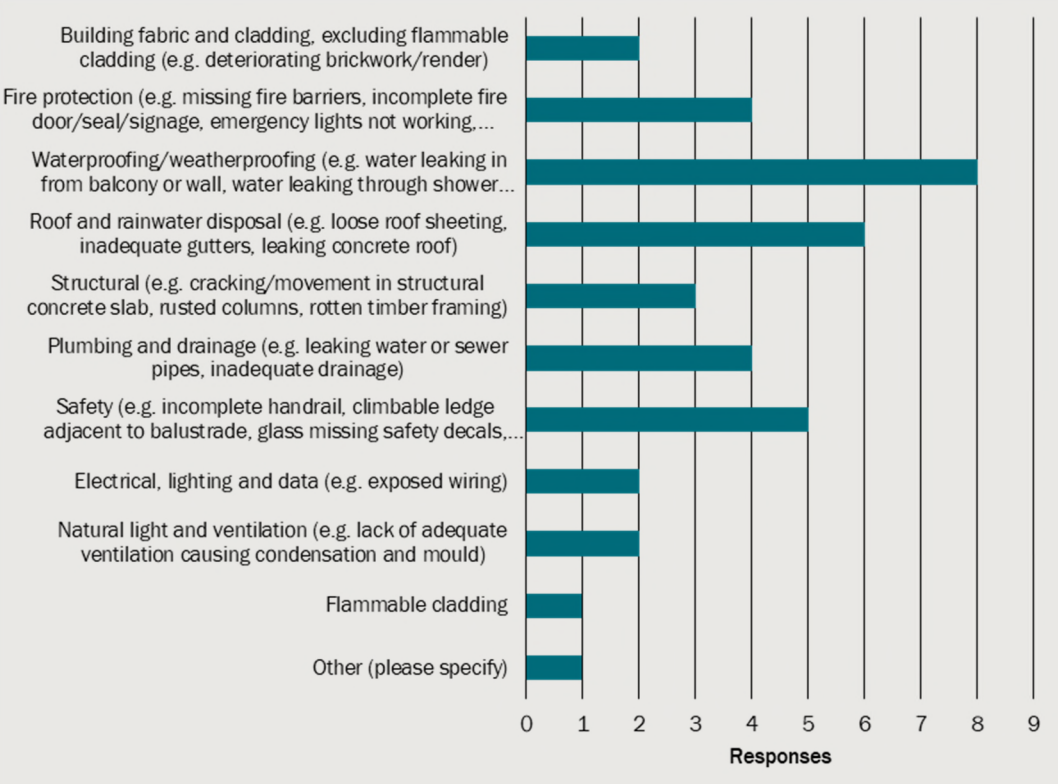
F.3 Proportion of commercial buildings completed with a major defect



Q/ In your experience, what proportion of commercial buildings are completed with a major defect (such as a structural, fire safety or water leakage defect) because the design or construction of the building didn't comply with the National Construction Code?

Data source: CIE survey of commercial building owners/managers.

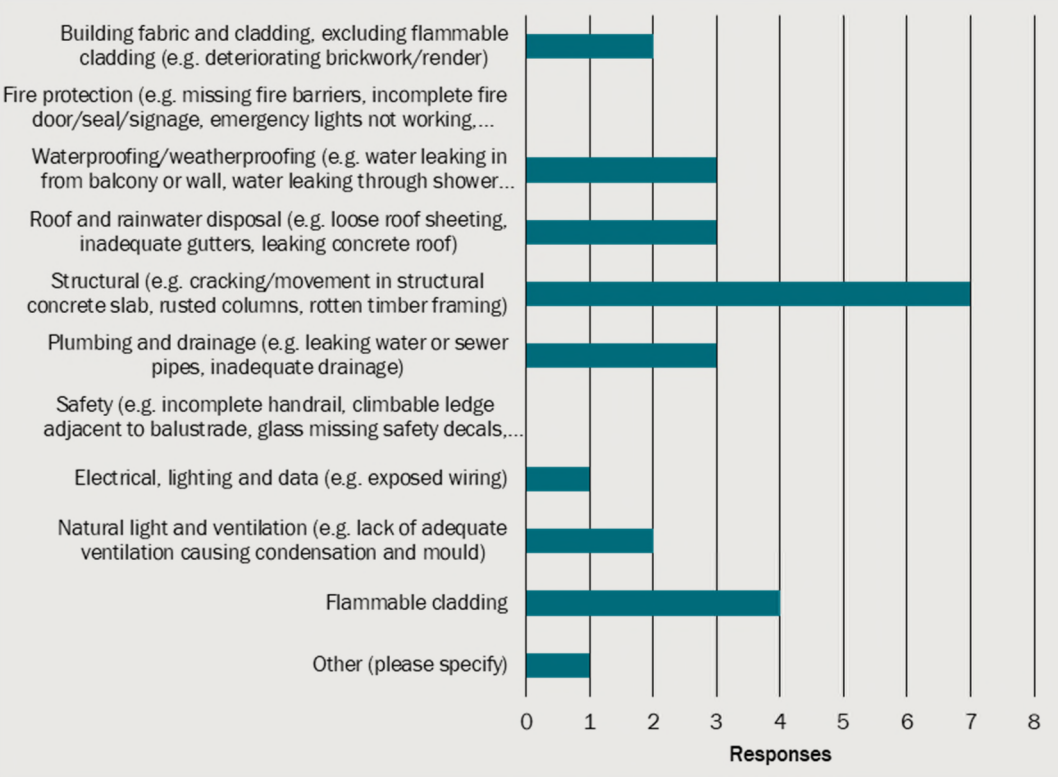
F.4 Most common types of major building defect



Q/ In your experience, what are the most common types of major building defect?

Data source: CIE survey of commercial building owners/managers.

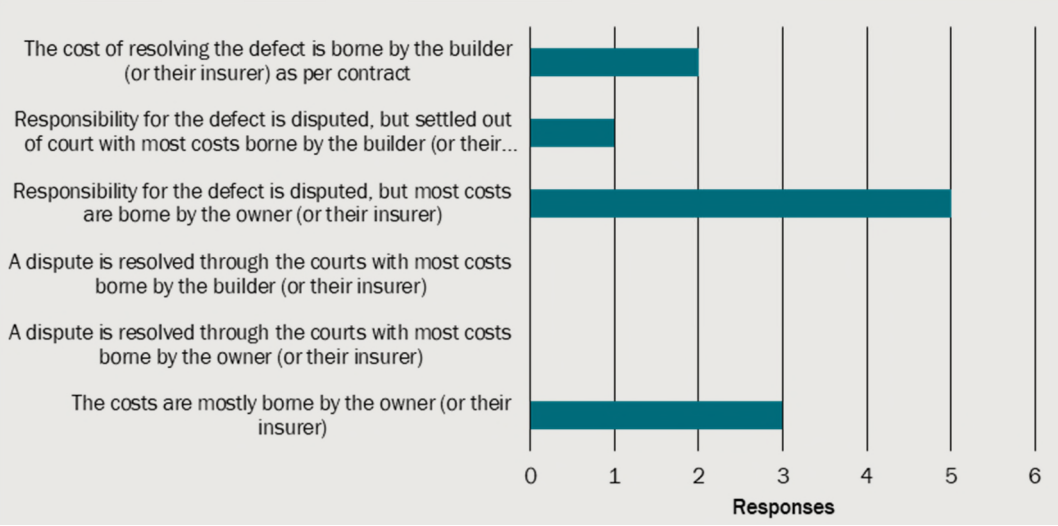
F.5 Most expensive types of defect to fix



Q/ In your experience, which types of major building defect are the most expensive to fix? (Please consider costs to all parties, including builders and insurers)

Data source: CIE survey of commercial building owners/managers.

F.6 Most common outcomes once a major defect has been discovered



Q/ In your experience, what are the most common outcomes once a major defect has been discovered?

Data source: CIE survey of commercial building owners/managers.

F.7 Costs of disputes and fixing defects

	Mean	Median
	$	$
Roughly, what would be the average total cost to all parties of fixing a defect of the relatively expensive type(s) you just selected? (Include any costs from temporary accommodation/lost rental income)	437 500	125 000
Thinking about all types of major building defect, what would be the average total cost (to all parties) of fixing a defect? (Include any costs from temporary accommodation/lost rental income)	300 000	45 000
In your experience, what are the costs incurred by a building owner (including legal costs, engineer reports and internal employee time) for a building defect dispute that is ultimately settled out of court?	53 333	40 000
In your experience, what are the costs incurred by a building owner (including legal costs, engineer reports and internal employee time) for a building defect dispute that is settled through the courts?	716 667	85 000

Base: Questions about repair cost n=8, questions about dispute costs n=6

Source: CIE survey of commercial building owners/managers.

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