



Advice Note

Level 2 BIM

Revisions:

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P01	21.01.2019	First publication	RIAI BIM Subcommittee	RIAI

Purpose of Document

This note attempts to define what BIM is, what it is not and how it affects current practice.

There is a common misconception that BIM is a software platform. BIM is a combination of Technology and Standards. The technology is relentlessly expanding as innovations in the construction industry and other sectors is being adopted to make processes faster and cheaper with less risk. Level 2 BIM was proposed in 2013 as a standard for BIM and was mandated by the UK government for publicly funded projects in 2016. During this period, a number of comprehensive standards documents were published by the British Standards Institute (BSI) and guidance documents were published by the Construction Industry Council (CIC) to support work undertaken in BIM. In 2019, ISO 19650 will be published as an international standard for BIM which has its foundations based on British Standards.

This document is an introduction to BIM for organisations and individuals considering undertaking a project in Level 2 BIM. Reference is made to other RIAI publications on Level 2 BIM, BIM Standards and guidance documents.

NOTE 1 The terms used in this document are those using in standards documents. For example, Employer is used to denote the contracting or appointing party which is aligned with PAS1192-2:2013.

NOTE 2 Advice is generally given in the context of PAS1192-2:2013 and related standards which is at the time of publication the standard for Level 2 BIM.

Scope

This Document document is intended to support all BIM work undertaken collaboratively between the design team members identified in the roles defined in PAS1192-2:2013. It is not the intention of this document to state how each organisation will implement BIM with their respective organisations but organisations are encouraged to ensure that their internal procedures support the roles defined in this document in the interest of project quality control and improving collaborative processes.

Update Procedure

Proposed changes to this document should be submitted in writing with accompanying examples, discussion or other supportive material to the RIAI BIM Committee. Feedback will be gathered and continuously reviewed; they will be collated to form new revisions at appropriate intervals.

Copyright

This document includes direct references to PAS1192-2:2013, the CIC BIM Protocol (Second Edition), 'The role of the Information Manager is defined in the Outline Scope of

Services for the role of Information Management' (first edition 2013) drafted by BL Consult and Beale and Company on behalf of the CIC and the BIM Task Group and 'Best Practice Guide for professional Indemnity Insurance when using Building Information Models' produced by Griffiths and Armour on behalf of the CIC and the BIM Task Group.

It is important to note that this document will only become truly useful if as many companies adopt it as possible. To that extent, it may be freely distributed and used in any format necessary, provided credit is given to the RIAI BIM Committee.

Disclaimer

All the advice outlined in this document is for information only. The authors and contributing companies take no responsibility for the utilisation of these procedures and guidelines. Their suitability should be considered carefully before embarking upon any integration into your current working practices.

"For things to remain the same, everything must change" is a quotation from the novel title 'The Leopard' by Giuseppe Tomasi di Lampedusa which aptly describes our conundrum with the built environment. If we wish to continue to deliver building and infrastructure as we have come to expect but in a sustainable manner, we must change the way we do things.

Building Information Modelling (BIM) involves the **digitalisation** of the construction industry through **standardisation**, incorporating manufacturing and off-site assembly. While manual systems can be interpreted by humans, digitalisation requires standardisation to ensure that outputs from each process provides information that can be consumed by subsequent processes with minimal human intervention, thus improving productivity and quality and letting humans engage with information in a better way through data driven online applications similar to how airlines and large retailers store, process and evaluate data.

The difficulty for the construction industry as a whole is that there are numerous participants in a complex mostly hierarchical supply chain that work to standards that are not industry standards and this significantly reduces the opportunity for automation and thus cost savings. This leads to an industry that is not innovative which is further compounded as there are limited funds for research and development due to the very competitive procurement.

In the UK, there have been numerous reports going back decades highlighting the inefficiencies of the construction industry and the costs of that inefficiency. The cost of inefficiency is compounded on larger and more complex projects where there are numerous participants and documents. In May 2011, the Cabinet Office in the UK produced a **Government Construction Strategy** which highlighted deficiencies in the construction industry and provided a strategy to improve outcomes for public projects which included significant changes to procurement and digitalisation of the industry. This led to the formation of the **BIM Task Group**, the announcement of a mandate for BIM in 2016 and the publication of numerous BIM Standards from 2013 onwards. The strategy has been far more successful than any previous initiatives in the UK or elsewhere but one of its most significant shortcomings has been that many in the industry perceived it as digitalisation only whereas it has significant implications for public procurement. Another shortcoming is that many clients in the UK procuring publicly funded projects are still not aware of their obligations and requirements for BIM, which leads to an inadequate brief for BIM.

In January 2019, ISO published new standards for BIM which are available from BSI. The standard is in two parts:

1. **ISO 19650-1** Organization of information about construction works - Information management using building information modelling. Part 1: Concepts and principles
2. **ISO 19650-2** Organization of information about construction works - Information management using building information modelling. Part 2: Delivery phase of assets

Part 1 gives recommendations for a structured framework to manage, exchange, version and organise information. It applies to the whole life cycle of a built asset, including strategic planning, design, construction, day-to-day operation, maintenance, refurbishment, repair and

end-of-life processes. It is intended for use by owners, operators, clients, the design team, the supply chain, regulators and end users.

Part 2 enables appointing organisations to establish their requirements for information during the delivery phase. It gives guidance on providing organisations with the right commercial and collaborative environment so that information is produced in an effective and efficient manner. It defines the information management process, provides best practice guidance on reducing wasteful activities and describes the activities necessary to collaboratively produce information.

ISO 19650-1 and ISO 19650-2 will be a EN (European Standard) which carries with it the obligation to be implemented at national level by being given the status of a national standard and by withdrawal of any conflicting national standard. Therefore, a European Standard (EN) automatically becomes a national standard in each of the 34 CEN-CENELEC member countries. ISO 19650 Parts 1 and 2 will likely be ratified as a national standard for Ireland in mid 2019 thus becoming IS EN 19650-1 and IS EN ISO 19650-2.

While UK standards are currently being incorporated in appointments and contracts, currently, there is no Irish standards for BIM although this will change with the introduction of ISO 19650 standards in mid 2019. The NSAI will need to agree the contents for the Annex B national standard for IS EN ISO 19650-2 which may match the UK standard or deviate slightly but it unlikely to be significantly different as numerous Irish organisations work in the UK market.

BIM is a significant challenge for SME businesses which make up a significant proportion of the construction industry. Many participants in construction won't see an immediate benefit in the use of BIM, as it requires investment in hardware, software and upskilling of staff in their knowledge of both technology and standards. Some smaller organisations may wait until BIM is more commonplace, inexpensive and proven on larger projects before committing to such change. Others with the required skills may see BIM as an opportunity. Deferring the introduction of BIM could prove expensive also as the opportunity to bid of work when Level 2 BIM is required must be foregone due to lack of capacity to do work in BIM and in the medium term capability will be difficult to prove due to lack of experience. The handover and interim deliverables of a BIM level 2 project are different to a traditional project that is based on CAD. The process to produce those deliverables requires skills that will fundamentally change the way many organisations work. Due to the significance of the change, the decision to continue to rely on payment for working to traditional processes with outputs that are traditionally industry accepted or change to Level 2 BIM should be included on the list of risks that affect all organisations in the construction sector.

Deliverables: The combined set of BIM deliverables including models, data and documents, known as the **Project Information Model (PIM)** is a uniformly organised set of information containing up to date and accurate data for a built asset. Under Level 2 BIM, designers are responsible for generating information to an agreed maturity which increases during the design and construction phases, which will be used by others to manage an asset throughout its life. Design and construction information is shared with an **Employer** at

intervals called **Information Exchanges** which ensures that the information in models is incremental and can be used by clients to make informed decisions. Designers may share construction information more frequently which could be daily, weekly or bi-weekly depending on requirements. Once the building owner/operator has accepted the Project Information Model, all or some of the data is transferred to the **Asset Information Model (AIM)** which is used to operate and maintain a building. The Asset Information Model could be as simple as spreadsheets or as complex as an FM system with ability to integrate models and other related data and documents.

BIM Levels has possibly been more confusing than helpful mostly through lack of awareness of what they entail and it is often confused with Level of Detail which refers to the maturity or complexity of geometry in a modelled object. Level 1, Level 2 and Level 3 are broad definitions of BIM devised by the BIM Task Group in the UK and are included in UK national standards such as PAS 1192-2:2013. In the UK, **Level 2 BIM** is mandatory for projects which are financed by central government and the range of standards and guidance for Level 2 is very well defined. **Level 3 BIM** is for future use and at present is not recommended due to legal and technical challenges which will be resolved but have not yet been. **Level 1 BIM** is a very broad definition for projects that are exchanging information electronically but are not working to the prescribed standards of Level 2 BIM. Level 1 BIM does include some common standards used in Level 2 BIM such as those for standardisation of file naming, annotative symbols, dimensions, tolerances and classifications. Unlike Level 2 BIM, Level 1 BIM does not however include any guidance on procurement of BIM which makes it unsuitable for incorporation into industry standards for procurement. The minimum requirements for Level 2 BIM are set-out on page viii of PAS 1192-2:2013.

In 2019, ISO 19650-2 will replace PAS 1192-2:2013 and is likely to become the accepted standard for BIM across Europe. The fundamentals of PAS 1192-2:2013 have been retained but significant allowances have been made for each country to deviate on detailed matters mainly relating to how the Common Data Environment (CDE) works such as file naming, revision control, document statuses and classification codes. It is important to note also that there are no Levels of BIM defined in ISO 19650-2, so it will be simply a case of compliance with the standard or not which is less confusing. Working to BS EN ISO 19650-1 and BS EN ISO 19650-2 can be considered Level 2 BIM but there may need to be an official update on this from CIC(UK) as some of their publications refer explicitly to the PAS and BS documents.

Insurance: Although there have been some independent publications regarding BIM and insurance in Ireland, there is no industry or government led publications which provide an accepted standard to work from. The Best Practice Guide for Professional Indemnity Insurance when using BIM produced by Griffiths and Armour on behalf of CIC (UK) is the recommended guide for Insurance and BIM. In summary, the guidance indicates that subject to verification with the relevant insurer and subject to certain conditions of engagement on a project, working in BIM, notably Level 2 BIM does not adversely affect PI insurance. It is important to note, that the document only provides advice for Level 2 BIM and the practical conditions set-out in section 2.5 are the minimum requirements necessary for working in

BIM. Of significant note is the requirement to ensure that the **Lead Designer** and **Information Manager** are part of the same team as there would be concerns that design and information coordination would not align which is probably very sensible. Organisations or individuals taking on both these roles, should also be careful not to confuse the scope for each role as Information Management does not include any design decisions or rights to issue instructions.

The principles set out in the CIC document would appear to broadly align with the standards set-out in ISO 19650 standards but it would be beneficial for the document to be updated with the publication of the ISO standards as references to Level 2 BIM may no longer be valid unless the UK adds it to Appendix B of ISO 19650-2.

Contracts: The Building Information Modelling (**BIM**) **Protocol** Second Edition drafted by Beale & Co. on behalf of CIC (UK) is a document which can be appended to any construction appointment or contract to ensure that minimum rights and obligations in relation to BIM are included in the appointment or contract. It is the responsibility of the **Appointing Party** to ensure that the protocol is included for each appointed party and any subsequent parties employed by that party, thus ensuring that the rights and obligations are the same for all project participants. This is a fundamental necessity for the success of BIM which is not always put in place due to lack of awareness on the behalf of the appointing party or a misunderstanding that the inclusion of such a protocol will restrict competition leading to higher bids. The lack of a level playing field leads to a situation whereby the organisations that adhere to BIM standards undertake more work to facilitate those that don't and the quality of information produced is not improved by using BIM.

The Protocol does not refer to any appointment or contract, making it suitable for use in projects in Ireland. It does refer to British Standards which may in time be replaced by ISO Standards. It would be advisable to not amend the Protocol but instead include an Appendix to the Protocol which amends clauses.

Roles: PAS1192-2:2013 includes a number of **roles** in relation to BIM which can be confusing initially as they are not generally used in Ireland unless a project is procured in Level 2 BIM. Contrary to what is included in many documents, there is no role called BIM Manager or BIM Coordinator. The **Information Manager** is a project lead role and the most significant in terms of impact on the scope of a BIM project compared to a non-BIM project. The **Employer** is responsible for ensuring that the role of Information Manager is included on Level 2 BIM projects for all project stages. The role of the **Information Manager** is defined in the 'Outline Scope of Services for the role of Information Management' (first edition 2013) drafted by BL Consult and Beale and Company on behalf of the CIC. The organisation or individual undertaking this role should become fully aware of the implications of this role on both their time and fees as it comprises effort that assists all designers in collaborative production of design information. The other two lead roles, **Project Delivery Manager** and **Lead Designer** are not unlike Project Manager and Project Architect roles, but the scope defined in PAS1192-2:2013 should be reviewed carefully to fully understand the scope. Lead Designer can be a significant executive type role in some UK contracts, so care

needs to be taken not to get the scope of this role in PAS1192-2:2013 confused with the role in contracts. The Lead Designer has significant input to resolution of clashes in models. There are four **Task Team** roles. A task team is any organisation or individual undertaking a task e.g. Architect, Structural Engineer, QS, etc. The roles are **Task Team Manager** which is the lead for the team, **Task Information Manager** who is responsible for ensuring models and related data are delivered in compliance with standards, **Interface Manager** who is responsible for clash avoidance and escalating clashes which cannot be avoided and **Information Authors** who produce the models. A comprehensive guide to all Level 2 BIM roles is available in the RIAI Information Management Roles Advice Note.

Many contractors are aware of the benefits of **clash detection** which is used to limit risk of lack of coordination on site by creating a digital version of the building that can be tested in advance of construction, thus reducing effort and waste. Many contractors are using the model issued at tender to validate the design which can highlight significant issues and raise numerous claims on some contracts which designers need to be aware of. Contractors may be obliged to provide significant O&M data for complex buildings such as healthcare buildings, pharmaceutical plants which they need to undertake significant planning with their subcontractors to ensure the appropriate organisations are obliged to provide information in a timely manner that is complete and accurate.

Summary

With ISO standards for BIM being impending, the construction industry in Ireland would be best placed to adopt ISO 19650-1 as the standards for BIM. There is a significant requirement to provide guidance for the private sector and smaller projects on the minimum requirements which must be used to ensure that those projects are using similar standards with guidance and what aspects of the ISO standards can be omitted or reduced to suit the programme, size and complexity of the project. There cannot be however different standards for different participants on a single project as this leads to an unlevel playing field which has economic implications for some participants. Appointing Parties must be offered a clear choice on procuring in BIM which should may be fully compliant with standards for larger complex projects and perhaps offer one or two options for smaller less complex projects which offers substantial compliance. This also offers the benefit for participants who work on smaller projects to gain familiarity with BIM standards and perhaps opportunity to work on projects that are fully compliant later. Careful consideration needs to be given to minimum requirements outlined in the CIC Insurance advice and CIC BIM Protocol documents when developing standards that offer substantial compliance.