

Electronic Building Passport

The role of an Electronic Building Passport for energy efficiency compliance and quality assurance in residential buildings

NEEBP Phase 4 Project 1

The National Energy Efficient Buildings Project (NEEBP) works with industry to improve compliance with the energy provisions of the National Construction Code.

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Disclaimer

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Executive Summary

This report is the latest in a series of reports relating to projects funded by the National Energy Efficiency Building Project (NEEBP) that commenced in 2012. Building on previous work, this project focused on addressing potential barriers to the implementation of an Electronic Building Passport (EBP) and visioning solutions that would be attractive to stakeholders in supporting energy efficiency compliance and quality assurance.

A well-designed and implemented EBP – a building data management system - could provide a Quality Assurance mechanism that enables the implementation, tracking and verification of compliance with the energy efficiency requirements of the National Construction Code (NCC).

Building data, in reference to this project, is considered to include the documents relating to a specific residential address that are required for the purposes of building approval (pre-construction) and certification (during and at completion of construction); the information contained in, or extracted from, these documents; and any data that was utilised to generate the information that is contained in the data.

This project consisted of two main tasks: an analysis of the building legislation in all states and territories with regard to documentary evidence; and an analysis of the data needs of stakeholders and the potential form and function of an EBP.

The key findings of this report are summarised here.

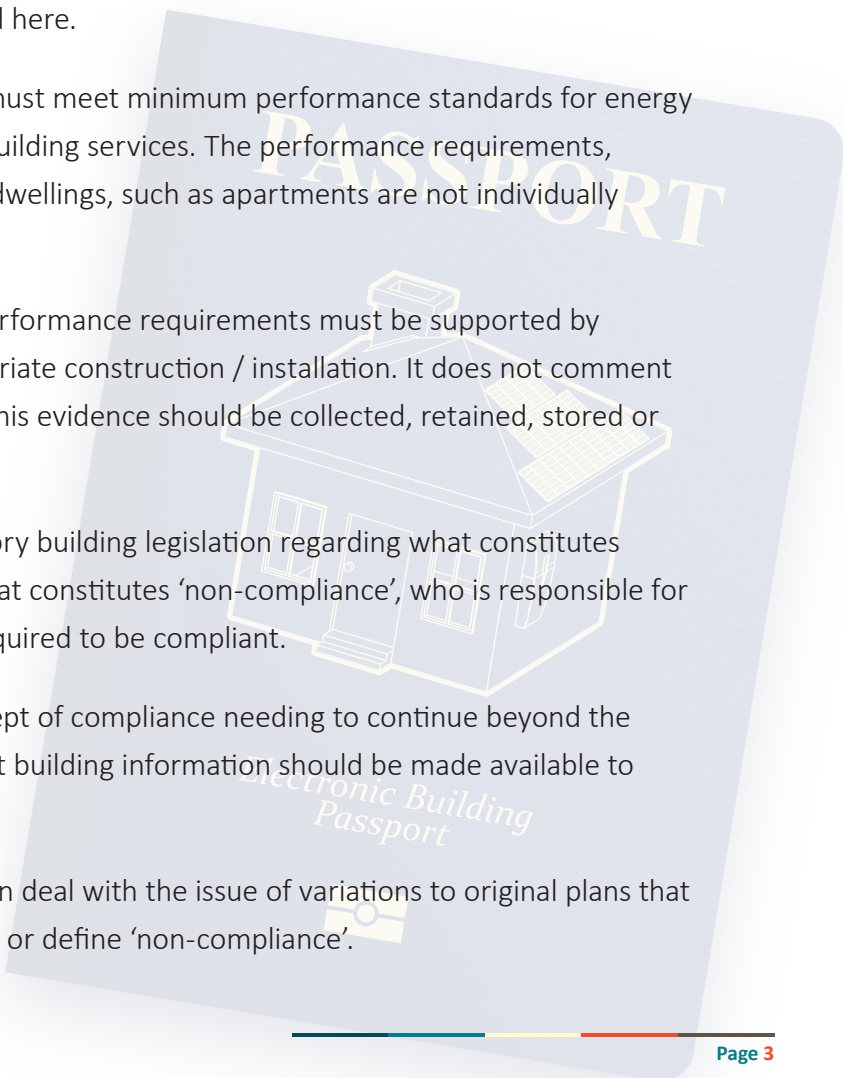
The NCC mandates that residential buildings must meet minimum performance standards for energy efficiency of both the building envelope and building services. The performance requirements, however, are different for Class 1 and Class 2 dwellings, such as apartments are not individually required to meet performance requirements.

The NCC requires that compliance with the performance requirements must be supported by evidence of suitability and evidence of appropriate construction / installation. It does not comment on what constitutes such evidence, and how this evidence should be collected, retained, stored or accessed.

There is lack of consistency in state and territory building legislation regarding what constitutes evidence or demonstration of compliance, what constitutes 'non-compliance', who is responsible for compliance, and at what stage a building is required to be compliant.

Some legislation appears to support the concept of compliance needing to continue beyond the initial construction stage, and the concept that building information should be made available to occupants (not just owners).

Very little legislation defines processes that can deal with the issue of variations to original plans that inevitably occur during a construction project, or define 'non-compliance'.



Documentation of evidence to support compliance with energy efficiency of building services (lighting, hot water, air conditioning, pool and spa pumps and systems, and piping and ducting systems) is seldom mentioned.

Each state and territory regulates, to various extents, issues relating to the storage of, and access to, building documentation that is generated and collected during a building approval / certification process. Legislation also typically dictates who should have access to these documents and how long the documents should be retained. The legislation, and specific 'building forms' that are supported by the legislation, typically have privacy and information disclosure statements detailing how information collected for the purposes of building regulations may be used, stored, shared and accessed.

Most states and territories give power to a particular role (for example, Building Commissioner) for determining the form, manner and information collected for building approval purposes and the requirements for building documentation storage, access and management. This is an important consideration for the possible development of an EBP, as legislative changes may not necessarily be required to make modifications to enable a functional EBP to be developed. It is perhaps feasible that agreement between the responsible person in each jurisdiction could lead to a nationally consistent approach to what building information is collected and the manner in which it is collected (e.g. structured rather than unstructured data).

State-wide planning portals currently being considered or developed by several states may provide an opportunity to transform existing documentation processes by ensuring IT architecture that enables the digitisation of data inputs and the functionalities of an EBP in the future.

Four international examples examined by stakeholders demonstrated the potential for an EBP to be:

- an open access national database, managed by the national government, that supports mandatory disclosure and a range of industry-developed products and services;
- an industry competency and quality assurance system;
- a cloud-based site management tool that enables real-time quality assurance and project management tasks; and
- a long-term roadmap for individual properties to inform policy and market mechanisms aimed at improving existing building stock over time.

Based on their experience and discussion on these international examples, stakeholders provided advice on the possible functionality and architecture of an EBP, and stated a preference for a national system. There was also a belief that an open and transparent EBP could provide significant benefits, beyond energy efficiency, to homeowners, building certifiers and the building industry.

The development of distributed ledger technologies and applications presents opportunities to examine EBP architecture that is beyond the limits of traditional data bases.

This project has provided advice and recommendations to government regarding future work to design and implement an EBP that embraces residential and commercial buildings, and encompasses compliance issues beyond energy efficiency.



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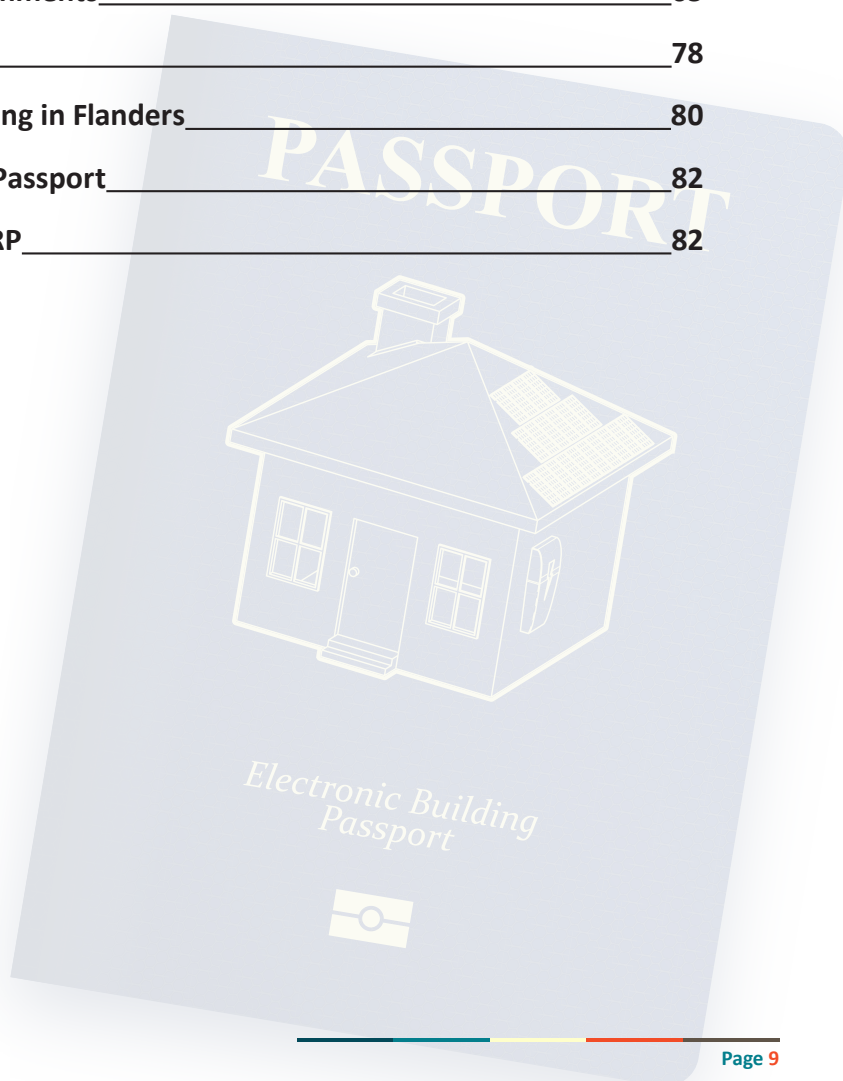


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1. About this Report

This report is the latest in a series of reports relating to projects funded by the National Energy Efficiency Building Project (NEEBP) that commenced in 2012.

The NEEBP aims to improve energy efficiency outcomes in residential and commercial buildings in Australia, improve processes around the application of energy performance requirements in the National Construction Code (NCC), and build industry knowledge and capacity to achieve these outcomes.

The NEEBP is supported by the Council of Australian Governments (COAG) Energy Council. It precedes and is incorporated into Australia's [National Energy Productivity Plan 2015-2030](#) (NEPP) that seeks to boost competitiveness, manage costs and reduce emissions. In particular the NEEBP supports NEPP measure 5 (improve residential building energy ratings and disclosure) and measure 32 (improve compliance with building energy efficiency regulation).



2. Project context and methodology

Lessons and recommendations from previous work relating to building documentation and energy efficiency compliance in residential buildings is summarised in Table 1.

Building on this previous work, this project focused on addressing potential barriers to the implementation of an Electronic Building Passport (EBP) and visioning solutions that would be attractive to stakeholders in supporting energy efficiency compliance and quality assurance.

A well-designed and implemented EBP – a building data management system - could simultaneously:

- Provide a quality assurance tracking component for all those involved in the building approval, construction and certification process (including building supervisors, trades people, certifiers, regulators, etc.) to confirm:
 - » regulatory compliance
 - » best practice documentation of design, product specification and installation quality
 - » on-site trade activity and off-plan variations
- Provide a uniform, site accessible 'Virtual Site Supervisor' platform with geo-time data that could be utilised by building supervisors, tradespeople and product suppliers
- Augment and support the inspection responsibilities of Regulators and Building Supervisors
- Include a trigger for an energy efficiency re-rating once a threshold of variations or non-compliance has been exceeded and identified. Such a trigger would be useful for owners, building supervisors, certifiers and regulators.

This project consisted of two main tasks:

- **Regulatory analysis**
An analysis of what the relevant legislation requires regarding documentary evidence to support compliance with the National Construction Code (NCC) requirements, including what type of documentation is required, who collects and stores this information, who has access to this information, and how privacy and confidentiality are treated.
- **Data needs and access functionality analysis**
An analysis of the data needs of stakeholders involved in the building approval, construction and certification processes, the current form and accessibility of that data to the stakeholders, and the potential form and function of an EBP.



Table 1 Overview of previous work

Year	Project / Report	Relevant Findings or Recommendations
2014	Sustainable Built Environment National Research Centre Project 1.29: Building Information Files and Performance Certificates	A lot of information about a specific dwelling is generated, discarded and recreated by multiple stakeholders throughout a building's life. This information is not co-ordinated or inventoried in any systematic manner. A shared building information platform could offer value to regulators, industry, home owners and society.
2014	NEEBP Phase 1: national review of compliance with NCC energy efficiency requirements	Under-compliance with energy efficiency requirements is widespread and systemic (covering all aspects of the building supply chain and regulatory processes)
2015	NEEBP Phase 2 Project 1: New Home Energy Efficiency Compliance Inspections	Recommendation 2.1: consult with stakeholders to develop an integrated compliance model Recommendation 2.2: develop an electronic checklist
2015	NEEBP Phase 2 project 2: Electronic Building Passport trial	Recommendation 2B: open dialogue with relevant stakeholders regarding optimal and collaborative implementation solutions for an EBP Recommendation 7a: Commence development of a national compliance framework that clearly explains the whole NCC and regulatory compliance system, and the role of the EBP and Audit protocol within that system Recommendation 8: Ensure that development and implementation pathways allow the future extension of the scope of the EBP and audit protocol beyond energy efficiency
2016	NEEBP Phase 2 Project 3: Application of NCC energy performance requirements to additions and alterations of residential buildings	There is inconsistency between jurisdictions (regarding some terminology) There is a need for a nationally consistent administrative framework for building regulations so that NCC requirements can be consistently applied

Year	Project / Report	Relevant Findings or Recommendations
2016 / 2017	NEEBP Phase 3 project 1: cross-industry skills training project (identification of priority knowledge and skill gaps)	“Quality assurance” and “Code compliance” must be clearly defined and understood in the context of integrated system thinking and cross-sector accountability
2018	NEEBP Phase 3 project 2: regulator needs analysis	Complementary action recommendation: Develop and implement a national Electronic Building Passport system that shows the energy efficiency compliance of both the rated and approved design and the building products specified

2.1 What is building data?

Building data, in reference to this project, is considered to include:

1. the documents relating to a specific residential address that are required for the purposes of building approval (pre-construction) and certification (during and at completion of construction) (Table 2); AND
2. the information contained in, or extracted from, these documents; AND
3. any data that was utilised to generate the information that is contained in the data (e.g. data inputs to the software tools that generate a NatHERS certificate).

Documents, information and data may be in print (hardcopy) or electronic form. Electronic data may be unstructured (e.g. digitised forms such as PDFs of building plans or certificates) or structured (e.g. a searchable database where individual building characteristics, such as star rating, cooling energy load or U value of wall insulation, are in separate fields (rows or columns)). Baseline building data is considered to be all data required to be included in the building approval / building permit documents (see Table 2, rows 1 and 2). Data deviation is considered to be any post-approval activities (e.g. during construction, inspection or auditing phases) that causes the dwelling to deviate from the baseline data.

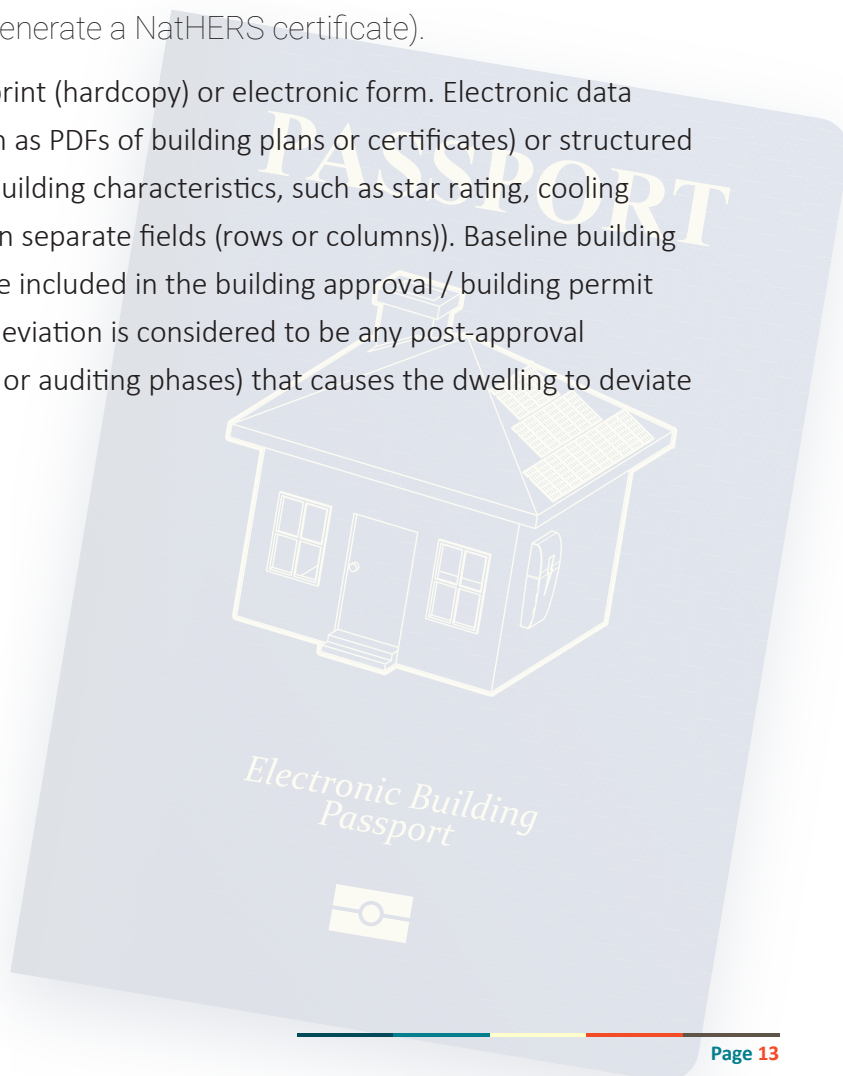


Table 2 Summary of document type, creator and repository

Document type	Creator / Depositor	Document / Data Repository
Building Approval / Permit Documents (e.g. construction plans, building specifications and all required forms, trade licences and certificates in accordance with local requirements)	Architect / Design; Builder; accrediting authorities	Local Government Area (LGA) / State Government / Building certifier/surveyor
NatHERS Universal Certificate or alternative verification methods (i.e. any documentation / data provided to demonstrate design compliance with NCC Energy Efficiency requirements)	Energy Assessor / other qualified person	CSIRO / LGA
'As Constructed / Installed' evidence demonstrating compliance (e.g. licenses, invoices, product documents and certificates of compliance, photos, contract amendments, alterations to building plans, etc)	Contract Builder / site manager (including suppliers and sub-contractors)	Builder / main contractor
Inspection reports	Certifier	Certifier / LGA
Audit reports / Certificate of Completion / Certificate of Occupancy	Local / state government	LGA

2.2 Project Methodology

This project is restricted to Class 1 (NCC 2019 Volume 2) and Class 2 (NCC 2019 Volume 1) residential buildings¹. The project methodology is summarised in Figure 1. It shows the methodologies undertaken in each of the three main stages. The methodologies include document review, regulator and industry engagement (interviews, workshops, survey, conference presentation), international case study review and expert consultation.

1. Shergold and Weir's report distinguishes between 'commercial buildings' (class 2-9) and 'domestic buildings (class 1 and 10), broadly reflecting two different construction markets. Both class 1 and class 2 buildings, however, are considered 'homes' by their occupants who don't distinguish by construction markets.

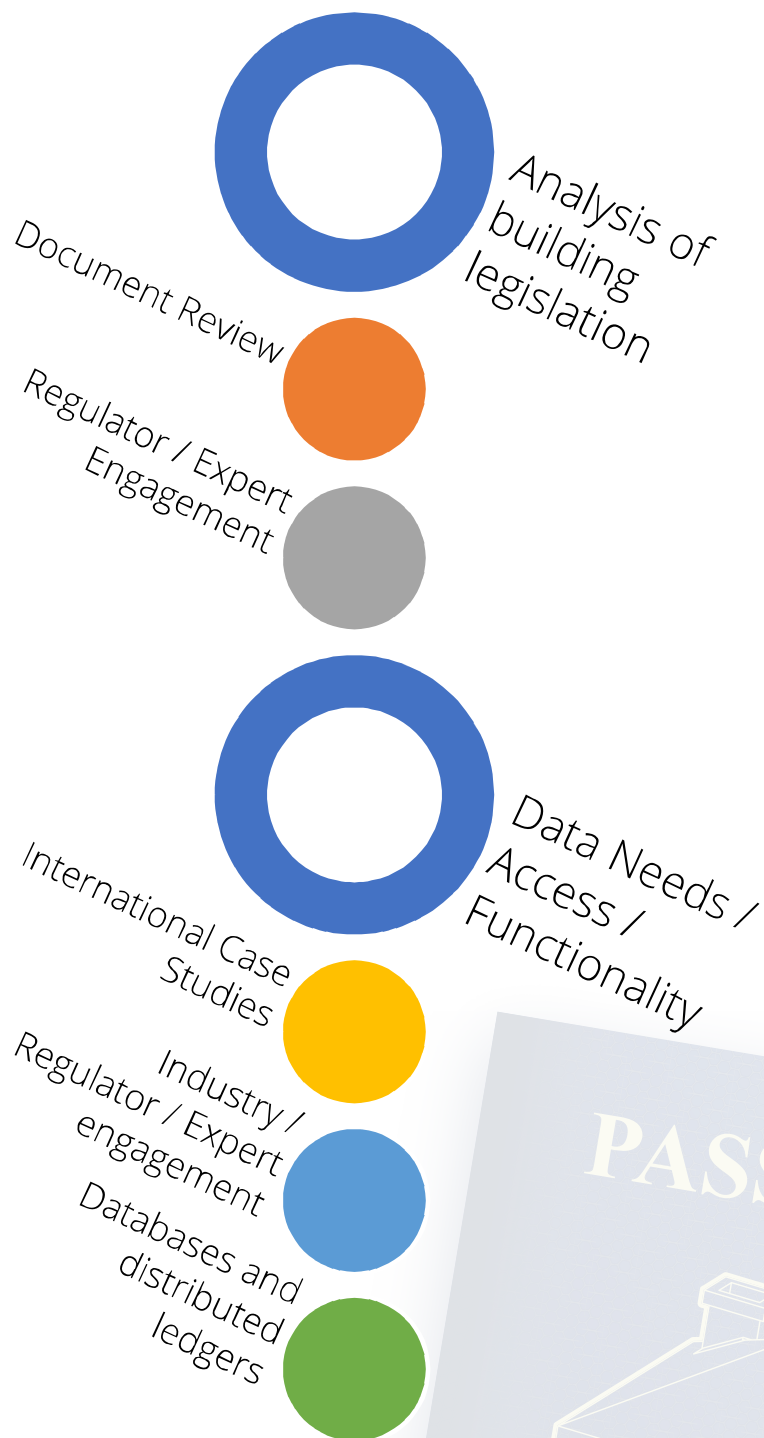


Figure 1 Project Methodology

2.3 Report structure

The following sections of this report look at each of the main stages in more detail.

Section 3 contains an analysis of building legislation (Acts and Regulations) of each state and territory. It concludes with regulator and stakeholder perceptions of what building documentation is currently required by the respective legislation.

Section 4 discusses what building data would be needed in order to enable energy efficiency compliance. It considers possible trigger points for a NatHERS rerating, triggers for non-compliance with approved plans, and issues relating to energy efficiency of building services. Through a review of several international examples of EBP-like programs, it presents industry perceptions of possible functionality and architecture of an Australian EBP.

Section 5 discusses possible next steps for the development of a national EBP.

Section 6 contains appendices relevant to this report, including details of stakeholder engagement, expert contributions and international case studies.

3. Analysis of Building Legislation

The purpose of this stage of the project was to undertake an analysis of documents and data relating to residential building data and the NCC (and state or territory variants) that are required by law.

Two types of documents were investigated:

- i. the key legislation (Acts and Regulations) that relate to residential building construction (Table 3); and
- ii. the documents or forms that are mandated by such legislation for the purposes of residential building approval / building permit applications and associated construction and certification processes.

Table 3 Legislation reviewed with respect to building compliance documentation

State / Territory	Act	Regulation
Australian Capital Territory	<i>Building Act 2004</i>	Building (General) Regulation 2008 – Republication No 35 May 2018
New South Wales	<i>Environmental Planning and Assessment Act 1979</i>	Environmental Planning and Assessment Regulation (2000) Environmental Planning Instruments
Northern Territory	<i>Building Act 2015</i>	Building Regulations 2016
Queensland	<i>Building Act 1975</i> <i>Planning Act 2016</i>	Building Regulation 2006 Queensland Development Code MP 4.1–Sustainable buildings (QDC 4.1) (Subordinate legislation to BR 2006)
South Australia	<i>Development Act 1993</i>	Development Regulation 2008
Tasmania	<i>Building Act 2016</i>	Building Regulations 2016
Victoria	<i>Building Act 1993</i>	Building Regulations 2018
Western Australia	<i>Building Act 2011</i> <i>Local Government Act 1995</i>	Building Regulations 2012

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Analysis was also guided by the contexts provided from two additional documents:

- National Energy Efficient Building Project Phase 3 – Report 1 Deep Dive Project Workshop and Survey Report, 2017.
- Building Confidence: Improving the effectiveness of compliance and enforcement systems for the building and construction industry across Australia. Peter Shergold and Bronwyn Weir. February 2018.

This project stage sought to understand what the law says with regard to the primary purpose for collecting building information, the type of information collected, how this information is stored and accessed, and any conditions relating to ‘personal information’ that might be collected as part of the building regulation processes.

3.1 National Construction Code

The NCC is a performance-based code that sets the minimum required level for the safety, health, amenity and sustainability of certain buildings (primarily the design and construction of new buildings). The uniform set of technical provisions that apply throughout Australia for building work are outlined in the Building Code of Australia (BCA) series in the NCC, and the plumbing and drainage installation provisions are outlined in the Plumbing Code of Australia (PCA) series in the NCC. These provisions allow for variations in climate and geological or geographic conditions². The responsibility for building regulation, however, falls within the powers of each state and territory, meaning that the NCC has no legal effect except that provided by each state or territory’s legislation. Table 4 details the specific sections of the NCC 2019 considered relevant for this project.

Table 4 NCC Documents and Sections examined

Building Class	NCC 2019	Sections / Subsections examined
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2. Australian Building Codes Board, National Construction Code (2015) <https://www.abcb.gov.au/ncc-online/About>.

Class 1 a (detached house, row house, town house, terrace house, villa)	Volume Two	Section 1 – Governing Requirements A2: Compliance with the NCC A5: Documentation of Design and Construction Section 2 – Performance Provisions 2.6: Energy Efficiency ³ Section 3 – Acceptable Construction 3.12 Energy Efficiency 3.12.1 Building Fabric 3.12.2 External Glazing 3.12.3 Building Sealing 3.12.4 Air Movement 3.12.5 Services Schedule 1 – State and Territory Appendices
Class 2 (building with 2 or more sole-occupancy units, each being a separate dwelling)	Volume One	Section 1 – Governing Requirements A2: Compliance with the NCC A5: Documentation of Design and Construction Section J – Energy efficiency

3.1.1 Energy efficiency requirements for dwellings

NCC 2019 Volume Two contains the requirements for Class 1 (residential) and Class 10 (non-habitable) buildings and structures and was adopted by States and NT from 1 May 2019 and by the ACT from 1 June 2019. The energy efficiency requirements for residential buildings relate to the:

- thermal performance of the building envelope (to facilitate the efficient use of energy for artificial heating and cooling)⁴, including building fabric (e.g. walls, floors and roof); external glazing and shading; sealing of the building envelope against air leakage; and the utilisation of air movement to assist cooling; and
- performance of the house's domestic services (heating, air-conditioning, mechanical ventilation, artificial lighting, pool pumps and heaters, water heating systems; and associated distribution systems and components)⁵.

3. Part 2.6 does not apply to New South Wales (which uses energy efficiency measures to support and complement BASIX) and to the Northern Territory (which uses BCA 2009 Part 2.6).

4. NCC 2019 Volume Two P2.6.1

5. NCC 2019 Volume Two P2.6.2

This is communicated in Volume Two through the non-mandatory, informational, functional statements (F2.6), the mandatory performance requirements (P2.6.1 Buildings and P2.6.2 Services), Verification Methods (V2.6.2.2 - Reference Building, V2.6.2.3 – Building Sealing), and Acceptable Construction Practices (Part 3.12). Similar provisions relate to Class 2 buildings in Section J of NCC Volume One. Two notable differences exist, however, in the wording of the performance requirements for Class 1 and Class 2 buildings, as shown in Table 5. First, Class 2 buildings are required to consider the level of human comfort required for the building use, while Class 1 buildings are only required to consider ‘the internal environment’. Second, Class 1 buildings are required to meet the minimum standards (e.g. 6 stars NatHERS rating), while sole-occupancy units of Class 2 buildings only need to meet a collective AVERAGE of the minimum standards (i.e. the collective average energy rating of all units within a multi-unit complex needs to be 6 stars; individual dwelling cannot be less than 5 stars). These differences could raise questions about fairness and equity (between occupants of Class 1 and Class 2 residential buildings) and owner expectations regarding levels of compliance (a lower level of compliance is permitted for Class 2 dwellings).

Table 5 Comparison of performance requirements for class 1 and class 2 buildings

Class 1 buildings (NCC 2019 Volume Two)	Class 2 buildings (NCC 2019 Volume One, Section J)
<p>“A building must have, to the degree necessary, a level of thermal performance to facilitate the efficient use of energy for artificial heating and cooling appropriate to</p> <p>(a) the function and use of the building; and</p> <p>(b) the internal environment;</p>	<p>“A building, including its services, must have features that facilitate the efficient use of energy appropriate to</p> <p>(a) the function and use of the buildings; and</p> <p>(b) the level of human comfort required for the building use;</p> <p>NOTE: J0.2 requires sole-occupancy units of Class 2 building MUST collectively achieve an average energy rating of not less than 6 stars, and individually achieve an energy rating of not less than 5 stars</p>

3.1.2 Demonstrating compliance

Compliance with these requirements (for both classes of buildings) requires complying with BOTH the governing requirements of the NCC and the performance requirements⁶, as represented by Figure 2. It is important to note the evidence of suitability (of a product, design, construction method) must include evidence of fitness for purpose to achieve the appropriate performance requirements as well as appropriate construction / installation. This would seem to infer demonstration of suitability at both the design phase (e.g. building approval application stage) as well as during, and at completion of construction. This would then imply that the onus of demonstrating suitability is just as relevant for people involved in the construction of a dwelling and the installation of its services (i.e. post building permit stages), as on the professionals involved in the design and specification of the building and its services (i.e. pre-permitting stage).

6. NCC 2019 Volume 2 Section 1 A2.0

The type or form of documentary evidence regarded as able to prove suitability to meet a Performance Requirement or a Deemed-to-Satisfy (DtS) Provision is listed in A1.2.2 and also shown in Figure 2. Alternative forms of documentary evidence are permitted as long as that evidence demonstrates that the item in question fulfils specific requirements AND sets out the basis on which such evidence is given (A5.2(f)). These requirements are mandatory.

This section of the NCC 2019 Volume Two, however, is silent on how evidence of ‘appropriate construction and installation’ can be demonstrated. It is also silent on the issue of retainment of such documents. The introduction to this section (a non-mandatory part of the NCC), mentions the preparation and retainment of evidence – but provides no further clarity or guidance. An examination of the remaining provisions of the NCC does not provide any further elaboration on the collection, storage or access to this documentary evidence. There is no mention of data or information privacy.

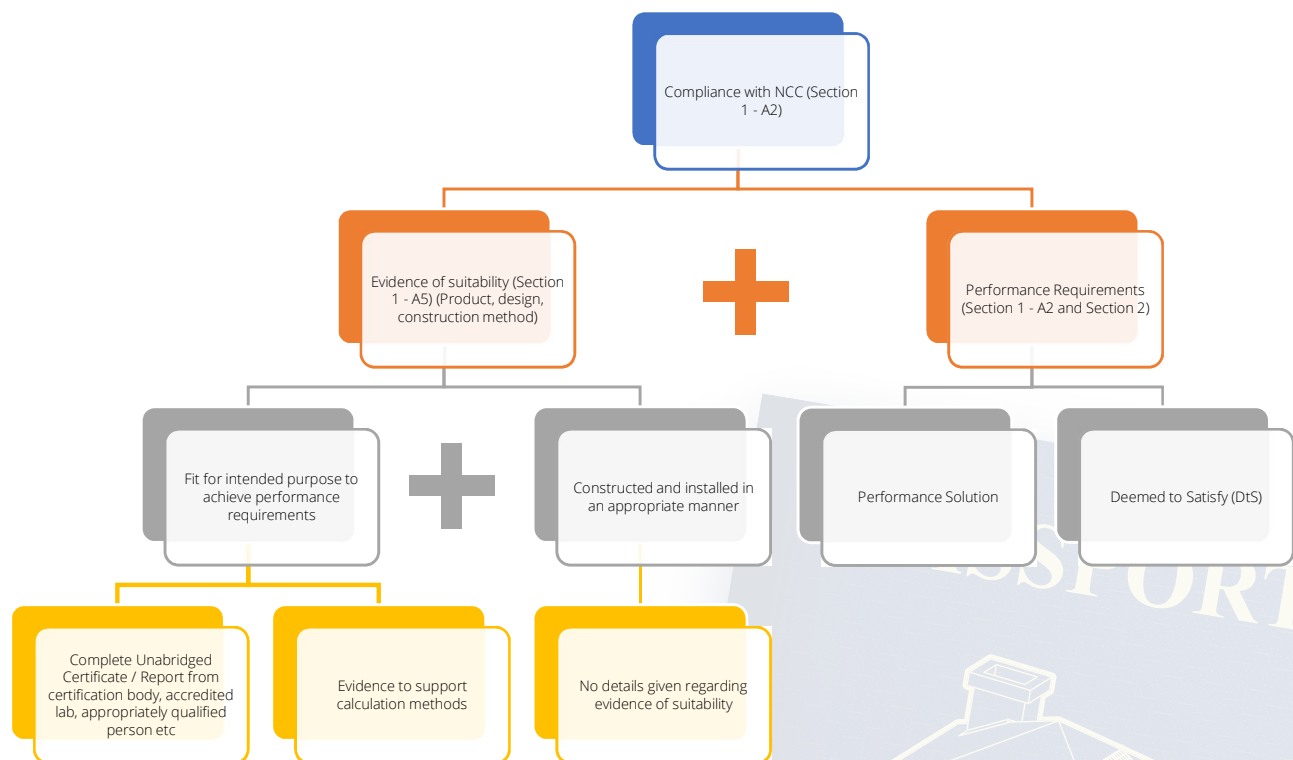


Figure 2 Compliance requirements as outlined in NCC 2019 Volume Two

3.1.3 Summary of NCC, Energy Efficiency and Documentation

- The NCC is given legal status through State and Territory legislation.
- The NCC mandates that:
 - » Both Class 1 and Class 2 dwellings meet minimum performance standards for energy efficiency of both the building envelope and building services, HOWEVER the performance requirements and minimum standards are different. This is even before considering state and territory variations and non-compliance.
 - » Compliance with the performance requirements must be supported by evidence of suitability (fit for purpose and can meet performance requirements) AND evidence that it has been constructed / installed in an appropriate manner.
 - » Copies of documentary evidence must be unabridged / complete.
- The NCC does not comment on how such documentary evidence should be collected, retained, stored or accessed.
- It is unclear what would constitute the minimum core information required in any document to thoroughly demonstrate compliance. This is consistent with the findings of the Pilot EBP project in 2015⁷. What constitutes 'evidence' or 'demonstration of compliance' appears to be open to interpretation.

3.2 State and Territory Legislation: Documentary Evidence

This section summarises the documentary evidence requirement of each state and territory, highlighting similarities and differences between the states and territories.

3.2.1 What documents are mandated?

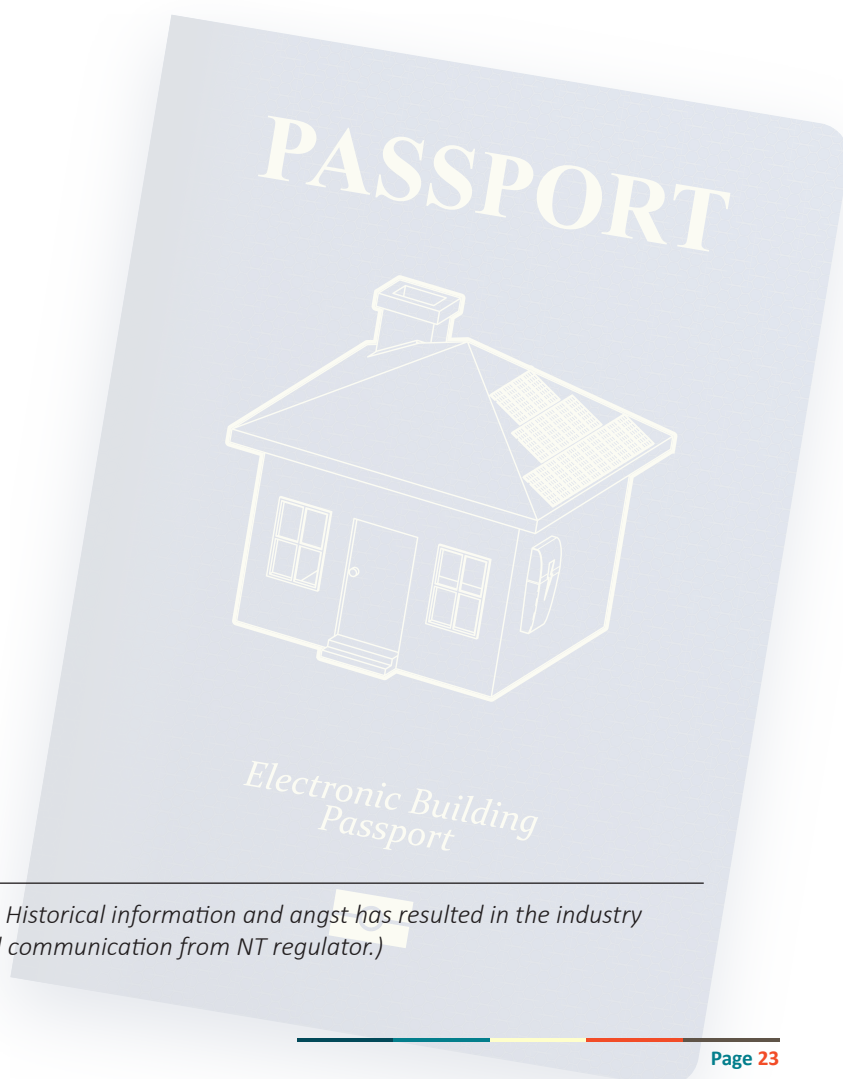
Building documents are required in all states and territories for the assessment of applications to build a dwelling and/or applications to occupy a newly constructed dwelling (including any intermediary processes). The purpose of the documents is to enable assessment of the relevant application by demonstrating that the building work complies with the relevant assessment provisions within each jurisdiction. The assessment of applications is carried out by building certifiers or surveyors, either as private contractors or on behalf of a local government authority.

The words used to describe the collections of documents that accompany applications include 'supporting documents', 'consent documents' and 'records'. These document collections include a range of document types, as illustrated in Table 6. Note that NatHERS Universal Certificates or 'energy certificates' are not necessarily explicitly listed.

7. Phil Harrington, 'Pilot Electronic Building Passport: Project 2 – National Energy Efficient Building Project Phase 2' (Final Report, pitt&sherry and Queensland University of Technology, 17 December 2015) <<https://eprints.qut.edu.au/93127/>>.

Table 6 Summary of ‘Building Documents’ required by legislation

State / Territory	Documents required
ACT	All plans or drawings, any approvals (e.g. inspection reports), all certificates (e.g. Certificate of Completion, Certificate of Occupancy and Use), determination, notification or permission issued or given; any certificate or other document given or prepared by someone else that the certifier has relied on; the certifier’s working papers and calculations that are relevant to the issuing of a relevant document
NSW	Site survey, building plans, building specifications, energy certificate (BASIX), Construction Certificate, Occupation Certificate
NT	Drawings (floor plans, elevations, sections; plumbing and drainage work; siting boundaries, lot dimensions, easements, adjacent streets, relationship with neighbours); Building Permit, Occupancy Permit, inspection certificates, builder’s declaration, product certificates ⁸
QLD	Plans, drawings and specifications to enable assessment, Form 15 (Compliance Certificates), Form 16 (Inspection Certificates), Form 21 (Final Inspection Certificate)
SA	Plans, structural details, drawings, specifications, energy efficiency report, Statement of Compliance, Certificate of Occupancy (Not for Class 1)



8. NT has no accredited assessors for energy efficiency. Historical information and angst has resulted in the industry being ‘behind the times’ on energy efficiency. (Personal communication from NT regulator.)

State / Territory	Documents required
TAS	Architectural / working drawings, site plan, engineering drawings Certificates of Responsible Designer ⁹ / Certificates of Qualified Person; Building Permit, Certificate of Final Inspection, Certificate of Completion, Occupancy Permit
VIC ¹⁰	Building drawings, specifications of materials, documentation of assessment methods / expert judgement / calculations ¹¹ , Certificates of Compliance (including documentation of performance solutions); notices or determinations made by the building surveyor; Certificates of Compliance
WA	Certificate of Design Compliance (signed by surveyor), accompanied by associated building plans, specifications, technical certificates, list of required inspections and tests; Building Permit, Certificate of Construction Compliance, Certificate of Occupancy (Class 2 only). WA requires completion of a Builders Technical Audit Checklist that enables the builder to record compliance with BCA3.12, including insulation and sealing. The energy efficiency of glazing, however, is not required to be specified

While all states and territories require documents to ‘enable assessment’ and ‘show compliance’, not all states and territories are clear about whether it is the documentation itself, or information that documents contain, that needs to demonstrate compliance. This relates to the issue raised in the previous section (2.1.2) regarding lack of clarity regarding what constitutes evidence or demonstration of compliance. This is demonstrated, for example, by comparing Queensland (QLD) with the Australian Capital Territory (ACT). QLD has a heavy reliance on the correct form being submitted (e.g. Form 15 Compliance Certificates) and local government authorities can rely and act on such documentation, for the purposes of building development application and approvals, without further checking¹².

The ACT in contrast provides a checklist of the documents and forms that must be submitted, and the information that is expected to be contained in each of these documents. The required ‘documents’ in the ACT include approved plans (site, floor, elevation, sections, demolition) and details (footing, slab, retaining walls, masonry construction, framing, roof cladding, exterior cladding and materials, wet area, windows glazing, fire safety, movement access, pools and spas, energy efficiency, water drainage, services)¹³.

9. This certificate is required for all design work and needs to indicate whether the design has been done under DtS or a performance solution. Each certificate must be supported by evidence.

10. Building Act 1993 (VIC) Schedule 2 and Building Regulations 2018 (VIC) R29 list other information that may be requested by the surveyor, such as evidence of lot ownership, parties to the building contract, and insurance details

11. Building Regulations 2018 (VIC) R38

12. Building Act 1975 (QLD) S53-54

13. Minimum Documentation Requirements for Building Approval Lodgement Class 1 and 10 – Residential Construction – AF2016-78 (references Building Act 2004 (ACT) S151 and s28A)

The information required for each document is specified. Some examples, relating to energy efficiency, include:

- i. Alternate solutions (all calculations, reports, certificates and manufacturer's information together with a written proposition to support a building solution which is not in accordance with the DtS provisions of the NCC);
- ii. Windows and Glazing details (Figure 3);
- iii. Energy efficiency details (Figure 4)

<u>Windows and Glazing Details</u>	<ul style="list-style-type: none"> • Window system description, manufacturer, frame material and energy rating • Glazing specification • Bushfire-prone areas requirements • Opening size for ventilation calculation • Other glazing <ul style="list-style-type: none"> ○ Internal glazing specifications including wet area glazing, shower screens, doors ○ Balustrade system specification (glass and fixings) ○ Overhead glazing, roof lights 	<input type="checkbox"/> Supplied as stand alone or in document <input type="checkbox"/> Not required <input type="checkbox"/> Office Use
---	---	---

Figure 3 ACT information requirements for glazing documentary evidence¹⁴

<u>Energy Efficiency Details</u>	<ul style="list-style-type: none"> • Building fabric thermal efficiency specification <ul style="list-style-type: none"> ○ walls, ceiling, floors and roof ○ Insulation location and R value ○ Sarking vapour permeability • Window energy specification • Energy rating documentation • Building sealing • Air movement control strategies • Pipe and services insulation • Glazing calculator to be supplied if a Deemed-To-Satisfy solution • Under slab or slab edge insulation 	<input type="checkbox"/> Supplied as stand alone or in document <input type="checkbox"/> Not required <input type="checkbox"/> Office Use
---	---	---

Figure 4 ACT information requirements for energy efficiency documentary evidence¹⁵

Furthermore, 'approved plans' are defined as plans that relate to the building work for which a building approval is in effect and includes amended plans. All pages of all plans must be approved, stamped and initialled, and accompany the building permit.

14. Minimum Documentation Requirements for Building Approval Lodgement Class 1 and 10 – Residential Construction – AF2016-78 (references Building Act 2004 (ACT) S151 and s28A)

15. Minimum Documentation Requirements for Building Approval Lodgement Class 1 and 10 – Residential Construction – AF2016-78 (references Building Act 2004 S151 and s28A)

The ACT requires ‘plans’ to contain sufficient information to enable three tasks to be undertaken:

- i. Allow a certifier to determine if the work would contravene the building codes;
- ii. Enable a competent builder to carry out the work in accordance with the plans and Act; and
- iii. Allow a certifier to determine if the work complies with the plan and the Act¹⁶.

The documents are specifically required to contain information to enable certifiers and builders to carry out their respective duties. This appears consistent with the documentary evidence requirements of the NCC as discussed previously.

No other legislation examined in this project was as clear in its communication of the information required to demonstrate (and enable) compliance.

In addition to the building documentation that is collected, each state and territory, through its building approval processes, collects a range of other information, as summarised in Table 7. This may be at a state / territory government level or at a local government level in accordance with state / territory requirements. This shows that it is common for all states and territories to collect property identifying information, owner personal details, builder’s details (and sometimes details of other professions), and estimated building value: information that is essential for the performance of each jurisdiction’s roles in assessing building applications.

Table 7 Information included in building approval / development application form

Person preparing document	Name, contact details
Land Title Information	Property address and unique identifier
Builder’s details (could also include architect, designer, engineers)	Name, contact details, licence / registration
Owner (if different from applicant)	Name, contact details, consent
Nature of building works	e.g. class of building, type (e.g. new, detached)
\$ value of proposed work	

16. ACT Building (General) Regulation 2008 Republication May 2018. R17(2)

3.2.2 Evidence of construction and installation compliance

The primary purpose for the building approval forms and associated documents are to enable the assessment of building applications. Such assessment relies on the documents provided to demonstrate compliance with the building assessment provisions in each jurisdiction. Some key differences and similarities between states and territories, or between residential building classes, include:

- QLD legislation has detailed requirements for inspections for Class 2 buildings, but not for Class 1.
- NSW uses an inspection at completion of construction to validate consistency with the Development Approval (DA) and Construction Certificate, and compliance with the BCA.
- VIC, TAS and ACT each require multiple inspection steps. VIC requires appropriate Certificates of Compliance from the respective stakeholders. TAS requires similar documents (called Certificates of Qualified Person) as well as Final Inspection and Building Completion Certificates and an Occupancy Permit. ACT has similar requirements to TAS.
- SA doesn't have a mandated inspection regime. The builder issues a Statement of Compliance once construction is completed. A Certificate of Occupancy issued by a private or council building surveyor is only required for Class 2 buildings, not for Class 1.
- WA and NT require an Occupancy Permit, but WA only requires this for Class 2 buildings.

The differences in the legislation raises some important questions of relevance to regulators, the construction industry and the Australian public...

The differences in the legislation raises some important questions of relevance to regulators, the construction industry and the Australian public:

- What does compliance mean?
- Who is responsible?
- At what stage does a building need to be compliant?
- Is the public aware of the different standards (in terms of performance standards and compliance processes) that apply to Class 1 and Class 2 dwellings?

The Tasmanian legislation appears to be the only one that specifically addresses some of these questions. The *Tasmanian Building Act 2016* has a very clear and concise statement about the objects of the Act that include, but go beyond, compliance:



The objects of the Act are to ensure that building, plumbing and demolition work meets or exceeds the minimum national construction standards, does not negatively affect the health and safety of people, and that owners, building services providers, practitioners and councils comply with the requirements of the Act and the NCC when performing work or performing functions and exercising powers, under this Act. (S3)

Under that Act, building work is considered to be complying with the Act if it complies with the relevant performance requirements of the NCC (S313(1)). Compliance is presumed if the building work has a building permit and a certificate of completion with respect to the building work (S313(2a and 2b)). Three entities are specifically mentioned in the Act (Part II, S11) as being responsible for ensuring that work complies with the Act and the applicable provisions of the NCC:

- A person performing the work; and
- The owner of a building where work is being performed; and
- A person named on a permit under which the work is done.

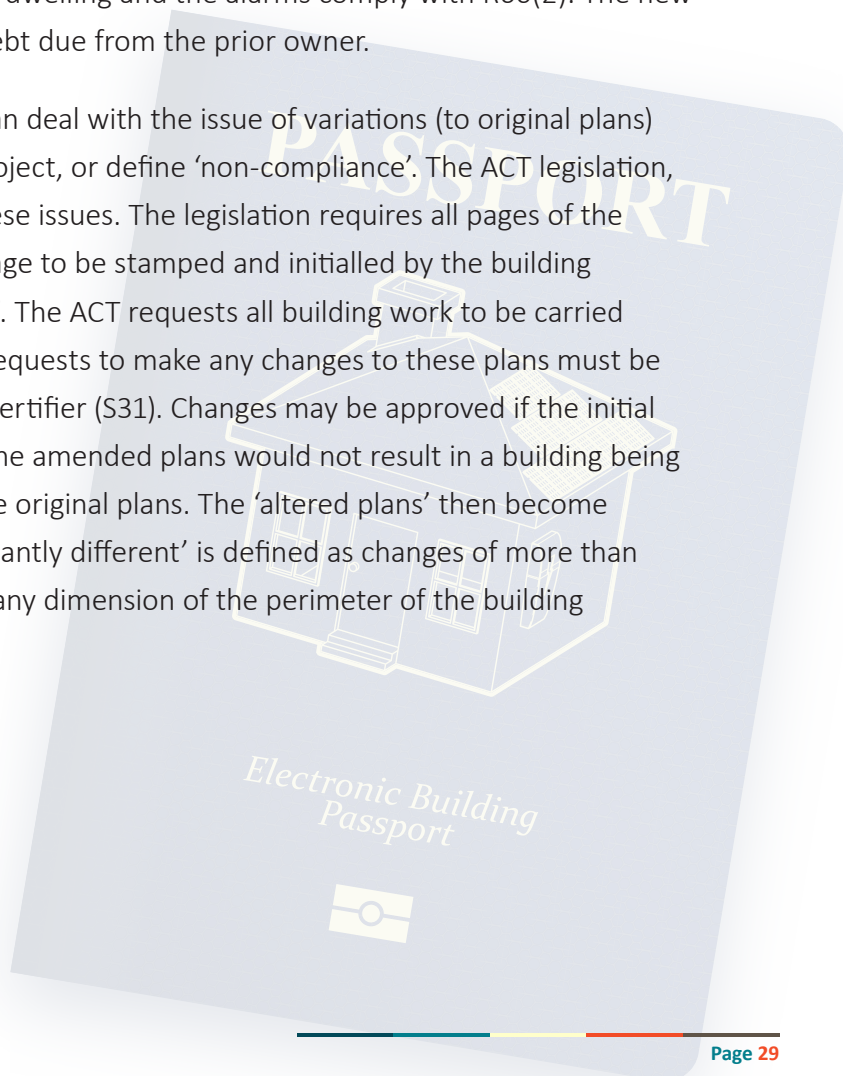
A building surveyor's responsibility is limited to the extent of their engagement with respect to the work. The broad application of responsibility for compliance, to varying degrees, is also implicit in the powers given to Tasmania's Director of Building Control, who may audit "*owners, owner builders, builders, building service providers, plumbers, designers, building surveyors, permit authorities, general managers, councils and other prescribed persons or organisation*". (Act S15)

This is in contrast to Western Australia where the person named as the builder on the Building Permit is the person who must ensure that the building is completed in accordance with the plans and specifications contained in the Certificate of Design Compliance, building permit and any conditions attached to the permit (Act S29).

Interestingly, some legislation provides examples of compliance being beyond the initial construction completion state. WA's legislation provides three examples that imply that a building (or at least some aspects of it) should be compliant beyond the initial construction stage:

- i. WA's *Building Regulations 2012* (R48A) relates to Maintenance of Buildings (including Class 2) and requires owners of existing buildings in Class 2-9 to ensure that safety measures, mechanical systems and building services are maintained to safeguard people and to perform at a standard of energy efficiency that is equal to or greater than the standard in the relevant building standards for the part;
- ii. WA's *Building Act 2011* (S94) defines 'compliance purposes' as (a) monitoring whether the provision of this Act has been, or is being complied with; (b) investigating a suspected contravention of a provision of this Act; (c) conducting an inspection or test of equipment, machinery or a system, or an existing building; and (d) ascertaining whether a building is in a dangerous state or is unfit for human occupation. It relates to Part 8 (enforcement) of the Act which says that an authorised person may request relevant information for compliance purposes.
- iii. WA's *Building Regulations 2012* (R57) appears to set a precedent for ongoing compliance and transfer of information to subsequent owners. R57(1) places the responsibility of installing smoke alarms on the new owner, should the prior owner fail to comply with R56(1) – which is a requirement 'to the extent practicable' to ensure that at the time of transfer the dwelling has smoke alarms installed so that the dwelling and the alarms comply with R60(2). The new owner may recover these costs as a debt due from the prior owner.

Very little legislation defines processes that can deal with the issue of variations (to original plans) that inevitably occur during a construction project, or define 'non-compliance'. The ACT legislation, however, provides some clarity on both of these issues. The legislation requires all pages of the plans that form part of the building permit stage to be stamped and initialled by the building certifier. These, then, are the 'approved plans'. The ACT requests all building work to be carried out in accordance with the approved plans. Requests to make any changes to these plans must be submitted in writing, from the owner, to the certifier (S31). Changes may be approved if the initial approval requirements are still satisfied and the amended plans would not result in a building being 'significantly different' from the building in the original plans. The 'altered plans' then become stamped as the new 'approved plans'. 'Significantly different' is defined as changes of more than 1 per cent in floor area, roof area, volume or any dimension of the perimeter of the building



(including footprint or elevation) (R30). The *Building (General) Regulation 2008 Republication No 35 2018* (R36 and Schedule 3) also provides examples of fundamentally noncompliant building work, such as:

- One or more elements not shown in the approved plans are added to the building, and the building as altered by the work is a different type of building.
- Placement of windows and doors inconsistent with the drawings or with what can be deduced from diagrammatic information in the approved plans (e.g. number of external doors or windows more than shown on plans; or doors / windows added to an external wall that did not have openings previously).
- Height of building more than 300 mm higher than on approved plans.

3.2.3 Ownership and retainment of building documents

No building legislation in any state or territory made any specific mention of building document ownership. Building Application Forms were developed by either state or territory or local government agencies specifically for the purposes of assessing building applications and consistent with the relevant Regulations. Some documents that accompany application forms (e.g. building plans) are automatically ‘owned’ by the person who generated the document (e.g. the architect or building designer), under Australia’s copyright legislation. Some professions (e.g. certifiers) and jurisdictions (e.g. local councils) have raised concern about the legality of making such documents available and have purportedly received legal advice that doing so may contravene copyright legislation. For example, in South Australia, certifiers are not required to provide any document to council if, in their opinions, doing so would unreasonably jeopardise the security of the building, infringe any copyrights, or break any other law¹⁷. At least one SA council has received advice that they cannot make such documents available¹⁸.

In South Australia, certifiers are not required to provide any document to council if, in their opinions, doing so would unreasonably jeopardise the security of the building, infringe any copyrights, or break any other law.

The assertion that providing building documents such as plans may infringe on copyright has not been explored in this project and warrants further investigation. In particular it is worth considering two aspects that define copyright infringement: the exploitation of a work for commercial purposes;

17. Regulation s102(3)

18. This information was provided by a council participating in the Adelaide workshop

and the permission of the owner of the copyright material. On face value, it would appear that neither of these aspects would be present in the case of a building certifier, local or state or territory government authority retaining such documents. Supporting documents such as building plans are submitted to the relevant authority with the knowledge of the owner and contracted professions (e.g. architects) as part of the building application process. Making such documents available to various other parties is permitted by building legislation (to various extents) and is not for commercial gain.

Each state and territory regulates, to various extents, issues relating to storage of, and access to, building documentation that is generated and collected during a building approval / certification process. Regardless of the building application and certification process, these requirements relate to private certifiers and government agencies. Documentation is in the form of either a Register or Building Records repository or both. Legislation also dictates who should have access to these documents, and how long the documents should be retained.

Registers typically contain names and contact details of key persons (e.g. owner, builder, certifier, sometimes designer), property identifiers (e.g. address) and summary data of applications, certificates, permits etc. such as applications, certificates. Building Records repositories can include a wide variety of document types. Table 8 summarises each jurisdiction's requirement for record keeping, including the retainment period. This table is indicative and may not be complete, as details about document retention may be in documents other than the examined legislation. The ACT and NT have one repository for all records, while the document repository in each of the states is each local government. Several states are in transition, however, with plans to have state-wide planning portals that may act as a central repository for that jurisdiction (for either a Register of building information and perhaps a repository for building records). These state-wide 'planning portals' may provide an opportunity to value add to existing documentation processes by ensuring IT architecture that enables the functionalities of an EBP in the future.

Table 8 Documents required to be retained by local government authority (or State /Territory)¹⁹

	Building Records	Register of Information	Retention period
ACT	All docs related to building approvals / completions / approved amended plans, including certifier's working papers and calculations	Construction Occupations Register	Unknown / Unspecified
NSW	Unclear	A register of details ²⁰	Unknown / Unspecified

19. This table is indicative and may not be complete. NT and ACT each have a central repository. NSW's Planning Portal is the repository for some records although it is unclear in NSW what building records are kept by local councils and what are kept by the Planning Portal. In QLD, TAS and WA legislation is unclear about how long records must be kept.

20. Environmental Planning and Assessment Regulation (NSW) 2000 (Registers and Other Records), Part 16, Clause 264

	Building Records	Register of Information	Retention period
NT	Applications and all documents relied on by certifier to grant a permit (e.g. plans, contracts, certificates, declarations)	Register	Unspecified
QLD	Building development information including building application, approval forms and related documents ²¹ , each with an identifier to application and certifier approval ²²	Documents as relevant to: (i) local government (ii) an assessment manager (iii) referral agency, or (iv) chief executive	Keep a copy for at least 5 years
SA	All Development Approval (DA) applications, plans and supporting documents ²³ , ²⁴	Register of Information	Until the building is demolished or removed from site (or 10 years, if doc from certifier)
TAS	A copy of each document submitted in respect to an application for a permit.	A register of administrative details (e.g. permits, certificates and details of relevant persons	Unclear
VIC	All plans, documents and details of building work received by, or produced by the building surveyor ²⁵ , ²⁶	Register of all building permits / occupancy permits ²⁷ .	Until the building is demolished or removed from site ²⁸
WA	Documents that comprise, accompany, are provided for in, are issued as a result of, or otherwise relate to the building that is the subject of a building permit application, or an inspection of a prescribed kind.	Register of all building permits, demolition permits, occupancy permits, building approval certificates ²⁹	Unclear

21. *Planning Regulation (QLD) 2017, Schedule 22 (as relevant to Planning Act 2016, s264).*

22. *Building Act 1975 (QLD) S 86.*

23. *Development Regulation 2008 (SA), R34 and R98*

24. *Development Act 1993 (SA) S101*

25. *Building Act 1993 (VIC) S30 and S73; Building Regulations 2018 (VIC) R44 and R47*

26. *Building Regulations 2018 (VIC) R203 and R205*

27. *Building Act 1993 (VIC) S31*

28. *Building Regulations 2018 (VIC) R49*

29. *Building Act 2011 (WA) S128*

For those jurisdictions with private certifiers, there are additional regulated responsibilities regarding documentation. Some examples include:

- In QLD, private certifiers are required to keep, for five years, a copy of development applications, approval and inspection documents³⁰ and reasons for decisions³¹.
- In SA, certifiers are required to keep, for three years, a 'record' of each applicant's name, address, date of application, description of land, brief summary, details of any referral or concurrence on the application, and any decision on the application³². There is no explicit requirement to keep documentary evidence of decisions. Building documents are required to be given to the local council which is then the repository (refer to previous table).
- The ACT requires certifiers to maintain documents, records and information in relation to building approvals, staged inspections, directions, notices and other matters³³.
- The NT requires certifiers to keep a register of building permits and occupancy certification, and provide the Director of Building Control copies of such documents.

It is expected that all or most states and territories have a Code of Conduct for building certifiers / building surveyors. These Codes have not been systematically identified and evaluated as part of this study, however a few codes that have been viewed appear to have a common requirement regarding information gathered in the course of their professional duties. For example, in NSW certifiers are bound by a Code of Conduct and requirements of the Act³⁴. Information obtained by accredited certifiers in the course of performing their official duties, can only be used for official purposes.

Some legislation specifically mentions what documentation must be provided to owners, and some legislation mentions what owners are expected to do with this information. These requirements are summarised in Table 9. Note that the requirements for owners of Class 2 buildings to keep building services maintenance records (TAS), ensure building services are maintained to enable performance to energy efficiency standards (WA), ensure occupants have access to building occupancy permit information (WA), and ensure a building is not occupied without an occupancy permit (ACT) would appear to support:

- the concept of compliance being beyond the construction stage, and
- the concept of building information being made available to occupants (who may not be owners).

Refer to other examples that are discussed in Section 3.2.2 Evidence of construction and installation compliance.

30. *Building Act 1975 (QLD) S147 and S150*

31. *Code of Conduct for Building Certifiers (QLD), Standard 9*

32. *Development Regulation 2008 (SA) R98*

33. *Building Act 2004 (ACT) S17A*

34. *Environmental Planning and Assessment Act 1979 (NSW) S148*



Table 9 State requirements regarding building documentation to be passed to owners

	Documents required to be passed on to building owner
ACT	Copy of building approval and relevant plans (stamped) It is an offence to occupy, or allow someone else to occupy, a building, if a certificate of occupancy has not been issued ³⁵ .
NSW	Purchasers of a property (or their legal representative) can request building information ³⁶ .
NT	Application, drawings, certificates and building permit ³⁷ . Authorised officers have the power to demand the owner or occupier to produce any records relating to the building; to search for, inspect, take extracts from and make copies of such records. It is an offence to fail or refuse to produce records on being required to do so ³⁸ .
QLD	Any Decision Notice and copy of plans, drawings, specifications and other lodged documents and information (stamped approved); certificates relied on to decide the application; list of information relied on to decide the application ³⁹ ; final inspection certificate and any inspection documentation ⁴⁰ .
TAS	Endorsed copy of each document ⁴¹ . An endorsed copy is also required to be kept on the premises where the work is being performed (this is the responsibility of the person performing the work). This means that building permit documents are now in the hands of the person creating the documents, the person applying for a building permit (taken to be the owner or delegate), the permit authority and the person performing the work. Each of these persons have a stake in the information and have legal requirements with regard to this information (refer to the Objects of the <i>Building Act 2016</i>). Owners of Class 1b and Class 2 buildings are also required to keep maintenance records of essential building services (natural or mechanical ventilation hot water, energy efficiency). Such records are to include an approved schedule of maintenance and a record of maintenance (inspections, monitoring, testing, periodical servicing, minor repairs and replacement, reporting of faults and issues). Such records are to be kept for not less than 10 years, in a location other than at the premises to which the record relates ⁴² .
VIC	Building Permit and all documents, including assessment methods, expert judgement and any calculations ⁴³ . These documents must also be given to the builder.

35. *Building Act 2004 (ACT)* S76

36. *Environmental Planning and Assessment Act 1979 (NSW)* Division 6.7

37. *Building Regulations 2016 (NT)* R14

38. *Building Act 2015 (NT)* S164

39. *Planning Act 2016 (QLD)* S99

40. *Building Act 1975 (QLD)* S99, S148

41. *Building Regulations 2016 (TAS)* R22(1)

42. *Building Regulations 2016 (TAS)* R72, R64, R77

43. *Building Regulations 2018 (VIC)* R38

	Documents required to be passed on to building owner
WA	<p>Building permit. This must be given to each owner, the applicant, the builder and each other prescribed person⁴⁴.</p> <p>Owners of Class 2 buildings are also required to ensure that information about, or contained in, the occupancy permit is displayed in accordance with the regulations, or is otherwise brought to the attention of the building's occupiers or other persons using the building⁴⁵. Owners of Class 2 buildings must also ensure that safety measures, mechanical systems and building services are maintained to safeguard people and to perform at a standard of energy efficiency that is equal to or greater than the standard in the relevant building standards for the part⁴⁶.</p>

3.2.4 Building Documents and Information Privacy

This project did not undertake a comparison of federal, state and territory privacy legislation. At a national level, the Office of the Australian Information Commissioner (OAIC) deals with issues covered by the *Privacy Act 1988*. This Act regulates the handling of personal information by Australian Government agencies. The OAIC also participates in international forums to promote best privacy practice internationally and address emerging privacy issues⁴⁷. State and territory-based legislation or other mechanisms that may be relevant to EBPs and information privacy include:

- *Information Privacy Act 2014* (ACT)
- *Privacy and Personal Information Protection Act 1998* (NSW)
- *Information Act* (NT)
- *Information Privacy Act 2009* (QLD)
- *Information Privacy Principles* (SA)
- *Personal Information and Protection Act 2004* (TAS)
- *Privacy and Data Protection Act 2014* (VIC)
- No legislative privacy regime (WA).



44. *Building Act 2011* (WA) S28

45. *Building Regulations 2012* (WA) R42

46. *Building Regulations 2012* (WA) R48(A)

47. <https://www.oaic.gov.au/privacy-law/other-privacy-jurisdictions>

Some general principles on which privacy legislation is based were taken into consideration in analysing the building legislation and development of recommendations for further work in EBPs:

- The manner and purpose of collection of data⁴⁸
- Relevance of the data for the purpose
- Use of the data for relevant purposes / limits on use
- Privacy notice (for information collected from individuals)
- Data storage, security and access
- Data accuracy
- Data amendment capability
- Limits on Disclosure⁴⁹.

These general principles were taken into consideration when examining the building legislation listed in Table 3. This section reports on that examination.

All states and territories prescribe the circumstances under which building documents (and/or information in those documents) are to be made available to persons other than the owner, certifier, regulator or contractors (e.g. builder). The typical requirement is that building applications, notifications (e.g. approvals) and permits (e.g. occupancy permits) are available for inspection and/or purchase. Other supporting documents may or may not be available to people other than the owner or person with the owner's approval, depending on the jurisdiction. Some examples are:

- **VIC** Councils give access to building permit documents (permits, plans, documentation) under Regulations S50, 51, provided the applicant has consent from the owner and pays the appropriate fee. This information includes building permits, building / architectural plans, certificate of final inspection, occupancy permit, engineering details, builder's details and warranty insurance details.
- **QLD** (Brisbane City Council): Some information, such as permits, applications, inspection records, property notices, estimated cost, and names of persons involved (builder, architect, engineer, certifier) is available without the owner's consent. With proof of ownership or authorisation from the owner, all available documentation relating to a specific property, including plans, certificates and related documents, is available for purchase.

48. Information is taken, in this project, to also mean data.

49. Disclosure relates to circumstances where the original 'collector' of the information ceases to have effective control of that information when/if it is released to another entity. A Disclosure Statement may be required if data is to be available to other entities.

- **SA** Provisional Development Plan (PDP) documents (relating to land development) kept by council are available for public inspection without fees⁵⁰ or a copy obtainable for a fee⁵¹. However councils are not required to share Provisional Building Rules (PBR) applications and documents (related to buildings) with the public (e.g. plans, drawings, specifications) unless advised by the owner or if inspection of documents is authorized by the Minister⁵².
- **NT** permits any person to apply for a certified copy of a document. There is no requirement to be the owner, have the owners' permission or demonstrate the reason for the information. There does not appear to be any restrictions on the nature of the information that can be requested, or on the person who can make such a request⁵³.

Legislation can express how building information may be disclosed for the purposes for which the information was originally collected (i.e. building approval and compliance), or for further purposes. Some examples are shown below:

- **NSW** "An accreditation authority is authorised to disclose to the Secretary any information (including personal information within the meaning of the *Privacy and Personal Information Protection Act 1998*) obtained by the accreditation authority in the exercise of its functions under this Act."
- This Act also grants the Secretary the authority to request, receive, or to disclose information with relevant agencies under the *Privacy and Personal Information Protection Act 1998* and the *Health Records and Information Privacy Act 2002*. The relevant agency could be a local council, any other Australian jurisdiction that exercises a relevant function (e.g. registration, approval, regulation of building work, or insurance), or any person prescribed by the regulations.⁵⁴
- **QLD** The Planning Regulation 2017 (Qld) ⁵⁵ has the authority to prescribe 'where, and in what form the documents must or may be kept' and whether these documents must or may be available for inspection and/or purchase⁵⁶. Application documents and approvals provided by private certifiers to local government must be made available to the public for 'inspection and purchase'⁵⁷. Such documents may be in electronic form⁵⁸. Such documents may also be published online (on the local government's website). The legislation also makes provision for withholding (from the public) information that may be considered 'purely private' or 'sensitive security information'⁵⁹.

50. *Development Regulation 2008 (SA)* R34, R98

51. *Development Regulation 2008 (SA)* R101(4)

52. *Development Regulation 2008 (SA)* R101(5)

53. *Building Act 2015 (NT)* S166

54. *Building and Development Certifiers Act 2018 (NSW)* Section 84, Division 5, Part 6

55. *Planning Regulation 2017 (QLD)* Schedule 22 Part 2 S3(4)(a). *Planning Act 2016 (QLD)* S264(5)(c) provides for requirements that must be met when documents are to be published on a website.

56. *Planning Act 2016 (QLD)* S264(1)(b)

57. *Planning Act 2016 (QLD)* S264; *Planning Regulation 2017 (Qld)* S70 and Schedule 22 Part 1 S1(zh). *Planning Act 2016 (QLD)* S264(5)(a)-(b) provides mandatory requirements for 'inspection and purchase' of documents and also 'inspection only' requirements

58. *Planning Act 2016 (QLD)* S264(3)(a)

59. *Planning Act 2016 (QLD)* S264(6)

- VIC The *Building Act 1993* Provision 229J, subsection 2 allows disclosing information if it is necessary to carry out functions, for legal purposes, or if the Minister gives consent.
- SA The *Planning Act 1993* (S102) states that confidential information obtained by a person performing any function under the Act must not be used for self or someone else's benefit. Confidential information must not be disclosed unless disclosure is necessary for the proper performance of that function; if disclosure is made to another who is also performing a function under this Act; or disclosure is made with the consent of the person who furnished the information or to whom the information relates.

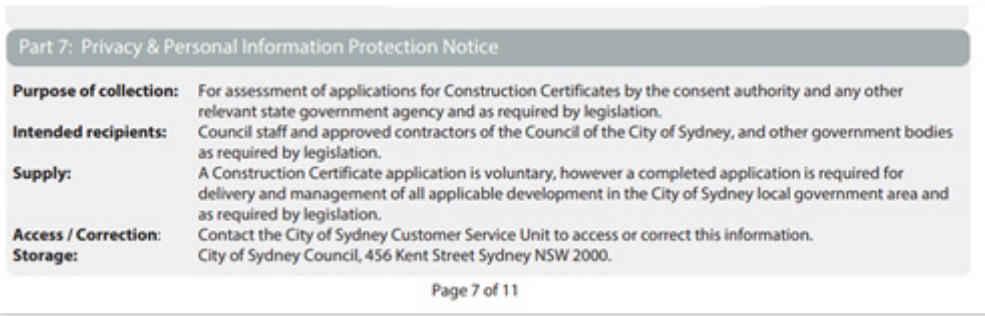
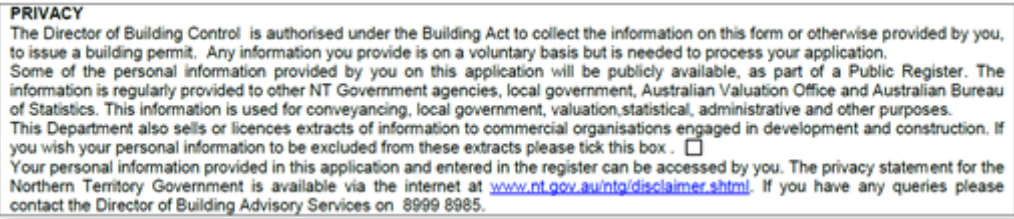
In addition to the legislation itself, it is not atypical for forms (online or print), used in various states and territories for the purposes of applying for building permits and other associated processes, to provide statements informing applicants of how the information on the building application forms may be used, stored and shared. This can include information about personal information (what is collected, and stored, and how to change it), and disclosure (who this information may be available to) and may include an explicit requirement for the applicant to provide acknowledgment of these conditions or indicate which information they wish to keep private. Some examples are shown in Table 10.

Table 10 Privacy, Disclosure and Consent statements on building forms

State / Territory	Examples of Privacy, Disclosure and Consent
ACT	<p><i>"I/we the Owner/s of the abovementioned property hereby apply under Section 26 of the Building Act 2004 to the certifier named above to issue a building approval for the building work described in this form. I/we have provided the certifier with information and documentation required to issue a building approval as specified in the Building (General) Regulation 2008."</i>⁶⁰</p> <p><i>"The personal information on this form is provided to Access Canberra to enable the processing of your application. The collection of personal information is authorised by the Building Act 2004. If all or some of the personal information is not collected Access Canberra cannot process your application. The personal information you provide may be disclosed to the Australian Bureau of Statistics, ACT Revenue Office and the Taxation Office. The information may also be disclosed where authorised by law or court order, or where the Directorate reasonably believes that the use or disclosure of the information is reasonably necessary for enforcement-related activities conducted by, or on behalf of, an enforcement body."</i>⁶¹</p>

60. Application of Building Approval (in the ACT)

61. Application for Building Occupancy (in the ACT)

State / Territory	Examples of Privacy, Disclosure and Consent
NSW	 <p>Figure 5 Privacy and personal information protection notice City of Sydney⁶²</p>
NT	 <p>Figure 6 Excerpt from Application for Building Permit⁶³</p>
QLD	<p><i>“The information collected in this form will be used by the assessment manager and building certifier in accordance with the processing and assessment of your application. Your personal details should not be disclosed for a purpose outside of the IDAS process or the provisions about public access to planning and development information in the Sustainable Planning Act 2009, except where required by legislation (including the Right to Information Act 2009). This information may be stored in relevant databases. The information collected will be retained as required by the Public Records Act 2002.”</i>⁶⁴</p> <p>The form provides an option for the applicant to request certain development information to remain private. Property owners can agree to the release of their name and the premises’ address for marketing purposes. The question is non-mandatory and the default response is no.</p>
SA	<p><i>“I acknowledge that copies of this application and supporting documentation may be provided to interested persons in accordance with the Development Regulations 1993”</i>⁶⁵</p> <p>Applicants sign this form.</p>

62. City of Sydney Construction Certificate Application <https://www.cityofsydney.nsw.gov.au>

63. NT Application for Building Permit (reference Building Act S3 Clause 3)

64. QLD IDAS Form 2 Building work details Version 3.1 – 3 Aug 2015, accessed 12/12/2018

65. SA Development Application Form

State / Territory	Examples of Privacy, Disclosure and Consent
TAS	<i>“Personal information is managed in accordance with the Personal Information Protection Act 2004 and may be accessed by the individual to whom it relates, on request to (the local council). Information can be used for other purposes permitted by the Local Government Act 1993 and regulations made by or under that Act, and, if necessary, may be disclosed to other public sector bodies, agents or contractors of (Launceston City Council) in accordance with Council’s Personal Information Protection Policy: (17-Plx-005).”⁶⁶</i>
VIC	<i>“The personal information requested on this form is being collected by City of Melbourne for the purposes of a Building Plan and Documentation search as set out in the Building Regulations 2018. The personal information could also be disclosed to our Information Management Team for the purpose of required record management procedures. It will not be disclosed to any other external party without your consent, unless required or authorized by law. If the personal information is not collected, we cannot process your request. If you wish to alter any of the personal information you have supplied ... please contact ...”⁶⁷</i>
WA	<i>“A person who is or has been engaged in the performance of functions under this Act must not, directly or indirectly, record, disclose or make use of any information obtained in the performance of those functions except for (a) the purposes of, or in connection with, performing functions under this Act or another written law; or (b) as required or allowed by this Act or another written law; or (c) with the written consent of the Minister or the person to whom the information relates; or (d) for the purpose of any proceeding before a court; or (e) in prescribed circumstances.”⁶⁸</i>

It appears that the legislation in most states and territories gives power to a particular role for determining the form, manner and information collected for building approval purposes and the requirements for building documentation storage, access and management. The role in each state and territory that has this power is listed below, however this authority is somewhat unclear in QLD and SA legislation.

ACT	Construction Occupations Deputy Registrar
NSW	Minister for Planning
NT	Director of Building Control, Minister
QLD	Minister for Planning?

66. Launceston, Building Plan request form

67. City of Melbourne, Building Search Application

68. Building Act 2011 (WA) S146

SA	Minister for Infrastructure?
TAS	Director of Building Control
VIC	Keeper of Public Records
WA	Building Commissioner

This is an important consideration for the possible development of an EBP, as legislative changes may not necessarily be required to make modifications to enable a functional EBP to be developed. It is perhaps feasible that agreement between the responsible person in each jurisdiction could lead to a nationally consistent approach to:

- what building information is collected
- the manner in which it is collected (e.g. structured rather than unstructured data)
- the manner in which such information may be accessed for the purposes of compliance.

3.2.5 What is considered personal information

One of the potential barriers to an EBP relates to the perception that building documents and information may contain information about a person, and hence cannot be shared without breaching privacy legislation. The previous section has discussed how the building regulations deal with some of these aspects. This section provides a brief context for how building information may be viewed in terms of 'information privacy'.

The Office of the Australian Information Commissioner (OIAC) states that information is considered personal if two criteria are satisfied:⁶⁹

- It is about an individual
- The individual's identity must be identified or reasonably identifiable.

In considering whether information is about an individual, the context in which the information appears needs to be considered by asking if there is sufficient connection between the information and the individual to reveal something about the individual. Within this context, it appears that:

- some building information will not be personal information (e.g. the technical specifications of building materials)
- some building information might be considered personal information (e.g. an energy certificate which specifies building materials, but also includes the name of the owner)
- some is likely to be personal information (e.g. forms with name, address and contact details of an owner; details about a person's land ownership, property identifiers such as address or lot number⁷⁰).

69. <https://www.oic.qld.gov.au/guidelines/for-government/access-and-amendment/introduction-to-the-acts/what-is-personal-information>

70. *Property ownership is a matter of public record and hence the identify of a property owner is always reasonably ascertainable; such information may or may not be considered 'personal information'*

It is important to note, however, that some ‘personal information’ that may be typically found in building documents would not normally be considered private. This includes the name and work contact details (email, phone) of people involved in the building (e.g. designers, certifiers, builders, engineers); professional opinions given for the purposes of building applications; or a person’s name appearing in work documents.

The two examples presented below demonstrate two approaches to consideration of ‘what is personal information’. The first applies the principles of the OIAC, the second represents a risk averse approach.

Example 1

A QLD property owner requested information from the local council pertaining to her property. The request was made under the Information Privacy Act. The council argued that they could not provide all of the information pertaining to the property. It was determined in court that the information sought was not about the applicant, and was therefore not her personal information. Under the IP Act the owner is only entitled to access documents containing her personal information⁷¹. The judgement considered two questions:

- i. can an individual be identified from the information sought? and
- ii. is the information sought about that individual?

The judgement provides some illustrations relating to whether information reveals anything about the individual⁷². Seeking information about the market value of a property, for example, was not considered personal information because it is not linked to the owners of the property and it does not reveal information about the owners (even though the property owners’ identities may be reasonably ascertainable). This is because the information sought is about the property, not the property owner. In contrast, seeking information about electricity usage at a property may be personal information because the information is being collected in a context which is linked to, and reveals information about, the property owner.

Example 2

NSW seems to adopt a risk averse approach to information privacy: *“When in doubt, assume that data will meet the definition of ‘personal information’ and apply the relevant privacy protections accordingly”*.⁷³ Note that NSW privacy legislation does not include the two-staged approach to determining what is considered personal information, i.e. it does not ask the question “Is the information about an individual?”.

71. <https://www.oic.qld.gov.au/decisions/mahoney-and-ipswich-city-council>

72. https://www.oic.qld.gov.au/_data/assets/pdf_file/0004/7195/310275-Dec-17-06-11.pdf Clause 26.

73. <https://www.ipc.nsw.gov.au/fact-sheet-reasonably-ascertainable-identity>

Australian Privacy Principles (APPs) apply to organisations and Australian Government agencies and may be relevant in the context of this project with regard to considering implications for CSIRO and NatHERS, for example.

The following principles are considered directly relevant for this project:

APP2.1 Individuals must have the option of not identifying themselves, or of using a pseudonym, when dealing with an APP entity in relation to a particular matter.

APP2.2 Subclause 2.1 does not apply if, in relation to the matter:

- The APP entity is required or authorized by or under an Australian law, or a court/tribunal order, to deal with individuals who have identified themselves; or
- It is impracticable for the APP entity to deal with individuals who have not identified themselves or who have used a pseudonym.

APP3.1/3.2 Must not collect personal information unless information is reasonably necessary for, or directly related, to the entity's functions or activities.

APP6 Relates to the use or disclosure of personal information. The entity that holds personal information about an individual that was collected for a particular purpose (the primary purpose), must not use or disclose the information for another purpose (the secondary purpose) unless:

- the individual would reasonably expect the entity to use or disclose the information for the secondary purpose and the secondary purpose is directly related to the primary purpose; or
- the entity is required / authorized under an Australian law; or
- the entity reasonably believes that the use or disclosure of the information is reasonably necessary for one or more enforcement related activities conducted by, or on behalf of, an enforcement body.

3.2.6 Regulator and stakeholder perceptions of building document systems

To further investigate building documentation systems, a relevant public servant from each jurisdiction was approached to participate in a short discussion (20-30 minutes) relating to their jurisdiction's building documentation system and practices in general, but within this project's focus on energy efficiency compliance. The questions discussed at these phone meetings can be found in the Section 6.1.3. The key issues arising from these discussions are summarised in Table 11.

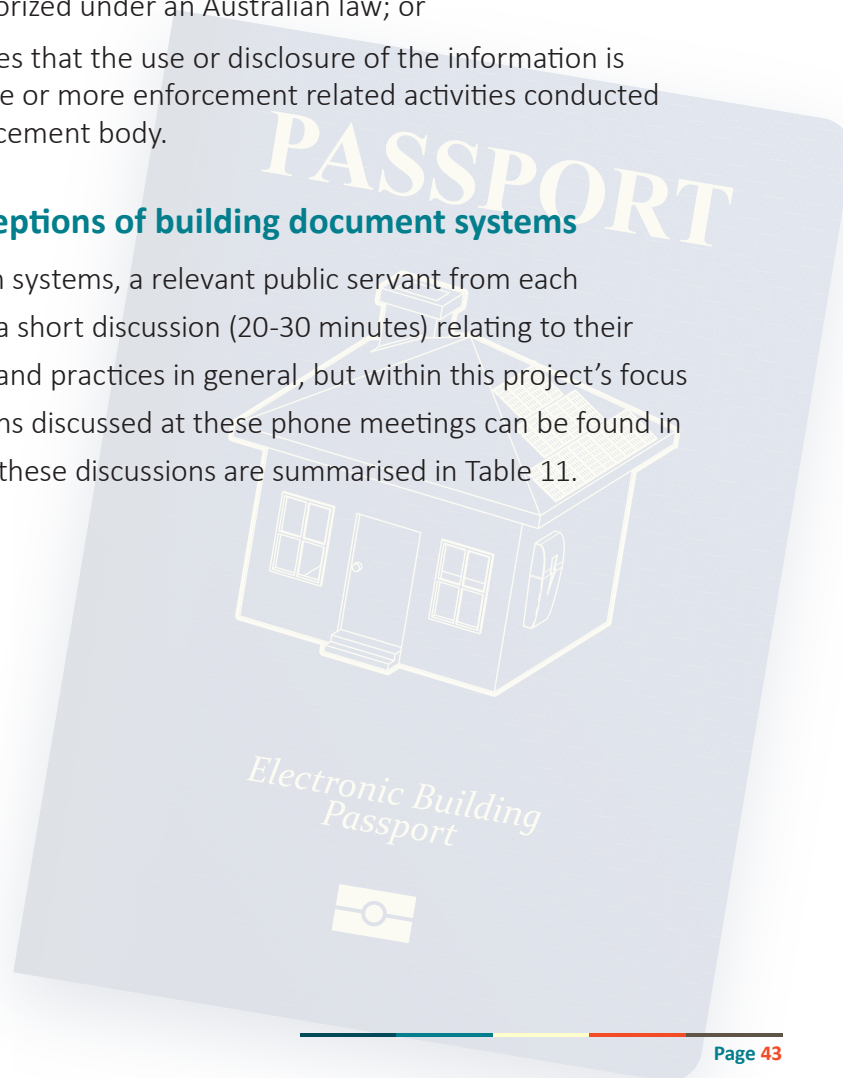


Table 11 Summary of Regulator perceptions of building document systems

What is considered documentary evidence and how is this aligned with the NCC requirements?
<ul style="list-style-type: none"> • In some states and territories the building certifiers / surveyors / inspectors are the persons who 'give credibility' that compliance has been met. • In other states and territories the surveyors' role is to collect the evidence, but they are not responsible for compliance. • There is ambiguity as to what compliance means (with respect to energy efficiency) and hence there can be variation in what evidence is required by, and collected by, certifiers / surveyors / inspectors as evidence of compliance.
How are building documents kept?
<ul style="list-style-type: none"> • A range of record keeping systems are utilised. • Local government authorities are often tasked with this administrative responsibility. • Multiple states and territories are moving towards online application processes and state-wide planning/building portals.
What is the typical form in which building data is kept?
<ul style="list-style-type: none"> • Building data nationally is a mix of paper and digital records. Digital data is typically unstructured (e.g. not searchable in terms of key building characteristics). • Some states and territories have moved / are moving towards digitisation of all records. • The benefits of an online structured system would include faster responses to people wanting that information, reduction in high storage costs of physical records, better access for everyone, and reduced workload for the local government authority.
Are existing systems interoperable with other relevant databases?
<ul style="list-style-type: none"> • None of the systems directly or automatically interfaces with other databases such as professional registration / licencing authorities or compliance/dispute authorities. • Surveyors / certifiers are generally responsible for checking that practitioners involved in a building are registered.
Do applicants give Informed Consent regarding how building information will be used?
<ul style="list-style-type: none"> • Building permitting, construction and certification processes typically use regulated / standardised forms, or forms based on guidelines in the regulations. • "Informed Consent" – in terms of the applicant consenting to the information and documentation being used for the purposes- may not be explicit or may not exist at all. • The respective legislation is seen by some as implying consent. • It is assumed in some states and territories that industry expects, and accepts, that government can use the documents and information for the relevant purposes.
How are documentation systems funded?
<ul style="list-style-type: none"> • The documentation systems within local government are typically funded by the fees raised from applications to access this documentation, sometimes with additional funds from state government. • The development of online portals is being funded by a mixture of federal and state funds. • Private certifiers select commercial software that meets their functionality requirements.

Who has authority to determine the form and content of building documentation?
<ul style="list-style-type: none"> • Most states and territories have a nominated position that can 'approve'. • Some states and territories indicated a lack of clarity as to the extent online processes and digitised structured data could be permitted under existing legislation, which may depend on the definition of 'form'.
What would help to improve the functionality of the documentation system?
<ul style="list-style-type: none"> • A very good guide / statement / checklist on what would demonstrate energy compliance. • An online application process where established fields must be filled in.
At what point should a residential building be compliant?
<ul style="list-style-type: none"> • Variations on concepts of when a building should be compliant. • Most common perception is at construction completion / occupancy permit stage.

Stakeholders' perceptions of existing documentation systems were discussed at the workshops (refer to Appendices for further detail of participants and topics). Key points raised at these workshops, pertaining specifically to documentation systems in SA and QLD, are summarised in Table 12.

Table 12 Stakeholder perceptions of document systems

	South Australia	Queensland
At what point does a building need to demonstrate compliance?	<ul style="list-style-type: none"> • Design, construction and completion are ideal compliance points 	<ul style="list-style-type: none"> • Pre-construction, during construction, post-construction (completion)
Does your state's system meet NCC requirements	<ul style="list-style-type: none"> • Private certifiers should have records, but often don't • Yes, but the standard is low 	<ul style="list-style-type: none"> • Certifiers provide local government with applications and all approval documents, including plans, specifications and certificates relied on for decisions
Is it predominantly paper based or electronic; structured or unstructured?	<ul style="list-style-type: none"> • 50/50 paper/electronic • Unstructured • Move to PDI (state planning portal) in 2020 will push all to digital 	<ul style="list-style-type: none"> • Paper and electronic (depending on council) • Unstructured
Does it link with other systems?	<ul style="list-style-type: none"> • No, systems at LGA level • PDI regulations push towards open data 	<ul style="list-style-type: none"> • No
Does the DA form provide 'informed consent' for the sharing of data and supporting documentation?	<ul style="list-style-type: none"> • Informed consent is not well known or understood in the current system 	<ul style="list-style-type: none"> • Some level of informed consent provided on IDAS Form 2

	South Australia	Queensland
What's working well / not working well?	<ul style="list-style-type: none"> • Energy efficiency standards only minimal • Sign off at different stages is lacking • Modifications can be made after building rules compliance 	<ul style="list-style-type: none"> • Not discussed at this workshop
What enhanced functionality would value-add to your profession?	<ul style="list-style-type: none"> • A system that records the product (data) and the entity that supplies it 	<ul style="list-style-type: none"> • Not discussed at this workshop

Practitioner views on what documents are required to be lodged (to a private or council certifier) for compliance purposes was 'tested' in a survey (refer to Section 6.1.4). The ranked results are shown in Figure 7 (with reference to the legend in Table 13). It is particularly interesting to note, from an energy efficiency compliance perspective, that less than half of the respondents believed that glazing certificates (showing safety and energy performance), inspection records and certificates of product/system/service conformity were required to be lodged. These results seem to suggest a strong focus on the lodgement of forms at the front end of the process, with decreasing focus on the lodgement of evidence of compliance 'as built'. It should be noted, however, that certifiers are not represented in the survey responses.

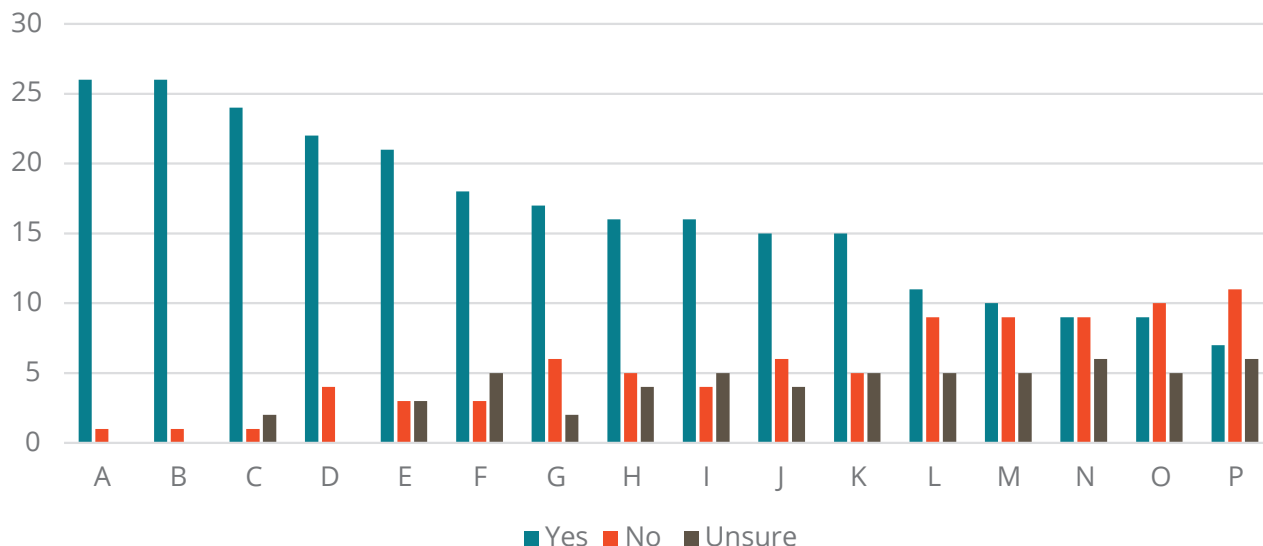


Figure 7 Documents required to be lodged in approval, construction process

Table 13 Legend to Figure 6 Documents required to be lodged

A	Full set of scale plans, drawing and specifications
B	Owners' name, address, contact details
C	Application forms
D	Universal Certificate / Energy Report / BASIX certificate
E	All compliance certificates
F	Any other certificates / reports relied on to determine compliance at BA / DA
G	Contact details of builders and other professionals involved
H	Any workings by persons providing information for BA / DA
I	Certifier's workings and documented reasons for compliance decisions
J	Any other certificates / reports relied on to determine compliance at construction / completion
K	Any restrictions, approval or notices given during construction
L	Glazing Certificate (showing safety and energy efficiency)
M	All inspection records
N	Certificates of conformity (products, systems, services)
O	Evidence of builder's financial position and insurance
P	Evidence of building contract



4. Data Needs and Access Functionality

This section reports on analysis of data needs / data access in order to:

- i. enable a building contractor to manage a construction project to ensure compliance with approved documents; and
- ii. enable inspection or auditing for compliance with the energy efficiency requirements of the NCC.

Investigations included CSIRO and industry consideration of what data deviation, from building approval documents, would or should trigger an energy re-rating. The data needs of various stakeholders and the design options for EBP functionality to address these needs, were examined through industry evaluation of international case studies (through interactive workshops) and consideration of priorities and preferences for an EBP (through interactive workshops and a survey).

A scan of international building data systems (relating to energy efficiency) for building approval, construction and/or certification processes was conducted. A number of systems were selected, providing diversity in data type, form, functionality, purpose and access. The current NatHERS process, Universal Certificate and HStar portal were also examined. BASIX was not examined. The examples selected for examination were presented at two industry workshops to enable various Australian stakeholders to discuss the relative merits and challenges posed by these systems. The ensuing discussions were utilised to determine possible solutions for the Australian context. The outputs of these discussions were used to develop a survey to seek further industry input.

4.1 Triggers for Energy ‘re-rating’ and ‘variations’ approval

4.1.1 NatHERS Certificate purpose – Building Envelope Energy Efficiency

The primary purpose of a NatHERS Certificate is to demonstrate compliance with the energy efficiency provisions of the NCC. A NatHERS rating is undertaken on a proposed design and assesses the thermal performance of the building envelope. A NatHERS Certificate is then issued and submitted along with the building plans in order to obtain a building permit. The NatHERS approach is the most common method used by builders to demonstrate compliance, but it is not the only method available.

NatHERS assesses the thermal shell of the house, not the household. Consequently, building services (appliances, lighting, heating and cooling systems, hot water systems) and how a household actually operates their house are not considered by NatHERS. What is considered is how well the house itself will perform thermally. To do this, NatHERS considers the building materials, insulation levels, type of windows and the orientation, size and location of the dwelling. NatHERS models and calculates how much energy is required over a typical year to maintain the house within a given temperature

comfort range during waking hours. As such, NatHERS only looks at heating and cooling energy requirements. How a household may go about heating and cooling their home and the systems they may use to do this are not considered.

NatHERS is an energy efficiency rating system, not an energy modelling system. Consequently, assumptions are required so that dwellings can be compared to each other. The temperature comfort range that NatHERS is aiming to keep each dwelling within is fixed, as are the hours in a given day that are required to be within the comfort range. However, because perceived comfort varies depending on the climate people live in, these fixed conditions are different depending upon the climate zone that the dwelling is located in. In all, there are 69 NatHERS climate zones in Australia, each with their own set of fixed assumptions, their own climate data and their own star rating bands. So, a 6 star house in Brisbane will have a much lower total energy requirement than a 6 star house of the same size in Melbourne, due to the fact that Brisbane has a much more moderate climate than Melbourne. There are other fixed assumptions built into the NatHERS modelling including air infiltration rates, latent heat from people and appliances like ovens, and how often doors and windows are opened and closed.

NatHERS assesses the thermal shell of the house, not the household. Consequently, building services (appliances, lighting, heating and cooling systems, hot water systems) and how a household actually operates their house are not considered by NatHERS. What is considered is how well the house itself will perform thermally.

4.1.2 Design process and NatHERS rating

The building design process will typically involve several design iterations before the final design solution is decided upon. Typically, most house builders will wait for the final design solution before undertaking a NatHERS assessment as changes to the design may impact on the NatHERS rating and each re-rating incurs a cost. For many volume builders their designs have already been optimised to achieve the required minimum NatHERS rating on any orientation and consequently minor design changes will have minimal impact on the NatHERS rating. However, major changes such as a significant increase in window area on one elevation may require the builder to undertake a preliminary NatHERS assessment to verify that the design will still comply.

4.1.3 Triggers for a NatHERS Re-rating

In theory, any changes to the stamped, approved building plans should trigger an energy efficiency re-rating (DtS or Prescribed), which should in turn trigger a need for applying for an amended Building Approval or similar.

Design changes can occur at any time in a build process, including after construction has started. Naturally any changes to the design need to be assessed to ensure that they do not impact negatively on the building's compliance with the NCC. A design change that has a negative impact on fire egress or structural integrity would generally not be allowed. Energy efficiency requirements are also mandatory, so design changes that may have a negative impact on the energy efficiency performance should also be assessed through a re-rating process.

NatHERS ratings focus on the thermal performance of the building envelope, so changes to any of these building elements are likely to have an impact on the NatHERS rating. Technically, any change to the building envelope should trigger a re-rating, but in practice some changes may have only minimal impact, while others may have no impact at all because a value is already assumed.

Table 14 outlines some possible changes to a design and at what point a re-rating could be required. Caution is always needed in determining whether to re-rate or not, as each house design is unique and the interactions between design, materials, site, climate zone, etc. will all factor in the rating achieved. Because of this complexity, it is difficult to develop clear-cut triggers and ultimately it is the responsibility of the energy assessor (or more correctly, the building certifier perhaps in consultation with the energy assessor) to make a professional judgement on whether a re-rating is warranted.

The possible triggers for a NatHERS re-rating listed in Table 14 also assume the change will result in a reduction in the star rating. Design changes that may result in an improved star rating are not listed as requiring a re-rating, but it may be beneficial to undertake a re-rating to achieve a higher star rating (and use this as a positive marketing tool).

Table 14 Possible triggers for a NatHERS re-rating

Changes to ...	Possible Re-Rating Triggers
Plan document version / date	Requires updating on the certificate but no re-rating required if this is the only change.
Building orientation	Any change in orientation by >10 degrees
Area: net floor area (m ²)	Change in area >2%
Construction materials	Any change in thermal properties
Insulation materials- thermal properties	Any decrease in R-Value
Insulation placement (e.g. under roof, on ceiling etc)	Any placement changes
Construction system	Any change
Airgaps (location and width)	Any change >2%
Depth of eaves	Any change >2%

Changes to ...	Possible Re-Rating Triggers
Windows / doors (external)- Number per orientation	Any change
Windows / Doors (external)- area per room	Any change
Window style	Only if opening % changes
Window glazing type	Any change
Window glazing treatment	Any change
Window frame type	Any change
Ceiling penetrations (number)	Any increase in penetrations
External building height	Any change >2%
Internal ceiling height	Any change >2%
External shading	Any change
External colour- walls (or solar reflectance)	Any change
External colour- roof (or solar reflectance)	Any change
Floor coverings- living rooms	Any change >10% in floor area
Floor coverings- bedrooms	Any change >10% in floor area
Ceiling fans- Living Rooms	Any reduction in number
Ceiling fans- Bedrooms	Any reduction in number
Lighting efficiency (type of light, number)	No re-rating required – not part of NatHERS
Air tightness	Assumed value- no re-rating required
Hot water system (type / efficiency)	No re-rating required – not part of NatHERS
Ductwork / pipe lagging	No re-rating required – not part of NatHERS
Swimming pool and spa pumps / heaters	No re-rating required – not part of NatHERS

4.2 Triggers for non-compliance with approved plans

It is not clear in most legislation what process should to be followed if approved plans are modified. The ACT process is clearly articulated: all building work to be carried out in accordance with the approved plans. Requests to make any changes to these plans must be submitted in writing, from the owner, to the certifier (*Building Act 2004*, S31). Changes may be approved if the initial approval requirements are still satisfied and the amended plans would not result in a building being 'significantly different' from the building in the original plans. The 'altered plans' then become stamped as the new 'approved plans'. 'Significantly different' is defined as changes of more than 1 per cent in floor area, roof area, volume or any dimension of the perimeter of the building (including footprint or elevation) (R30). The *Building (General) Regulation 2008 Republication 35 2018* (R36 and Schedule 3) provides examples of what would be considered 'significantly different'. Other states and territories may have processes for dealing with 'modifications' to consent documents, however these are not easily discernible in the legislative documents.

Electronic Building
Passport



In the view of participating stakeholders, a number of issues may occur during construction that could result in non-compliance and therefore should trigger a need for re-rating:

- Any changes to windows, including glass doors (area, location, fabric, type, glazing, operability)
- Any changes to insulation (type, specifications, placement)
- Any changes to external or internal cladding
- Changes to plan shape, size, orientation, net floor area, volume
- Changes to wall or roof construction
- Changes to shading or building projections
- Changes to zoning
- If a building is not well sealed
- If the number of people occupying the building, and how they use the building, is different from the building approval (note that NatHERS ratings have assumed occupancy rates and behaviour in terms of room use and building and appliance operation)
- Any construction by contractors with a history of low level of compliance / under review for alleged breaches.

In addition, some participants suggested that a new NatHERS rating could be triggered at specific times as well:

- 10 years, or periodically after a building has been constructed and occupied
- At renovation, sale or rent.

4.3 Energy efficiency of building services

Discussion up to this point has focused on the energy efficiency of the building envelope. The documentation of evidence to support compliance with NCC requirements for energy efficiency of building services is not explicit in the systems and processes examined, with the possible exception of the ACT government (refer to Figure 4). It is unclear what mechanisms building certifiers / surveyors use to check compliance with these energy efficiency requirements. For example, none of the several thousand building records examined in one local government contained any documentary evidence about the lighting efficiency, hot water system, HVAC system, pool / spa pumps or any of the pipes and ducts of these systems. It is possible that the industry is relying on Minimum Energy Performance Standards (MEPS) for filtering out poor performance appliances. It is not clear whether ANY checking of pipe lagging or efficiency in the design of the whole installation (e.g. of air conditioning systems) is being checked. These considerations may become more important as whole-of-home tools for NatHERS are developed over coming years.

None of the several thousand building records examined in one local government contained any documentary evidence about the lighting efficiency, hot water system, HVAC system, pool / spa pumps or any of the pipes and ducts of these systems.

4.4 Industry evaluation of EBP Case Studies

EBPs in various forms, and for various purposes, exist in a range of countries. A broad scan of existing and emerging systems was conducted through internet searches, International Energy Agency task groups, discussions with international colleagues and academic conferences and publications. Four case studies were selected to show diversity, represented by differences in main agent, purpose and functionality. A brief summary of the selected case studies is provided in Table 15, with further details provided in the Appendices. Additional EBPs that could serve as exemplars are summarised in Table 16.

Table 15 Selected EBP case studies - summary

Country	System	Purpose / Management	URL
United Kingdom	Energy Performance of Buildings Register	To provide open access to individual property certificates and underlying data contained in the national database. Managed by national government.	https://www.gov.uk/government/collections/energy-performance-certificates https://www.epcregister.com http://opendatacommunities.org/home (UK's Open Data Strategy)
Flanders, Belgium	Quality framework for airtightness testing	To implement a competency and quality assurance system and database for air leakage testing. Similar system exists for ventilation systems. Managed by industry association.	

Country	System	Purpose / Management	URL
European Union (EU) / United Kingdom (UK)	Refurbify	<p>To provide a cloud-based site management tool to bring together all documents, permissions and tasks related to residential projects.</p> <p>Developed through EU research collaboration; Commercialised and managed by private enterprise.</p>	https://www.vrmtech.ie/refurbify-1
EU	Building Renovation Passport	<p>To develop a long-term roadmap for individual residential properties that includes a single point of access for all relevant building information and enables an up-to-date view of a building over its lifetime.</p> <p>Development managed by policy research institute and being examined by EU Parliament.</p>	http://bpie.eu/publication/building-renovation-passports-consumers-journey-to-a-better-home/

Table 16 Additional international EBP exemplars

Country / System	Purpose
France: database of building airtightness and ventilation ductwork	<p>Database used for evaluating industry development / compliance, policy outcomes, building stock transformation.</p> <p>Database operated by Cerema, an organisation that manages scientific and technical knowledge and innovative solutions.</p>
USA: Building Performance Database	<p>USA's largest dataset of information about the energy related characteristics of commercial and residential buildings. Combines federal, state and local data, utilities, energy efficiency programs, building owners and private companies, and makes it available to the public. Allows users to explore the data across real estate sectors and regions, comparing various physical and operational characteristics to gain a better understanding of market conditions and trends in energy performance.</p> <p>https://www.energy.gov/eere/buildings/building-performance-database-bpd</p>

Country / System	Purpose
USA: National Residential Efficiency Measures Database	A publicly available centralised database of residential building retrofit measures and costs for the building industry. https://remdb.nrel.gov
Buildings as Material Banks	An EU project working on the development of Materials Passports that represent the banks of valuable materials in buildings, thereby increasing the value of building materials. https://www.bamb2020.eu/about-bamb

The four selected case studies were examined in terms of:

- The purpose and intended users / beneficiaries
- The management of the dataset and access
- The structure of the data records
- The system's potential benefits and challenges, in an Australian context.

A brief overview of each case study was provided to attendees at the Adelaide and Brisbane workshops. Small groups of participants discussed a particular case study in detail and reported back to the whole group. The results presented in Table 17 are a summation of all discussion points from both workshops.

Table 17 Features and challenges of international case study EBPs

Case Study	Attractive Features	Challenges for Australian adoption
Energy Performance Certificates (EPC) Register	A national structured database with universal access and transparency	There is no big policy driver in Australia (Refer to Section 6.3.1 for UK policy drivers)
	Can drive upgrades / property improvement and improve building standards / quality	Energy performance of buildings not well understood by consumers (Refer to Section 6.3.1 for UK drivers)
	Helps private certifiers	Industry pushback
	Data can be searched and used for policy verification and development	Energy assessors could be responsible for onsite inspection at completion and certify compliance

*Electronic Building
Passport*



Case Study	Attractive Features	Challenges for Australian adoption
Air Leakage QA process	Quality control of process (accreditation, testing and auditing)	Helps comply with NCC but not NatHERS
	Better homes	Perhaps not necessary in some of our mild climates
	National data on home performance and industry capabilities	Who would pay for it, especially if not mandatory?
		Australian public would need to be brought on the journey
		Better to have one universal QA system
Refurbify	Structured data pulls out greater granular information	Challenge to create a national product
	Could be used for more than energy efficiency	Would need to be mandated / locked into legislation
	Takes away the need to have multiple certifiers	Potential for falsification of information / documentation
	Real time audits, instant upload of data	Are there enough large portfolio owners in Australia?
	Avoidance of rework	Could it work for Class 1 homes?
	Brilliant idea, great quality assurance	Doesn't necessarily collect comparable data across users / buildings
	Greater consumer awareness	
Building Renovation Passport	These requirements should be put into the NCC (refer to Figure 18 and Figure 19 in Section 6.3.4)	We should focus first on new builds
	Regulation to improve performance of existing housing could help improve supply of materials and reduce costs	Volume home builders don't disclose any information to their customers (e.g. they don't see the energy efficiency certificate)
	Ease of use, uniformity (could be similar to South Australia's online portal PD Online)	Standard building contracts (e.g. HIA) do not include energy efficiency requirements
	Useful learning tool for homeowners	Data asset security
		Could be a starting point for EBPs
		Access – for whom? How? Restrictions?

4.5 Functionality and Architecture of an EBP

EBP potential functionality and architecture were explored through the two industry workshops and the online survey (refer to Section 6.1 for more details). Figure 8 summarises workshop participants' suggestions regarding core functionality of an EBP, collated under the broad subtopics of data inputs, compliance and architecture. Figure 9 is one group's concept map of a national EBP.

Data inputs	Compliance	Architecture
<ul style="list-style-type: none"> • Data from building approval docs • Data from any inspections / certificates • NatHERS data inputs (obtainable from CSIRO's Australian Housing Data Base) • Test results (e.g. blower door) • Photo evidence • New data over life of building 	<ul style="list-style-type: none"> • Identify and track substitutions and re-rating triggers • Chain of custody information • Boom gate (allow / stop progress) • Lock EBP into certificate of occupancy • Licence / trade registration • Supports APPS that can be used onsite to make evidence submission easy 	<ul style="list-style-type: none"> • Online • Cloud based • Automated certification processes • State or national database • Consumer interface • Transparency

Figure 8 Summary of EBP functionality from workshop discussions

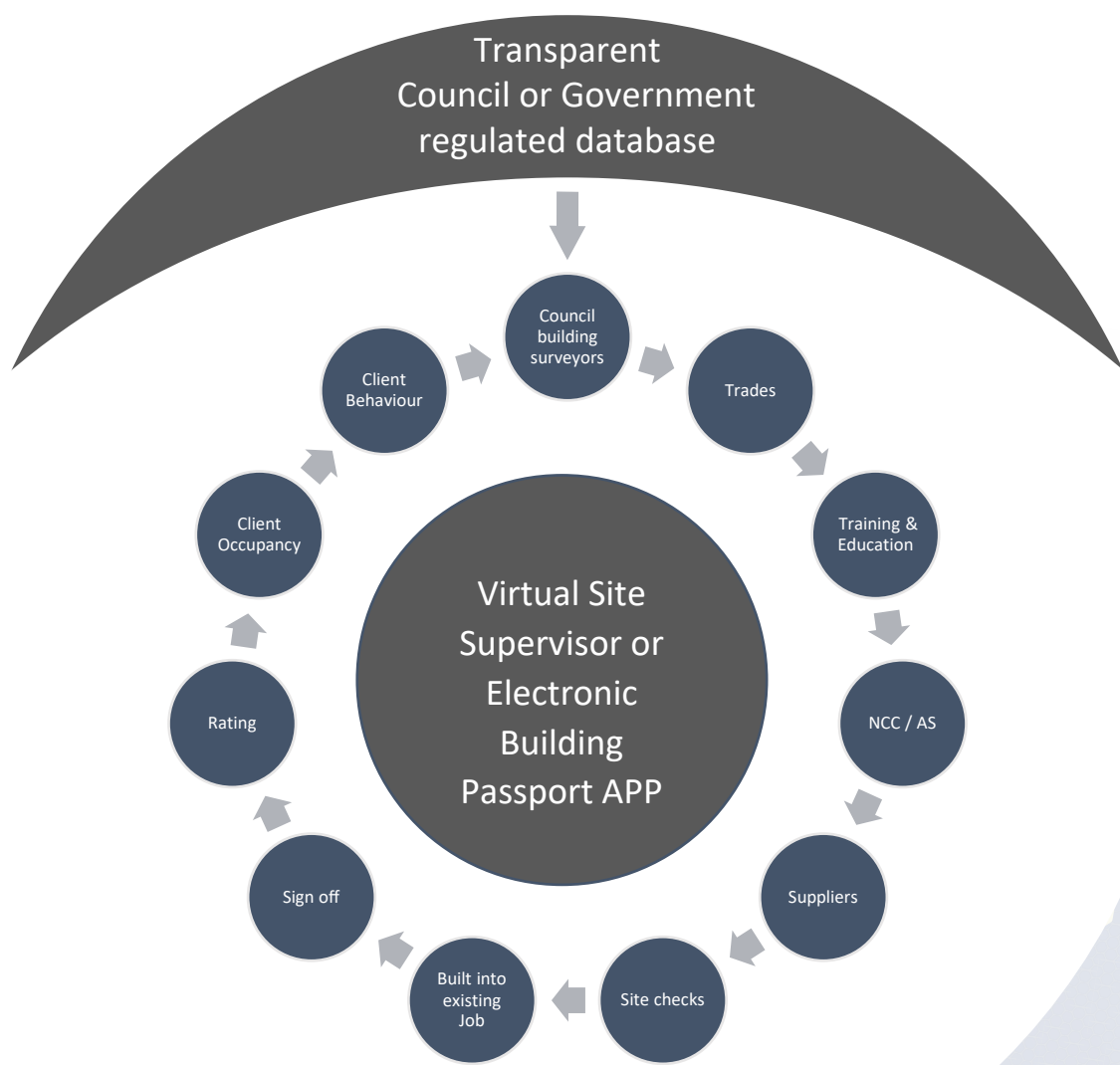


Figure 9 Concept map of EBP (Adelaide workshop)

4.5.1 Compliance Checklist

A potential list of elements that could be included in an EBP checklist was developed (refer to Table 18) based on the data inputs required by an energy assessor in conducting a NatHERS assessment (elements A – W), and on the additional energy efficiency requirements for building services, as stipulated in the NCC (elements AA – DD).

Survey respondents were asked to indicate whether these elements, on a checklist, would be useful in enhancing their workflow, productivity and quality assurance. The results are presented in Figure 10, showing that all of the elements were considered useful for the majority of respondents. There were, however, some interesting findings. Some respondents found elements D, I, J, K, O, P, Q, R, S, V and W to be not useful (refer to Table 18). This finding is curious, as each of these elements, by themselves, can influence the energy efficiency of the building envelope.

These results may indicate a lack of understanding among some sectors of the residential building industry of the importance of particular elements. It may, on the other hand, merely indicate that these particular elements have no bearing on the specific workflow or productivity of the respondents (i.e. the question specifically asked respondents to rate the elements for usefulness for enhancing their workflow). Note also that element U (floor coverings – living rooms) was not evaluated by all respondents (resulting in a reduced number of responses).

Some respondents found elements such as air gaps, depth of eaves, ceiling penetrations, external shading and air tightness to be not useful. This finding is curious, as each of these elements, by themselves, can influence the energy efficiency of the building envelope.

The 'neutral' responses to elements B - W may be a reflection of the demographic of the survey respondents (refer to Table 23) – perhaps with a focus on the design end of the process, rather than construction and completion end. Elements AA, BB, CC and DD displayed a lower 'usefulness' rating than most other elements, again perhaps a reflection of the respondents' roles in the industry and a focus on the building envelope efficiency rather than building services efficiency.

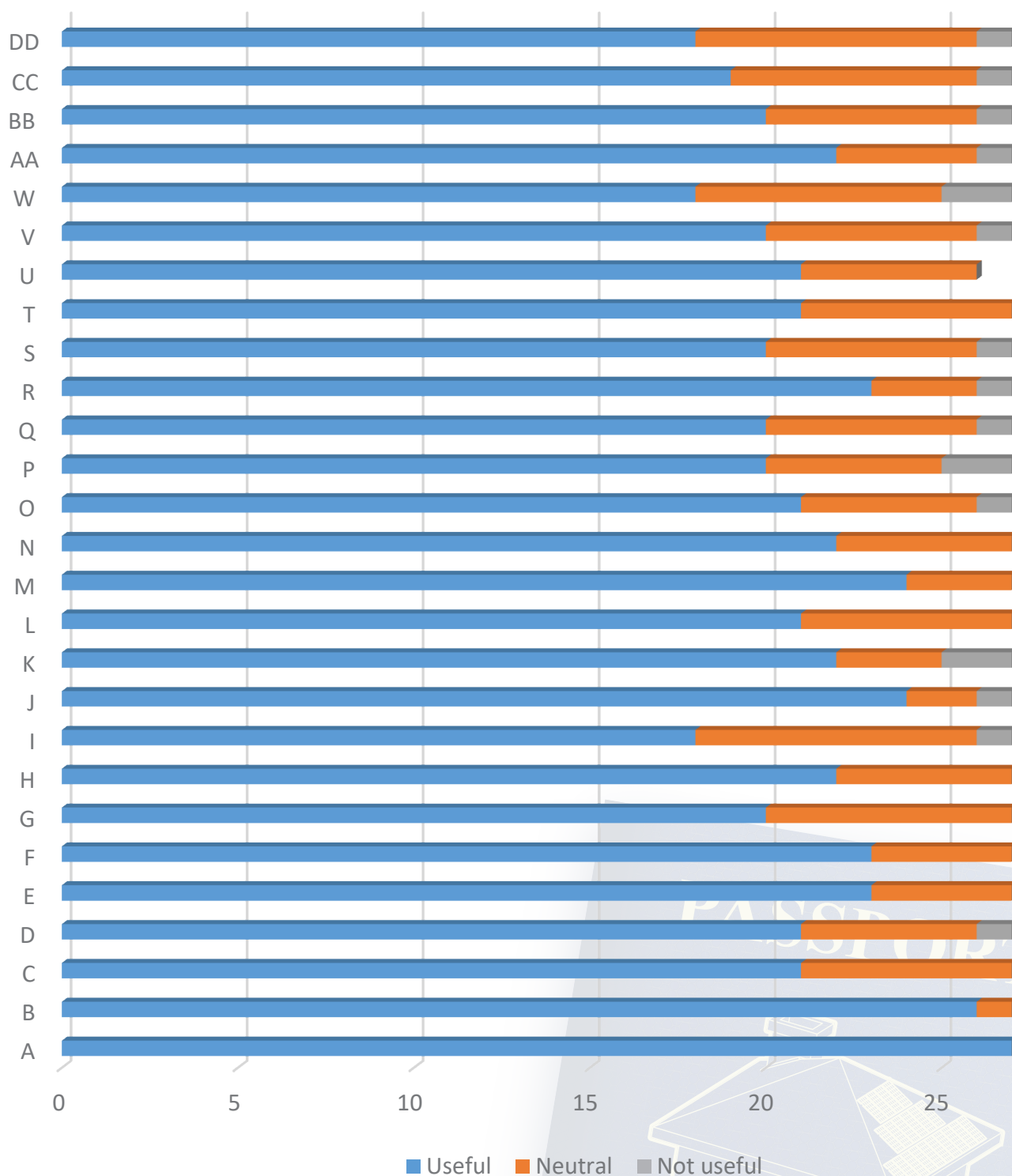


Figure 10 Useful elements for an EBP checklist

Table 18 Legend to Figure 10 Useful elements for an EBP checklist

A	Plan document version / data on which the checklist is based
B	Orientation
C	Net floor area- Total m ²
D	Net floor area- broken down into m ² in total and for living zones and sleeping zones
E	Main construction materials and their thermal properties

F	Insulation materials- type and thermal properties
G	Insulation placement (details of what insulation is to be laces where / how)
H	Construction system
I	Air gaps (location and width)
J	Depth of eaves (if varying, then for each orientation)
K	Windows and doors (external)- area per room
L	Window style (e.g. casement, sliding, double hung, louvre etc)
M	Window glazing performance
N	Window frame type
O	Ceiling penetrations (total and number per room; fully open or controllable)
P	External building height
Q	Internal ceiling height
R	External shading
S	External colour- walls (or solar reflectance)
T	External colour- roof (or solar reflectance)
U	Floor coverings- living rooms
V	Floor coverings- bedrooms
W	Air tightness (design rating then actual test results)
AA	Lighting efficiency (number and type of lights, efficiency of each type, lighting density)
BB	Hot water system (type, fuel source and carbon intensity, heating efficiency, details of pipe lagging)
CC	Space heating and cooling (type and efficiency of main components; details of ductwork insulation and airtightness)
DD	Water pumps for spas and swimming pools (energy efficiency of pump and all components, including plumbing design)

4.5.2 Mechanisms for documenting compliance with specific elements

A number of features that could enable documentation of compliance against a checklist were proposed in the survey and respondents were asked to rate the usefulness of each feature for improving their workflow or productivity. The results are shown in Figure 11, with the legend in Table 19.

The figure shows all available data, indicating that not all respondents rated each feature. The most useful features for these respondents were considered to be key project data, technical certificates and compliance certificates. This seems to again highlight the industry's reliance on forms and certificates themselves, not necessarily in data on those forms and whether that data / information is accurate, correct or true. More direct evidence (e.g. features B and C) are considered less useful than certificates. This may indicate that the industry (at least these respondents) places a high level of trust in certificates' authenticity, and hence feel little need to validate certificates. Previous NEEBP reports (as summarised in Table 1) and more recent high profile examples of non-compliance (for example ⁷⁴) would seem to indicate that this level of trust is misplaced.

74. <http://theconversation.com/australia-has-a-new-national-construction-code-but-its-still-not-good-enough-113729>

It is also interesting to note the high level of ‘neutrality’ on the feature of the payment schedule. Project payments, or mortgage release payments, are typically linked to the completion of specific construction stages (e.g. foundation, lock up, completion). Creating a link between compliance milestones and payment milestones may provide an opportunity for the finance and insurance sectors to play a role in encouraging compliance, or requiring evidence of compliance before releasing the next payment. As demonstrated in the Refurbify case study (see appendix 4.3.3), the linking of payments to evidence can also provide benefits within a construction team, e.g. linking subcontractor and supplier payments to the provision of evidence that a product / system / installation practice complies with the specifications on the checklist and the building / development approval. It is a means through which responsibility for compliance can be distributed to multiple stakeholders.

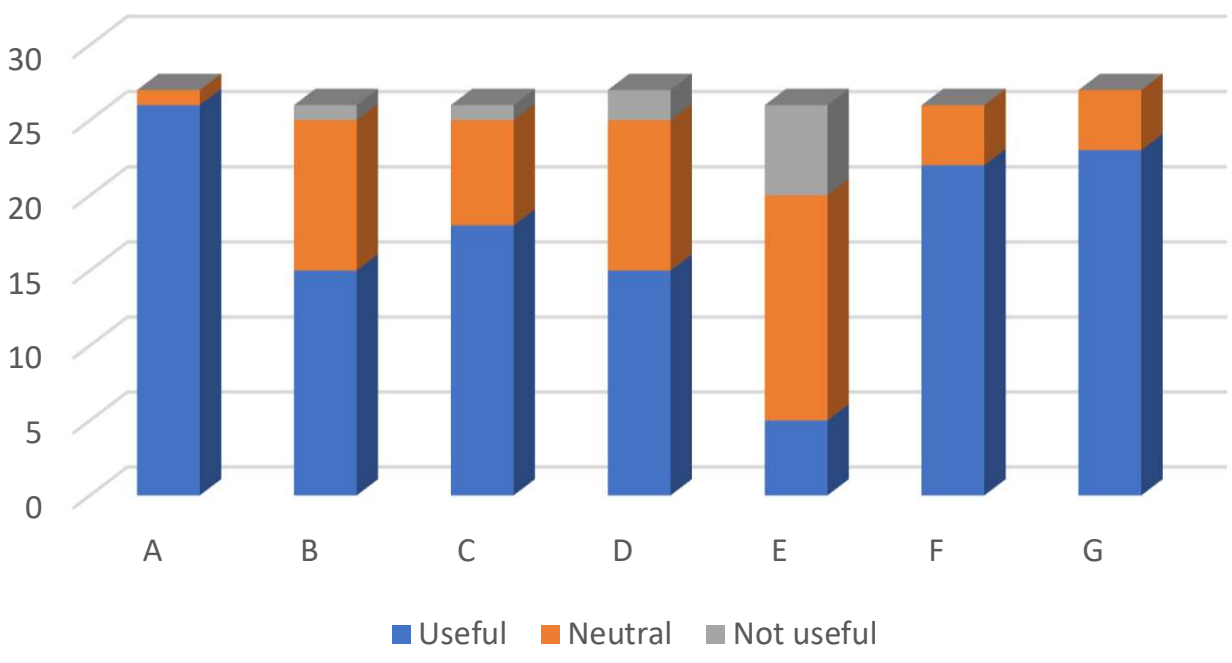


Figure 11 Compliance Documentation Functions of an EBP

Table 19 Legend to Figure 10 Compliance Documentation Functions of an EBP

A	Key project data relating to property information, design and construction information and professional / trade certifications
B	Photos of barcodes / product information (time, date and location identifiable)
C	Photos of installed features (time, date and location identifiable)
D	Automated notifications (e.g. of inspections, of task completions)
E	Payment schedule
F	Technical certificates
G	Compliance certificates and processes/timelines

4.5.3 EBP data access / permissions

The online survey sought stakeholders' perceptions regarding access to EBP data. The results are shown in Figure 12 and its related legend Table 20. Most respondents felt that regulators (legend D) should have full access to data on an EBP, and certifiers/surveyors (legend B) should have full access to data relating to properties for which they are responsible. Respondents were evenly divided on whether other professionals involved in a specific property (e.g. builders, contractors, designers and architects) (legend A and C) should have full access to that data, or restricted time access.

Most respondents felt that regulators should have full access to data on an EBP, and certifiers/surveyors should have full access to data relating to properties for which they are responsible

A majority of respondents believed that the initial home owner should have full access, but views on what access should be given to subsequent home owners was divided (still with a slim majority supporting full access). The arguments for NOT making all information relating to a specific property available to subsequent owners (and/or occupiers) are worth pursuing further, especially in the context of volume house construction and Class 2 construction where the initial owner is likely to be a business entity or corporation that will not occupy the dwelling or be responsible for its ongoing operation. Very few participants believed that real estate agents, financial institutions and insurers (providing a service relating to a property) should get no access to property data, however views were divided as to what level of restriction could be applied to each of these sectors.

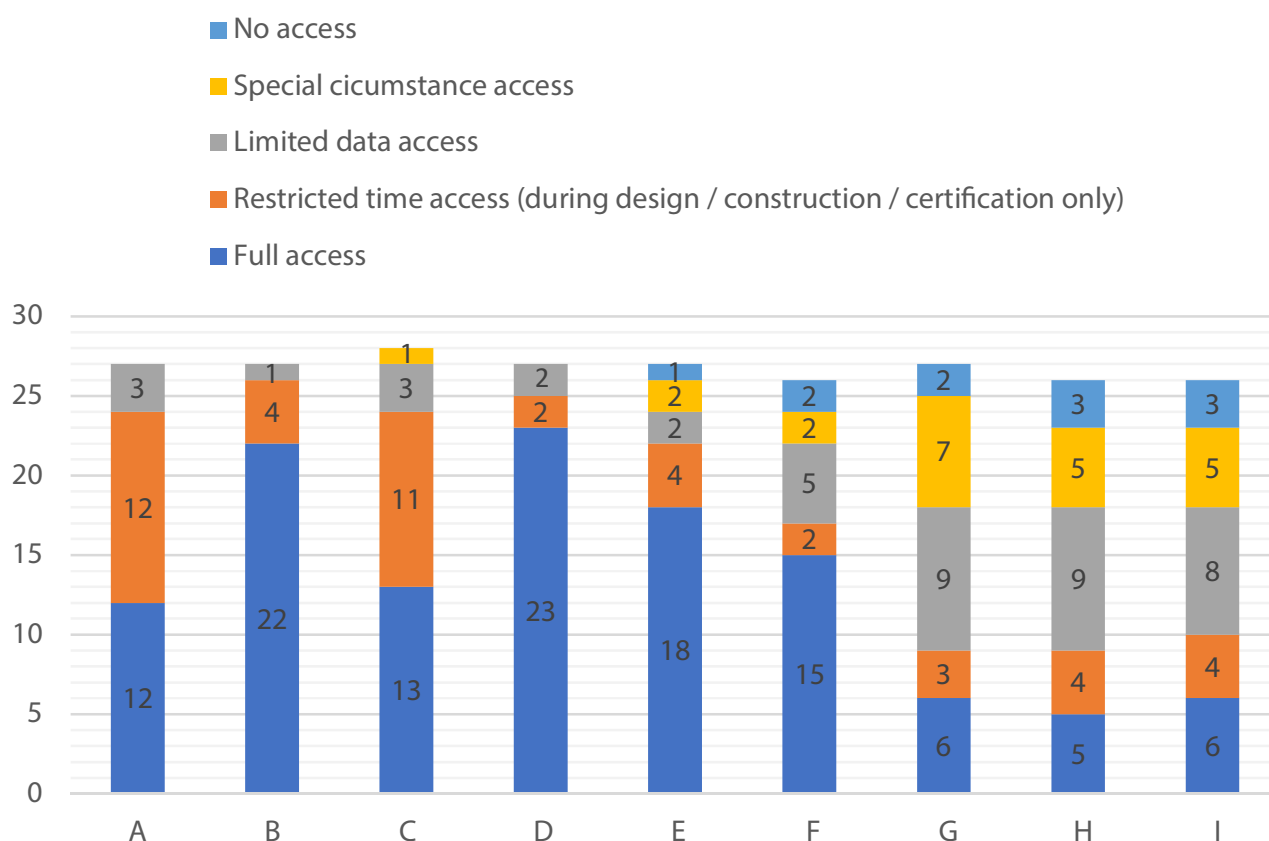


Figure 12 Perception on EBP data access

Table 20 Legend for Figure 13 Perception on EBP data access

A	Builders and key contractors associated with the specific property
B	Building certifiers / surveyors / local government planning officials (responsible for the specific property)
C	Designers / architects (of the specific property)
D	Regulators (local, state and national)
E	Initial home owner
F	Subsequent owners / buyers / renters
G	Real estate agents (acting as agents to owners of the property)
H	Financial institutions (providing a mortgage for the property)
I	Insurance industry (providing a mortgage or home insurance)

4.5.4 EBP 'ownership' / management

Online survey respondents were asked to indicate their preference for jurisdictional management of an EBP, if one was to be established. Figure 13 shows that the most preferred option (highest ranking in 1st preferences) was for a national system; the least preferred option was for a mixed mandated and free market mechanism. State based systems were also considered somewhat acceptable (highest ranking of the second preferences).

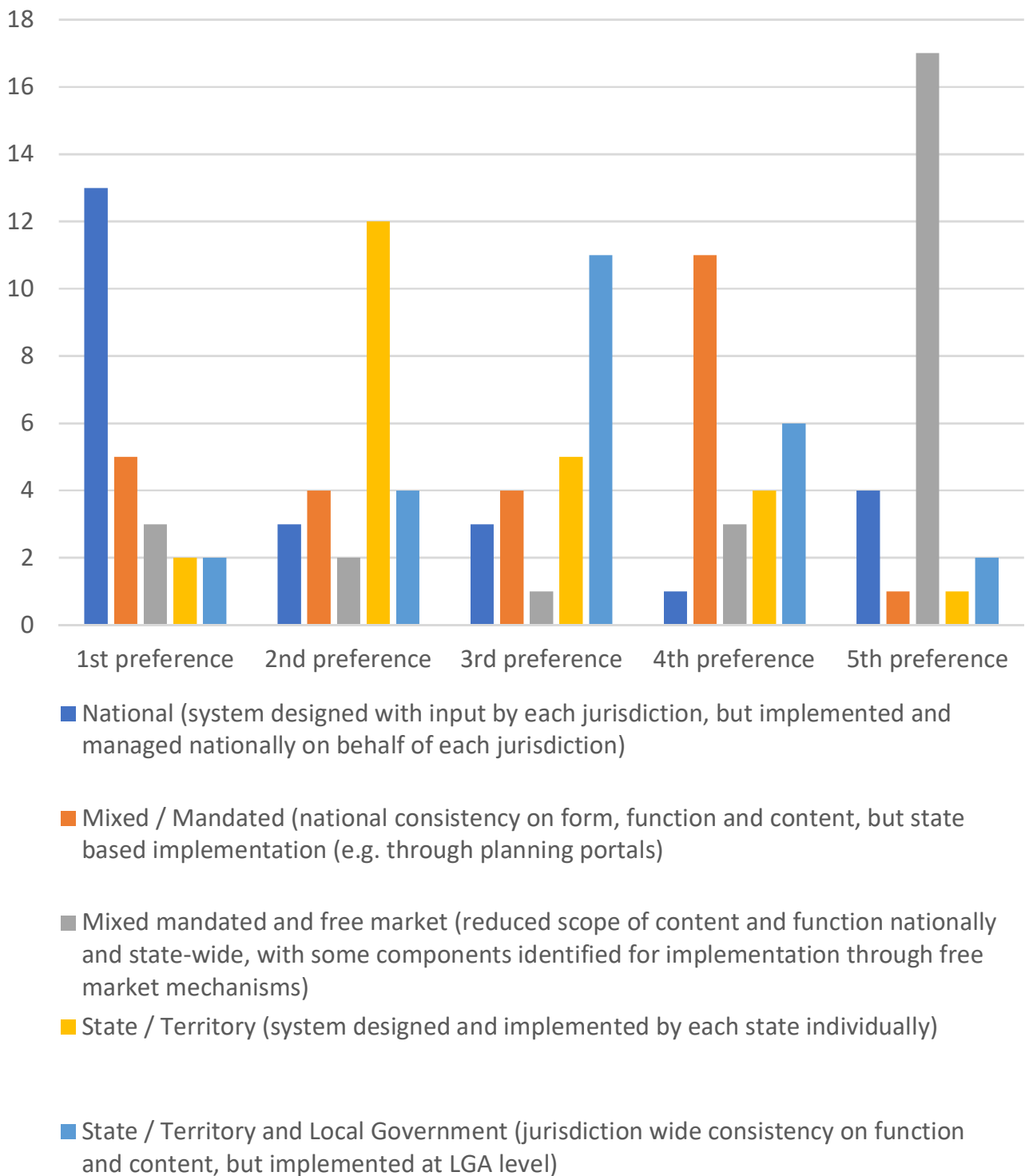


Figure 13 Preferences for EBP Management

4.6 Value of an EBP beyond energy efficiency compliance

Based on the experiences of other applications of EBPs globally, it is envisaged that an EBP could provide value beyond compliance with energy efficiency regulations. The potential value of an EBP was explored in the online survey, with results present in Figure 14. The ranked responses show that about 85 per cent of respondents believe it is possible for an EBP to provide significant benefits to

homeowners (current and future) and inspector bodies (government and private). In addition an EBP could assist the building industry, including subcontractors and suppliers, in providing evidence of compliance and tracking faulty or non-compliant products. There was less certainty (but still over 50 per cent) about the possibility of an EBP to link with trade training and certification processes, and supporting builders in quality assurance and site management practices.

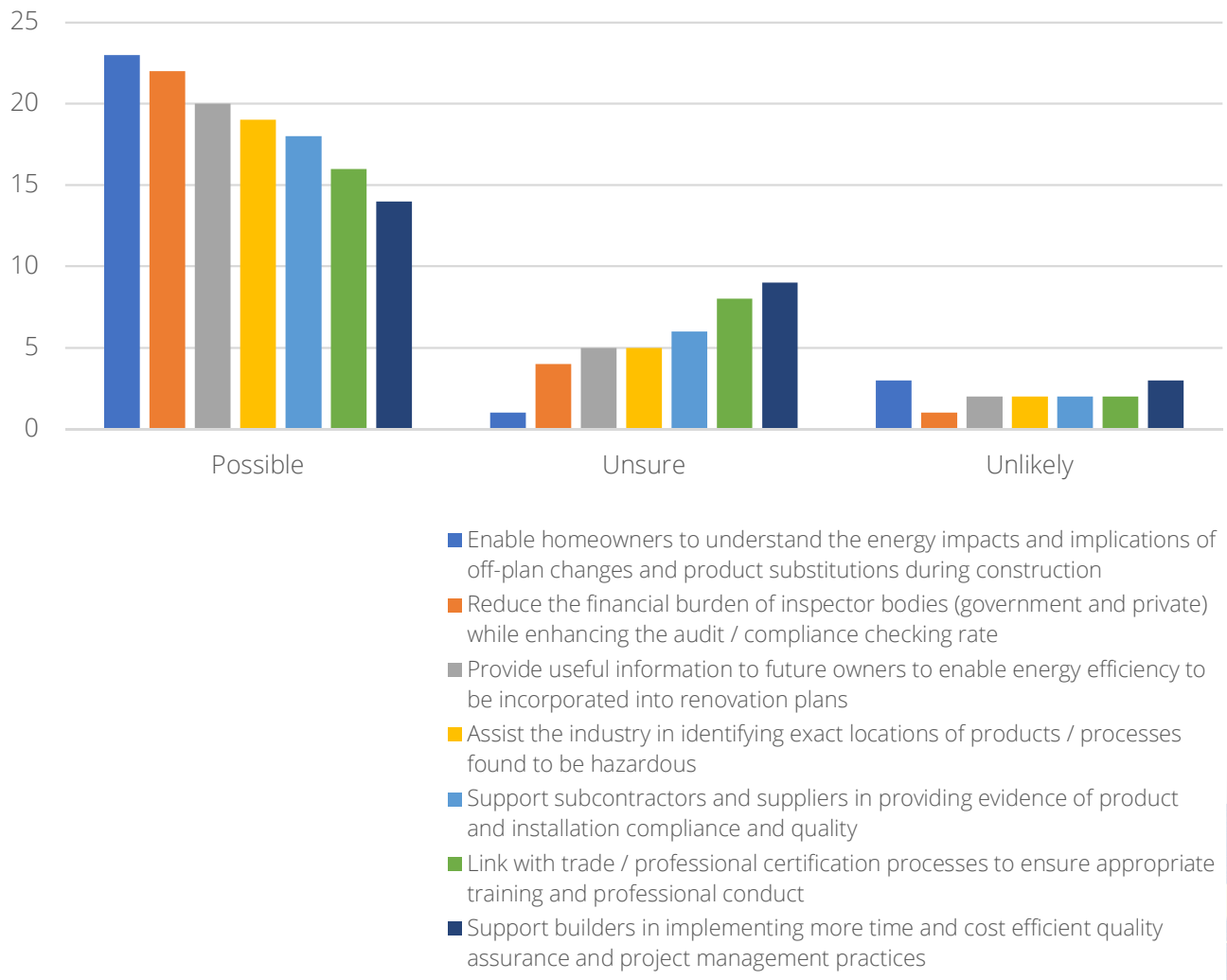
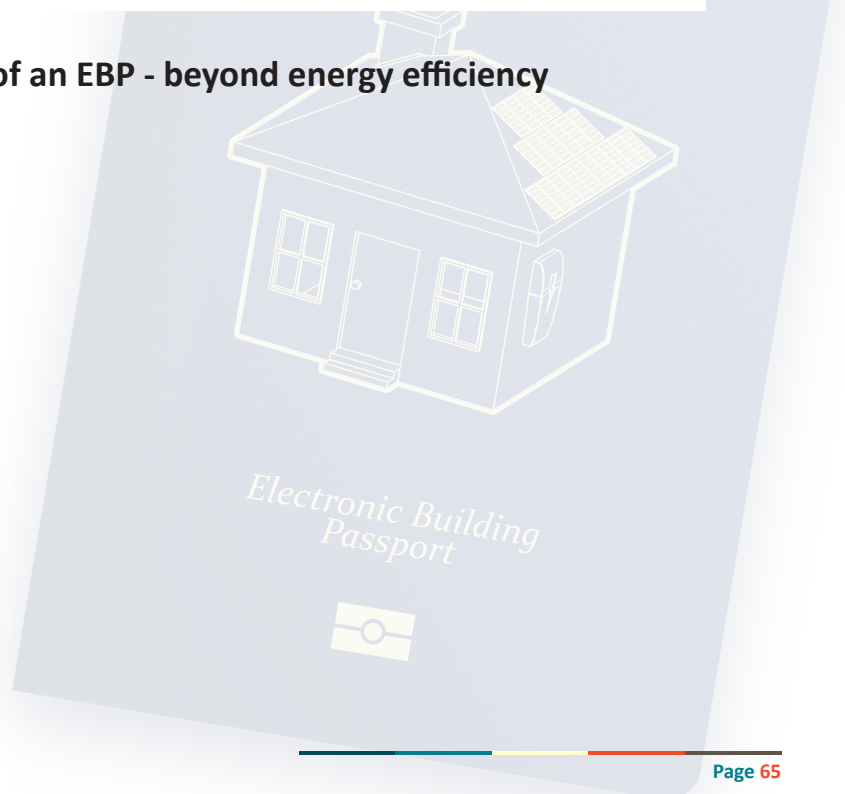


Figure 14 Ranked value propositions of an EBP - beyond energy efficiency compliance



4.7 Un-prompted comments about EBPs

Seven free text comments were submitted in the online survey. A word cloud of the comments is shown in Figure 15. Six of the comments related to ways in which an EBP could be functionalised: a compliance guarantee; a marketing incentive; a reflection of each stage of the approval process; linked to the completion certificate (no EBP + no 'as built' rating = no completion certificate); a means of tracking changes; an enforceable requirement. One respondent commented that compliance 'of an EBP' should be voluntary as there are already mechanisms at local government to view uploaded documents.

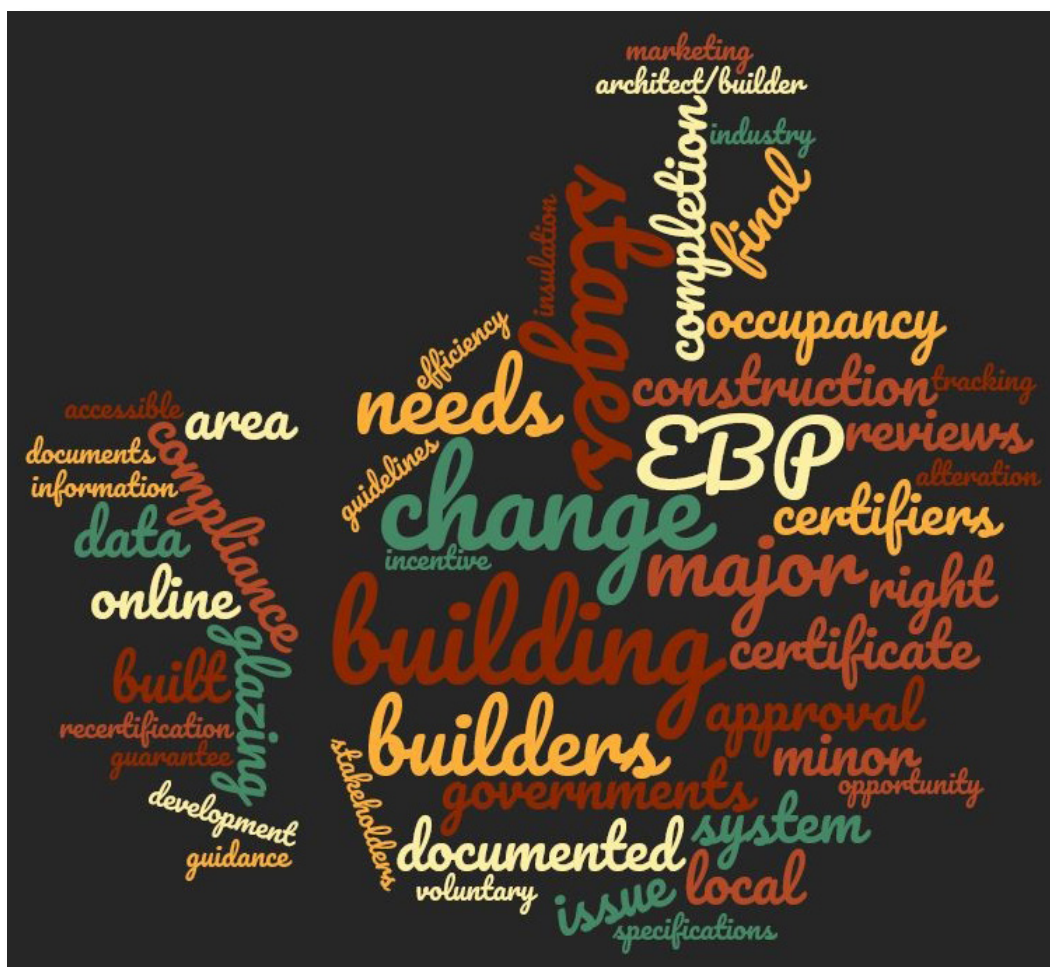


Figure 15 Word cloud of survey free text comments

4.8 Traditional Databases or Distributed Ledgers

Databases are typically established and controlled by a central authority that determines the form of the data and access rights to the data. The data can be either structured (e.g. contain tables with rows and columns of data) or unstructured (e.g. contains online documents), and reside in a centralized or decentralized server.

In contrast, block-chain technology, or more accurately, distributed ledger technology, enables a number of features not possible with traditional databases. This includes:

- No central authority: 'power' is distributed across all users
- No central repository (data is on all computers in the network)
- A consensus based agreement process that requires all attached computers to accept any changes made by authorized persons
- No deleted files (changes are additive)
- Data security (almost hack proof)
- Almost real time transactions
- Reduce transaction costs there is no central authority.

The development of an EBP for Australia would need to consider the relative advantages and disadvantages of traditional approaches to data and cloud storage, or the utilisation of distributed ledger technologies that present a new way of thinking about software development, deployment and utilisation. Examples of distributed ledger platforms include:

- Hyperledger
- Smart Contracts (a permission system where users and validators have specific roles and encryption and keys are used for identity management)
- Ethereum (open source platform and peer-to-peer network)
- Applications (called 'dapps' in this sector), for example 'Civic' (www.civic.com) which combine blockchain and biometrics on a mobile device to prove identity.

Distributed ledger projects have recently been applied to land registry records and property transactions to address some of the inefficiencies and expenses of current paper based systems, as shown in Table 21. Distributed ledger technology is also being implemented in the energy sector – a sector characterised by a high volume of transactions and a large number and wide range of participants, including regulators, state owned and private corporations, intermediary service providers and consumers/prosumers. Some examples include Share&Charge (www.shareandcharge.com), Grid Singularity (www.gridsingularity.com) and Power Ledger (www.powerledger.io). The technology is also being used for identity management, i.e. the creation of digital passports for citizens (e.g. Estonia). In this application it is seen as a way to reduce the risk of identity theft and, in the future, to enable the potential for online voting (e.g. Switzerland).

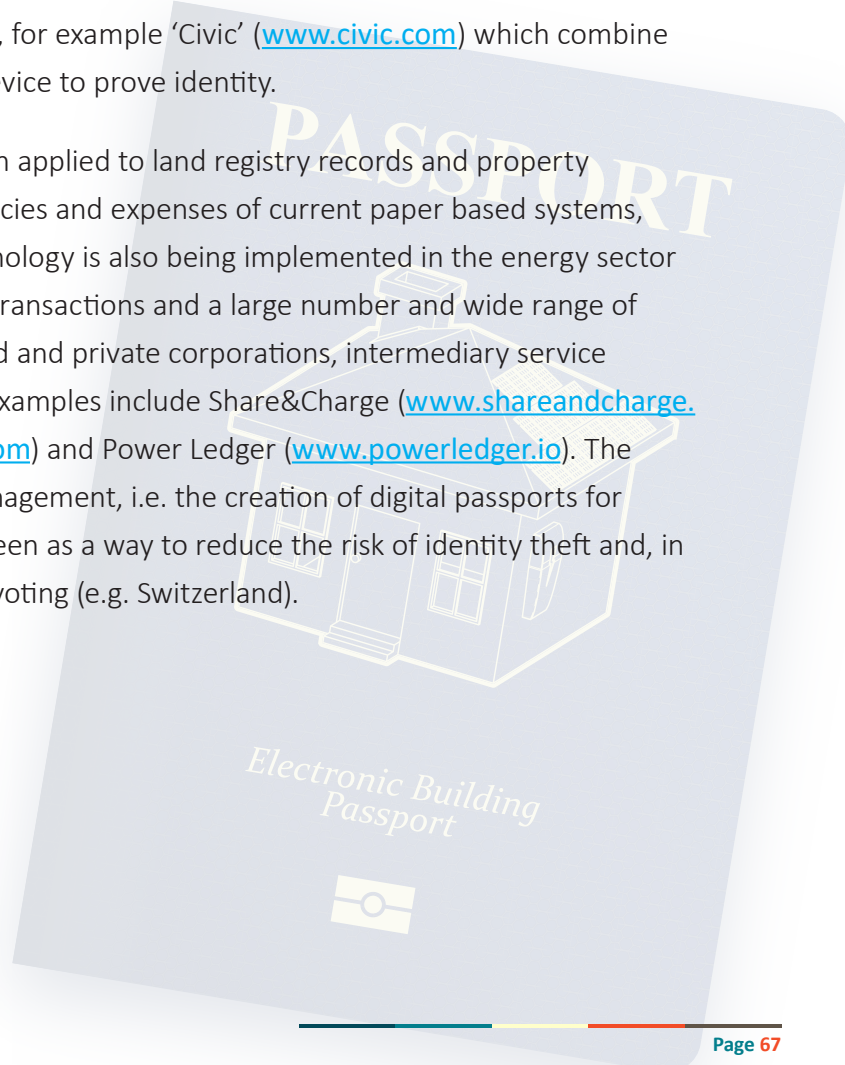


Table 21 Examples of distributed ledger technology applications to property

Category	Description	Where
Land Registries	Land registries	Georgia, Sweden, Ukraine
	Bitland Global	Ghana
Property Deeds	Property deeds by Propy, using Ethereum (an open-source platform)	South Burlington, Vermont USA.
Mobile Apps	OAKAPPS: a resident-facing single sign-on portal that houses all new and future city services applications. Contains a range of apps (e.g. for planning and building) that allows contractors and developers to upload documents for review, simplifying the permitting process and reducing wait times.	Oakland, USA.
Mortgage Documentation	Factom Harmony: uses blockchain technology to ensure that mortgage companies and their clients have complied with regulations, documents are securely preserved, and everything is easily accessible in the event of an audit.	Austin, Texas USA
Property Valuation	Uses distributed ledger data security capabilities to provide quick property valuations for mortgage applicants. Reduces the need for (and cost and time of) multiple valuations on the same property.	Bank of China, Hong Kong

Distributed ledger technology enables a number of features not possible with traditional databases.

5. Next Steps

As shown in Table 1 of this report, the work described in this report follows on from previous work aimed at improving compliance with energy efficiency requirements of the National Construction Code (in the residential sector).

This work is incorporated into Australia's [National Energy Productivity Plan 2015-2030](#) (NEPP) that seeks to boost competitiveness, manage costs and reduce emissions. In particular it supports NEPP measure 5 (improve residential building energy ratings and disclosure) and measure 32 (improve compliance with building energy efficiency regulation).

At a national level, this report finds that there is an immediate need for states and territories to agree on and adopt a common lexicon of terminology relating to 'building documentation and evidence', i.e. documents, records, information, forms, drawings, plans, written evidence, evidence, approved plans, workings, calculations, certificates, supporting documents and specifications. Such alignment will remove much of the confusion and inconsistencies that currently exist and assist the construction industry, owners and building inspectors to undertake their respective roles and responsibilities. This is consistent with the findings of NEEBP Phase 3 Project 1 report (that recommended the development of consistent definitions of compliance) and Recommendation 22 of Shergold and Weir⁷⁵.

An EBP could simultaneously support existing building regulation policy goals, enhance construction industry productivity and grow consumer confidence in the housing market.



*Electronic Building
Passport*

75. Peter Shergold and Bronwyn Weir. *Building Confidence: Improving the effectiveness of compliance and enforcement systems for the building and construction industry across Australia*. February 2018.

This reports provides further evidence to support the development and implementation of a national Electronic Building Passport (EBP) recommended by the Regulator Needs Analysis Report of 2018 (NEEBP Phase 3 Project 2). An EBP that simultaneously supports existing building regulation policy goals, enhances construction industry productivity and grows consumer confidence in the housing market, needs to be implemented in a manner that enhances the productivity and credibility of the existing building regulation, approval, construction and compliance processes, i.e. through enabling:

- i. an online building approval application process where specific data (about energy efficiency or products for example) can be entered into discrete fields (i.e. creating a searchable data base of structured and unstructured digital information as the basis for other functionalities)
- ii. an efficient building approval stage (enabling a certifier to readily determine if the work would contravene the building codes)
- iii. a more productive and efficient construction stage (enabling a competent builder to carry out the work in accordance with the plans and relevant legislation, upload supporting evidence, note any changes made during construction, and notify the certifying authority of those changes)
- iv. more efficient and quality assured building inspection / certification processes (enabling a building inspector/ certifier to download associated checklists and upload supporting evidence of compliance, report non-compliance, trigger a re-rating/re-approval process if changes are made, or halt the construction process if non-compliance is not addressed)
- v. An automated generation of occupancy certificates / certificates of building compliance when all steps are completed and shown to be compliant.

This approach would also address (and extend the application of) recommendations 12-19 of Shergold and Weir, with regard to collecting and sharing building information, the adequacy of documentation and record keeping, and inspection regimes.

In order to provide this functionality, an EBP would need to:

- Be based on structured digital data in combination with digital records
- Be scalable and modular, to meet current and future needs
- Be incorporated into existing regulatory processes yet be flexible enough to enable possible future regulatory processes
- Utilise or be compatible with state- and territory-wide planning / building portals and associated software
- Have a permission system that provides a hierarchy of access for data input and extraction
- Link with other databases associated with buildings (e.g. trade and professional accreditation bodies, land registries, housing databases etc).

While this report was prepared in the specific context of energy efficiency in residential buildings, the proposed Electronic Building Passport concept also provides solutions to commercial buildings, buildings beyond the construction stages, and for other construction related challenges faced in Australia. As commented by Peter Shergold and Bronwyn Weir, the nature and extent of building related problems *“have led to diminishing public confidence that the building and construction industry can deliver compliant, safe buildings which will perform to the expected standards over the long term.”*

A few examples of how an EBP can contribute to solutions, are given below.

Building product safety and compliance

Shergold and Weir recommend that a product certification system for high-risk building products be established (recommendation 21). An EBP could link to such a system but also to other building product registers (e.g. general product compliance). It would also enable the location of such products to be recorded, within the records of each individual building, to enable targeted, timely and effective replacement processes should a product be the subject of a safety recall.

Consumer confidence in the construction industry

An EBP can be linked with professional / trade certification databases and building dispute bodies. This would enable ease of checking that practitioners involved in a residential or commercial building have appropriate registration, insurances and professional development. This supports and extends the application of Shergold and Weir recommendations 1-3.

Consumer access to information about building quality and safety

An EBP can address the issue of poor and inadequate building documentation that can result in unsafe / non-compliant products, exacerbate disputes about the quality and compliance of building work, and provide inadequate information to guide future maintenance. (These are issues raised by Shergold and Weir). While this is relevant to all building types to some extent, Class 2 residential buildings (typically with Body Corporate governance) seem to be particularly devoid of the information required for owners to manage and protect their collective assets.

Post-disaster recovery

The post-flood recovery process in Townsville in early 2019 saw some inappropriate ‘stripping out’ of affected housing, due to insurers’ panel builders lack of knowledge about local building practices and lack of access to specific property building records. The speed and effectiveness of recovery, and the finalisation of insurance claims, could be greatly assisted by on-site access to all construction documentation related to affected buildings.

Tailored insurance for specific buildings

Insurance costs are rising dramatically, with some parts of Australia predicted to be ‘uninsurable’ in the future. The cost of insurance against natural hazards is particularly high in northern Australia. In the absence of detailed information about specific buildings, insurance premiums are typically calculated on ‘average’ buildings and associated regional risks. This gives no incentives for designers,

builders or building owners to construct beyond the minimum requirements of the National Construction Code. Detailed specific property building information could be used by building owners and insurers to negotiate specific property risks and drive the market towards solutions beyond the minimum safety requirements.

Tier 2 commercial buildings

Commercial buildings under 1000 m² are not currently covered by the Commercial Buildings Disclosure requirement. There is also little information known about such buildings, in terms of building age and condition, energy efficiency, operational costs, code compliance etc. An EBP could be one means of collecting such data for the benefit of owners and operators (in making investment decisions to enhance operational efficiency), and to inform future policies or rating tools / programs.

Building documentation for owners and successive purchasers

Shergold and Weir recommended that jurisdictions require a comprehensive building manual for commercial buildings be lodged with building owners and successive purchasers (recommendation 20). Note that Shergold and Weir regard apartment buildings (Class 2) as commercial buildings. This EBP report has shown that current legislation is not consistent about what information about a



residential building is provided to the initial owner, and further, that successive owners and tenants are virtually locked out of the building information cycle. An EBP paves the way for the orderly collection and curation of building information as it is created over its lifecycle, giving successive owners and tenants access to this information to help inform their decisions relating to specific buildings.

In view of the multiple recommendations, from multiple reports, it seems that the next logical step would be for regulators, the building and construction industry, the financial services industry and consumer protection advocates to work collaboratively on developing and implementing a nationally consistent Electronic Building Passport system.



6. Appendices

6.1 Industry Consultation

6.1.1 Industry participants

Workshops were held in Adelaide and Brisbane. State and local government representatives as well as industry practitioners were invited to attend. Regulators from each state and territory were invited to participate in a 20-30 minute phone conversation relating specifically to their jurisdiction's document system. An online survey was developed and distributed to gather further feedback from industry and regulators. Table 22 summarises the industry representation for this engagement activities.

Table 22 Workshop and Interview participant representation

	Adelaide Workshop Participants 20/5/2019	Brisbane Workshop participants 30/5/2019	Telephone discussions May / June 2019
Project leaders	4 (SA Govt 1, QUT 1, CSIRO 2)	2 (QUT, CSIRO)	1 (QUT)
Research (housing regulation, design, markets)	2	2	-
State government (Regulation)	2 (SA)	2 (QLD)	NSW (1) NT (2) TAS (1) VIC (1) WA (1)
State government (Compliance)	-	1 (QBCC)	-
Local government (Compliance)	3	-	-
Industry (Designer/ Architect)	3	-	-
Industry (Assessor)	2	1 + (ABSA)	-
Industry (Planner)	2	-	-
Industry (Construction)	2	(MBA, HIA)	-
Industry- Govt (Training)	1	-	-
Industry Association	1 (MBA)	5 (MBA, HIA, ABSA, IESANZ)	-
Total	22	13	7

6.1.2 Workshop topics

The workshop discussions focused on four main topics:

- The state's residential building energy data requirements, legislation, IP and privacy issues
- Four international case studies of different types of EBP
- NatHERS / Universal Certificate: compliance, variation triggers, HStar portal / database
- Design of an EBP – 'best practice' functionality and architecture



6.1.3 Regulator questions (phone discussions)

Regulators were asked a range of questions relating to building documentation systems in their jurisdiction:

- Purpose
 - » How does the documentary system relate to the NCC?
- Distribution
 - » Is there one system for the whole state/territory, or is it up to each local government area to document building information?
- Form
 - » Is the system predominantly paper based or electronic?
 - » If electronic, is it structured (searchable) or unstructured (digital files)?
- Inter-operability
 - » Does the system link to any other systems such as trade certification / professional registration records?
- Informed Consent
 - » Do the Building Approval application documents contain a statement advising how the documents may be used?
- Funding
 - » How is the system funded?
 - » Is there an IT budget and management/operational budget?
- Authority
 - » Who has the authority to make decisions regarding what information is gathered, the format of that information and how it is gathered, stored and accessed?
 - » What is the decision making process?
- Functionality
 - » Is the document system working well?
 - » Why / why not?
 - » What enhanced functionality would value-add?
- At what point should a building be compliant?

6.1.4 Survey

An invitation to complete the online survey was distributed to over 200 stakeholders, most of whom had been involved to various extents in previous NEEBP projects in some manner. 27 responses were received (approximately 13% response rate).

Table 23 shows the distribution of the survey participants by industry sector, jurisdiction and experience. Participants represent a wide range of sector stakeholders however there is a definite bias (in terms of numbers) towards energy assessors, accreditation organisations and researchers. Note that no building certifiers or surveyors participated (nor were any present at the industry workshops). Five states/territories were represented in the survey. Most respondents considered themselves sufficiently experienced to be able to comment on Class 1 buildings, with far fewer (just over 50%) experienced in Class 2 buildings.

Response to EBP related questions covered by the survey have been included in the text of the report.



Table 23 Survey participant sector, jurisdiction and experience

Participants	Number
Accreditation organisation (e.g. energy assessors, building surveyors, designers)	6
Building industry peak body (e.g. HIA, MBA)	2
Building industry – residential – low volume home builder	1
Building industry – residential – class 2 buildings	1
Certifier / Surveyor – local government	1
Consultant	2
Design industry – designer / architect	3
Energy assessor	7
Engineer (associated with residential construction)	1
Research (residential buildings)	8
Building regulations (state)	4
Software tool developer	1
States and territories	
NT	1
QLD	5
SA	14
VIC	2
WA	1
Australian government	3
Type of residential construction experienced to comment on	
Class 1- NEW	26
Class 1 – alterations or additions	19
Class 2	14

6.1.5 Conference Presentation

This project was also presented at the Improving Residential Energy Efficiency (IREE) conference in Brisbane, 15-16 April 2019 and an extended abstract appears in the conference proceedings⁷⁶. Attendees at the conference were invited to participate by contacting the lead author.

76. Miller, W (2019) "Electronic Building Files and Resilient Cooling: What are these national and international projects and why do they matter?" In *Improving Residential Energy Efficiency Conference 2019: Conference Proceedings and Book of Abstracts*. Ed. Russell-Bennett, R, Gordon, R, Bedggood, R. Published by QUT Business School, Brisbane. pp83-84. <https://www.iree.org.au/wp-content/uploads/2019/05/IREE-2019-Proceedings.pdf>

6.2 Expert contribution

This report drew on the expertise of the project team (marked with an * in Table 24) with additional expert advice provided by law and IT specialists.

Table 24 Expert contributions to this project

Organisation	Name	Speciality
QUT	Dr Wendy Miller*	Electronic Building Passports; Residential building energy efficiency, policy and regulation; stakeholder engagement
QUT	Dr Sherif Zedan*	Research and Industry in the areas of building design, construction, energy assessment as designed / constructed /operated, and stakeholder decision making
QUT / ANU	Ms Ernestine Kirsch*	B. Laws
QUT / Chinese University of Hong Kong	Assistant Professor Angela Daly	Legal research in the areas of competition law and regulation, intellectual property, privacy and data protection, human rights, legal theory, socio-legal studies, and the political economy of law.
QUT	Professor Des Butler	Legal research in the areas of privacy, contract law, defamation, legal education, liability for psychiatric injury, media law, negligence, torts, HERN
	Associate Professor Mark Burdon	Legal research in the areas of information privacy, privacy law, data protection, cybersecurity, and information security regulation
QUT	Professor Yuefeng Li	Computer and data science research in the areas of data mining, knowledge and data engineering, web intelligence, and knowledge-based systems.
CSIRO	Dr Stephen White	NatHERS
CSIRO	Anthony Wright*	HStar portal, Australian housing data
CSIRO	Dr Michael Ambrose*	NatHERS simulation software, Australian housing data
SA Gov	Sabina Douglas-Hill*	Project Manager, Energy Efficiency Buildings

*Electronic Building
Passport*



6.3 Building Passport Case Studies

6.3.1 National Energy Performance of Buildings Register (UK)

The aim of the EU's Energy Performance in Buildings Directive (EPBD) is to increase the energy efficiency of buildings, reduce building carbon emissions and lessen the impact of climate change. Energy Performance Certificates (EPCs) in the UK are required at the construction stage and the complete certificate must be provided to the owner after construction. The performance indicator (similar to Australia's star rating) must be included in all advertisements and when a building is offered for sale or rent. An EPC is valid for a maximum of 10 years. An excerpt of an EPC is shown in Figure 16.

The National Energy Performance of Buildings Register contains three separate registers: (1) all EPCs; (2) Display Energy Certificates (required for large buildings); and Air-conditioner Inspection Reports (required for all AC's over a specific capacity). The EPC register contains all of the EPC reports as well as the underlying data used to generate the reports. This would be similar to a database containing all NatHERS certificates and the underlying data used to generate those certificates. As of March 2016 the register contained over 15 million records.

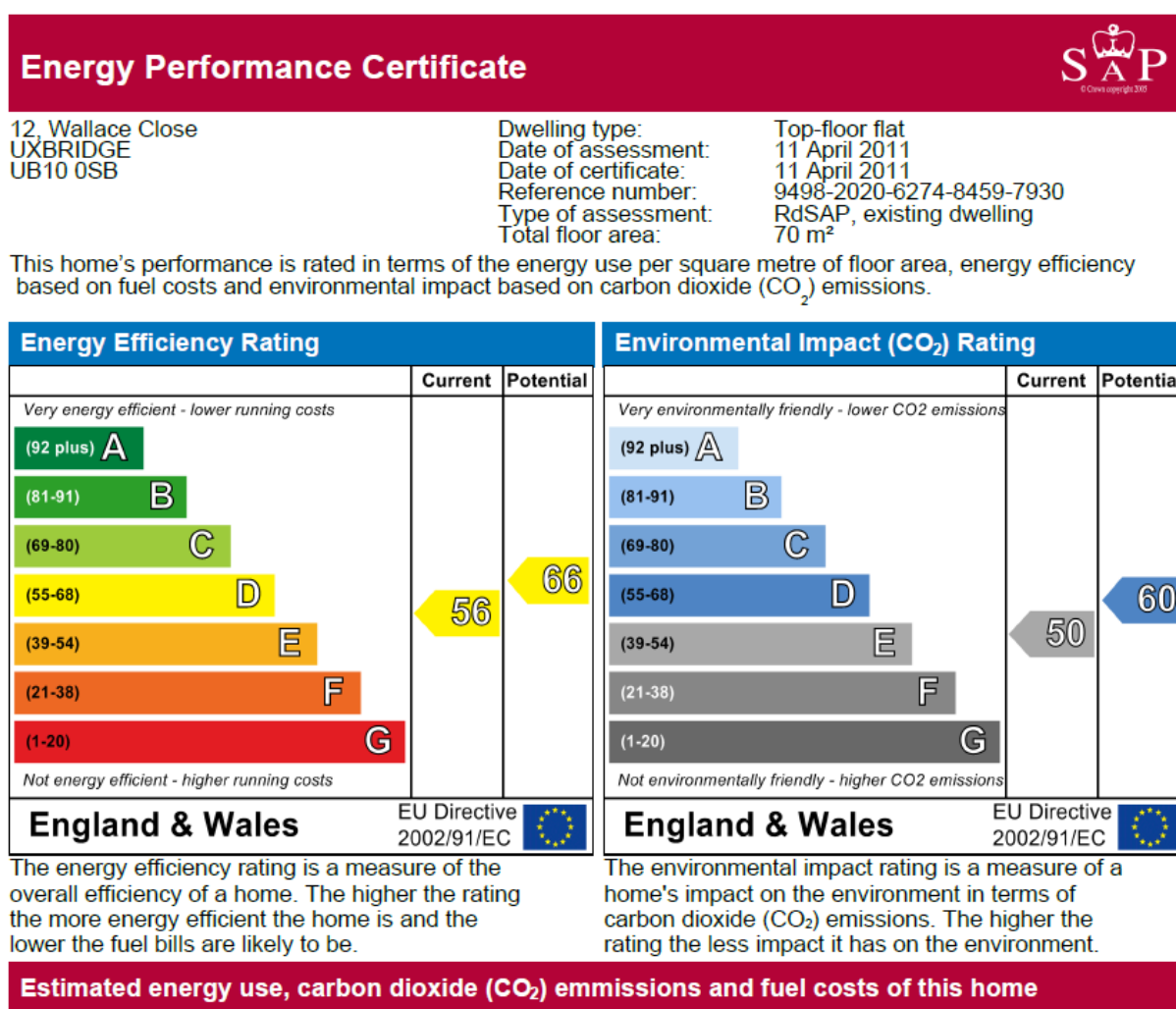


Figure 16 Partial front page of a UK EPC

From its inception in 2012, access to the EPC for individual dwellings was available by entering the street address and postcode into the online search facility. This enabled any individual to access individual EPCs without restriction, unless an-opt out clause had been triggered at the registration of the EPC. If an 'opt out' had been triggered, the EPC was only available if the person requesting the information had the EPC ID number. Bulk data download was available to approved organisations / individuals for permitted purposes (e.g. social housing asset managers, local government, research organisations). A Privacy Impact Assessment was undertaken in 2016 to investigate possible risks and benefits in making better use of the data. Key issues are highlighted in Table 25.

Table 25 Benefits and considerations for open access: UK EPC Privacy Impact Assessment 2016

Benefits	Risks	Considerations
Increase research and technology innovation to improve energy efficient building knowledge and performance	Increase in unwanted marketing (considered to be low risk as there are other legislated mechanisms dealing with direct marketing)	A lot of data about buildings is readily available in the public domain
Enable households at risk to more readily identify and support local programmes	Security i.e. potential for increase in burglary (considered to be low risk)	Benefits outweigh risks
Enhance the role of real estate companies to enable potential buyers / tenants to compare properties		Select specific data items to make available (73 items selected)
Enable property management companies to better manage and upgrade their building stock		Provide Opt Out clause

As of 2019 all EPCs are available for open bulk data access (except the very small percentage of EPCs where an opt-out clause has been triggered; less than 0.05%).

6.3.2 Quality Framework for Airtightness Testing

Airtightness testing for residential buildings in Belgium has been promoted since 2016 and is implicitly mandatory since January 2018. (This testing is implicit because, in the absence of an airtightness test, a default value of 12 ACH/hr @50Pa is required to be used when calculating if a building will meet the energy efficiency regulations (e.g. EPC). Such a value would mean that an EPC would not pass minimum performance requirements.) An industry association (Belgian Construction Certification Association) was tasked with developing:

- (a) a quality framework that included qualification training for testers;

- (b) credentials processes for companies providing testing services (including requirements for calibration of test equipment);
- (c) quality assurance / audit processes; and
- (d) a database for gathering all measurement data (for government use).

This online data base consists of both structured and unstructured data relating to building ID and specifications, test results, photos etc. The QA processes are shown in Figure 17. It is interesting to note that smart phone technology is incorporated to enable streamlined audit processes.

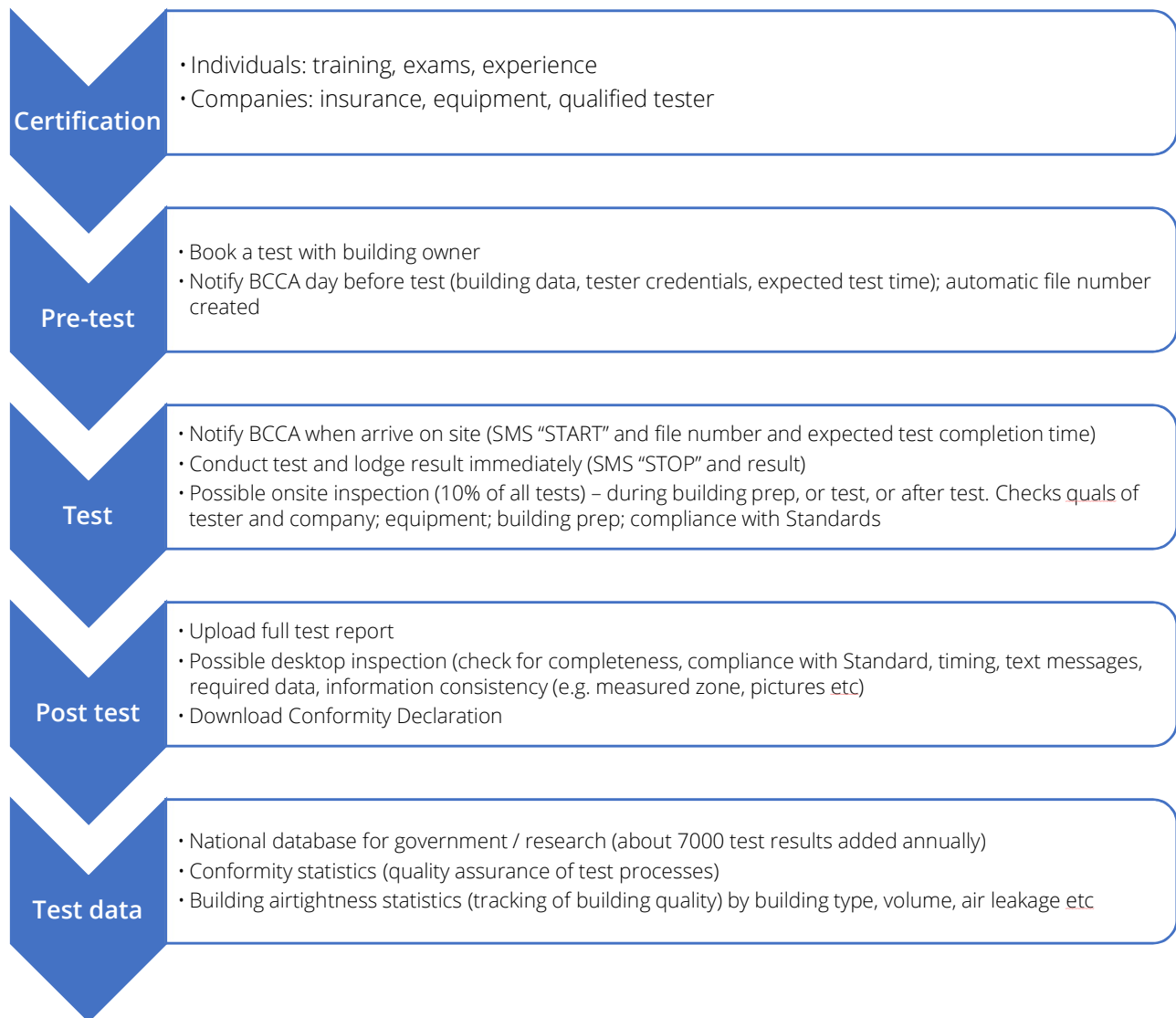


Figure 17 QA processes for airtightness testing in Flanders

6.3.3 Refurbify

Reburbify is a cloud-based site management tool aimed initially at housing stock owners and their supply chains, to manage refurbishment, repair and maintenance activities. This tool was initially developed as part of the EU Built2Spec (B2S) project that sought to find ways to enhance the productivity of the construction industry in retrofitting Europe's building stock to meet EPBD

requirements into the future. Refurbify brings together all documents, permission and tasks associated with a whole building renovation project. It streamlines interactions between housing stock owners, residents and suppliers by sharing, viewing and managing project activities using real-time information direct from the field via mobile apps.

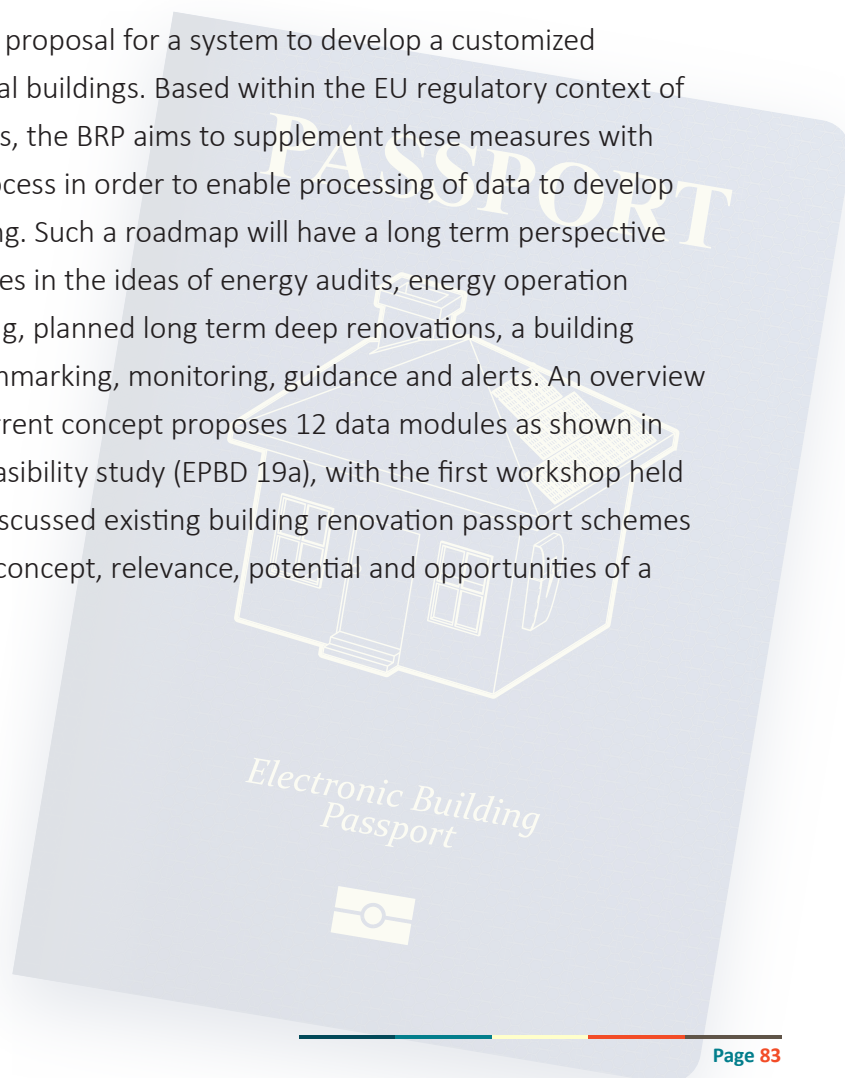
“As Built” evidence (e.g. photos, product barcodes etc) can be uploaded onsite, triggering automatic alerts to the responsible approver / certifier. Developed using Platform-as-a-service (PAAS) architecture, the benefits of this tool are reported to be:

- i. the creation of a digital audit trail;
- ii. the ability to monitor and approve works (including release of payments) in real time;
- iii. a reduction and administrative costs;
- iv. quicker resolution of onsite issues; and
- v. an increase in the quality of work delivered (due to higher accountability).

It results in integrated central register that is easily accessible by owners, residents and contractors. The register contains critical compliance certification, as-built information, warranties, operation and maintenance documentation, customer aftercare documentation, instruction videos and the ability to give and receive feedback.

6.3.4 Building Renovation Passport

A Building Renovation Passport (BRP) is an EU proposal for a system to develop a customized roadmap for the deep renovation of residential buildings. Based within the EU regulatory context of the EPBD and Energy Performance Certificates, the BRP aims to supplement these measures with an onsite energy audit and data gathering process in order to enable processing of data to develop a systematic renovation roadmap for a building. Such a roadmap will have a long term perspective and take into account individual contexts. It ties in the ideas of energy audits, energy operation (consumption and generation), data processing, planned long term deep renovations, a building logbook, and interactive tools to enable benchmarking, monitoring, guidance and alerts. An overview of this proposal is shown in Figure 18. The current concept proposes 12 data modules as shown in Figure 19. The BRP is currently subject to a feasibility study (EPBD 19a), with the first workshop held in Brussels on 24 June 2019. This workshop discussed existing building renovation passport schemes and initiatives (German and Flemish) and the concept, relevance, potential and opportunities of a BRP.



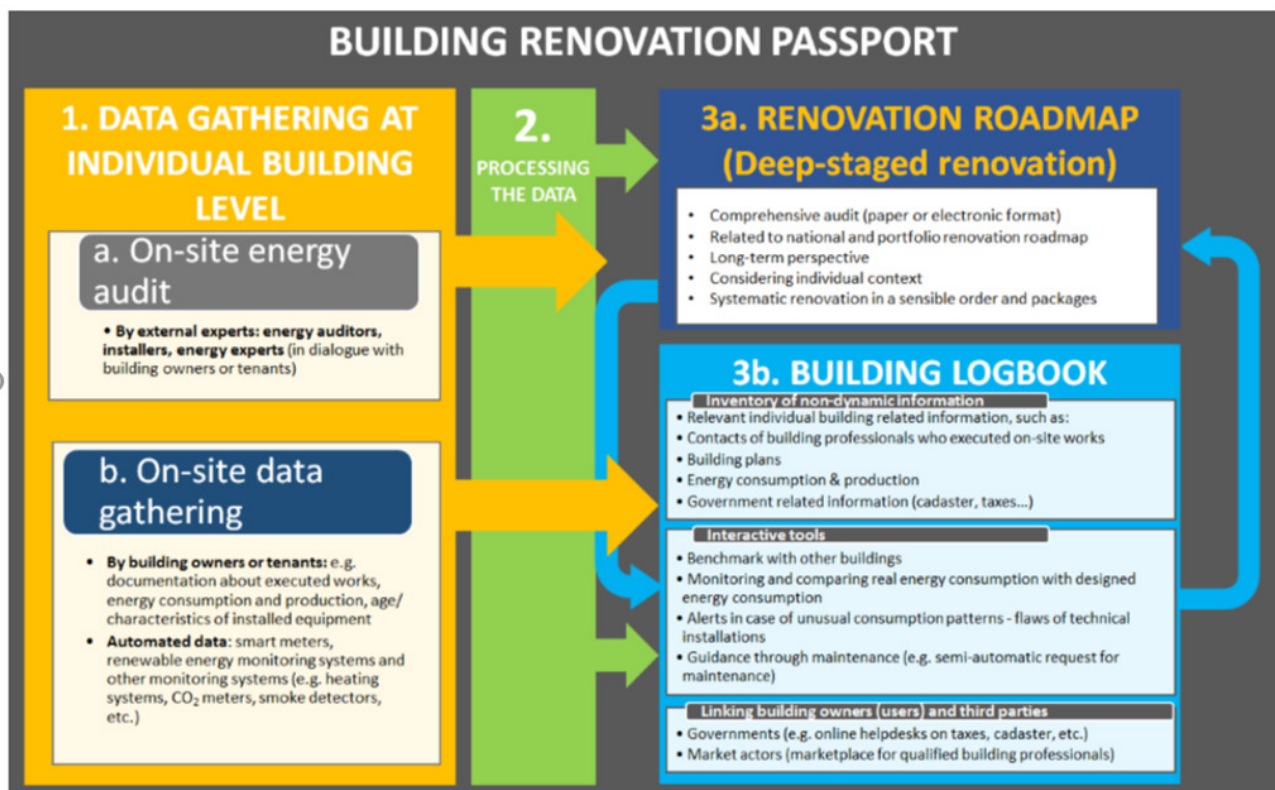
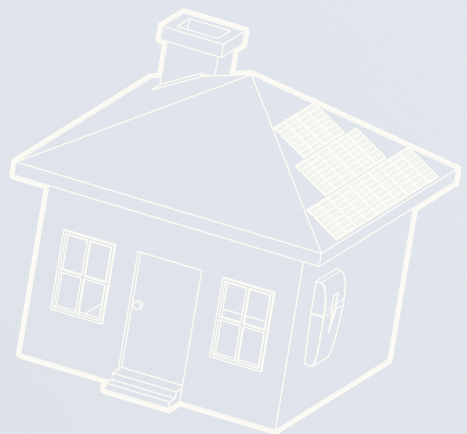


Figure 18 Overview of Building Renovation Passport



Figure 19 Data modules proposed for the BRP

PASSPORT



*Electronic Building
Passport*



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