Construct Innovate
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Review of the system for standards, testing, certification and accreditation for the delivery of housing

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List of acronyms

Some important acronyms are listed as follow:

AC	Assigned Certifier
AVCP	Assessment and Verification of Constancy of Performance
BCA	Building Control Authorities
BCAR	Building Control (Amendment) Regulations
BCMS	Building Control Management system
BOPAS	Buildoffsite Property Assurance Scheme
CPR	Construction product regulation
DC	Designed Certifier
EU	European Union
EN	European Standard
ETA	European technical assessment
EAD	European assessment document
EOTA	European Organisation for Technical Assessment
hEN	Harmonised European Standard
I.S.	Irish Standard
MMC	Modern method of construction
NSAI	National Standards Authority of Ireland
NHBC	National House Building Council
SI	Statutory instrument
TAB	Technical Assessment Body
TGD	Technical guidance documents
UKAS	United Kingdom Accreditation Service
UK	United Kingdom

1 Executive summary

This report examines the existing Irish housing delivery system, with a comprehensive review of standards, testing, certification and accreditation. The report presents a concise literature review to draw insights from similar standards, testing, certification and accreditation systems in the United Kingdom (UK) and Europe. Additionally, interviews of construction professionals are undertaken to understand perspectives of industry on the current Irish system of standards, testing and certification.

The methodology employed comprises extensive desktop research combined with semi-structured interviews of a cross-section of the construction sector. The aim is to gain a comprehensive understanding of the current situation and identify potential obstacles in the system of standards, testing, certification and accreditation that could be impeding the more efficient delivery of housing in Ireland. The findings highlight challenges embedded within the existing system. In Ireland, the key components of the construction of housing related to standards, testing and certification include; building regulations, building control regulations, technical guidance documents, national standards, European design/material/product standards, execution standards, testing standards, certification and accreditation, as well as construction product regulations. When adopting a novel or innovative construction product, material, or system, NSAI Agrément emerges as the most practical avenue for demonstrating compliance with Irish Building Regulations, especially in the absence of established national standards or harmonized European standards. During semi-structured interviews, several recurring challenges emerged, including a lack of understanding of the Agrément process and a lack of clear guidance.

In response to these challenges, the report presents potential recommendations aimed at streamlining the approach to Building Regulation compliance for novel or innovative housing construction products. By comparing extensive research, semi-structured interviews with a cross-section of the construction sector, and comparative analysis, this report serves as a valuable resource for policymakers, industry professionals and stakeholders involved in the housing construction sector.

2 Introduction

At present, the housing delivery system in Ireland is comprehensive, involving multifaceted components such as Building Regulations (Government of Ireland (2022a)), Building Control Regulations (Government of Ireland (2021a)), Technical Guidance Documents (TGDs) (Government of Ireland (2021b)), national standards, European standards (e.g. Eurocode), testing standards (e.g. I.S. EN 206-1:2013, Concrete - Part 1: Specification, performance, production and conformity), certification (e.g. NSAI Agrément), and accreditation (e.g. the Irish National Accreditation Board accreditation). In order to demonstrate compliance of housing products/materials/systems with the Irish Building Regulations, there are two routes; (1) products/materials/systems for which TGDs, national design standards, European design standards or existing certification already exist, or (2) for innovative products/materials/systems where no TGDs, national design standards, European design standards or existing certification already exist then certification is required.

Advanced construction technologies and novel materials offer significant benefits, promising to transform aspects of housing construction. These innovations bring many advantages, including accelerated house delivery, enhanced quality, improved sustainability, reduced waste, lowered carbon emissions, and increased material recycling (CIF (2020), Datta and Assafi (2022), CPS (2022)).



Figure 1. 3D Modern Method of Construction (MMC) product (MJHSE (2023))

Timely adoption of these technologies, such as offsite construction (Figure 1), can expedite the construction process but also ensure a higher quality of housing, making it more sustainable and environmentally friendly (Razkenari et al., (2020)). Additionally, embracing these innovative materials/products/systems aligns with global efforts to reduce carbon footprints, minimize waste, and promote the circular economy (Mao et al., (2016)). However, the rapid evolution of construction technologies and materials in recent years has posed challenges to the existing system, leading to obstacles in the timely integration of these innovations (Green (2022)).

Amidst these challenges and opportunities, a comprehensive review of the existing system of standards, testing, certification and accreditation of housing delivery in Ireland is required. This report undertakes this review and identifies barriers in the system but also identifies potential recommendations to improve the system.

3 Research objectives and methodology

There are three main objectives to this report; (1) examine the existing Irish housing delivery system, with a comprehensive review of standards, testing, certification and accreditation; (2) understand the procedure for testing and certification in other jurisdictions and compare to the Irish system; and (3) identify any potential recommendations to improve the system.

The report provides a comprehensive overview, providing invaluable insights into the existing system. This overview will help construction professionals understand and navigate the existing system of standards, testing and certification. This report also conducts a thorough analysis through semi-structured interviews of a cross-section of construction sector professionals, aiming to understand the barriers faced and the potential solutions available. Finally, a concise literature review was conducted to explore how other countries have approached the testing and certification of new materials/products/systems into their construction sector.

4 Current system for housing delivery

In Ireland, the design and construction of buildings are subject to regulation through the Building Control Acts 1990 to 2014 (Government of Ireland (2014)). These Acts play a crucial role in safeguarding the well-being of individuals within the constructed environment. This section will outline the key elements of housing delivery in Ireland, covering various facets of manufacturing, design, and construction stages. The Building control framework is summarised in Figure 4 and details are discussed later. The essential components include:

1. **Irish Building Regulations**: These serve as the foundational legal framework, outlining mandatory requirements for various aspects of construction and building safety.
2. **Technical Guidance Documents (TGDs)**: TGDs offer detailed guidance and practical recommendations for meeting the standards and regulations set forth in the Irish Building Regulations.
3. **Standards**: Adherence to relevant national and international standards is vital to ensure the quality and safety of buildings. These standards cover materials, construction practices, and design parameters.
4. **Building Control (Amendment) Regulations (BCAR)**: BCAR sets forth specific requirements for the control and oversight of building projects, emphasizing compliance and certification procedures.
5. **Certification (NSAI Agrément)**: 'Agrément certification is designed specifically for new building materials, products and processes (and building systems) that do not yet have a long history of use and for which published national standards do not yet exist. NSAI Agrément assesses, specifies testing, and where appropriate, issues Agrément certificates for such products' (NSAI (2023a)).
6. **Accreditation**: This encompasses various bodies and institutions that evaluate and accredit professionals and organisations in the construction industry, ensuring they meet the necessary qualifications and standards to give certification.

4.1 Irish Building Regulations

The Building Control Acts 1990 to 2014 provide for the making of Building Regulations. The Building Control Act 1990 - 2014 places a statutory obligation on owners, designers and builders to design and build works or buildings in accordance with the requirements of the Building Regulations (CCMA (2016)). The Building Regulations encompass a comprehensive set of legal requirements governing the design, construction, modification, and maintenance of buildings in Ireland. In general, these regulations pertain to three key scenarios;

- **New Construction:** They are applicable to new building projects to ensure they adhere to established safety and quality standards.
- **Extensions and Significant Alterations:** When extending or significantly modifying an existing building, building regulations are in effect to guarantee that these changes meet the necessary safety and functionality criteria.
- **Material Change of Use:** Certain parts of the regulations come into effect when there is a material

change of use in an existing building. This ensures that the building complies with the relevant standards for its new intended purpose. In general, the Building Regulations typically do not apply to buildings constructed before June 1, 1992. However, when modifications or extensions are made to such older structures, the regulations may apply to the altered or expanded sections.

The Building Regulations are the law that defines the requirements of a building from different aspects to ensure safety, health, welfare, and accessibility of occupants, while also promoting energy efficiency and sustainability. Each aspect is described as a part which range from Part A to M (12 parts in total):

Part A - Structure: Statutory Instrument (SI) 138 of 2012 Building Regulations (Part A Amendment) Regulations 2012

Part B - Fire Safety: SI 115 of 2006 - (Part B) - Building Regulations (Amendment) Regulations 2006

Part B - Fire Safety 2017 Volume 2 Dwelling Houses: SI 57 of 2017 Building Regulations (Part B Amendment) Regulations 2017

Part C - Site Preparation and Resistance to Moisture: SI No. 497 of 1997 Building Regulations

Part D - Materials and Workmanship: SI 224 of 2013 Building Regulations (Part D Amendment) Regulations 2013

Part E - Sound: SI 606 of 2014 Building Regulations (Part E Amendment) Regulations 2014

Part F - Ventilation: SI 263 of 2019 - Building Regulations (Part F Amendment) Regulations 2019

Part G - Hygiene: S.I.335 of 2008 Building Regulations (Part G Amendment) Regulations 2008

Part H - Drainage and Waste Water Disposal: SI 561 of 2010 Building Regulations (Part H Amendment) Regulations 2010

Part J - Heat Producing Appliances: SI 133 of 2014 Building Regulations (Part J Amendment) Regulations 2014

Part K - Stairways, Ladders, Ramps and Guards: SI 180 of 2014 Building Regulations (Part K Amendment) Regulations 2014

Part L - Conservation of Fuel and Energy: SI 535 of 2022 - Building Regulations (Part L Amendment) Regulations 2022, SI 534 of 2022 - European Union (District Heating) Regulations 2022

Part M - Access and Use: SI 608 2022 – Building Regulations (Part M Amendment (Ireland)) Regulations 2022

It is important to note that Irish Building Regulations are updated to align with advancements in technologies, changes in social needs and environmental concerns. Those involved in the construction industry, from architects and engineers to contractors and building owners, must adhere to these regulations to ensure safety, comfort, and sustainability of building environment in Ireland.

4.2 Technical Guidance Documents (TGDs)

The TGDs accompany each part of the Building Regulations. The TGDs indicate how to interpret and implement the Irish Building Regulations in practice. The TGDs are designed to facilitate comprehension of complex technical information through the inclusion of numerous diagrams, charts, tables, and visual aids. These visual elements serve to illustrate key concepts and solutions, enhancing the understanding of the technical intricacies involved. If the approaches outlined in the TGD are adhered to, this is regarded as evidence of compliance with the requirements of the relevant part of the Building Regulations. Other routes to compliance also exist and will be discussed later.

The TGDs provide guidance in relation to the application of the Building Regulations. To illustrate how TGDs

function as supplementary documents that align with the Building Regulations, the following example is provided:

In TGD A – Structure (Government of Ireland (2012)), the reference to safety (see Appendix A) in Part A to the second schedule of the Building Regulations (Part A Structure) is further elaborated as 'the safety of the structure depends on the successful combination of design and execution, particularly:

(a) The design should be based on identification of the hazards to which the structure is likely to be subjected and assessment of risks. The selection of relevant critical situations for design should be made reflecting the conditions that can reasonably be foreseen during future use;

(b) Actions (both direct and indirect);

(c) Properties of materials;

(d) Design analysis;

(e) Details of construction;

(f) Safety factors;

(g) Workmanship and execution.'

The relevant Eurocodes and National Annexes are also listed in TGDs (as well as other standards). For example, the actions in Part A should be calculated accordance with the appropriate code i.e.:

(i) for densities, self-weight and imposed loadings, I.S. EN 1991-1-1: 2002 (Eurocode 1);

(ii) for accidental actions, I.S. EN 1991-1-7: 2006 (Eurocode 1);

(iii) for snow loadings, I.S. EN 1991-1-3:2003 (Eurocode 1);

(iv) for wind actions, I.S. EN 1991-1-4:2005 (Eurocode1);

(v) for earth retaining structures, I.S. EN 1997-1:2004 (Eurocode 7);

(vi) any greater loadings to which the building is likely to be subjected (Eurocode 1).

In Part L, the Acceptable Construction Details (ACDs) are mentioned to focus on thermal bridging and airtightness. This guide helps appropriate persons to achieve the performance standards in the Building Regulations Technical Guidance Document L 2021 – Conservation of Fuel and Energy – Dwellings (Government of Ireland (2022b)).

4.3 Standards

A standard is an agreed way of making a product, managing a process, delivering a service or supplying materials. Standards can be agreed for all aspects of how we live, from standards for quality, product performance and safety to standards for building design and services. In Europe, the European standardisation system (see Figure 2) related to construction is comprehensive and contains many aspects including: Eurocodes, Material and Product standards, European technical approvals, execution standards and test standards. The Eurocodes (European Committee for Standardization (2007a)) play a fundamental role in offering comprehensive technical specifications and design methodologies for house delivery. These standards are a set of ten European standards, denoted as EN, which 'apply to the structural design of buildings and other civil engineering works including, geotechnical aspects, structural fire design and situations including earthquakes, execution and temporary structures' (European Commission (2023a)). A harmonised standard is a European standard developed by a recognised European Standards Organisation: European Committee for Standardization (CEN), European Electrotechnical Committee for Standardization (CENELEC), or European Telecommunications Standards Institute (ETSI). The Eurocodes are designed to harmonize and standardize construction practices across the EU member states, ensuring consistency and

high standards in the design and construction of buildings and infrastructure.



Figure 2. European standardisation system related to construction (European Commission (2023b))

Eurocodes serve as reference documents for the following purpose (text extracted from European Committee for Standardization (2007b)):

- as a means to prove compliance of building and civil engineering works with the essential requirements of Council Directive 89/1 06/EEC, particularly Essential Requirement N° 1 - Mechanical resistance and stability and Essential Requirement N°2 - Safety in case of fire;
- as a basis for specifying contracts for construction works and related engineering services;
- as a framework for drawing up harmonised technical specifications for construction products (ENs and ETAs)

There are 10 Eurocodes made up of 58 Parts as follows (these are current versions, but all are in the process of being updated and the 2nd generation of codes are due to be published in 2027):

- EN 1990 – Eurocode: Basis of Structural Design (1 Part);
- EN 1991 – Eurocode 1: Actions on Structures (10 Parts);
- EN 1992 – Eurocode 2: Design of Concrete Structures (4 Parts);
- EN 1993 – Eurocode 3: Design of Steel Structures (20 Parts);
- EN 1994 – Eurocode 4: Design of Composite Steel and Concrete Structures (3 Parts);
- EN 1995 – Eurocode 5: Design of Timber Structures (3 Parts);
- EN 1996 – Eurocode 6: Design of Masonry Structures (4 Parts);
- EN 1997 – Eurocode 7: Geotechnical Design (2 Parts);
- EN 1998 – Eurocode 8: Design of Structures for Earthquake Resistance (6 Parts);
- EN 1999 – Eurocode 9: Design of Aluminium Structures (5 Parts).

For many construction products, the hENs and ENs do not set minimum performance levels or threshold levels for specific intended uses. In this regard, the National Standards Authority of Ireland (NSAI) has 'produced additional national guidance for some hENs and ENs in the form of National Annexes and/ or Standard Recommendations (SRs) which provide guidance on the appropriate minimum performance levels for specific intended uses of the products in Ireland' (Government of Ireland (2013)). Each part of each Eurocode is implemented nationally with a National Annex. These Annexes contain information on Nationally Determined Parameters to be used for the design of building and civil engineering works to be constructed in

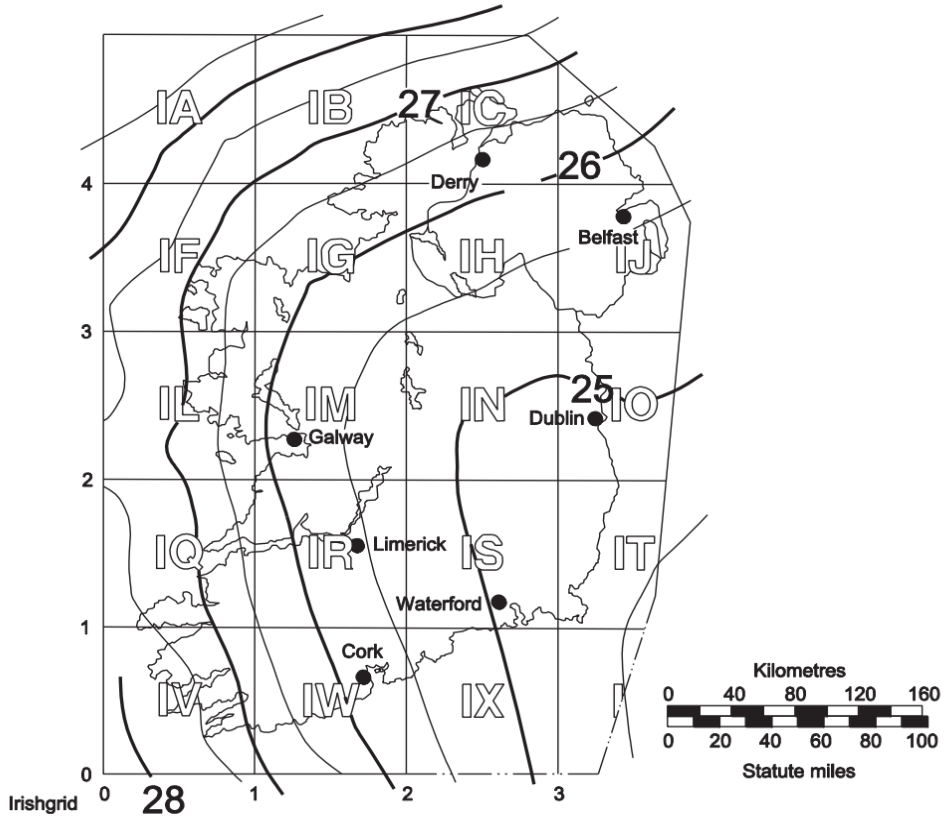
the country concerned, addressing for example particular national safety parameters, geographical and climatic conditions, and procedures. Irish national choices are contained in the Irish National Annex or National Foreword to each Part of each Eurocode. Therefore, any reference to the Eurocodes must be taken to include reference to the relevant Irish national annex.

The national annex may only contain information on those parameters are left open in the Eurocode for national choice, known as Nationally Determined Parameters, to be used for the design of buildings and civil engineering works to be constructed in the country concerned. For example, values and/or classes where alternatives are given in the Eurocode; values to be used where a symbol only is given in the Eurocode; country specific data (geographical, climatic, etc.) e.g. snow map; the procedure to be used where alternative procedures are given in the Eurocode.

Here, an example is given to demonstrate a national determined parameter choice in a national annex. In Eurocode 1, the National annex (NA) NA.2.4 Subclause 4.2 (1) P Note 2 (I.S. EN 1991-1-4:2005+NA:2013 (NSAI (2013))) provides an equation and reference map to determine fundamental value of the basic wind velocity in Ireland (see Figure 3). The fundamental value of the basic wind velocity $v_{b,o}$ should be determined from Equation NA.1 below

$$v_{b,o} = v_{b,map}. C_{alt} \quad \text{(NA.1)}$$

where, $v_{b,map}$ is the value of the fundamental basic wind velocity before the altitude correction is applied. $V_{b,map}$ is given in Figure 3 (NA.1); c_{alt} is the altitude factor given in NA.2.5.



NOTE This map is intended for sites in the Republic of Ireland only. User to reference NA to BS EN 1991-1-4 when designing in Northern Ireland.

Figure 3. Value of fundamental basic wind velocity $v_{b,map}$ (m/s) before the altitude correction is applied. (NSAI (2013))

It is important to note that Eurocodes are not the only standard available in Ireland. There are other national standards, such as I.S. 440 (NSAI (2014)) for timber framed dwellings and SR325 (NSAI (2019)) for masonry structures.

4.4 Building Control (Amendment) Regulations (BCAR)

The Building Control Regulations establish the administrative mechanisms necessary to support the implementation of Building Regulations including various components such as Commencement Notices, Fire Safety Certificates, Disability Access Certificates, and, in certain cases, inspection regimes and Certificates of Compliance. The Building Control Regulations, place obligations on property owners, builders, and registered construction professionals. They require these stakeholders to provide evidence, documented in the Statutory Register of Building Control Activity, demonstrating that the construction work or building in question adheres to the stipulated Building Regulations. 'The Building Control Regulations [Building Control (Amendment) Regulations 1997 to 2021] apply to new buildings, extensions, material alterations and changes of use of buildings' (Government of Ireland (2023)). The Building Control Regulations promote observance of the Building Regulations by supplementing powers of inspection and enforcement given to Building Control Authorities. There are 31 Local Authorities designated as Building Control Authorities (BCAs) under the Building Control Acts from 1990 to 2014. These authorities play a vital role in overseeing and enforcing compliance with building regulations at the local level, ensuring that construction activities meet the required standards and contribute to safe and well-designed structures. The BCAs monitor compliance with Building Regulations in their area having regard to (DHLGH (2023)):

- The minimum requirements for the design and construction of buildings as set out in the Building Regulations;
- Detailed TGDs showing how these requirements can be achieved in practice;
- Procedures set out in the Building Control Regulations for demonstrating compliance in respect of an individual building or works.

BCAs have strong powers of inspection and enforcement under the Acts. Responsibility for compliance rests at all times with the owner of the proposed building or works, and with any builder or designer engaged by the owner. As shown in Figure 4, BCAs are also designated enforcement authorities for the purposes of ensuring compliance with other legislation:

- Marketing of Construction Products in line with European Union (Construction Product) Regulations 2013 (SI No. 225 of 2013) (European Union (2013));
- Building Energy Rating Certificates for buildings in line with the European Union (Energy Performance of Buildings) Regulations 2012 (SI No. 243 of 2012);
- Registration of multi-storey buildings for the purposes of the Local Government (Multi-storey Buildings) Act 1988.

'The Building Control Regulations 1997 to 2021 require owners, builders, and registered construction professionals to demonstrate through the Statutory Register of Building Control Activity that the works or building concerned have been designed and constructed in compliance with Building Regulations' (Government of Ireland (2023)). The roles are explained in the Code of Practice for Inspecting and Certifying Buildings and Works September 2016 (Government of Ireland (2016)). The BCMS facilitates the electronic administration of building control matters. Owners, builders and construction professionals may use the BCMS to upload building control forms, design and compliance documents, and statutory certificates and should register as users on the BCMS in good time in advance of the intended date of commencement of works.

BCAR plays an important role in overseeing both the design and construction phases of a building project to ensure compliance with applicable regulations. Figure 5 shows the Statutory Building Control Documents and the person who should sign. There are two main certifiers defined in Building Regulations: Design Certifier

and Assigned Certifier. “Design Certifier” means the person who signs the Certificate of Compliance (Design). "Assigned Certifier" means the competent, registered professional person so assigned, in accordance with the Building Control Regulations. The role of Design Certifier and Assigned Certifier is restricted to Chartered Engineers, Registered Architects or Registered Building Surveyors (RICS (2023)).

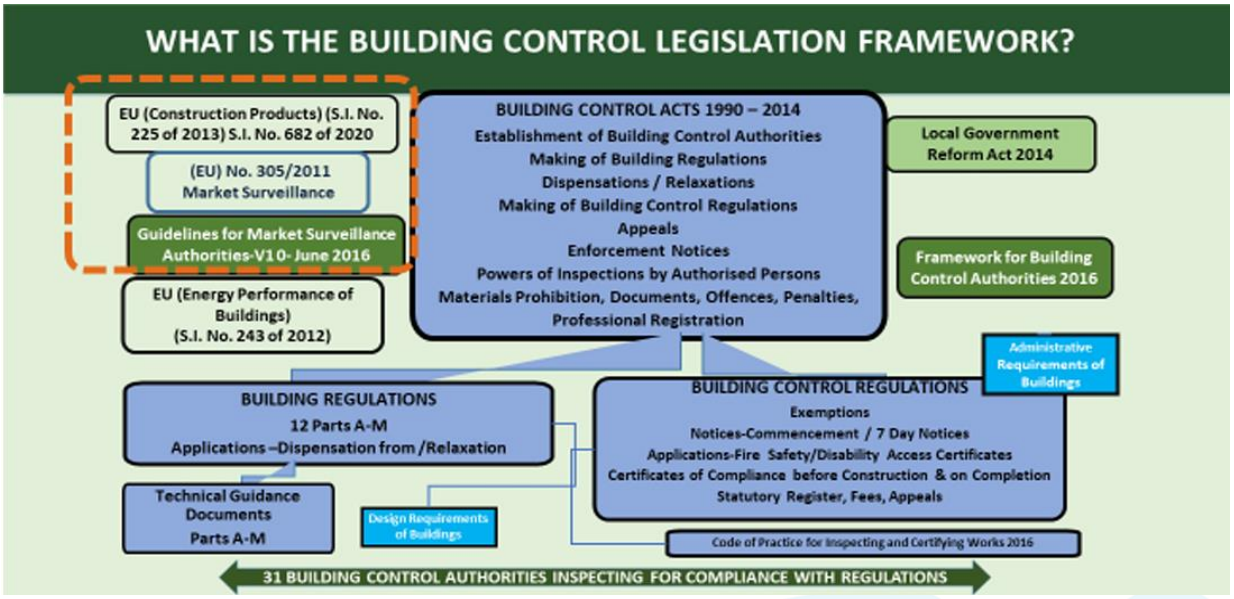


Figure 4. What is the Building Control Legislation framework? (NBCMP (2023))

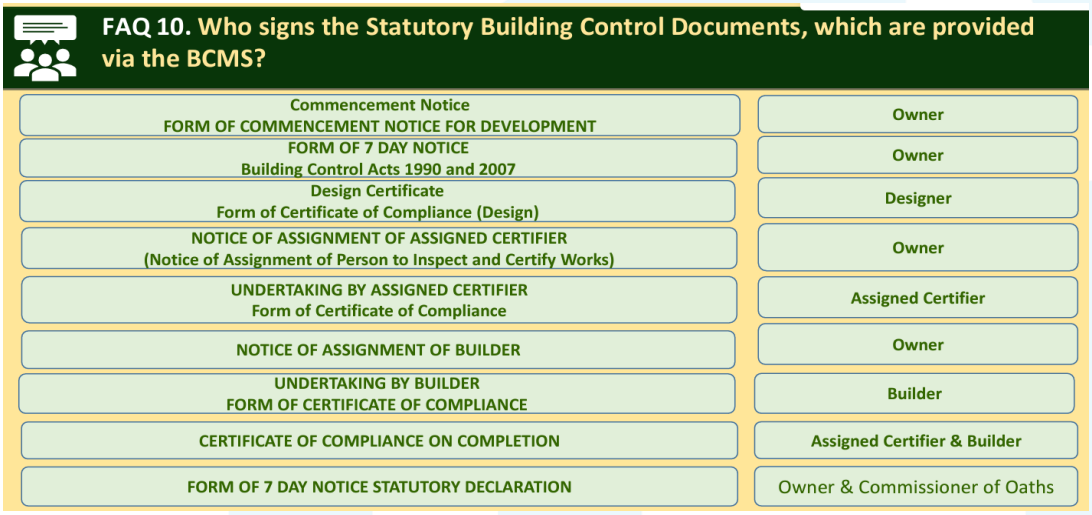


Figure 5: ‘Who signs the Statutory Building Control Documents, which are provided via the BCMS?’ (NBCMP (2023))

Once the design documentation is completed and compiled into a package, it must be submitted to the BCA for review. If the design is deemed satisfactory, the BCA issues a 'Notice of Compliance on Design,' signifying that the design is cleared for construction. In the event of any changes or amendments to the design during construction, these modifications should be promptly communicated to the Design Certifier for review and approval. Additional documentation or approvals may be necessary from the BCAR to accommodate these changes. Throughout the construction process, the Assigned Certifier conducts regular site inspections to verify that the work aligns with the approved design and adheres to regulatory standards. Upon completion, the Assigned Certifier performs a final inspection. If the Assigned Certifier is satisfied with the results, they issue a 'Certificate of Compliance on Completion' as shown in Figure 5. A guidance flow chart prepared by Master Builders & Contractors Association (MBCA) to introduce BCAR process and responsibilities is shown as Figure 6.

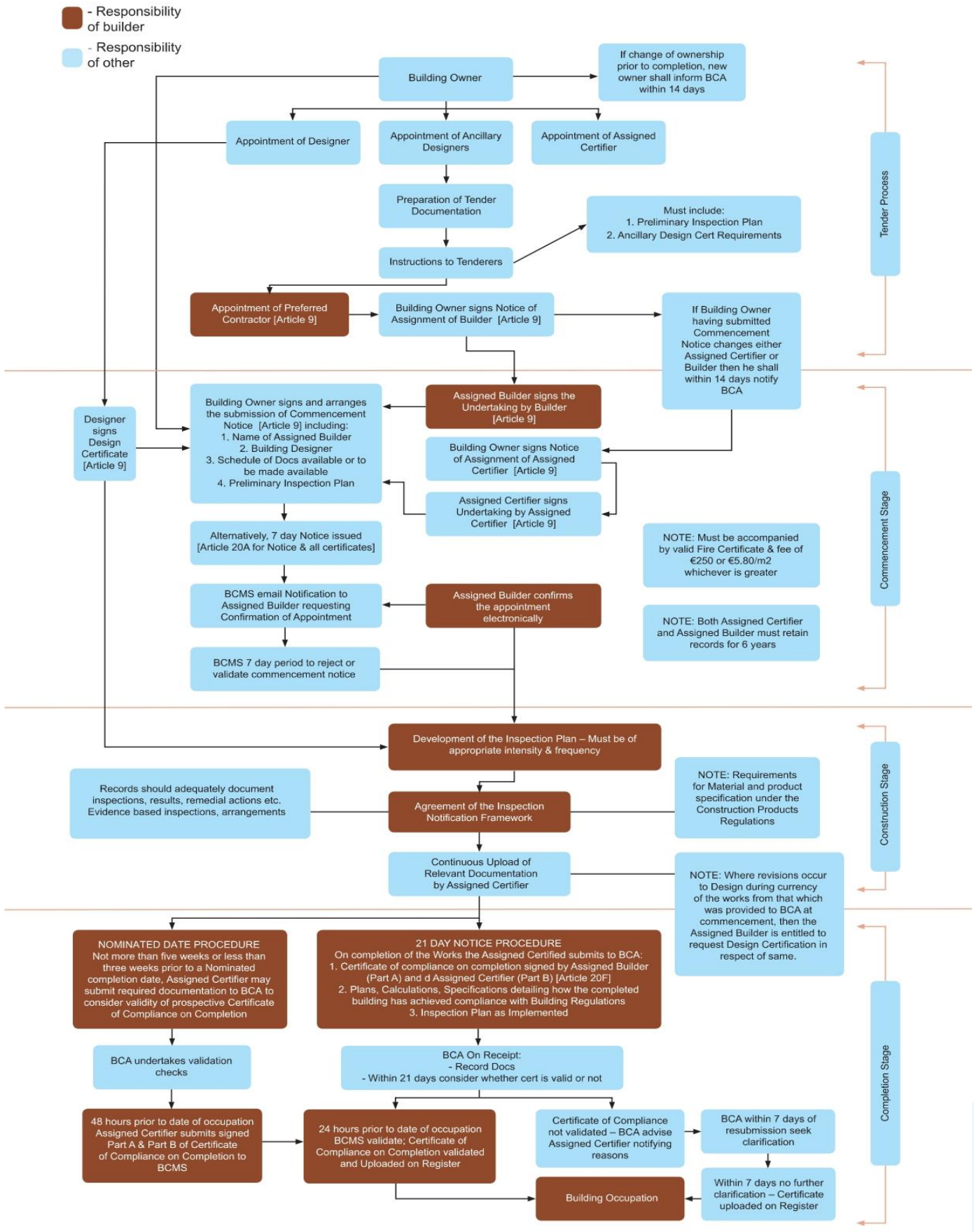


Figure 6. Flow chart of BCAR process (MBCA (2023))

4.5 Certification (NSAI Agrément)

Certification is a formal process by which an individual, organization, product, or system is evaluated and confirmed to meet specific standards, requirements, or qualifications. Certification provides recognition that an entity has achieved a certain level of competence, expertise, or compliance with established criteria.

In Ireland, the NSAI is responsible for conducting Agrément assessments and certifications (previously known as the Irish Agrément Board). The board of NSAI Agrément is comprised of representatives from the following organisations: NSAI Agrément, Department of Housing, Local Government and Heritage, Enterprise Ireland, Construction Industry Federation, Irish Business and Employers Confederation, Royal Institute of the Architects of Ireland & Association of Consulting Engineers of Ireland. 'Agrément certification is designed specifically for new building materials, products and processes (and building systems) that do not yet have a long history of use and for which published national standards do not yet exist' (NSAI, 2023b). This is often the case when these products or processes are innovative or deviate from established industry norms. As stated in TGD Part D, 'NSAI Agrément assesses, specifies testing, and where appropriate, issues Agrément certificates confirming that new building products, materials, techniques and equipment are safe and fit for purpose in accordance with the Irish Building Regulations and with the terms of the certificate. Such certificates may be in addition to, but not conflict with, CE marking'.

NSAI Agrément Certification confirms materials/products/systems are fit for purpose and when installed with due regard to the limitations contained within their Agrément certificate, the new building materials, products and processes (or building system) will satisfy all relevant Parts of the Irish Building Regulations 1997 - 2021. The material, product or system will be assessed against Parts A to M to the Irish Buildings Regulations. Assessment of the system may include the following (depending on the product/system):

- Irish Building Regulations and European standards compliance verification
- Laboratory tests results checks
- On-site evaluations of as constructed product/system
- Factory production inspection
- Quality management system verification-Installation procedures and on-site inspection plan check-Post construction maintenance program
- Factory Production Control inspection

The main steps in Agrément certification are as follows:

1. Client initiates the application process
2. NSAI develops a Technical Assessment Specification (TAS), which sets out the technical criteria for assessment and testing
3. NSAI assesses the product ensure its compliance with the TAS, which may involve laboratory testing, on-site evaluation and inspection of the production process
4. Subject to the results of the assessment, NSAI drafts an NSAI Agrément Certificate
5. NSAI publishes the Certificate on the NSAI website

Figure 7 shows the steps when Agrément is required for a MMC.

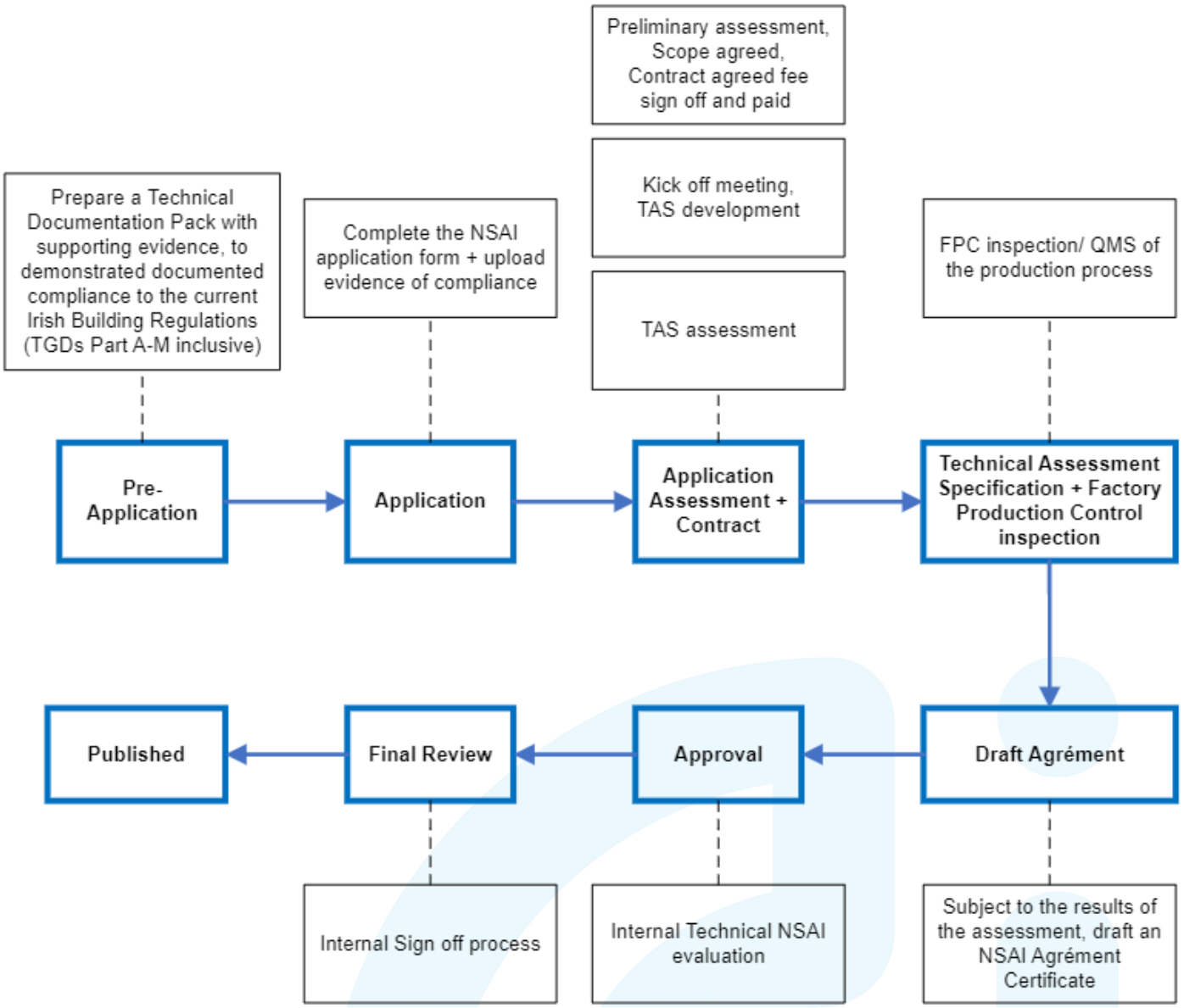


Figure 7. Pathway for NSAI MMC agreement (Reproduced based on the presentation from NSAI (2023b))

When the client has a new construction product that is to be used in Ireland, the following process in Figure 8 can be used to determine if the Agrément is required or not.

As shown in Figure 8, there are four possible alternative procedures for new products or product evolution to be approved for use:

1. There is an existing standard and the standard is harmonised

- The hEN should comply with the CPR.
- hEN should have compliance in accordance with Assessment and Verification of Constancy of Performance (AVCP) and national provisions for performance in use established.
- A Declaration of Performance is produced, based on national provisions if applicable.
- Final data should be submitted to AC, BCA, BCMS, Designer and assessed against national provisions, codes, contract specifications.

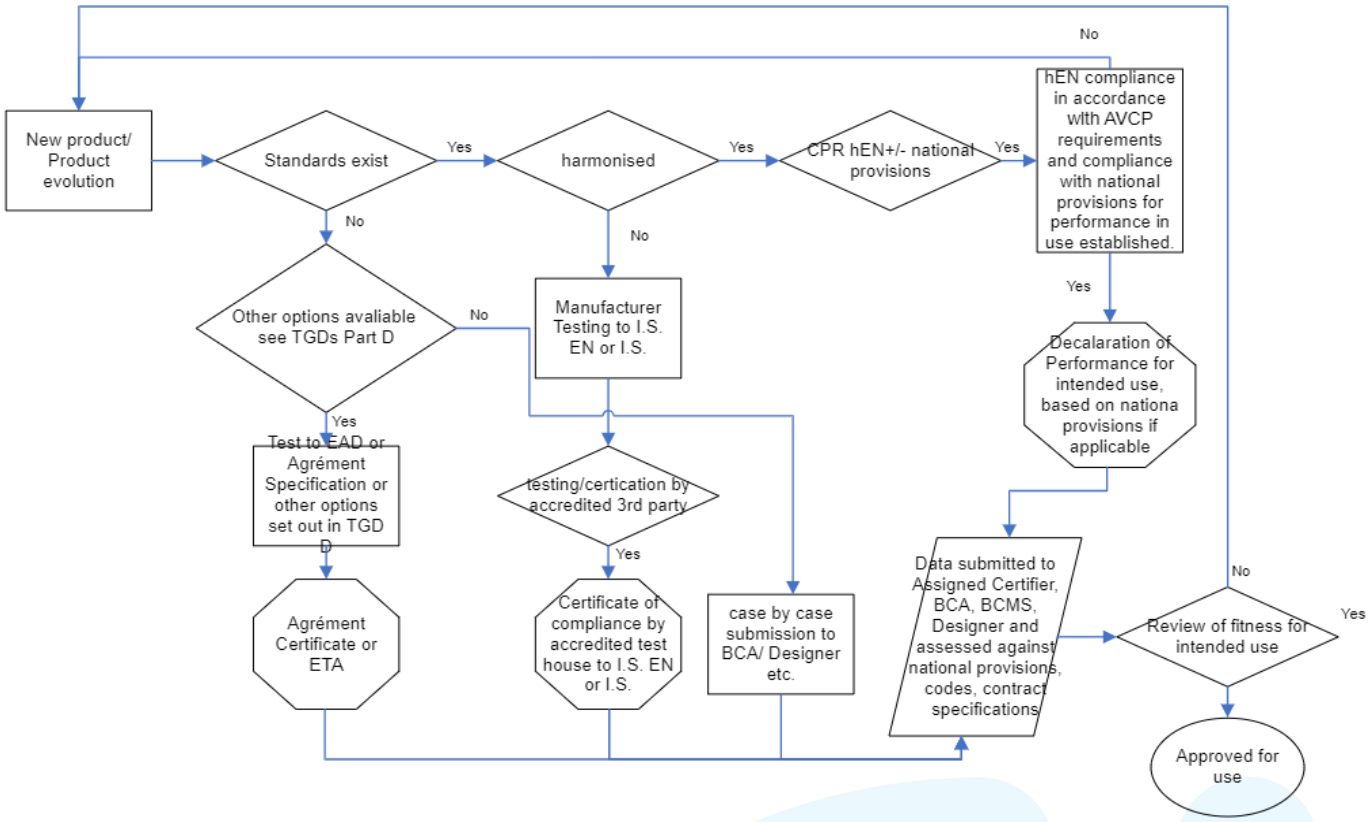


Figure 8. Construction standards and technical assessments for innovative construction products (Reproduced based on the image from NSAI (2023c))

2. There is an existing standard but the standard is not harmonised

- The manufacturer should perform testing to I.S. EN or I.S.
- The testing/certification should be performed by an accredited 3rd party.
- A Certification of Compliance should be issued by the accredited test house to I.S. EN or I.S.
- Final data should be submitted to AC, BCA, BCMS, Designer and assessed against national provisions, codes, contract specifications.

3. No standard exists and no other option in TGD Part D exists – such circumstances should be reviewed on a case-by-case basis by BCA/Designer

4. No standard exists but other options exist, e.g. test to EAD or Agrément specification or other options set out in TGD Part D

- Obtain an ETA or Agrément certification.
- Final data should be submitted to AC, BCA, BCMS, Designer and assessed against national provisions, codes, contract specifications.

Figure 9 shows the definition of 'proper materials' in Building Regulations Part D and alternative Part D3(c). In TGDs Part D, it further explains the application of the Agrément certification and requirements D3(c) as follows:

'The process of Agrément certification applies to those products and processes which do not fall within the scope of existing construction standards, either because they are innovative or because they deviate from established norms. NSAI Agrément assesses, specifies testing, and where appropriate, issues Agrément

certificates confirming that new building products, materials, techniques and equipment are safe and fit for purpose in accordance with the Irish Building Regulations and with the terms of the certificate. Such certificates may be in addition to, but not conflict with, CE marking.'

'Requirement D3(c) refers to an equivalent level of safety and suitability'.

Materials and workmanship	D1	All works to which these Regulations apply shall be carried out with proper materials and in a workmanlike manner.
Letterplates	D2	A letter plate aperture shall be so positioned at a reasonable height above ground level so as not to endanger the health and safety of persons using such apertures.
Definition for this Part	D3	In this Part, "proper materials" means materials which are fit for the use for which they are intended and for the conditions in which they are to be used, and includes materials which: (a) bear a CE Marking in accordance with the provisions of the Construction Products Regulation; (b) comply with an appropriate harmonised standard or European Technical Assessment in accordance with the provisions of the Construction Products Regulation; or (c) comply with an appropriate Irish Standard or Irish Agrément Certificate or with an alternative national technical specification of any State which is a contracting party to the Agreement on the European Economic Area, which provides in use an equivalent level of safety and suitability. "Agreement on the European Economic Area" means the Agreement on the European Economic Area between the European Union, its Member States and the Republic of Iceland, the Principality of Liechtenstein and the Kingdom of Norway as published in the Official Journal of the European Communities (O.J. No. L1, 03.01.1994, page 3). "Construction Products Regulation" means Regulation (EU) No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

Figure 9. Part of Building Regulations Part D (Government of Ireland (2013))

4.6 Accreditation

Accreditation is the process through which a certification body obtains recognition for providing certification services. This process assesses the technical competence and integrity of organizations that offer various evaluation services, including testing, proficiency testing, examination, validation, verification, inspection, calibration, and certification. These services are often collectively referred to as conformity assessment services, and the accreditation process serves the public interest.

In Ireland, the Irish National Accreditation Board (INAB) is the national authority responsible for accreditation (INAB (2023)). INAB accredits a range of organisations, including laboratories, certification bodies, verification bodies, biobanks, reference material producers, and inspection bodies. INAB grants accreditation in alignment with the relevant International Organization for Standardization (ISO) 17000 series of standards. Similar accreditation bodies exist in all European countries such as UKAS in UK, COFRAC in France and DAkkS in Germany (EA (2023)). INAB is Ireland's signatory to European and international multilateral agreements with the European co-operation for Accreditation, International Laboratory Accreditation Cooperation and International Accreditation Forum.

In Section 4.5 it was mentioned that if there is no harmonised standard, testing/certification should be performed by an accredited 3rd party. Such testing/certification 3rd parties in Ireland would need to be accredited by INAB. INAB provides a directory of all accredited organisations and testing laboratories.

5 Certification in the EU and UK

Similar to the Irish system for standards, testing and certification, some common processes are used in other jurisdictions. In this section, some examples will be given from both Europe and the UK.

5.1 European Union

5.1.1 Construction product regulation (CPR)

Since July 1, 2013, Regulation (EU) No 305/2011, also known as the Construction Products Regulation (CPR), mandates the use of Conformité Européene (CE) marking for all construction products entering/sold within the European Economic Area (EEA). There are several other EU Directives that relate to construction, but only one that relates to products i.e. the CPR. CE marking is applicable to products covered by harmonised European product standards or European Technical Assessments. CE marking indicates that the product has been assessed by the manufacturer and meets all EU health, safety and environmental protection requirements. Ultimately, the CPR harmonises the methods of testing, Declarations of Performance and Assessment and Verification of Consistency.

The CPR ensures the availability of reliable performance-related data, expressed through Declarations of Performance, for construction products on the European market (European Commission (2023c)). The Declaration of Performance is drawn up by the manufacturer, identifies the product, informs that the product falls under CPR, demonstrates the testing/assessment has been performed and declares the assessed characteristic and their performance (DoP (2023)). Harmonised standards establish assessment methods and criteria for evaluating product performance, detailing the level of third-party assessment needed for manufacturers to issue Declarations of Performance and affix the CE marking. Notified bodies, which must be established in a member state and designated by the member state's notifying authority, are responsible for conducting third-party assessments. In Ireland, INAB accredits and monitors notified bodies.

Organizations wishing to be notified under the CPR should first seek accreditation from INAB for the relevant services they intend to offer.

The CPR enhances the functioning of the single market and facilitate the free movement of construction products within the European Union (EU). The CPR achieves this by establishing consistent rules for marketing these products and providing a common technical language for evaluating their performance. Key points of the regulation include (European Union (Construction Product) Regulations 2013 (SI No. 225 of 2013)):

- Defining conditions for marketing construction products.
- Setting criteria and methods for assessing and expressing construction product performance.
- Outlining the conditions for using CE marking.
- Clarifying that Member States retain responsibility for matters such as fire safety, mechanical resistance and stability, environmental compliance, energy requirements, and other aspects applicable to buildings and construction works.

It is worth mentioning that the CPR is currently being revised with enhanced focus on digitisation and sustainability.

5.1.2 European technical assessment (ETA)

The European technical assessment (ETA) is an alternative for construction products not covered by a harmonised standard. The ETA is a document providing information on their performance assessment (European Commission (2023b)). The procedure to get an ETA is established in the CPR and offers a way for manufacturers to draw up the Declaration of Performance and affix the CE marking. The ETA contributes to the free movement of construction products and the creation of a strong single market. The ETA offers manufacturers a voluntary route to CE marking, when the product is not or not fully covered by a harmonised standard (hEN) under the European Union (Construction Product) Regulations 2013 (SI No. 225 of 2013).

ETAs contain the following:

- Details on the manufacturer (ETA holder) and manufacturing plant(s)
- Applicable European Assessment Document
- Trade name and description of the product and its intended use(s)
- Product performance and references to the methods used for the assessment
- Applicable AVCP system(s) and technical details necessary for the implementation of the AVCP system.

The main procedures of ETA are outlined in Figure 10 as follow:

1. A manufacturer requests the ETA for a construction product that is not covered or not fully covered by a harmonised standard. The request is addressed to the technical assessment body (TAB) for the respective product area – see list of TABs in the New Approach Notified and Designated Organisations database (NANDO) (NANDO (2023))
2. The TAB issues the ETA on the basis of a European assessment document (EAD) adopted by the European Organisation for Technical Assessment (EOTA)
3. An updated list of references for the final EADs is published by the Commission in the Official Journal of the European Union

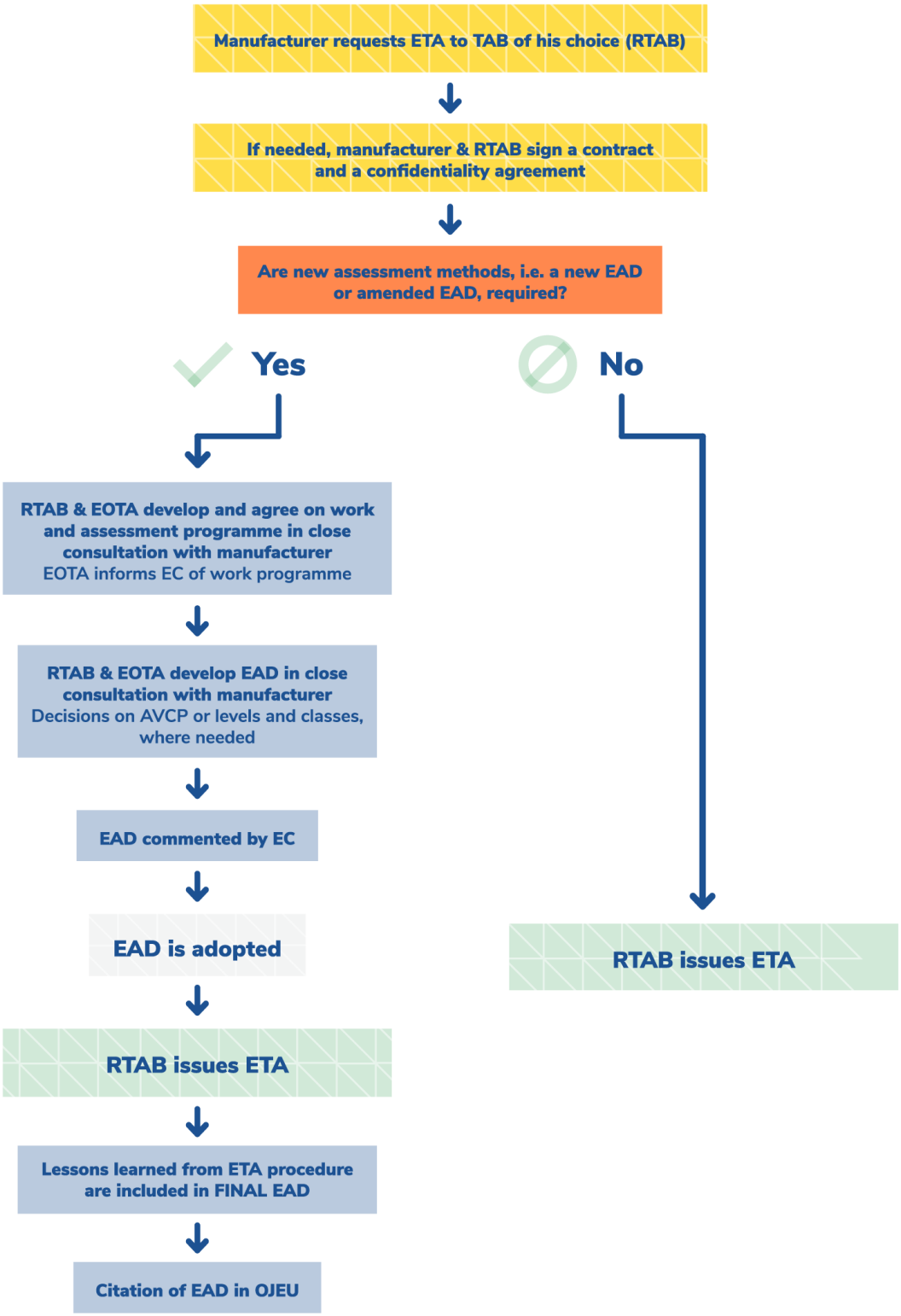


Figure 10. Procedure of ETA (EOTA (2023))

EADs are harmonised technical specifications for construction products**.** The EADs are developed by the EOTA for cases where a product is not fully covered by harmonised European standards. EADs are the basis for issuing ETAs. An EAD contains the following information:

- a general description of the construction product;
- the list of essential characteristics agreed between the manufacturer and EOTA;
- the methods and criteria for assessing the performance of the product in relation to these essential

characteristics;
- principles for factory production control to be applied.

5.1.2 Accreditation

Within Europe, the European co-operation for Accreditation (EA), is a not-for-profit association of national accreditation bodies. EA is formally appointed by the European Commission in Regulation (EC) No. 765/2008 (EA (2023a)) to develop and maintain a multilateral agreement of mutual recognition based on a harmonized accreditation infrastructure. EA currently has 49 members (EA (2023b)), of which INAB is a member. The EA members are National Accreditation Bodies that are officially recognised by their national governments to assess and verify – against international standards – organizations that carry out conformity assessment activities such as certification, verification, inspection, testing and calibration. The EA Multilateral Agreement is a signed agreement between the EA members whereby the signatories recognise and accept the equivalence of the accreditation systems operated by the signing members, and the reliability of the conformity assessment results provided by Conformity Assessment Bodies accredited by the signing members. One of their objectives are: 'accredited once, accepted everywhere'.

5.2 United Kingdom

5.2.1 Accreditation

The United Kingdom Accreditation Service (UKAS) is the sole national accreditation body recognized by the UK government. UKAS . UKAS accredits organizations, including certification bodies and testing laboratories, to assess conformity against international standards (UKAS (2023)). UKAS plays a similar role to the INAB in Ireland, but importantly . UKAS provides a list of all accredited companies.

5.2.2 Certification

The British Board of Agrément (BBA) Certificate is a certification scheme accredited by UKAS. A BBA Agrément Certificate is designed for manufacturers of construction industry products to demonstrate their fitness-for-purpose. The BBA in the UK is an independent certification body for construction products and systems. The BBA assesses products and systems, providing quantifiable data on their performance (BBA (2023)). The result of this assessment is the Agrément Certificate. Following Brexit, BBA Certificates are not acceptable in Ireland (NBCO (2023)). Recognition of the CE marking was extended indefinitely in the UK in August 2023. In the UK, certification can also be provided through third-party certification. Third-party certification demonstrates that products and services meet appropriate standards, which can give access to new markets. The British Research Establishment (BRE) Group is one such organisation that provides third-party certification through their testing, certification and verification service.

5.2.3 National House Building Council (NHBC)

The National House Building Council (NHBC) is a UK warranty and insurance provider specialising in new homes. NHBC establishes technical standards and guidelines, which are aligning with British Standards, for construction practices, materials, and workmanship in new homes. House builders are required to adhere to these standards to qualify for NHBC warranties. In cases where materials, products, or systems are not covered by a relevant British standard or harmonized European technical product specification, NHBC also accepts various approaches to meet NHBC's Technical Requirement (NHBC (2023a)). Some examples of the schemes recognised by NHBC are given as follows (NHBC (2023b)):

- Agrément certifications by BBA and Kiwa (Kiwa is a European institution for testing, inspection and certification, headquartered in Rijswijk, the Netherlands)
- BRE Global certification

- BSI Kitemark schemes
- Kitemark or Quality Scheme for Ready Mixed Concrete for ready mix concrete products

NHBC Accepts

NHBC Accepts is a comprehensive review service designed for innovative systems. NHBC Accepts serves as the expedited route for obtaining approval for innovative systems for use in homes covered by all NHBC warranty and insurance policies. It is important to note that NHBC Accepts is not an independent accreditation scheme or a performance guarantee. Third parties have to directly engage with the relevant manufacturer to assess their product's performance. Products that have been assessed under an independent product certification scheme do not automatically align with NHBC Standards. NHBC-registered builders must ensure that the constructed home is designed and constructed in accordance with the relevant NHBC performance standards and Technical Requirements (NHBC (2023b) Standards Chapter 2.1 The Standards and Technical Requirements).

5.2.4 Buildoffsite Property Assurance Scheme (BOPAS)

The Buildoffsite Property Assurance Scheme (BOPAS) is an independent third-party accreditation program for MMC providers and their construction systems. BOPAS offers assurance to lenders, developers, and homeowners regarding the quality and durability of properties accredited under the scheme. BOPAS was created to address concerns and perceived risks associated with innovative construction methods.

Mortgage lenders recognise BOPAS as a source of confidence that properties constructed using MMC or innovative methods will be mortgageable for a minimum of 60 years. The MMC providers are audited and assessed to ensure that the construction systems are delivered using processes which conform to current good/best practice as defined in the BOPAS standard (BOPAS (2023)). It is important to note that BOPAS accreditation is not same as UKAS accreditation to confirm the ability to certify.

6 Semi-structured interviews and results

6.1 Semi-structured interviews

In order to gain insight into various Irish construction sector perspectives on the current system of standards, testing, certification and accreditation for new residential properties, a semi-structured interview was developed. The interview questions were designed to investigate several aspects, including the existing systems, challenges, potential enhancements, and the possibility of an EU standard for innovative products such as MMC. Participants were firstly asked to describe the certification procedure for new housing products/outputs in Ireland. Secondly, participants were asked to describe what issues/difficulties they have faced with certification for new construction housing sector products. Participants were then asked to describe what improvements could be made to the certification procedure. Lastly, as work has just started at international level on standards for prefabricated buildings ISO/TC 59/ SC 19 Prefabricated Building, interviewees were asked what their opinion on developing a European/Irish standard on offsite/MMC.

A total of 19 construction sector stakeholders were contacted, of which 13 agreed to participate in the semi-structured interviews. The interviews took place online in Summer 2023. The interviewees were from the following backgrounds; architects, engineers, contractors, industry representative bodies, MMC manufacturers, MMC designers, testing/certification organisations, standards/building control and government agencies.

6.2 Semi-structured interview results

Regarding the current system of certification, NSAI Agrément was the most recognised procedure for new products, materials, and systems in Ireland. Other approaches were also mentioned by interviewees, such as BRE certification, CE marking, ETA, BOPAS and NHBC Accepts. The interviewees were not prompted for positive or negative opinions, however, when the interviewees were asked to describe the current certification procedure for new housing products, 23.1% explicitly stated they believe the current system functions effectively as a robust scheme and ensures quality, while 23.1% stated they consider it to be a complex system. Those interviewees that consider the system to be complex tended to be from architecture, contracting and building control backgrounds.

The second interview question centred on issues and difficulties associated with the current system of testing and certification. Understandably, the interviewees mostly focused on NSAI Agrément is it is the current practical way to achieve certification. This also indicates that the interviewees see no alternative routes to certification. Some common issues identified by interviewees with the NSAI Agrément process are presented in Figure 11.

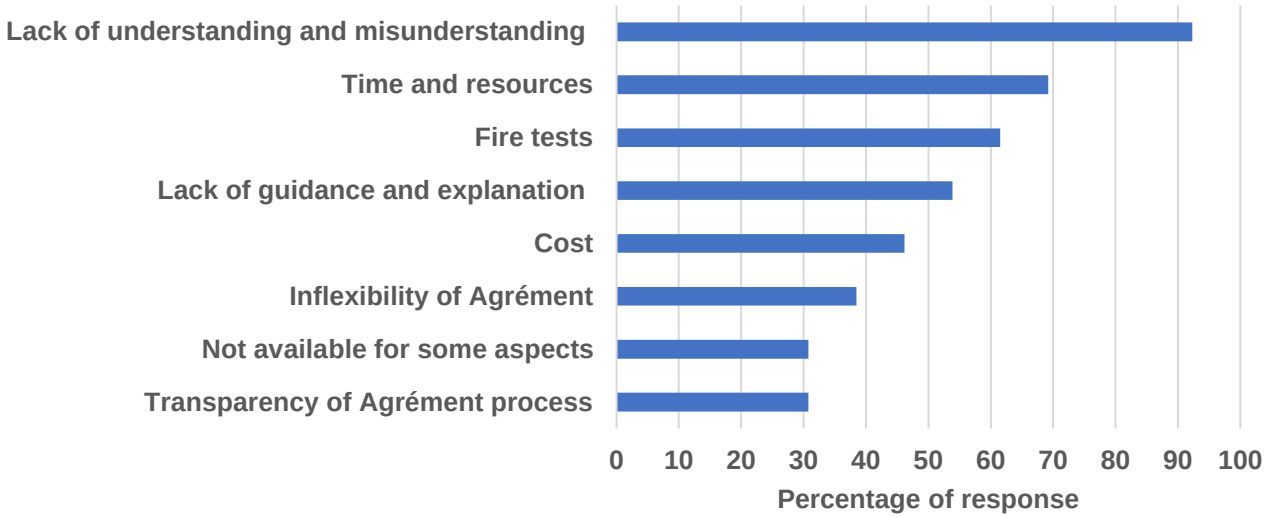


Figure 11. Issues and difficulties raised by interviewees related to NSAI Agrément

Lack of understanding and misunderstanding of the current system: The most common issue highlighted in the interviews was the lack of understanding and misunderstanding of the current system, cited by 92.3% of interviewees. This lack of understanding is not limited to the industry but also extends to local authorities and building control. Since these new technologies are relatively novel, nearly half (46.2%) of the construction sector interviewees lack knowledge and experience of the Agrément process. For instance, there is confusion about why Agrément is required when a product meets BCAR and already has an ETA. There is also uncertainty about the responsibilities of sign-offs within BCAR and Agrément. An Assigned Certifier still signs off the entire project but may not be involved in the MMC aspect of the project. The interviewees are also confused about who should sign off on what within the BCAR process and who holds responsibility for what. Additionally, the participants are unclear about whether design validation can be achieved through design calculations alone instead of certification.

Lack of guidance: 53.8% of the construction sector interviewees believe that the current system lacks guidance and explanation. There is no shared resource or clear roadmap to help them understand the procedure. For example, the design guidance for timber is considered good, but guidance for other methods,

such as panelised and volumetric products, is lacking.

Cost and time duration of achieving Agrément: The time required to obtain certification is seen as a challenge, as identified by 69% of interviewees. The interviewees believe the entire process takes too long due to Agrément approval resource limitations: i.e., resources to help understand the Agrément process, a list of requirements, a list of acceptable materials. Moreover, preparing for certification is time-consuming, especially for those new to the procedure. It is important to emphasise that the construction sector interviewees see the need for the certification process and do not want to undermine it, but they want to enhance the efficiency of the certification process. Regarding the cost of Agrément, 46.2% of interviewees believe it is high.

Transparency in the current Agrément certification process was mentioned by 30.8% of participants, as they would like to know how long it will take and what is required. Inflexibility of Agrément was mentioned by 38.5% of interviewees as an issue. This particularly related to the volume of tests needing to be repeated even for minor design changes such as changing plasterboard supplier in fire tests. This poses a significant barrier to achieving certification of a building system.

Not available for some aspects: 30.8% of interviewees also noted that the current certification system does not cover some less commonly used materials e.g. natural materials such as stone, and durability of cladding systems.

Fire testing: 61.5% of interviewees mentioned issues and difficulties related to fire tests. Fire test facilities are not currently available in Ireland, leading most companies having to send their products to the UK for testing. The inconsistency in fire test requirements between different local authorities was mentioned by 23.1% of interviewees. Regarding the tests themselves, 30.8% interviewees expressed that full module tests and double-side fire tests are current challenges.

The third question focused on potential improvements that could address the identified issues and difficulties in the current procedure. The main points collected from this question is summarised in Figure 12.

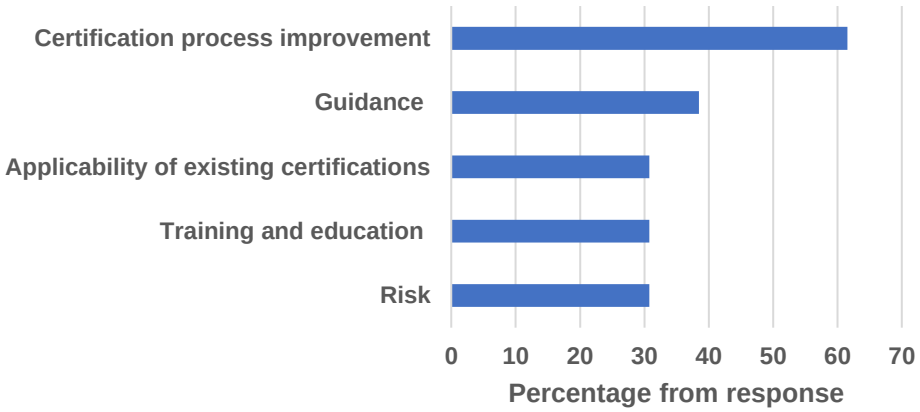


Figure 12. Improvement of current procedure identified from interviews

Improvement related to current certification process: 61.5% of interview participants think the current certification process should be improved. Some potential ways were suggested as: have a well-defined process, explain the process clearly, visibility and understanding of performance requirements.

Guidance: Guidance has been mentioned by 38.5% of interviewees in different aspects such as: when Agrément is required rather than an ETA, supplementary design guidance, guidance to the Agrément process, guidance to clarity between product and system.

Training and education: Better training and education was identified by 30.8% of interviewees. This is not only for the industry but also for local authorities, specifically on regulations, BCAR and NSAI Agrément.

Use of existing certification from other countries: To improve the efficiency of the current process, 30.8% of interviewees suggested utilising existing certification or test data from other jurisdictions.

The final question inquired about opinions regarding an EU standard for MMC. 38.5% of interviewees believe that it is challenging to establish a single code for MMC due to the broad scope of each type of MMC. On the other hand, 46.2% of interviewees expressed the view that a standard is necessary, as it could enhance system efficiency and serve as a reference for the market. Meanwhile, 15.4% of interviewees hold the opinion that there is no need for an EU standard.

7 Summary and recommendations

7.1 Summary:

From this study, several key findings are summarised from the literature review and interviews.

7.1.1 Summary of literature review

Compliance to Irish regulations: The regulatory system for Irish housing delivery is comprehensive and includes EU Directives, Building Regulations, BCAR, TGDs, National standards, harmonised European standards, ETA and NSAI Agrément. All these components work together to ensure building safety and performance.
New/innovative construction compliance: For a construction product/material/systems which do not yet have a long history of use and for which there may be no national standard, hEN or ETA, NSAI Agrément is the most practical way in Ireland to demonstrate its compliance with Irish regulations.
EU system for new/innovative construction: In Europe, there are two approaches for novel/new construction products/materials/systems: (1) obtain certification from an accredited body or (2) use the ETA process with an EAD.
UK system for new/innovative construction: The UK has accreditation and certification bodies for construction products. In addition, they have NHBC for warranty and insurance of new homes and BOPAS for MMC relating to quality and durability. Similar alternative approaches to certification are missing in Ireland.

7.1.2 Summary of interviews

Lack of Understanding: There is a clear consensus within Irish construction sector (92.3% of interviewees) that a lack of understanding or misunderstanding of the current construction system of standards, testing and certification exists. The industry is particularly confused about the process for novel/new construction products/materials/systems.
Confusion regarding NSAI Agrément: There is confusion within the industry regarding the relationship between ETA and NSAI Agrément. Many of the industry interviewees are uncertain about why NSAI Agrément is required, even when a product meets ETA and/or could just be signed off in the BCAR process

without certification.

Barriers associated with NSAI Agrément: Various difficulties related to NSAI Agrément include concerns about time and cost, transparency of the process, inflexibility of Agrément and a lack of resources for guidance.

NSAI Agrément: The time and costs associated with NSAI Agrément are considered a barrier within the industry, although it is widely seen as a means for the industry to demonstrate compliance rather than a necessary task.

Challenges relating to fire: Fire tests pose significant difficulties for the industry due to the unavailability of test facilities in Ireland, in particular the time and cost involved in conducting the tests (e.g. double-sided wall tests). 23% of interviewees noted inconsistent fire safety requirements from fire officers in different local authorities as an issue.

Diverse Opinions on Standard for MMC: The construction sector interview participants have varying opinions regarding the need for a Eurocode/International Standard for MMC, influenced by their different backgrounds and experiences.

7.2 Recommendations

According to the results from the literature review and interviews, some recommendations are given as follow:

- **Routes to certification guidance**: Provide an overall guidance/roadmap to help navigate the use of innovative/new housing construction materials, products or systems. There is confusion in the construction sector relating to the certification routes e.g. BCAR, Agrément, CE marking. NSAI are currently undertaking Housing for All Action 61 to develop information supports to assist applicants to prepare for the certification process. Construct Innovate could assist NSAI to engage with industry on the content needed for the information supports.
- **Training and education**: Offer training and education on testing and certification of new construction materials, products or systems to assist the industry to help better understand the requirements. The documentation and guidance already in existence is complex, so offering short online training courses, for example, could prevent issues with the Agrément process taking too long. Construct Innovate could partner with other organisations to ensure education and training needs are met.
- **Clarity on certification from other jurisdictions**. Participants in interviews were unsure why certification from other jurisdictions is not applicable here in Ireland, for example, they need guidance on reasons why ETAs do not comply with Irish Building Regulations. There may be repeat reasons why certain ETAs do not comply with Irish Building Regulations, and case studies of these might be useful for industry. In line with the guidance/roadmap to certification suggested above, specific guidance on how other forms of certification should be assessed for applicability in Ireland would be helpful. Sharing of industry knowledge and experience on such issues would be beneficial and something Construct Innovate could help facilitate this.
- **Speed up Agrément certification process:** The time taken to achieve an Agrément certificate is a significant barrier to the use of innovative materials, products or systems. Methods to reduce the time to achieving Agrément certification should be investigated, including for example increase resources in the Agrément assessment team and providing industry with clarity about the process.
- **Reduce the cost of achieving Agrément certification:** The cost of testing, in particular, to achieve an Agrément certificate is a significant barrier to the use of innovative materials, products or systems. Methods to reduce the cost of Agrément certification should be investigated, such as creating open source test data.
- **Third-party testing/certification:** The possibility of developing INAB accredited third-party testing facilities for innovative construction materials, products or systems should be explored by Government such that companies can use Irish test data for the Agrément process. In terms of third-party certification, a model similar to the BRE in the UK could be adopted here, where testing and non-Agrément certification is undertaken.

- **Exploring alternative approaches to certification**: Methods in the UK, such as NHBC Accepts, provide alternative approaches than certification. NHBC Accepts provides warranties and insurance once the newly built home meets their guidance/specification. The possibility of adopting a similar approach in Ireland could be investigated by the industry, Government or bodies such as Homebond. Specifically for MMC, schemes such as BOPAS could be established in Ireland.

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