



Autodesk and the UK BIM Level 2 Mandate

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BIM 360™



BIM Level 2 Mandate

The UK Cabinet Office is in the midst of a multi-year effort to reform the way in which the UK government procures construction — helping to ensure that the government “consistently gets a good deal and the country gets the social and economic infrastructure it needs for the long-term.” A central mandate of that effort is the use of Building Information Modelling (BIM) on all centrally funded public projects by April 2016.

This paper provides a summary of the Level 2 mandate, including its relevant standards and specifications, and offers guidance on how Autodesk solutions can help you comply with the mandate.

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1 About the UK BIM Mandate

In May 2011, the UK Cabinet Office announced a long-term government construction strategy¹ aimed at improving the efficiency, cost-effectiveness, and sustainability of UK government construction projects. The strategy's short-term goal is to reduce construction costs by 15 to 20 percent.

This program is one of several strategies to support the UK's broader goals for its construction industry:

- To reduce construction costs and project delivery time
- To reduce long-term operating costs for buildings and infrastructure
- To help the UK meet carbon reduction targets for buildings
- To make the UK design and construction industry more competitive in the global marketplace

The strategy calls on the construction industry to work more collaboratively and to use information technology to support the design, construction, operation, and maintenance of the government's built assets. [One key part of the strategy is the requirement that collaborative 3D BIM processes be used on all centrally funded public projects \(both buildings and infrastructure\) by April 2016](#), the start of the UK government's 2016 fiscal year. The mandatory requirement for BIM has a phased implementation to allow time for the development of new standards, specifications, and other tools that support the mandate.

1.1 The Components of the UK BIM Mandate

Since the launch of the strategy, a number of public-private steering groups and organisations have been helping to implement this construction strategy and strengthen the BIM capabilities of both government organisations and industry supply chains. To support the strategy, several standards and specifications have been created; new policies, protocols, and tools have been devised and others revised; and government projects have been used to test new methods and obtain feedback from government and industry.

Based on this ongoing development effort, the UK BIM mandate currently includes eight main components that enable project teams (government owners, supply chain designers, contractors, and fabricators) to understand, specify, and adhere to BIM processes and procedures for working together on BIM projects.

1) PAS 1192-2:2013 (Publicly Available Specification 1192-2, issued in 2013)

PAS 1192-2 is at the heart of the UK BIM mandate, identifying how BIM should be used for the delivery (design and construction) of a project. The underlying standard for PAS 1192-2 is [BS 1192:2007](#) (British Standard 1192, issued in 2007), which defines the collaborative production of architectural, engineering and construction information and establishes project team roles and responsibilities as well as rules for naming, classifying, layering, and exchanging project data. PAS 1192-2 includes only information exchanges specific to BIM and introduces new concepts for BIM projects such as levels of BIM maturity and the use of Construction Operations Building Information Exchange (COBie).

A Publicly Available Specification or PAS is a 'fast-track' standard to meet an immediate market need.

In the UK, formal standards and PASs are both developed by the British Standards Institute (BSI)—a multinational standards-related services provider. Within several years after publication, a UK PAS is reviewed to assess whether it should be revised, withdrawn, or become formal British Standard.

¹ Cabinet Office, Government Construction Strategy, May 2011



BIM Level 2: PAS 1192-2 details the depth and complexity of BIM collaboration required by April 2016, which is referred to as BIM Level 2 maturity. The core principle of BIM Level 2 is the use of individually authored models that are shared between project team members for collaboration and coordination.



COBie: PAS 1192-2 also directs project teams to use COBie for improved information handover. COBie is a neutral data structure for the exchange of information about new and existing facilities, and BS 1192-4 defines the UK usage of COBie for exchanging facility information.



CDE: Both PAS 1192-2 and BS 1192 state that project data exchange should be managed through a common data environment (CDE), which is defined as a single source of information for any given project that is used to collect, manage, and disseminate all relevant approved project documents for multidisciplinary teams.

2) PAS 1192-3:2014 (Publicly Available Specification 1192-3, issued in 2014)

PAS 1192-3 is similar to PAS 1192-2, but deals with the operational phase (versus delivery) of a project. The PAS describes how an Asset Information Model (AIM) should be created from the Project Information Model (or PIM, which is developed during design and construction), including the establishment of data requirements from the very beginning of a project. The PAS also describes how that model should be used and maintained through the life of the asset up to final disposal.

3) BS 1192-4:2014 (British Standard 1192-4, issued in 2014)

This standard defines expectations for the exchange of primarily nongraphical project information throughout the lifecycle of an asset. The UK government uses the COBie information exchange schema for BIM Level 2. COBie enables the exchange of structured facility information for the commissioning, operation, and maintenance of a project in a neutral spreadsheet format that will be used to supply data to the facility owner or operator to populate decision-making tools, and facilities management and asset management systems.

4) PAS 1192-5:2015 (Publicly Available Specification 1192-5, issued in 2015)

PAS 1192-5 provides technical security considerations for UK government owners and project stakeholders regarding vulnerability issues and the controls required to help ensure that information is being shared in a security-minded fashion.

5) BIM Protocol

The BIM Protocol is a legal addendum to design and construction contracts, allowing parties to share data within a contract when working to BIM Level 2. It establishes specific obligations, liabilities, and limitations on the use of project models.

6) Government Soft Landings

The Government Soft Landings (GSL) is a policy of graduated handover for government projects. This policy requires project teams to stay with their government clients for several years to assist them in learning how to operate their asset effectively. The policy also stresses the importance of involving operational personnel in the design and construction phases of a project to assess operational impacts.

7) Classification

In support of its construction strategy, the UK government commissioned the development of a unified classification system that provides a 'common language' for all team members who are designing, constructing, and managing a government asset. A single classification system enables electronic project data (regardless of who has created it and when) to be indexed and structured to make it easily accessible and searchable. The

classification system is digitally enabled in the form of an online tool and is integrated with the digital plan of works (dPoW) (see sidebar on right).

8) Digital Plan of Works

In addition to a standardised classification system (see above), the UK government commissioned the development of a dPoW that defines what data is required at what point in a project’s lifecycle and who is responsible for creating and issuing that data.

1.2 What is BIM Level 2?

The UK government’s construction strategy employs a BIM maturity roadmap to set realistic targets of BIM compliance for its supply chain, with BIM Level 2 mandated by April 2016. So what exactly is BIM Level 2?

Much of the UK government’s construction strategy and plan of action was based on an earlier strategy paper² that explored the construction and operational benefits of BIM for UK public projects and described various levels of BIM maturity. Those levels are outlined below in Figure 1. PAS 1192-2 designates BIM Level 2 as the first target for the government mandate (by April 2016).

NBS BIM Toolkit

The ‘digital enablement’ of the classification and dPoW systems is an online tool developed by National British Standards (NBS). The NBS BIM Toolkit provides step-by-step guidance for documenting what geometry, data, and other information is required throughout the different stages of a project cycle.

Clients can use the toolkit to define their Employer Information Requirement (EIR). Potential suppliers (architects, contractors, and so on) can use the toolkit to respond with details of their teams and the services they offer. Once the project moves into the design and construction phases, the toolkit enables teams to grow the digital plan of work, providing information regarding tasks or deliverables to meet the client’s requirements.

Project teams can also use the tool to digitally verify that a supplier’s project data (provided in open standards such as COBie spreadsheets or IFC models) meets the requirements of the project (containing the appropriate level of information or level of detail for example).

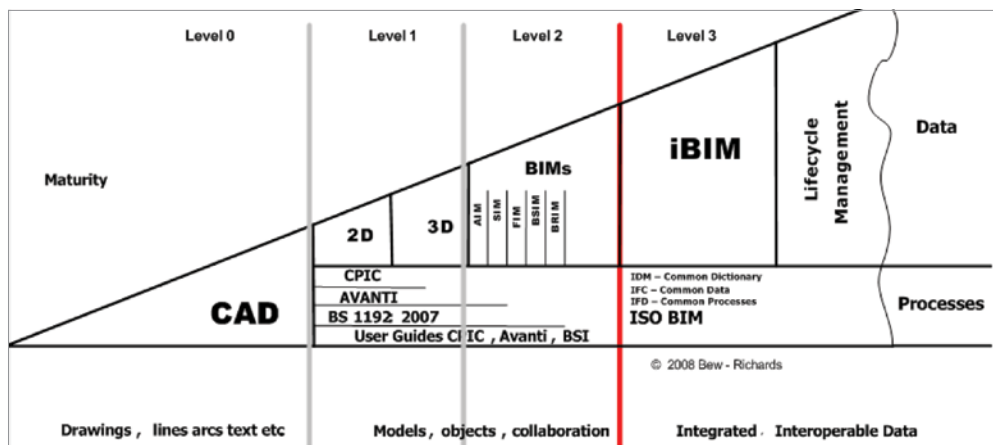


FIGURE 1. Levels of BIM maturity, as defined by the BIM Industry Working Group. Source: Report for the Government Construction Client Group Building Information Modelling (BIM) Working Party Strategy Paper.

Many firms use BIM software and processes internally—to improve the quality of design or produce design documentation more efficiently for example—but do not share their graphical model with external partners. Traditional drawings form the basis of project collaboration, coordination, and deliverables. This is ‘Level 1 BIM’ shown in Figure 1.

The UK government is requiring BIM Level 2, which is a more sophisticated use of BIM that features collaborative working and sharing of digital project information. Project teams (designers, builders, fabricators, and so on) use their chosen software tools to produce digital 3D models and supporting project data. Collaboration is achieved by the exchange of graphical and nongraphical information between the different parties on the project team

² BIM Industry Working Group, A Report for the Government Construction Client Group, Building Information Modelling (BIM) Working Party Strategy Paper, March 2011

to create a federated model (rather than a single, shared project model that is the basis of 'Level 3' BIM). The CDE described earlier is used to exchange this project information. The graphical data exchange formats could be native model files, Industry Foundation Classes (IFC) models, or some other agreed-upon file format, based on the direction of the client or the input of the tier 1 suppliers. Minimally, native model files are required.

Graphical project information (3D models) from different project disciplines are combined for physical project coordination and clash detection. Project teams share their individual models using the agreed-upon exchange formats, and the federated model is managed as a set of these self-contained models. Nongraphical project information used to support operations, maintenance, and asset management is exchanged via COBie: a data standard that uses spreadsheets to capture, record, and share important project data such as warranties, spare parts lists, maintenance schedules, and so on.

PAS 1192-2 does not require specific software. Instead, it defines the information delivery cycle and practices for government projects, including critical information exchange points at different stages of a building project between the government client and its supply chain. The specification identifies information that should be produced—such as an Employer's Information Requirements (EIR), a BIM Execution Plan (BEP), a Project Information Model (PIM), and so on—and when it should be produced.

2 Autodesk Software and Compliance with BIM Level 2

For each centrally procured UK government project, the government client will evaluate the proposed approach, BIM capability, and capacity of a supplier and its supply chain to deliver the required information. As such, a potential 'tier 1' government supplier (such as a lead designer, main contractor, or joint venture partner) must convince its government client that it is BIM-ready by detailing the processes that it will use to fulfil the client's requirement. Likewise, a supplier further down the supply chain must demonstrate its BIM readiness to its higher-tier client.

Part of a company's 'BIM readiness' is the software it uses to provide services, produce deliverables, and deliver the information required by the government client. [Autodesk® BIM 360™ Docs was designed to provide the technological capabilities to help government clients comply with the demands of the BIM Level 2 mandate in the UK.](#)³

2.1 Autodesk Support of Open Standards in the AEC Industry

Autodesk has a long history of supporting the open industry standards that underpin the collaborative BIM efforts of the UK mandate. For example, Autodesk was the first major CAD vendor to publish an open standard (DXF) for transferring data to and from its flagship CAD product (Autodesk® AutoCAD®). In fact, it was the first CAD company to run on open systems and non-proprietary hardware.

Autodesk has always been at the forefront of BIM development and collaborative working, as illustrated by its continued investment in staff time to support the organisations that develop the guidelines and standards associated with both BIM and collaboration.

Concerning the documents, specifications, and standards specifically developed to support the UK construction strategy, Autodesk personnel were members of the steering groups and technical committees involved in the development of PAS 1192-2 and BS 1192-4. Autodesk was also on the leadership team of the BIM Industry Working Group (the public-private steering group that developed the original strategy paper that informed much of the UK's construction strategy) and its personnel have been on the technical sub committees for much of the UK BIM mandate guidance materials.

2.1.1 COBie

COBie is a non-proprietary information standard for exchanging facility information and is a part of the UK government's BIM Level 2 requirement. Autodesk has been involved in shaping and promoting COBie for many years, including BS 1192-4 (which defines the UK government's use of COBie) as well as its inclusion in the US National BIM Standard (NBIMS) and US National CAD Standard (NCS). For more information about Autodesk BIM solutions and COBie, see section 3 below.

³ The precise makeup of the PIM is defined in the post-contract BEP based on constraints imposed by the EIR. For BIM Level 2 projects, PIMs will most likely be a set of federated 3D graphical models along with associated nongraphical data and documentation.

2.1.2 IFC

IFC is not specifically required by the UK mandate but is a commonly used format for data sharing on BIM projects. The IFC standard is developed and maintained by the nonprofit industry-led organisation buildingSMART.

Autodesk holds a board level position in buildingSMART's North American chapter, serves on its international Standards Committee, participates in international buildingSMART chapters, and is continuously developing and improving IFC data exchanges within its software solutions. For example, Autodesk was one of the first software vendors to achieve the more rigorous IFC 2.0 Coordination View export certification for its BIM software platform (Autodesk® Revit®) and the company continues to provide leadership in open standards by providing support of IFC Export in Revit as open source technology.

IFC and Infrastructure

buildingSMART is currently extending the IFC definitions for infrastructure works, beginning with alignments, and expanding into other areas such as roads, rail, bridges, and tunnels. Autodesk is supportive of this initiative and looks forward to having actionable IFC Infrastructure Model View Definitions that can be used to export and import infrastructure models and information from/to its civil engineering products such as AutoCAD® Civil 3D® and Autodesk® InfraWorks®.

2.1.3 CDE

The CDE described in BS 1192 and PAS-1192-2 is the information exchange platform for the UK government's BIM delivery process. Autodesk has participated in the industry groups that have shaped the requirements for the technical capabilities of the CDE (section 9.2 of PAS 1192-2) and its security considerations (outlined in PAS 1192-5). This gave Autodesk greater insight as it developed solutions to support a CDE, including Autodesk's cloud-based BIM data management solution: Autodesk® BIM 360 Docs™. As such, BIM 360 Docs will support the collaborative workflows described in BS 1192 and PAS 1192-2, and will help government clients meet the technical requirements for the CDE.

Moreover, the security controls and features of BIM 360 Docs help enable government clients, suppliers, and asset operators who use the CDE to comply with PAS 1192-5. One of the driving principles of the PAS is a 'need-to-know' approach to the sharing and publication of information about built assets—information that could potentially be used by those wishing to do harm in some way. As such, BIM 360 Docs includes authentication mechanisms to securely verify the identity of users, as well as a granular permission system that can be used to restrict access to sensitive data based on a user's role. For more information about Autodesk BIM solutions and CDE, see Section 4.2 on page 15.

3 Autodesk Solutions and COBie

The UK's BIM mandate for BIM Level 2 is based on the collaborative, ongoing production and sharing of project information throughout the lifecycle of a project. As a project moves from design to construction to commissioning and handover, the project information grows and eventually represents what has been built and delivered to the government client. This information is then used to support the operations and maintenance of the built asset. COBie (Construction-Operations Building information exchange) is the UK government's chosen BIM Level 2 exchange schema for this information (as well as digital models and PDF documents).

3.1 About COBie

The information needed by facility owners and operators is wide ranging—from as-built drawings of the facility to serial numbers and installation dates of warranted equipment. Traditionally, this information was provided during handover via boxes full of paper drawings, operations and maintenance manuals, and so on. More recently, these paper submittals have been accompanied by CDs containing electronic versions of the same information. It may require thousands of hours to process and enter the data into systems used for facility management, operations, and maintenance.

In 2007, the US Army Corps of Engineers (USACE) developed the COBie exchange format as a pilot standard to remedy this situation for its own building projects. Since then, it has been expanded upon and used by many private and public organisations around the world, and has been formally incorporated into many CAD and BIM standards.

COBie enables the capture of facility information throughout the phases of a project, and the exchange of that information in a structured format using neutral spreadsheets. Two types of assets are included in COBie: 'visitable' spaces and managed or maintained components and equipment. COBie enables the supply chain to provide electronic information directly about the facility *as that information is created*.

The COBie spreadsheet will contain data from design consultants, the contractor and subcontractors, suppliers, and the client. In a collaborative BIM project, the COBie spreadsheets from all these participants are merged together. More of the COBie fields and tabs are filled in as the project progresses, in preparation for operation and maintenance. In general, COBie files are not intended to be 'read' by end-users. Instead, they are a vehicle that can be used to exchange space and equipment information between systems.

BS 1192-4 provides guidance and recommendations for the UK government's usage of COBie for exchanging facility information between the employer and the supply chain. The timing and number of specific exchange points (referred to as COBie data drops) are aligned to project stages and will vary depending upon the requirements of individual government clients to suit their internal processes and approvals. At a minimum, there will probably be four data exchanges: at the end of preparation and brief, at the end of conceptual design, at the end of design development, and at handover.

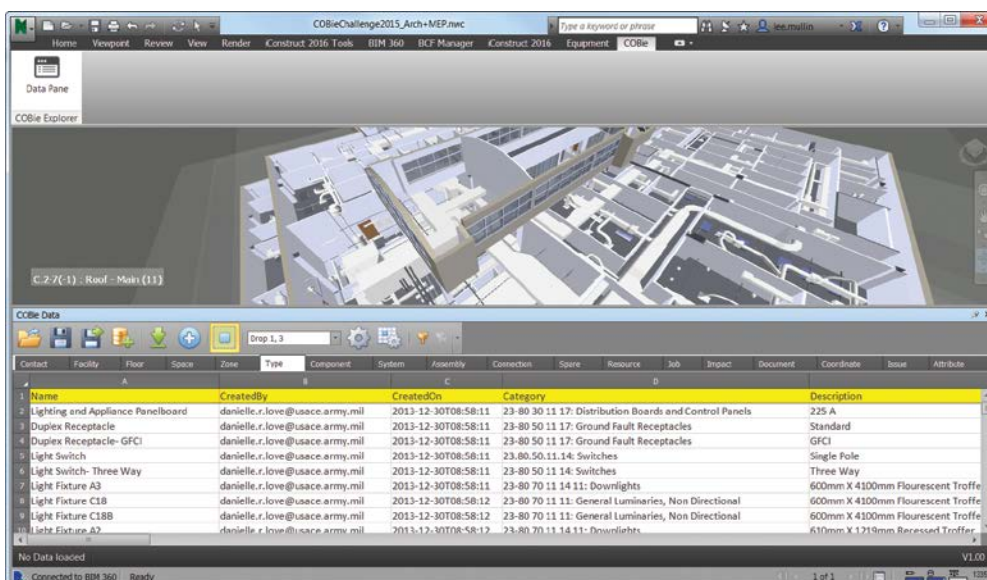
3.2 Autodesk Support for COBie

As mentioned earlier, Autodesk has been supporting and promoting COBie for many years. Its personnel have worked on the various technical committees that developed the original USACE standard, BS 1192-4, and the many other standards that include COBie.

Moreover, Autodesk has also developed a COBie extension for its Autodesk Navisworks software platform that is used to create federated, multidiscipline project models from over 50 different file formats including IFC, DGN and manufacturing file formats. For example, Autodesk Revit can create and export COBie building handover information directly using two methods: directly to a spreadsheet or via an IFC model. Autodesk provides a free plug-in for Revit (the COBie Extension for Autodesk Revit⁴) that assists users in preparing their models with COBie data and provides the capability to export the model directly to the UK COBie spreadsheet standard format (see section 3.3 below). *This method is the path required for BIM Level 2. Alternatively these COBie enabled Revit Models can also be exported to the IFC FM Handover Extended Model View Definition.*

Autodesk is also developing COBie extensions for its software platforms that are used to create federated, multidiscipline project models such as the Autodesk Navisworks software platform⁵.

FIGURE 2. Prototype of COBie data drop created in Autodesk Navisworks.



Name	CreatedBy	CreatedOn	Category	Description
Lighting and Appliance Panelboard	danielle.r.love@usace.army.mil	2013-12-30T08:58:11	23-80 30 11 17: Distribution Boards and Control Panels	225 A
Duplex Receptacle	danielle.r.love@usace.army.mil	2013-12-30T08:58:11	23-80 50 11 17: Ground Fault Receptacles	Standard
Duplex Receptacle- GFCI	danielle.r.love@usace.army.mil	2013-12-30T08:58:11	23-80 50 11 17: Ground Fault Receptacles	GFCI
Light Switch	danielle.r.love@usace.army.mil	2013-12-30T08:58:11	23.80.50.11.14: Switches	Single Pole
Light Switch- Three Way	danielle.r.love@usace.army.mil	2013-12-30T08:58:11	23-80 50 11 14: Switches	Three Way
Light Fixture A3	danielle.r.love@usace.army.mil	2013-12-30T08:58:11	23-80 70 11 14 11: Downlights	600mm X 4100mm Fluorescent Troffe
Light Fixture C1B	danielle.r.love@usace.army.mil	2013-12-30T08:58:12	23-80 70 11 11: General Luminaries, Non Directional	600mm X 4100mm Fluorescent Troffe
Light Fixture C1BB	danielle.r.love@usace.army.mil	2013-12-30T08:58:12	23-80 70 11 11: General Luminaries, Non Directional	600mm X 4100mm Fluorescent Troffe
Light Fixture A2	danielle.r.love@usace.army.mil	2013-12-30T08:58:12	23-80 70 11 14 11: Downlights	610mm X 1219mm Recessed Troffer

3.3 COBie Extension for Autodesk Revit

The COBie Extension for Autodesk Revit enables Revit users to output a COBie-compliant spreadsheet directly from Revit project models. The free plug-in provides features for:

- setting up a Revit model for export to COBie
- modifying and managing the relationship between Revit elements and attributes and COBie data structures
- exporting a COBie spreadsheet

⁴ This tool is available for download at <http://www.autodesk.com/campaigns/interoperability>

⁵ The COBie Extension for Autodesk Navisworks is currently in final testing.



Setup: During setup, a wizard helps users configure the default parameters for mapping Revit model data to the COBie data structure. During setup, the user can also select options such as the locality (the UK for example, which automatically applies the UK COBie template), the default scheduling system (Uniclass, for example), units of measurement, applicable area measurement standards, and so on.

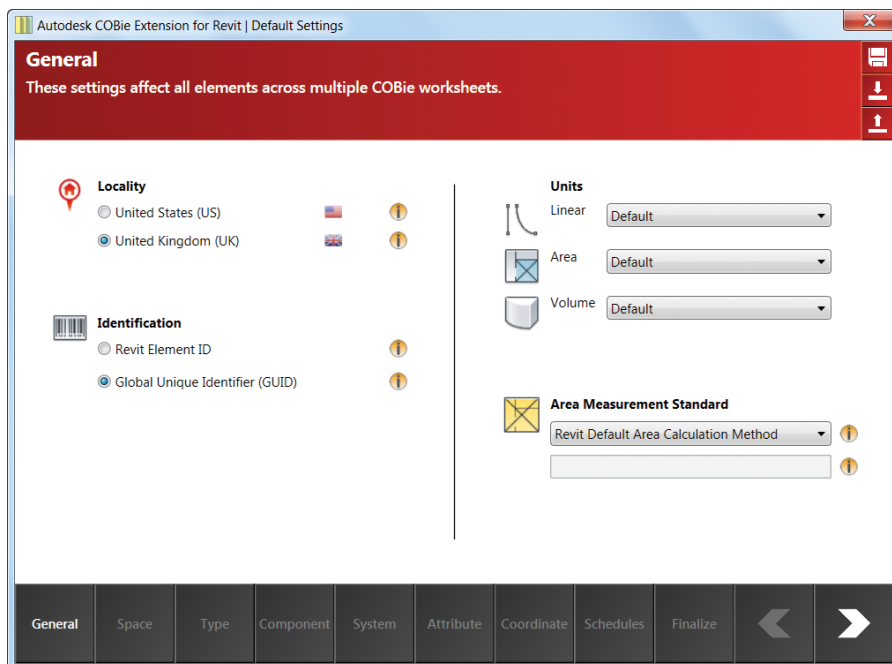


FIGURE 3. The COBie Extension for Autodesk Revit enables Revit users to output a COBie-compliant spreadsheet directly from Revit project models.



Modify: A zone manager helps users define and dynamically manage separate Revit rooms and spaces as COBie zones. The plug-in also enables users to specify which Revit families, types, and elements are exported, and perform batch operations on the current model to help ensure that items in the Revit model include accurate data for the COBie fields.

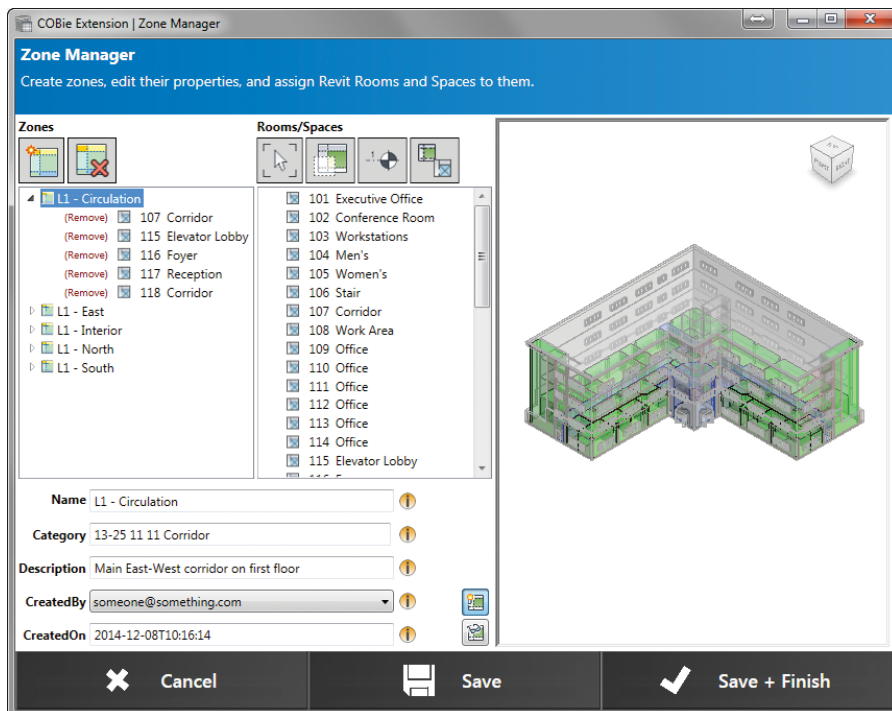


FIGURE 4. A zone manager helps the user define and dynamically manage separate Revit rooms and spaces as COBie zones.



Export: When creating COBie data drops, a dialog box allows users to specify which parts of the standard COBie data exchange format are exported from the current Revit model and whether the export will generate a new spreadsheet using the built-in COBie template, or append an existing COBie spreadsheet.

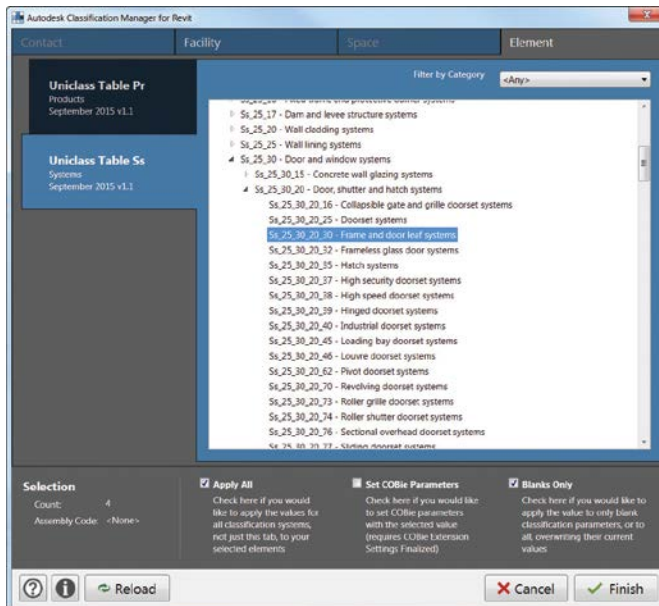


FIGURE 5. A companion tool to the COBie Extension for Revit is the Classification Manager. This tool has support for multiple classification systems including Uniclass 2015.

3.4 COBie Verification

Prior to creating COBie drops, UK government clients and project teams are able to use Revit Model Checker to verify that a Revit model contains the necessary information needed to meet the client's specific project requirements. This free tool⁶ can be used to verify the graphical and nongraphical data in a Revit model, based on a configurable checklist. The tool also includes a Revit Model Checker for COBie that checks to make sure that a COBie spreadsheet exported from Revit will meet the UK's requirements for COBie.

In addition, a UK government client or supplier can use the NBS BIM Toolkit (dPoW) to digitally verify that a supplier's project data provided in a COBie spreadsheet meets contract requirements.

⁶ This tool is available for download at <http://www.autodesk.com/campaigns/interoperability>.

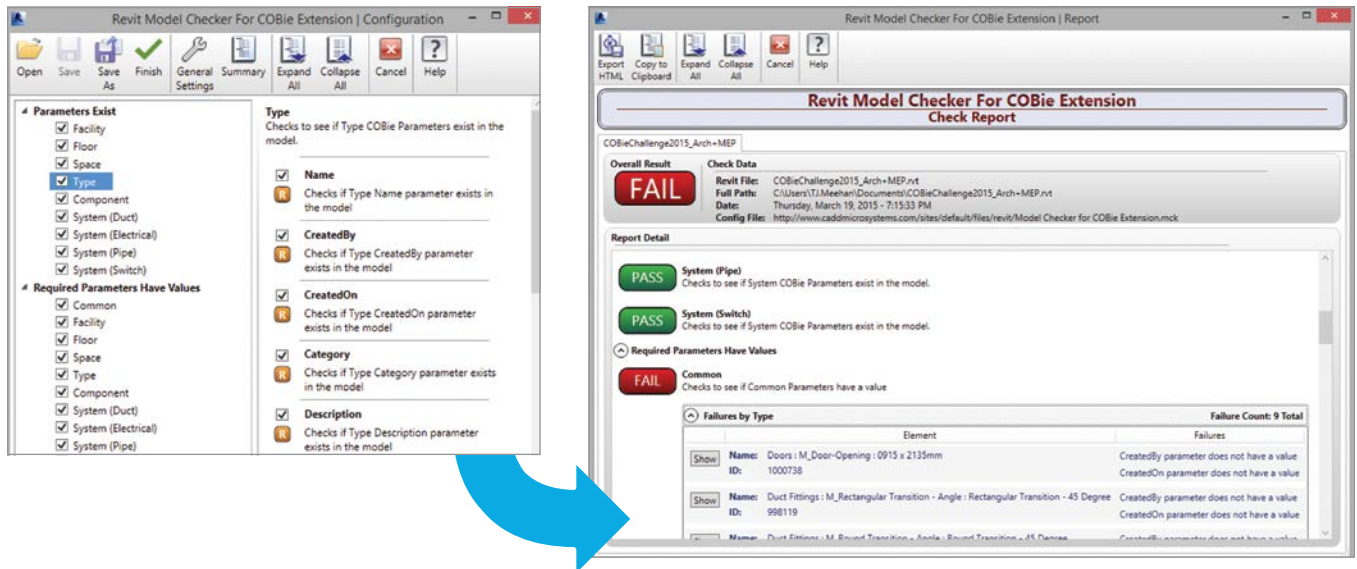


FIGURE 6. The Revit Model Checker for COBie can be used to check that a COBie spreadsheet exported from Revit will meet the UK’s requirements for COBie.

4 Autodesk BIM 360 Docs and the CDE

A successful implementation of the UK government strategy and BIM Level 2 mandate relies on a common data environment (CDE) to support a project's information delivery process. Both PAS 1192-2⁷ and BS 1192⁸ specify that project data exchange should be managed through the CDE.

4.1 What is a CDE?

A CDE is defined as a single source of information for any given project, used to collect, manage and disseminate all relevant approved project information for multidisciplinary teams in a managed process.

In particular, PAS 1192-2 Section 9.2 describes how a CDE should accommodate information from government BIM projects and enable multidisciplinary project teams to collaborate in a managed environment, where the build-up and development of information follows the design, manufacturing and construction sequence. A CDE may use a project server, an extranet, a file-based retrieval system or other suitable toolset, but should allow information to be shared efficiently and accurately between all members of an extended project team that may work across companies and geographic locations. Figure 7 (from PAS 1192-2) provides a visual summary of the CDE for a new capital expenditure (Capex) project.

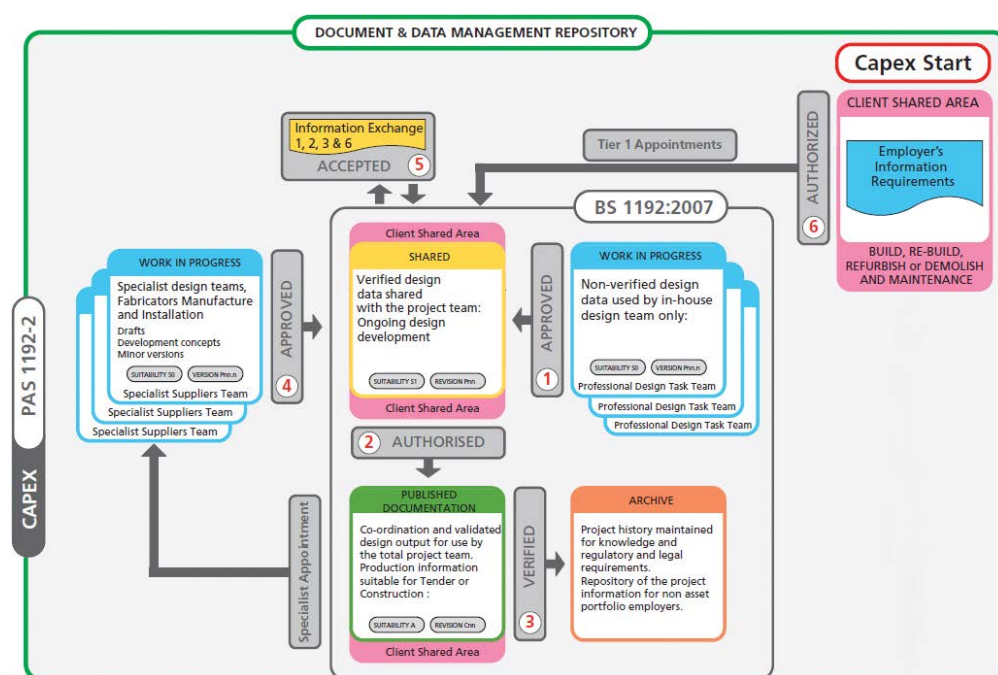


FIGURE 7. A CDE is used to collect, manage and disseminate all relevant approved project information for multidisciplinary teams in a managed process.

A CDE helps ensure that information is only generated once and is then reused as necessary by all members of the supply chain, and that information is constantly updated and enriched for final delivery to the government client and/or operator.

⁷ PAS 1192-2 is the UK's information management specification for the capital/delivery phase of construction projects using BIM.

⁸ BS 1192:2007 is the British standard and code of practice for the collaborative production of architectural, engineering and construction information.

Therefore, to accommodate collaborative BIM processes and projects, a CDE should include these four fundamental data management capabilities:

- 1 A shared project workspace for project team members from different disciplines, companies, and locations
- 2 Controlled access to the information stored in the CDE
- 3 A structured, configurable approval process to control the flow of project information
- 4 A process to track and manage activity related to the CDE's information and controls

4.2 BIM 360 Docs: a Common Data Environment for BIM Level 2

Autodesk BIM 360 Docs is a cloud-based platform solution that provides general document management as well as specialised functionality for 2D drawings, 3D models, and other project information, and is specifically tailored for the construction industry and BIM projects. BIM 360 Docs was designed to support the collaborative workflows described in BS 1192 and PAS 1192-2, and will help government clients meet the UK government's technical requirements for a CDE.

In addition, the security controls and features of BIM 360 Docs help UK government clients, suppliers, and asset operators who use the CDE comply with PAS 1192-5 and its 'need-to-know' approach to the sharing and publication of information about built assets. BIM 360 Docs includes authentication mechanisms that can be used to verify the identity of users, and a permission system that can be used to restrict access to sensitive data based on a user's role.

4.2.1 Shared Workspace

BIM 360 Docs allows organisations working together on a project to exchange information in an efficient and collaborative manner using a shared project workspace. This shared workspace can be configured to accommodate the four functional sections described in PAS 1192-2, clause 9.2.2—WIP (WORK IN PROGRESS), SHARED, PUBLISHED DOCUMENTATION, and ARCHIVE—that are associated with BIM Level 2 project approval gates and information states. These sections can have independent data structures, permissions, and approval workflows.

BIM 360 Docs can accommodate project files regardless of their formats or the vendor-specific software used to create them. This includes models, drawings and documentation, specifications, contracts, change orders, emails, schedules, videos, and photographs.

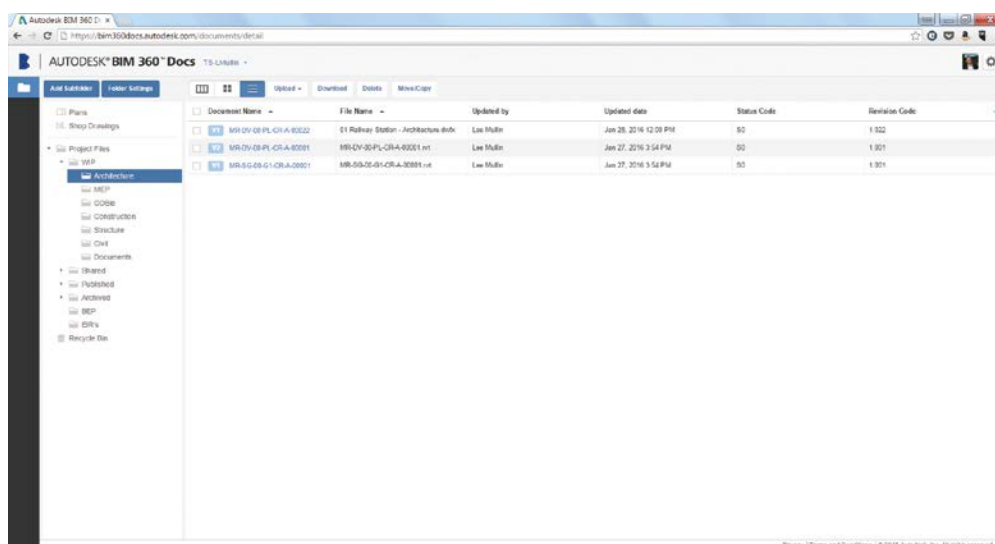


FIGURE 8. BIM 360 Docs provides a shared workspace for organisations to exchange project information in an efficient and collaborative manner. This workspace can be configured to accommodate the PAS 1192-2 four functional sections (WIP, SHARED, PUBLISHED, and ARCHIVE) that are associated with BIM Level 2 project approval gates and information states.

Once the work has been approved for sharing with other organisations as reference for their own design development, BIM 360 Docs provides controlled release of the pertinent data or documents to the 'SHARED' area. In a similar manner, project data will pass through gates and undergo sign-off procedures as it is moved into the CDE's 'PUBLISHED DOCUMENTATION' and 'ARCHIVE' sections.

BIM 360 Docs provides general document management functionality, as well as specialised features for management of project drawings and models.

BIM 360 Docs can be configured to provide storage structures and names based on the codes called out in BS 1192 and PAS 1192-2 for:

- project zones, assets, levels, and locations
- types of information
- the role of CDE users (A for 'Architect', B for 'Building Surveyor', and so on)
- file suitability (S1 for 'suitable for coordination', D1 for 'suitable for costing', and so on)

4.2.2 Controlled Access

Project teams using BIM 360 Docs can organise, distribute, and provide secure, cross-organisational, permission-based access to project data while capturing milestones and history. BIM 360 Docs provides full access control, at an individual level, and will provide a full audit trail of all CDE activities. In addition, approved team members can access project information in the CDE from a mobile device with internet access since BIM 360 Docs is a cloud-based data management, solution project information can also be viewed offline once synced.

Secure authentication and authorisation controls are especially important for offerings like BIM 360 Docs that are hosted in the cloud. BIM 360 Docs provides authentication mechanisms to verify the identity of users as well as a permission system to restrict access to resources based on roles.

Information may be managed using version control and full activity tracking. When changes are made to files, a complete version history of all changes is maintained.

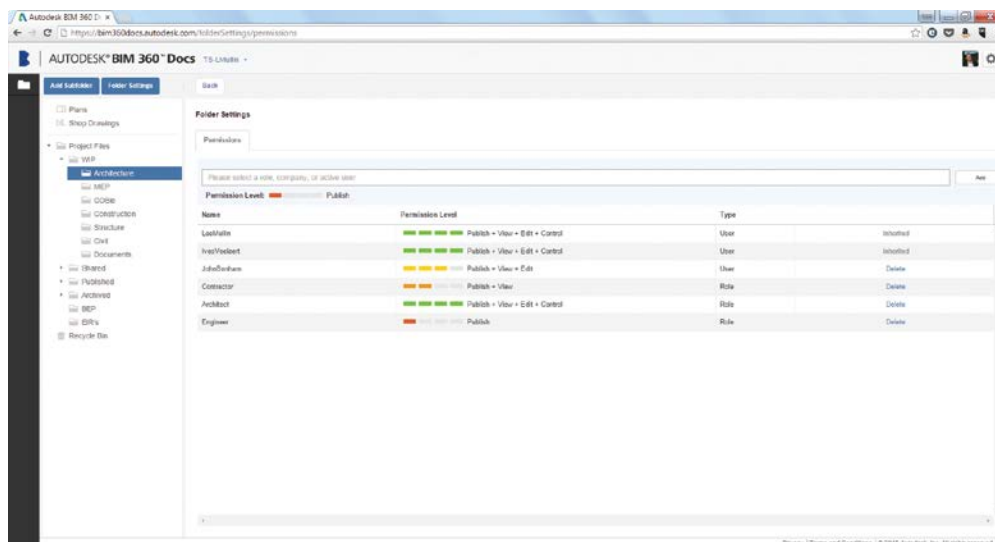


FIGURE 9. BIM 360 allows for controlled access to information in the Common Data Environment.

4.2.3 Configurable Approval Process

BIM 360 Docs has a built-in workflow engine that can be configured by government clients to manage the BIM Level 2 approval process for moving data through approval gates and functional areas (see Figure 7). Once configured, the BIM 360 Docs approval gates and sign-off procedures will allow project information to flow between the sections. It provides functionality for hosting 'work in progress' information as well as the controlled publication and sharing of approved project information.

The BIM 360 Docs approval process will ensure that only the appropriate approver is able to allow information to pass through the approval gate, as specified in PAS 1192-2, clause 9.2.2. With BIM 360 Docs, the government client or its representative(s) can be given the correct authority and approvals to access information in the functional sections of the CDE and promote data to the next functional level if the work passes the various checks required by the project.

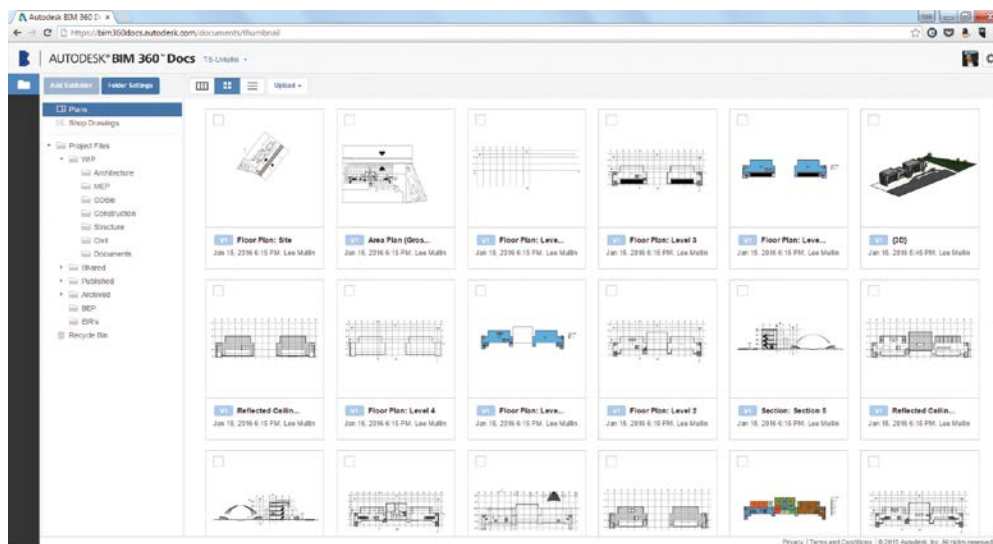


FIGURE 10. BIM 360 Docs will include a configurable approval process that will be aligned with the PAS 1192-2 suggested lifecycle stages and approval gates.

4.2.4 Activity Tracking

BIM 360 Docs will provide a full audit trail of all CDE activities including rollback capabilities to revert to previous versions when required. In addition, BIM 360 Docs provides authenticated access, data/time stamping, and version control.

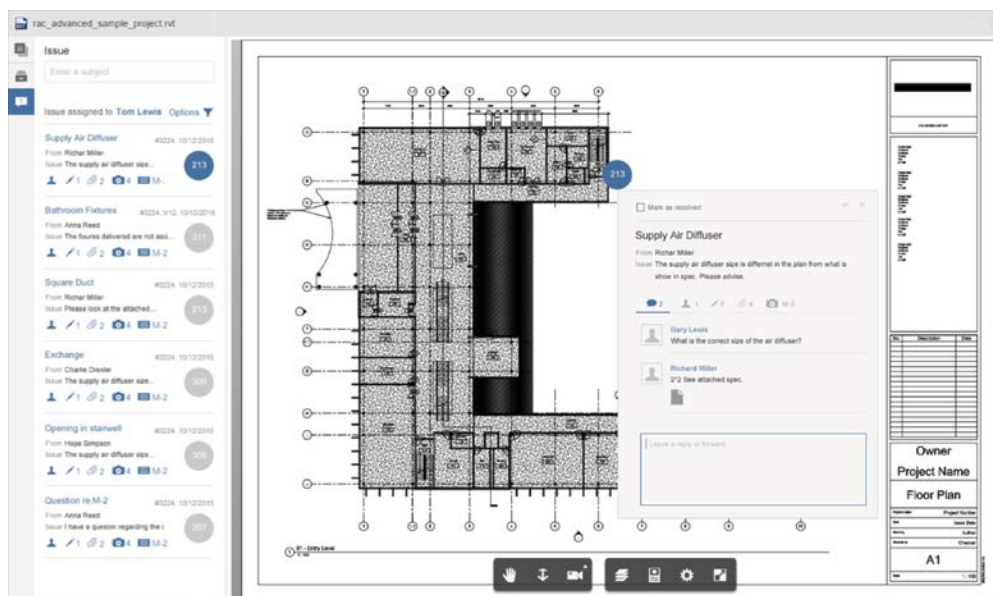
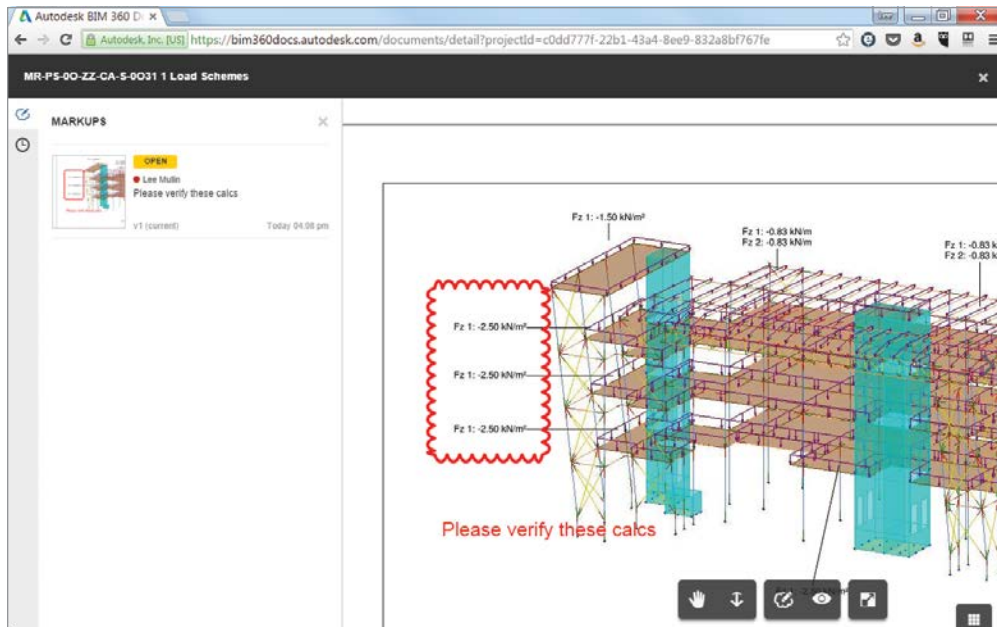


FIGURE 11. BIM 360 Docs will include activity and issue tracking capabilities.

FIGURE 12. BIM 360 Docs also includes issue markup capabilities.



4.3 Autodesk Security Policies for BIM 360 Docs

PAS 1192-5 requires suppliers and contractors to meet the same level of security standards as employers or asset owners. One of these requirements is to have security policies that detail methods for protecting sensitive data based on a risk assessment methodology.

The majority of PAS 1192-5 applies to asset owners and their supply chains, but also holds these parties responsible for ensuring their suppliers and contractors uphold the same level of security that applies to them. As a supplier of BIM software, Autodesk designed BIM 360 Docs to help government clients comply with the requirements of PAS 1192-5. Autodesk has internal security policies that it uses to regularly assess a wide range of technical and procedural controls within its development processes and products operations (including BIM 360 Docs) and complies with the requirements of information security standard ISO 27001:2013⁹. Autodesk security policies cover the following topics:

- Sensitive data management
- Autodesk staffing policies
- Autodesk personnel security training
- Autodesk personnel access control
- Autodesk incident response, disaster recovery, and breach notification
- Autodesk risk management process and schedules
- Autodesk disclosure policies in compliance with laws and regulations

Throughout the lifecycle of a project, BIM 360 Docs can be used as a pipeline for publishing data to third parties, such as governmental organisations, planning and environmental committees, and so on. Certain published data may contain sensitive information. Autodesk BIM authoring tools and BIM 360 Docs support mechanisms for redacting sensitive areas before publishing, as well as attaching metadata to request special arrangements for handling the data by the recipients.

⁹ Visit <http://www.bpmcpa.com/Certificate-Directory/002-121814-01.pdf> to view Autodesk's Certificate of Registration.

As a provider of cloud services (such as BIM 360 Docs), Autodesk undertakes a range of steps for risk mitigation in relation to cloud computing, including:

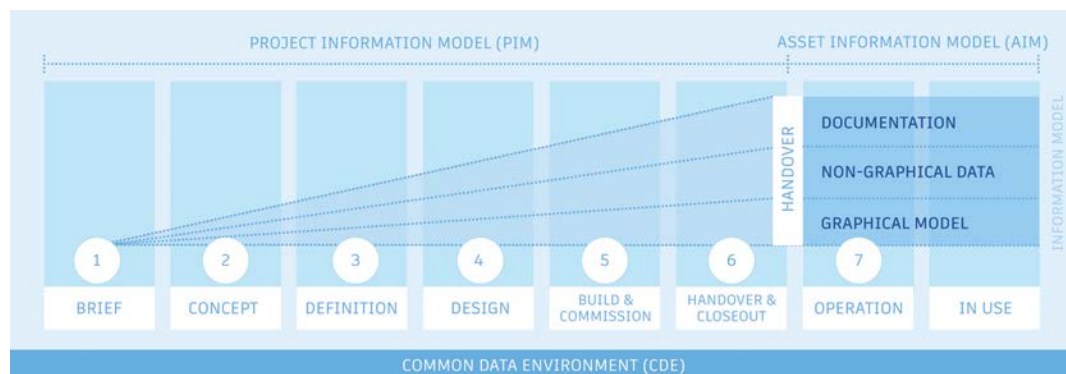
- Contractual agreements covering data location and cross-border data transfers, quality assurance principles, continuity assurance and recovery guarantees, compensation and service termination issues, and UK legal jurisdiction
- Clarification of security model(s), including restrictions on access to data hosted on common platforms
- Data encryption to ensure secure data at rest and in transit
- Separation of data, i.e. demonstrable separation of the asset information from other customer or asset data
- Assurance of quality of service levels, and compliance with privacy and security requirements

NOTE: In the past, Autodesk Vault has frequently been used for 'on-premise' collaboration and data management, supplemented by Autodesk Buzzsaw to accommodate users outside an organisation's firewall. These products can be used for an on-premise CDE. In addition, the technical and security advancements in cloud computing has made BIM 360 Docs a suitable data management solution and CDE for multidiscipline, extended project teams.

5 Get Started Today

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Compliance with Level 2 requires the construction industry to collaborate more efficiently as we use information technology to support the design, construction, operation, and maintenance of the government’s built assets. The use of collaborative 3D BIM processes will assist with a successful response to these mandates on all centrally funded public projects starting in April 2016.



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BIM 360 Docs was designed to support collaborative project information delivery and provide a single source of information for a project, across all phases. To learn more about BIM 360 Docs or to sign-up for a free account, visit bim360.com/docs. For more information about the BIM 360 portfolio of products, visit bim360.com.

For more information about how Autodesk software can be applied to the BIM Level 2 mandate, please contact your local Autodesk reseller or your Autodesk sales representative.

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