BIM Basics

BIM LAB
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A Wienerberger guide to BIM and BIM LAB

1st Edition

Wienerberger
Building Material Solutions

Welcome

Contents

What is BIM?

Building Information Management or **BIM** (often referred to as a Building Information Model or Building Information Modelling) is a process involving the generation of digital representations of building projects to assist in the development and management of every stage of the process, from design and construction to operation or ownership.

Design has previously been seen as the primary function of BIM. However, the pioneering technology creates a comprehensive framework, enabling accurate information to be passed between every party, ensuring clarity and efficiency on both specification and design.

BIM is a structured way of working that enables collaboration from an early stage and clearly outlines the client's requirements before work begins. The process of distributing and communicating building plans is thousands of years old, but BIM has united the physical with the digital to revolutionise and streamline the entire process.

BIM is about the management of information within a given project. With that in mind, is there an argument that it should be called Project Information Management or PIM instead? Indeed, It seems we may well be seeing a shift in this direction.

In 2016, all government projects worth over £5million must be run in BIM level 2 regardless of build type, channel or sector. 95% of architects are now aware of BIM - a colossal step forwards from last year when 43% hadn't even heard of the process.

The government's 2016 targets have instigated an immediate increase in industry-awareness and proactivity. The expansive network of accurate information that is created by BIM can assist in every stage of a project.

The term 'building' is misleading as the BIM process is required for more than just the construction of buildings. It also applies to the construction of roads and infrastructure.

How does BIM work?

The framework enables each team (architect, M&E and structural etc.) to work in an open and collaborative way with data audit points between each release. Duplications of efforts, breakdowns in communication and an unforeseen lack of building information can often lead to wasted time, materials and finance in both the building and operational functionality of a project.

Each team creates its own model based upon a pre-agreed series of common data points and outcomes, this means greater collaborative involvement from the beginning. After sign-off, each model is fully approved and accuracy checked before it is shared with the wider team. The models are then combined in what is known as the 'federated' model. This is the single model that will act as the working bible, with adaptions and revisions made during the process of construction - including any last minute changes on site, which should be minimised if the BIM process is followed. Crucially, BIM can ensure the final model passed over to the client for the purposes of facility management accurately represents the finished project and is "as built".

The Government directive: BIM or Bust

By 2016 all government projects over £5 million must be run in BIM level 2 regardless of build type, channel or sector. The government's 2016 targets have instigated an immediate increase in industry-awareness, **but that's not the only reason BIM is becoming the norm.**

By 2050, the global population is set to increase by 40%. Obviously, for any infrastructure to cope with that sort of population increase, more hospitals, schools, roads and homes will inevitably be built. At the same time, by 2050 all UK buildings must be carbon neutral, whether new or existing.

Meeting this target will require a major national drive for building efficiency and operational control - two qualities that BIM can significantly improve.

In the UK, the Government's annual construction spend is £44 billion with a target to reduce waste using BIM by 20%. This means an extra £8.8 billion would be available to spend each year on delivering and improving infrastructure towards the 2050 targets.

Government Soft Landings (GSL)

BIM is not only about the design and construction of a project; it also takes into account the facilities management element of the lifecycle in the form of Government Soft Landings. The GSLs ensure that the transition from construction to ownership runs smoothly by using BIM to deliver and assess designs and outcomes.

Government Soft Landings give the Facilities Manager (FM) a single point of reference for a building during its operational life, this package will be electronic and downloadable onto any facility management system; helping to ensure the free-sharing of crucial structural knowledge to every party involved in the building's lifespan.

"Imagine if in the final phases of construction, the M&E team move a key junction box located behind a wall without telling anyone, then, two years later when it needs replacing, the FM team have to rip the room down to find it (this does happen!). With BIM GSL, they will know exactly where everything is thanks to the 3D model and the data package provided at handover. The digital accuracy of BIM GSL brings a lot of practical benefits."

With BIM everything has its place.

What does BIM mean for our customers?

This depends on who you are. BIM benefits the entire chain but every contributor will gain different advantages from the pioneering technology.

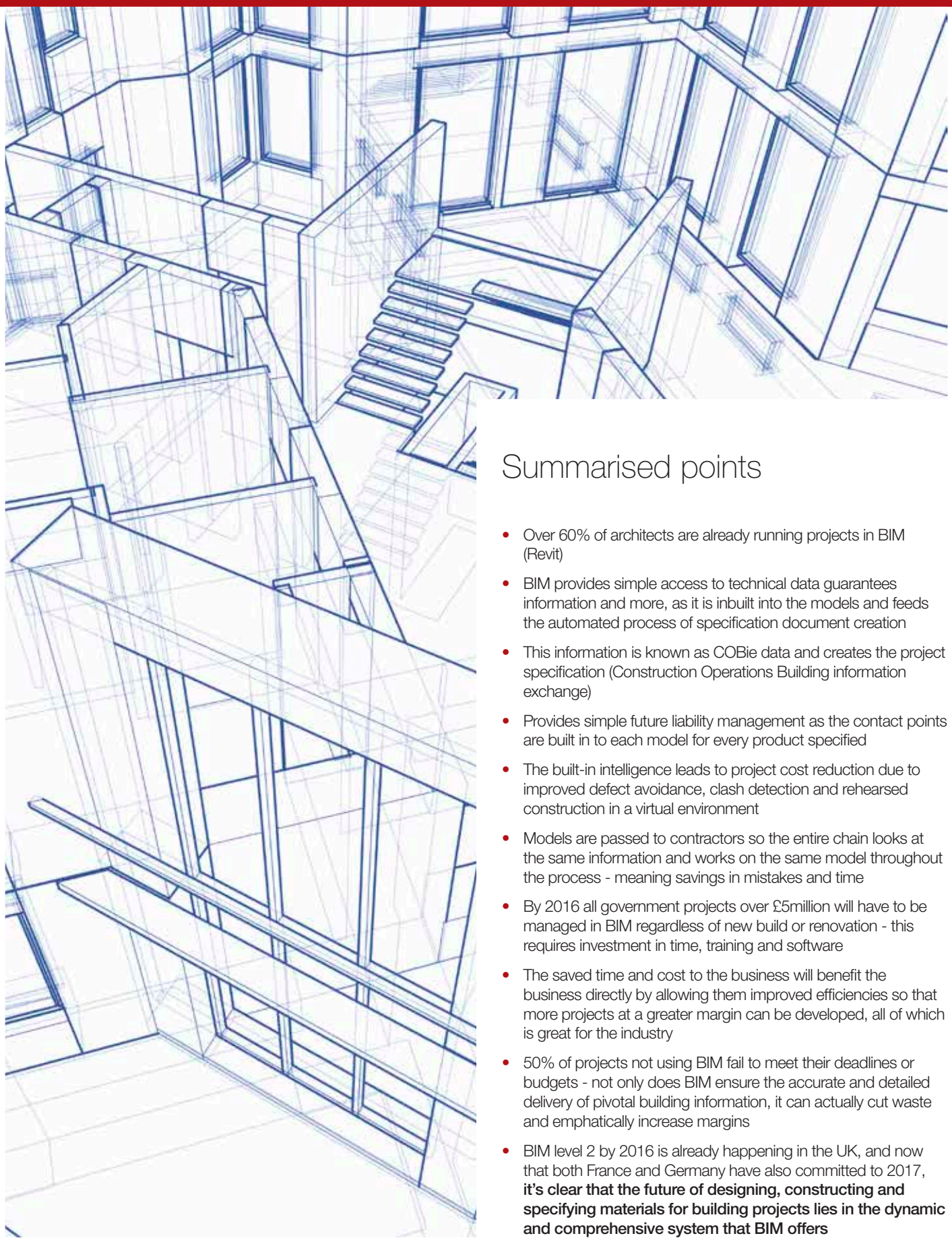
The architect's viewpoint

For architects it's easier to understand. They are supported by improved clash detection, improved liability cover, reduced time wastage, duplicated workflows, improved margins and the ability to offer cheaper constructions without the need for lowering the quality of design and materials.

It's easy to see why over 60% of architects are already using BIM in the UK.

The contractor's viewpoint

Thanks to BIM, contractors are provided with a comprehensive and fully accurate brief and design. This leads to improved effectiveness, reduced time lost due to double checking project data, earlier collaboration in the build process (dependant on contract type - if D&B, they control the process), and the ability to virtually rehearse constructions, achieve early clash detection in labour and plant, lower costs and increase margins.



Summarised points

- Over 60% of architects are already running projects in BIM (Revit)
- BIM provides simple access to technical data guarantees information and more, as it is inbuilt into the models and feeds the automated process of specification document creation
- This information is known as COBie data and creates the project specification (Construction Operations Building information exchange)
- Provides simple future liability management as the contact points are built in to each model for every product specified
- The built-in intelligence leads to project cost reduction due to improved defect avoidance, clash detection and rehearsed construction in a virtual environment
- Models are passed to contractors so the entire chain looks at the same information and works on the same model throughout the process - meaning savings in mistakes and time
- By 2016 all government projects over £5million will have to be managed in BIM regardless of new build or renovation - this requires investment in time, training and software
- The saved time and cost to the business will benefit the business directly by allowing them improved efficiencies so that more projects at a greater margin can be developed, all of which is great for the industry
- 50% of projects not using BIM fail to meet their deadlines or budgets - not only does BIM ensure the accurate and detailed delivery of pivotal building information, it can actually cut waste and emphatically increase margins
- BIM level 2 by 2016 is already happening in the UK, and now that both France and Germany have also committed to 2017, **it's clear that the future of designing, constructing and specifying materials for building projects lies in the dynamic and comprehensive system that BIM offers**

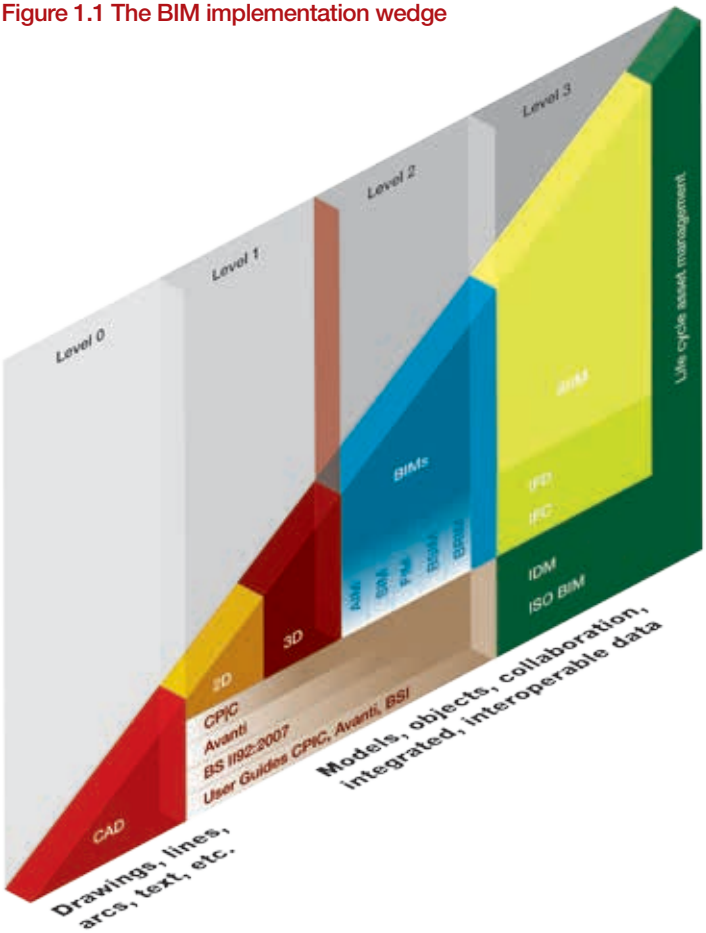
What about 3D CAD?

We've spoken about BIM but we haven't yet mentioned 3D CAD. 3D CAD is not actually an essential part of BIM; in fact you can reach level 1 BIM by utilising 2D CAD, provided you follow the process of work outlined in PAS1192-2:2013.

However, the benefits of utilising 3D CAD are clear. The functionality offered by Revit and other systems eases the process of sharing information between peers and aligns with the Government Soft Landing (GSL) requirements. It is worth noting that 3D CAD is required in order to reach level 2 BIM for 2016 compliance.

The PAS1192-2 (3 and 4) guidelines outline the fundamental process elements of BIM - which are so important to the core of the system that they are being moved straight into ISO status, leapfrogging BS status completely.

Figure 1.1 The BIM implementation wedge



The BIM implementation wedge

Figure 1.1 highlights the level of interconnection between the differing models by combining into one federated model at level 2 BIM. The red line represents 2016 and the maturity BIM must reach by that point.

The component models that form the federated model are:

AIM = Architects Information Model

SIM = Structural Information Model

FIM = Facilities Information Model

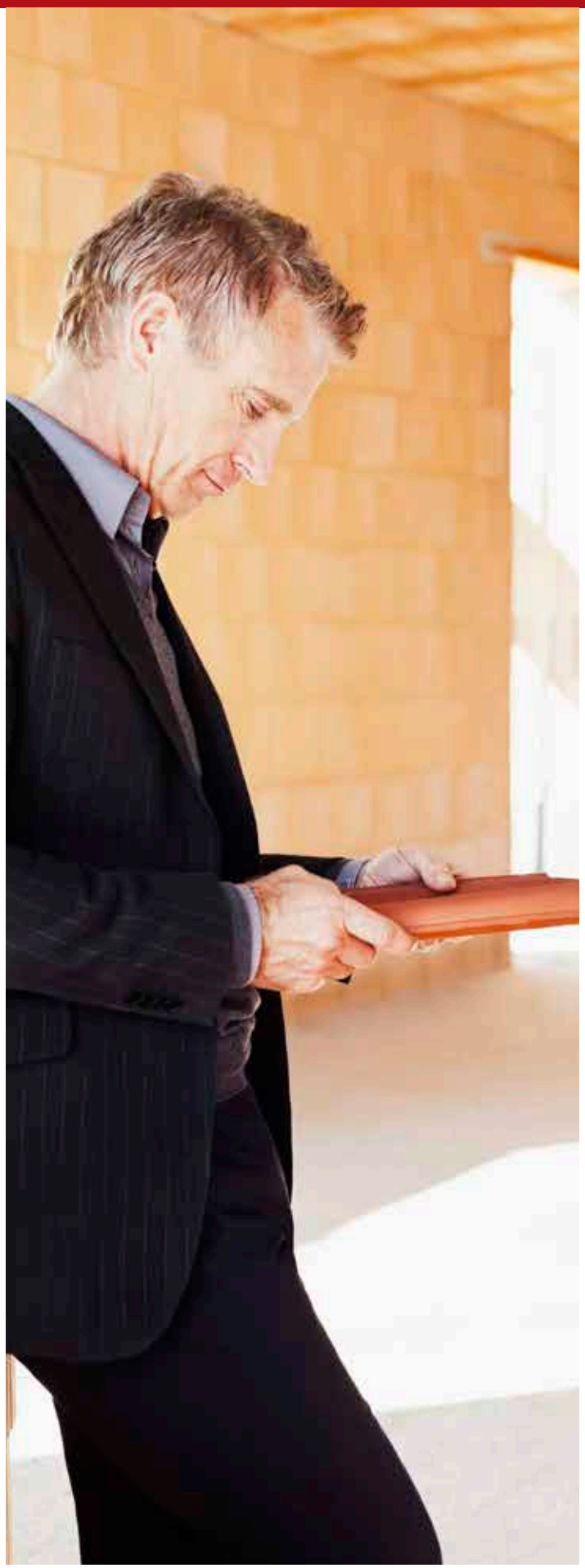
BSIM = Building Services Information Model

BRIM = Bridging Information Model

Level 1 BIM demonstrates the move from 2D to 3D, and shows the expected progression a stakeholder must undertake in order to reach level 2. At level 2 the aim is to encourage deeper collaboration between stakeholders while ensuring information is highly accurate.

In order to share information correctly we also need a common naming mechanism for files. This is outlined in BS 1192:2007 and is once again linked to the wider BIM process.

The classification system is also incredibly important as it represents the ability to define a given object and ensure all stakeholders understand the term is key to the success of the process. The system currently employed in construction is known as Unicode, but a new version is being created for BIM that will be accurate across all functions.



What is COBie?

Construction Operations Building Information Exchange or COBie is a formal scheme that helps organise information regarding both new and existing facilities. It can be used to document both building and infrastructure components and can be transmitted using a simple spreadsheet. It's a method of sharing structural numerical information and forms an essential basis for the specification of a project.

The information in our objects, feeds the COBie files.

The owner's view

An owner may require the delivery of COBie from the lead designer and/or lead contractor to support the timely delivery of information regarding the management of the facility (GSL). A complete COBie should be expected at the time of handover, but earlier interim deliveries can be used to monitor the business case for the facility and to help plan for ownership.

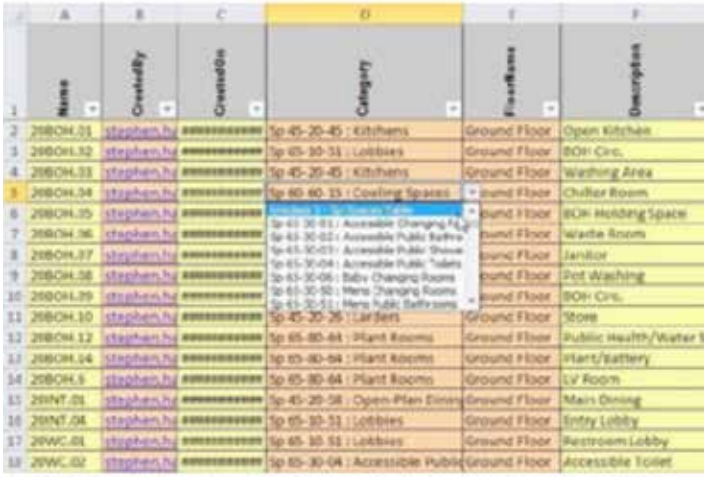
The COBie information can either be kept as delivered, held in ordinary databases, or loaded into existing facility management or operations applications. The owner should be explicit about the purposes for which the information is required and about the timing and content of any interim deliveries, especially where it differs from the Digital Plan of Work (DPoW) and will be noted in the EIR (Employers Information Requirements).

The designer's and contractor's view

COBie allows the construction team to document their knowledge about a facility in both its spatial and physical aspects. Usually the information needed to complete the deliverable COBie will be available already, either in BIM models, reports, schedules or other material prepared for handover.

During the design and construction process, BIM dictates a number of preset data drops (DPoW). Each data drop provides a different level of information according to the stage of the process.

Figure 2.1 Example COBie file



But where do manufacturers fit in and why are we important to the process?

Manufacturers can provide product information in a clear and accessible way to cover a variety of platforms. This includes Revit, IFC and Bentley. Technical information is required as a part of the modelling process that fits with the various COBie data drops and aligns with the **Digital Plan of Work** or **DPoW**.

The DPoW is communicated in variety of ways by different organisations (RIBA RICS etc.) For us at Wienerberger, it is the RIBA plan of work - the four COBie data drops align to that plan as follows…

- **COBie datadrop 1** : RIBA phase 1 – Preparation and Brief
- **COBie datadrop 2** : RIBA phase 3 – Developed Design
- **COBie datadrop 3** : RIBA phase 4 – Technical Design
- **COBie datadrop 4** : RIBA phase 6 – Handover and Close Out

In short, digital information is logged at different points in the process.

Drops two and three are the most important to us as this is the point where the federated models are combined and detailed. It is in this model that the specific product selections are likely to be made.

What other systems exist?

Bentley Systems Incorporated is a software company that produces solutions for the design, construction and operation of infrastructure. The company's software serves the building, plant, civil, and geospatial markets in the areas of architecture, engineering, construction (AEC) and operations. Its software solutions are used to design, engineer, build, and operate large constructed assets such as roadways, railways, bridges, buildings, industrial and power plants and utility networks. The company actively re-invests 20% of their revenues in research and development. This software is mainly used on larger projects where multiple buildings span across a site (eg. airports).

Autodesk Revit is a building information modeling programme for architects, structural engineers, MEP engineers, designers and contractors. It allows users to design a building and structure and its components in 3D, annotate the model with 2D drafting elements and access building information from the building models database. Revit is 4D BIM with tools capable of planning and tracking various stages in the building's lifecycle, from concept to construction and eventually demolition.

Cradle to grave construction

Modern construction theories are forcing contractors and designers to consider how we demolish a building before it is even built, minimising time and effort when the building no longer serves its purpose. Flexibility is also a great concern. Systems ensuring flexibility of purpose are becoming more essential in our renewable society.

What is IFC? - The international open standard for BIM

Industry Foundation Class or **IFC** can be used to exchange and share BIM data between applications developed by different software vendors without the software having to support numerous native formats. As an open format, IFC does not belong to a single software vendor; it is neutral and independent of a particular vendor's plans for software development. Our models have been developed with this in mind and are currently IFC supported.

IFC4

The latest version of IFC, IFC4 was released in March 2013. It incorporates several extensions of IFC in building, building services and structural areas, enhancements of geometry and other resource components, numerous quality improvements, a fully integrated simple IFCXML specification and a new documentation format.

Every implementation of an IFC exchange should follow what is known as an 'exchange requirement'. This requirement specifies the information that needs to be present in an exchange of data at a certain stage in a project.

It is important to be specific about the information needed. The exchange requirement prevents woolliness and uncertainty, helping to avoid wastage of time and resources.

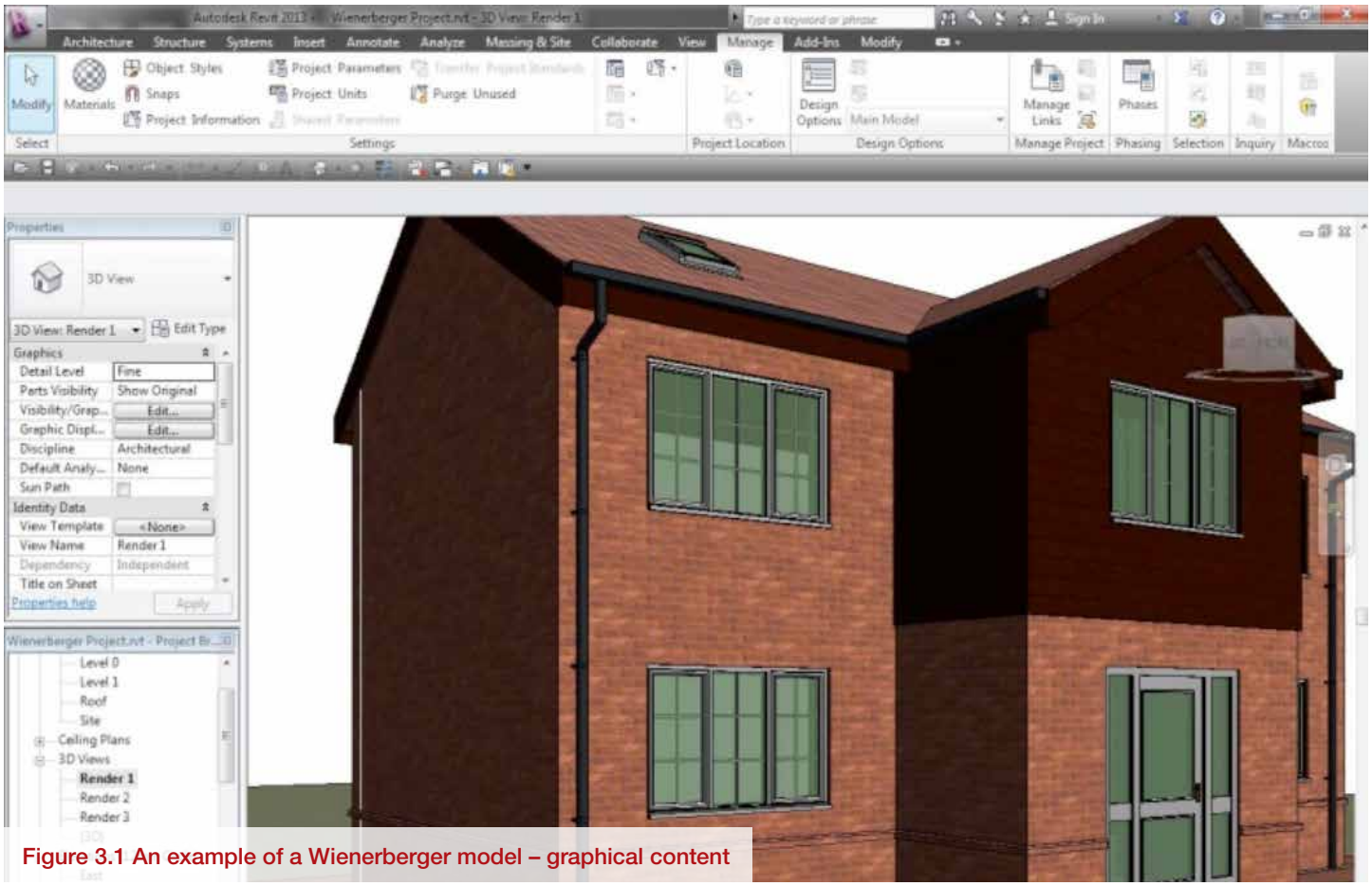


Figure 3.1 An example of a Wienerberger model – graphical content

Wienerberger objects

All of our objects can be found on our BIMlab web portal. They are free to download and provide a market-leading level of information within them.

Each model has two types on information, graphical and non-graphical. The graphical element simply depicts the product when rendered and allows the designer to see the shape and size of the product. The non-graphical provides all of the certification, guarantee, life expectancy, technical specifications and material information for the product. It is this element that allows the creation of the specification. By simply utilising one of our models, any contractor wishing to switch a product needs to ensure it meets or exceeds every test result and certification, or it is liable for any future incidents the building may suffer.

We currently have 150 models on BIMlab, however the number is growing as the project evolves.

What does this mean for you?

It is important that you have an understanding of what BIM is, how it works and what the objectives for BIM are. As the market adapts you will find more and more elements of the chain enquiring about the capabilities of BIM. This document aims to explain these capabilities and the many operational improvements that BIM will bring to the industry.

BIM is changing the way architects, house builders and contractors work; Architects will be working on individual projects and require a deep understanding of what our BIM models offer, where they can be found and at what point the physical components will need to be delivered (linked to DPoW).

Contractors and house builders will be developing their own models and will require information at the estimating or design stages, depending on the type of contract and build.

Our capabilities will always be adapting and improving as we all progress on the journey to level 3 BIM and beyond. The latest models can always be found on the BIM lab at…

www.bimlab.biz

Wienerberger objects

In Summary

- Architects that download our models for use are provided to us as leads for sales to follow up
- Any project or architect that uses one of our models is specifying our product
- We have already won projects including roof tiles and solar as a result of a BIM lead
- Reduces basic technical calls as the models have all the information included
- Our models are currently aimed at architects but contractors are adopting the service very quickly
- Large contractors are also heavily utilising Revit and are seeking cost savings through virtual construction, therefore seeking manufacturers to work with who have models – creating more specs/leads

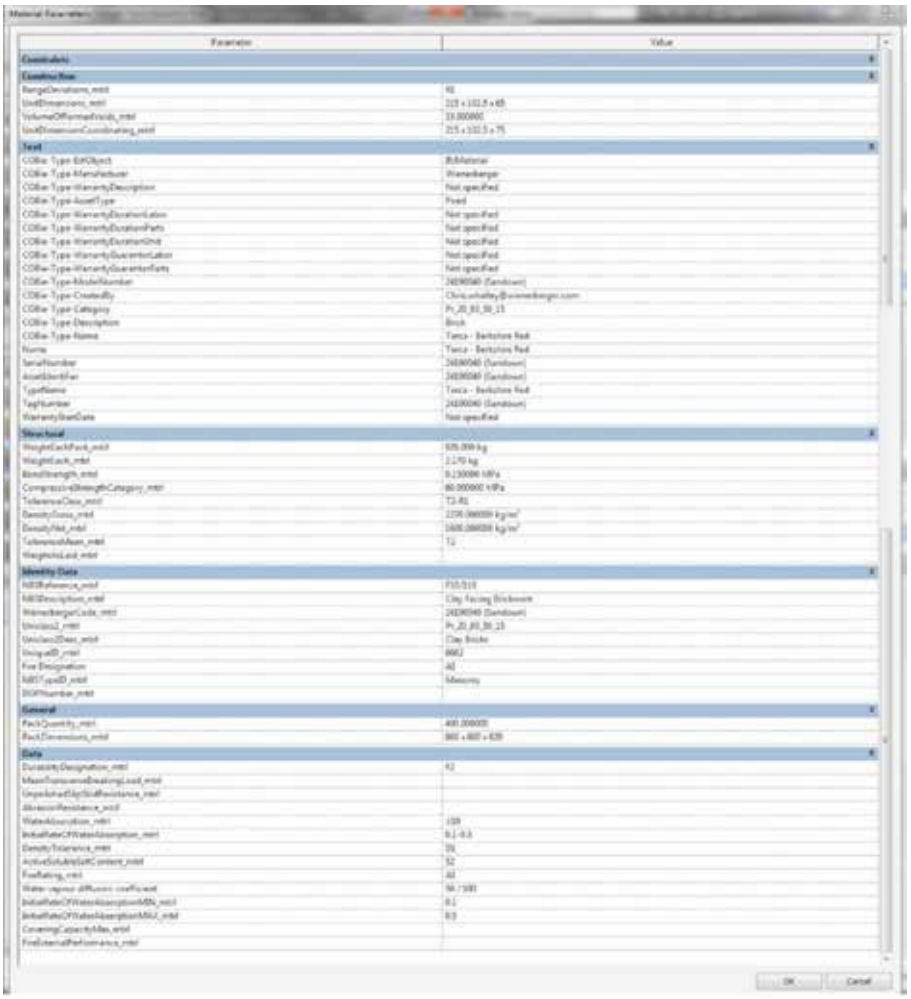


Figure 3.2 An example of Wienerberger non graphical model content

One final thought….

"The day is near when there will be a significant cost to product manufacturers if they do NOT produce BIM information for their clients. The stark reality is that BIM will continue to significantly change the construction business environment and product manufactures who are not willing to adapt to support the BIM process will face the reality that they will cease to remain competitive in the marketplace."

John I. Messner, Professor of Architectural Engineering

Director, Computer Integrated Construction Research Program

Penn State University

Glossary

Building Information Modelling
(BIM) A process for managing the information produced during a construction project, in common format, from the earliest feasibility stages through design, construction, operation and finally demolition.

Building Information Model
A representation of a building project in BIM format, usually consisting of a three-dimensional model integrated with a database about materials, products, components, systems and their properties and performance.

BIM object
An element of a building modelled in BIM format.

BIM platform
A software system that supports BIM.

BIM Task Group
A working group set up by the UK government to implement BIM in construction, with cross-industry representation.

buildingSMART International
The organisation that develops, maintains and promotes Industry Foundation Classes (IFC) as a neutral common data standard for BIM.

CAD
Computer aided design.

CADD
Computer aided design and drafting.

Construction BIM
The BIM of a project that contains the information required for construction.

Contract BIM
The BIM of a project that forms part of the building contract documentation (usually very similar to the Construction BIM).

Construction Operations Building information exchange (COBie)
A standard format for organising, holding and transmitting information about new and existing buildings through the handover process, to support their operation; COBie is a non-geometric subset of IFC.

Construction Products Association
The trade association representing manufacturers and suppliers of construction products in the UK and joint author of this publication.

COBie UK 2012
The UK government's required format for BIM data drops, from 2016.

Data Drop
Transmission of a package of building data from a BIM to a developer, contractor, regulator or user.

Design BIM
The BIM of a project that supports the development of the design.

Federated model
A BIM model that combines all of the different elements into one master model

Green Building XML (gbXML)
An open scheme developed to facilitate the transfer of information about a building from a BIM to engineering analysis tools.

Industry Alliance for Interoperability
An industry consortium formed in 1994 by Autodesk to advise on software development for BIM; subsequently renamed the International Alliance for Operability and then buildingSMART International.

Industry Foundation Classes (IFC)
An industry-wide open and neutral data format that is becoming the de-facto standard for exchange of BIM data.

Interoperability
The ability of BIM software to transmit and receive data from other BIM software, through the use of commonly agreed data standards such as gbXML and IFC.

Modelling Support Group (MSG)
A standing working group of buildingSMART International that is tasked with development and maintenance of Industry Foundation Classes.

Multi-format BIM object
A BIM object that embraces more than one data format, e.g. three-dimensional geometrical information about a product combined with its technical properties.

NBS
The organisation that has developed and maintains the National Building Specification in the UK, and the NBS National BIM Library.

Operational BIM
The BIM of a building that supports its operation and maintenance, after it has been handed over to the occupant.

Project BIM
A collective term for the series of linked BIMs (Design, Construction, Record, Operation, etc.) that may be associated with a project.

Publicly Available Specification (PAS)
A published specification for common use, usually developed with industry support by the International Standards Organisation (ISO) or a national standards body such as BSI.

Record BIM
The BIM that records a building as it was built.

Standard for Exchange of Products (STEP)
An open computer modelling standard for the industrial and manufacturing industries, developed by the International Standards organisation during the 1980s.

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