



# AEC (UK) BIM Standard for Bentley Building

*A workable implementation of the AEC (UK) BIM Standard for the Architectural, Engineering and Construction industry in the UK.*

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# AEC (UK) BIM Standard for Bentley Building

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# 1 Introduction

## 1.1 Background

The AEC (UK) CAD Standards Initiative was formed in 2000 to improve the process of design information production, management and exchange. Initially the initiative addressed CAD layering conventions as the primary concern for users of design data. As design needs and technology has developed, the initiative has expanded to cover other aspects of design data production and information exchange.

The committee was re-formed in 2009, including new members from companies and consultancies highly experienced in BIM software and implementation, to address the growing need within the UK AEC industry for a unified, practical & pragmatic BIM standard in a design environment.

The AEC (UK) BIM Standard was released in November 2009, and this document forms part of that body of work, as a Bentley-specific standard which conforms with the platform-generic BIM standard.

The AEC (UK) CAD Standard Basic Layer Code was released in 2001, with an Advanced Code released in 2002.

### *Copyright Notice:*

It is important to note that this standard 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.

## 1.2 The Committee

The group has representatives from architectural, engineering and construction companies in the UK, large and small, hence the adoption of the AEC (UK) moniker. The BIM committee is working together to realise a unified, usable, co-ordinated approach to Building Information Modelling in a design environment.

### Committee Members

Nigel Davies ( <i>Committee Chair</i> )	Evolve Consultancy
Chris Seymour-Smith ( <i>Bentley Sub-Group Chair</i> )	Nightingale Associates
Paul Woddy ( <i>Revit Sub-Group Chair</i> )	Digital Construction International
Andrew Coombes	Hampshire County Council
Chris Hobbs	CADline
Chris Senior	Revit Factory
David Light	HOK
Gavin Skidmore	Mott MacDonald
Ian John	BDP
Joe Stott	Aedas Architects
Michael Bartyzel	Buro Happold
Ray Purvis	Atkins Global
Robert Klaschka	Studio Klaschka
Scott Grant	Excitech
Stephen Holmes	Foster & Partners
Steve Wright	Ramboll UK

For full contact details and further information on the committee, please refer to [www.aec-uk.org](http://www.aec-uk.org).

## 1.3 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.

## 1.4 Scope

**This standard is intended to support all BIM work undertaken within a practice, or on a specific project, unless otherwise dictated by the client.**

The AEC (UK) BIM Standard for Bentley Building builds on procedures and methodologies from a broad consensus of experienced users from all disciplines, as well as consultants to BIM and Bentley Building products use, in addition to guidelines defined by world-wide standardisation initiatives, including BS1192:2007.

In particular, this standard expands upon the principles defined within the recently developed AEC (UK) BIM Standard 2009. The AEC (UK) BIM Standard is developed by a committee of key BIM experts who represent the leading consulting engineering and architectural organisations in the UK, to address industry best practice irrespective of software platform.

This Standard focuses primarily on adaptation of those standards for practical and efficient application of Bentley Architecture, Bentley Structural, Bentley Electrical and Mechanical Systems.

Terminology and reference to functionality is based around the Bentley Building platform.

The objectives are:

1. To maximise production efficiency through adopting a coordinated and consistent approach to working in BIM.
2. To define the standards, settings and best practices that ensure delivery of high quality and uniform drawing output across an entire project.
3. To ensure that digital BIM files are structured correctly to enable efficient data sharing whilst working in a collaborative environment across multi-disciplinary teams both internally and in external BIM environments.

**When working as a project team, communication is paramount. This Standard looks to ensure that all parties speak the same language.**

## 1.5 Update Procedure

Proposed changes and additions to this standard should be submitted in writing with accompanying examples, discussion, or other supportive material to the AEC (UK) committee. Feedback will be gathered and continuously reviewed; they will be collated to form new revisions at appropriate intervals.

It is expected that this standard will undergo a relatively rapid evolution process, as the industry adapts to the implications and advantages of BIM methodology.

## 1.6 References

This standard is written with reference to the following documents:

- BS1192:2007
- AEC (UK) BIM Standard for Autodesk Revit
- AEC (UK) BIM Standards 2009
- AEC (UK) CAD Standard for Layer Naming v3

## 1.7 Definitions

The following terms define the concepts of BIM and data structures used in this Standard.

<b>Project BIM Co-ordinator</b>	Responsible for setting and implementing Project BIM Execution Plan.
<b>BIM</b>	Building Information Modelling (BIM): Data beyond graphics. The creation and use of coordinated, internally consistent, computable information about a building project in design and construction.
<b>Component</b>	A component (typically a DataGroup item or a Compound Cell) is an individual element that can be reused in a number of situations. Examples include doors, stair cores, furniture, façade panels, columns, walls etc. Components are typically inserted and moved/rotated into required position.
<b>Assembly</b>	A collection of components and/or modelled elements arranged to define part or all of a building model. An assembly typically contains information that can be referenced without repositioning. In Bentley terms this would be a reference file of a complete floor.
<b>Container</b>	An optional repository which can be used to compile assemblies and components for specific purposes including export and publication. A container can exist for each individual

profession/discipline or for multiple disciplines, for buildings or for a complete project. This would be a file that contains no modelled elements, only references.

- WIP** Work In Progress (WIP): each individual company or discipline's own work. This information has not been approved or verified fit to share across the project team. Reference BS1192:2007.
- Shared** Information that has been checked and approved and is made available across the project team such as information for data exchange between BIM software, like gbXML, CIS/2 and IFC files. Reference BS1192:2007.
- Published** Published information refers to documents and other data generated from Shared information. Typically this will include contract drawings, reports and specifications. Reference BS1192:2007.
- Views/  
Output files** A generated rendition of graphical or non-graphical information (a plan, section, elevation, schedule, or other view of a project).

## 2 Best Practice

To achieve technical excellence and a successful outcome to a project, it is essential that BIM working and subsequent drawing production output is carefully planned. This must involve explicit attention to management, display and quality of the design data. Below are a number of best practice key principles that will aid efficient, high quality working.

### 2.1 BIM

- A Project BIM Co-ordinator shall be appointed for every project.
- A Project BIM Execution Plan shall be put in place that identifies key project tasks, outputs and model configuration.
- BIM Project Reviews should be agreed and take place regularly to ensure model integrity and project workflow is maintained.
- Develop clear guidelines for internal and external collaborative working which maintain the integrity of electronic data and the process of data sharing.
- Identify clear ownership of model elements through the life of the project.
- Understand and clearly document what is to be modelled and to what level of detail. Do not over model.
- Sub-divide models between disciplines, and within single disciplines to allow effective access to the data at all times. A typical reference file approach should be taken. Refer to Section 0.
- All changes to the model shall be carried out as 3D modifications, rather than 2D 'patches' to maintain the integrity of the model.

### 2.2 Drawing Production

- A drawing shall contain design information solely for the purpose of the intended use of the drawing.
- To maximise efficiency a policy of minimum detailing without compromising quality and integrity shall be adopted.
- Numbers of drawings should be kept to an absolute minimum and organised in a logical manner.
- Avoidance of view duplication is essential to ensure drawings maintain their integrity as the iterative design process progresses and amendments are made.

## 3 Project BIM Execution Plan

### 3.1 Project BIM Co-ordinator

The Project BIM Co-ordinator shall:

- Develop and implement a Project BIM Execution Plan which shall record key information on how BIM will be implemented and used on a project,
- Keep the Project BIM Execution Plan updated over the life of the project.
- Ensure all stakeholders (internal and external) are in alignment with the Project BIM Execution Plan,
- Facilitate / identify appropriate levels of staff training in order to comply with the Project BIM Execution Plan,
- Take a leading role in planning, setup and maintaining models.

### 3.2 Project BIM Execution Plan

A Project BIM Execution Plan pro-forma and a complementary Project BIM Guidance Note are available and shall be used to ensure consistency between projects. Larger and more complex projects may warrant additional clarification; the Execution Plan will expand accordingly.

The Project BIM Execution Plan shall address as a minimum the following key items:

- **Standards:** The BIM standard used in the project and any deviation from that standard
- **Software Platform:** Defines BIM software to be utilised and how interoperability issues will be addressed.
- **Stakeholders:** Identifies project leadership and additional stakeholders and their roles and responsibilities.
- **Project Deliverable:** Defines the project deliverable and the format in which it is delivered and exchanged.
- **Project Characteristics:** Number of buildings, size, location etc. Division of the work and schedule.
- **Shared Coordinates:** Defines the common coordinate system for all BIM data.
- **Data Segregation:** Addressing such issues as reference file organisation to enable multi-discipline, multi user access and project phasing as well as ownership of project BIM data.
- **Checking/Validation:** Defines the checking/validation process of drawings and BIM data.
- **Data Exchange:** Defines the communication protocols along with the frequency and form of data exchange.
- **Project Review Dates:** Sets out key dates for reviews of the 3D model which all teams buy in to (both internal to the company and externally with the full design team).

## 4 Collaborative BIM Data Sharing

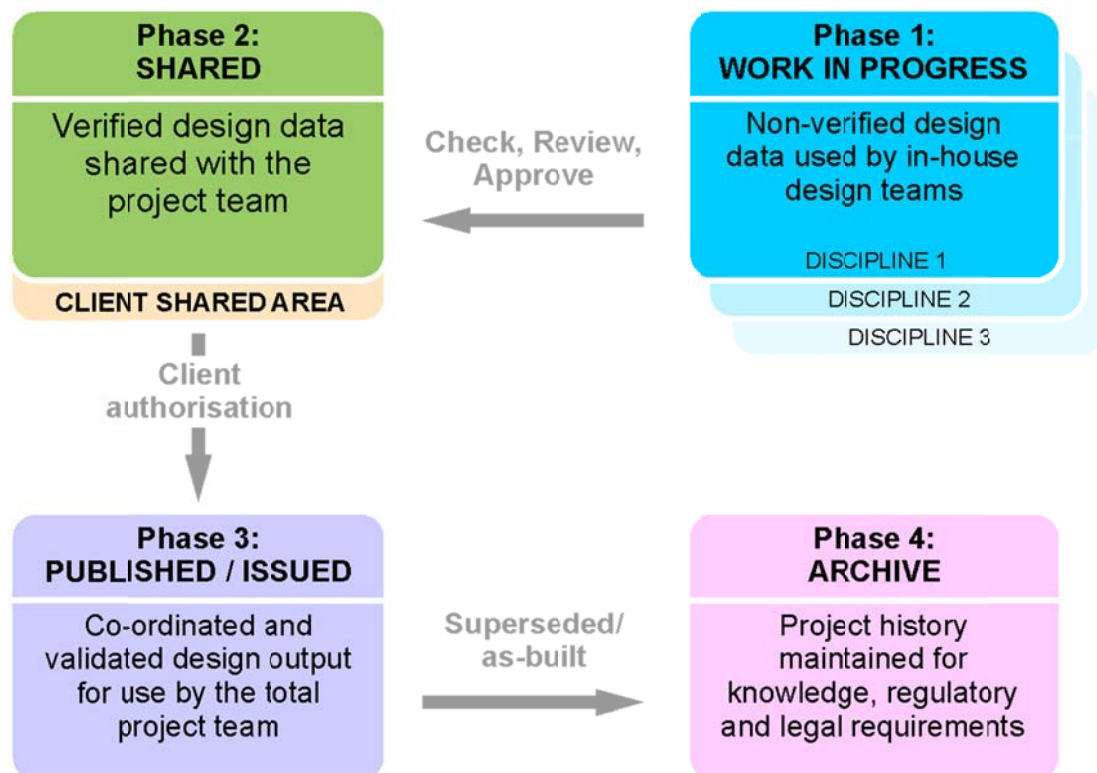
This Standard is aligned with **BS1192:2007 Collaborative Working**, which defines the process for project collaboration and efficient data sharing. A major constituent of collaborative environments is the ability to communicate, re-use and share data efficiently without loss or misinterpretation.

### 4.1 Common Data Environment (CDE)

A **Common Data Environment (CDE)** approach allows information to be shared between all members of the project team.

For full details of a Common Data Environment, refer to BS1192:2007 “**Process and the Common Data Environment**”.

There are four phases to **CDE** as illustrated below:



### 4.2 CDE Phase 1: Work In Progress (WIP)

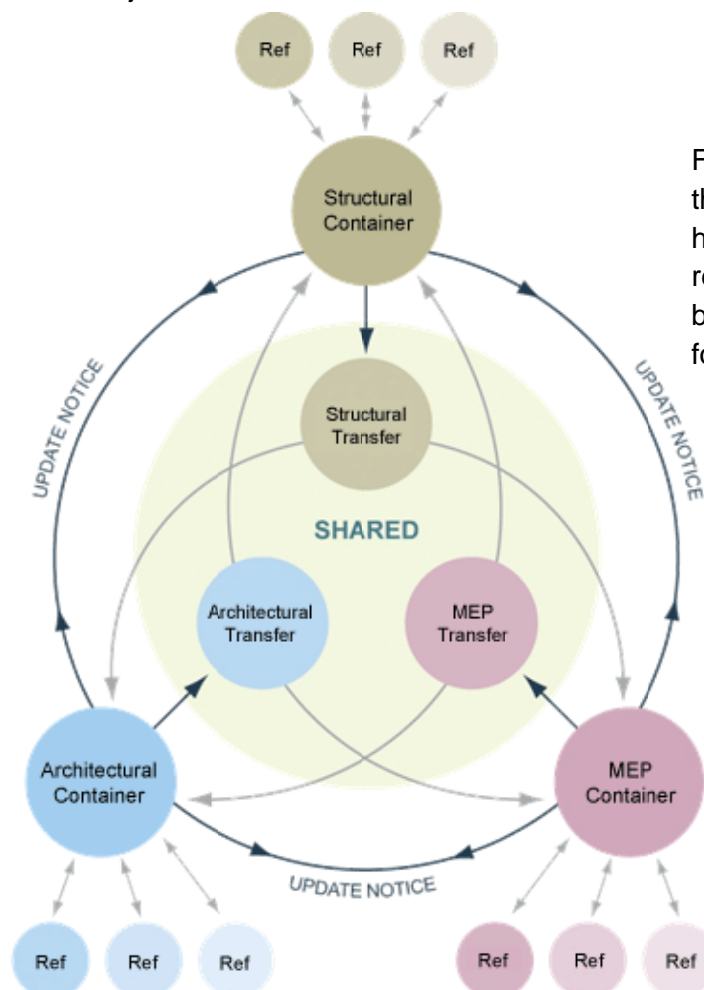
Data described as Work in Progress is that which is currently in production and has not yet been checked and verified for use outside of the authoring team.

- WIP model files shall be developed in isolation and contain information for which each stakeholder is responsible.
- These shall be stored in, and worked on from the team’s WIP section of the filing system.

## 4.3 CDE Phase 2: Shared

To facilitate co-ordinated, efficient working, each party shall make their design data available for project-wide formal access through a shared repository or exchange protocol. These files shall be accessible by all from a central location, or replicated in the **Shared Area** of the project folder structure of each party. Prior to sharing, the data shall be checked, approved and validated as ‘fit for co-ordination’ in line with the BS1197 workflow.

- Only BIM files validated ‘fit for co-ordination’ shall be transferred to the Shared Area (see section 4.6 for validation process).
- Sharing of models shall be carried out on a regular basis in order that other disciplines are working to latest validated information as defined in the Project BIM Execution Plan.
- Model files shall be issued in conjunction with verified 2D document submissions to minimise the risk of errors in communication.
- The Shared Area shall also act as the repository for formally issued data provided by external organisations that is to be shared across the project.
- Changes to the shared data shall be effectively communicated to the team through drawing issue, change register or other suitable notice, such as e-mail, as defined in the Project BIM Execution Plan.



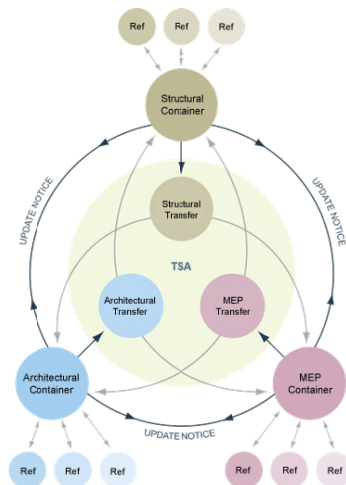
For indicative purposes, the Shared area is shown here as a single shaded region. This may, in truth be synchronised locations for each stakeholder.

### 4.3.1 Inter-Discipline Access to WIP

On occasion, project time-frames do not accommodate the delays associated with the checking and verification of information originating from another discipline or company. Such workflows are non-compliant with the BS1192 workflow, and as such, are not recommended. Where necessary however, protocols which provide access to other party’s WIP models may be applicable through either ‘Direct Access’ (*real-time*) or a ‘Temporary Shared Area’ (TSA) (*near real-time*).

- Both of these methods carry risk as they involve the use of non-verified data as the basis for design decisions.
- The BIM Co-ordinator, in liaison with the design team, shall decide whether to permit access to the WIP models, and if so whether to utilise *real-time* or *near real-time* data sharing.

#### Access via the “TSA”



#### Medium Risk

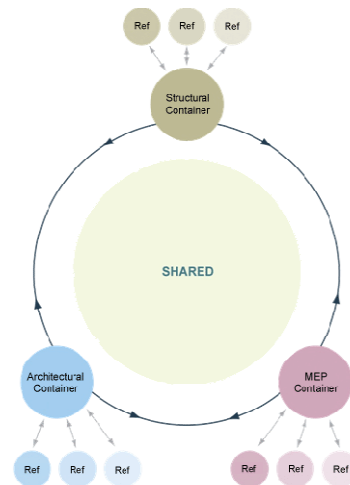
Data is transferred at pre-defined intervals into a repository for linking by other teams.

Allows for an amount of un-official communication of model changes avoids use of rapidly changing data

Internal / external use

The temporary shared area will reside in **WIP** under **WIP\_TSA** repository (see section 8.2 - Project Folder Structure).

#### “Direct Access” via the WIP



#### High Risk

Referenced data is live and subject to fluid design change, without notice or delay.

Used when the time available to a design team is too restrictive to wait for validated information to emerge.

Appropriate only for internal use in multi-disciplined design and engineering practices

This method requires that permissions be granted such that other disciplines can access the WIP.

#### Warning!

Access to model data held within the WIP will contain un-validated data. It will be subject to rapid change and should be used with caution. Neither of these methods are a replacement for the verified sharing of data defined in section 4.3

## 4.4 CDE Phase 3: Publication and Document Issue

2D PDF drawings, reports and schedules shall be stored in the **Published Area** of the folder structure once formally checked, approved and authorised in accordance with corporate quality procedures.

- It is recommended that Model Files should be issued exactly as produced with no additional merging (binding), or editing. All necessary References should also be issued.
- A Model File Issue (or any CAD format) should be issued only when it is a requirement to be able to manipulate or reference the CAD data in whole or in part.
- Revision/Issue control shall follow the Document Control systems established for the project.
- A record of all issued deliverables shall be maintained in softcopy and hardcopy where appropriate.
- Information within a BIM is inter-dependent and changes in one view may affect other views. As such the BIM files and all associated views shall be treated as **Work In Progress** or shared as un-controlled documents until such time as they leave the BIM environment in a non-editable format.
- Only those drawings which it has been deemed necessary to revise will be re-issued following modification work.

**Note:**

At this stage of the industry's adoption of BIM, contract deliverable will, in general, be a 2D drawing. Issuing of editable CAD or BIM data to external organisations shall be issued with a disclaimer '**ISSUED FOR INFORMATION ONLY**'. No liability is implied for such data and how it is subsequently utilised.

## 4.5 CDE Phase 4: Archiving

- Archiving of all output data from the BIM shall be stored in the Archive section of the project folder, including published, superseded and 'As Built' drawings and data.
- Additionally, at key stages of the design process, a complete version of the BIM data and associated drawing deliverables shall be copied into an archive location.
- Archived data shall reside in logical folder repositories that clearly identify the archive status *e.g. 2011-03-17 Stage D Design*.

## 4.6 Validation

Sheets from the BIM shall be published to PDF (preferred) or other non-editable format, where they can be checked, approved, issued and archived as traditional documents according to existing company procedures.

Validation of the BIM data prior to sharing shall check that:

- All drawing sheets and extraneous views and elements shall be removed from the BIM;
- Model file has been compressed;
- File format and naming conventions conform to project Data Exchange protocols,
- Data segregation conforms to the agreed project BIM methodology,
- Model files are up-to-date, containing all users' modifications,
- Any unnecessary reference files have been removed and any other associated data required to load the model file is made available,
- Model is correctly assembled through visual inspection,
- Any changes since the last issue are communicated to the project team.

## 4.7 Data Security & Saving

- All BIM project data shall reside on network servers which are subject to regular back-ups.
- Staff access to BIM project data held on the network servers shall be through controlled access permissions.

## 4.8 Project Issue Logging and Resolution System

Coordination discrepancies discovered during the collaboration review process shall be logged and managed. These issues shall be communicated to the relevant parties in a report which provides the following as a minimum:

- Specific location of any clash, including 2D and 3D images where possible
- File names of the elements in question, and element IDs where relevant
- A detailed description of the problem
- Details of the date/revision/origin of the reference information being cross-referenced
- Suggested solutions or actions to be taken, by whom and by what date
- Author of the issue and the distribution list for information or resolution
- Confirmation that the resolution has been tested in the model
- Issue status – pending response / overdue / unsuitable response / closed

Items with an unsuitable response shall be re-logged as a new issue to avoid confusion over whether the issue has been resolved. The original issue shall then refer to a new issue number.

Outstanding issues shall be discussed at the project co-ordination meetings. This process may be aided by using Navigator on larger projects to keep the 3D information manageable.

## 4.9 Reviewing BIM Data

Untrained users shall not open Bentley Building models directly. Instead, the model shall be reviewed using the freely available Bentley View or, where interrogation and analysis of the model is needed, Bentley Navigator.

# 5 Interoperability

## 5.1 Introduction

Interoperability between software products is of paramount importance for successful BIM working. Whether it is output to 2D CAD for subsequent drawing production or output for 3D visualisation or analysis, the preparation and methods adopted to compose the BIM will ultimately determine its successful application within other software packages and technologies.

## 5.2 Incoming CAD/BIM Data Management

- All incoming CAD/BIM data shall be logged in accordance with the project's data management procedures.
- A copy of incoming CAD/BIM data shall be stored in its original format within the project Incoming sub-folder.
- The project BIM Co-ordinator shall verify the suitability of incoming data prior to making available project-wide through the project Shared area.
- Modifications of incoming CAD/BIM data shall be kept to the absolute minimum and only be carried out where the received data format prevents design progress. Modifications shall only be carried out with the approval of the project BIM Co-ordinator.
- Data shall be cleansed prior to importing or referencing to the BIM model to remove any irrelevant or extraneous data which may destabilise the BIM model.
- CAD data may need be shifted to within the Solids Working Area prior to import – see section 7.4.
- Details of the changes made in cleansing a file shall be fully documented in the Project BIM Execution Plan.
- Unless data is used in its as issued state, ownership of this cleansed data is transferred from the originator to the cleansing discipline. Cleansed data is stored within the discipline's **WIP** area unless deemed appropriate to share project-wide, in which case it is stored in the Shared area.
- Responsibility for ensuring that cleansed data is current lies with the party making the modifications.

## 5.3 Fit For Purpose Modelling

BIM data shall be prepared 'fit for purpose', taking into account the requirements of any recipient software applications, to ensure that error free, reliable data is exchanged (e.g. link to analysis packages or interface with GIS).

**Example:**

When modelling structural frames, some analysis software may dictate that columns need to be stopped at each floor level regardless of whether, in reality they continue as a single length.

## 5.4 Data Transfer between Packages

Prior to data transfer between packages, the following tasks shall be carried out:

- Requirements and limitations of the target software/hardware system shall be understood in order that BIM data can be prepared appropriately for exchange.
- 2D output from the BIM shall be constructed in a manner that is usable to the team, reasonably complies with project CAD Standards, and allows easy manipulation of the data held within the file, e.g. layering.
- Data exchange protocol between different software/hardware systems shall be verified through sample testing to ensure data integrity is maintained.
- The appropriate export layer tables shall be used during export to CAD

## 6 Data Segregation

### 6.1 General Principles

A BIM model should not be thought of as a single file containing all the project data. Instead, maximum use should be made of Bentley's referencing capabilities to enable collaborative working in a BIM environment, including working practices and team management as well as the technological solutions covered by the remit of this document.

This section deals with the principles of subdividing a model for the purposes of:

- multi-user access,
- operational efficiency on large projects,
- inter-disciplinary collaboration.

The terminology refers primarily to the Bentley subjects of, referred to herein as "model sub-division". The following practices shall be followed:

- The methods adopted for data segregation shall take into account, and be agreed by, all stakeholders involved in the modelling.
- In line with the model development methodology described in section 0, models shall initially be created as isolated, single-user files. The model will be sub-divided as it becomes larger or additional members of the design team are introduced.
- No more than one building shall be modelled in a single file.
- A model file shall contain data from one discipline / project stakeholder only (although exceptions may apply for Building Services where multiple disciplines converge).
- In order to avoid duplication or co-ordination errors, clear definition of the data ownership throughout the life of the project shall be defined and documented. Element ownership may transfer during the project time-line – this shall be explicitly identified in the Project BIM Execution Plan.
- Where multiple models make up a single project, a container model should be considered, whose function is to link the various assemblies together for coordination/clash detection purposes.

Example of Data Segregation:

Discipline	Breaks in Design
Architecture	Floor by floor or groups of floors
Structure	Major geometry splits such as east-wing or west-wing
Mechanical	Construction joints such as podium and tower
Electrical	Work packages and phases of work
Civil	Document sets
	Work allocation such as site, roadways or drainage

For an example architectural DGN reference file structure, refer to Data Segregation, page 11 of the generic AEC (UK) BIM Standard document.

## 6.2 Division

- Reference division shall be carried out in a logical manner that allows for other members of the design team to collaborate and/or assist with the model development without recourse to complicated introductions to the project methodology.
- A project shall be broken into a sufficient number of references to avoid congestion in workflow. This also provides the means for adequate control over the efficiency of the model.
- The BIM Co-ordinator shall define how the model is split into references, such as described in the above table.
- The BIM Co-ordinator shall manage the access permissions and reference ownership across disciplines.
- References shall be named following the conventions defined in section 8.4.
- Task allocation shall be considered when dividing the model so as to minimise the need for users to switch between models.
- How and when the model is split shall be defined in the Project BIM Execution Plan.

### 6.2.1 Reference access & ownership

References should be treated as read-only information for the purposes of iterative design. In no circumstances should elements be modified from another discipline's reference. In cases where information needs to be revised, two methods can be used: a design change request to the owner of the reference or by taking ownership of the elements:

- Users reference the information from the required file.
- The required elements are copied through into the active file and the Level remapped to identify new ownership.
- When first referencing the models together, '**World Coordinates**' shall be used as the orientation.
- When splitting a file into sub-models the information should be split out using the Copy/Move Fence Contents to New File tool. The Processing Mode should be set to Move.

## 6.2.2 Inter-Disciplinary Model Referencing

Each separate discipline whether internal or external, involved in a project shall have its own BIM model, composed of multiple references, and is responsible for the contents of that model. A discipline can reference in another discipline's models for coordination purposes.

- Coordinate systems and Project North rotation shall be agreed and documented at the outset. No deviation from these shall occur without permission of the BIM Co-ordinator. Refer to section 7.4 for full details.
- Details of any discipline-specific requirements, such as the difference between Finished Floor Level (FFL) and Structural Slab Level (SSL), shall be fully documented in the Project BIM Execution Plan.
- A single Floor Manager dgnlib should be defined and shared between each discipline to ensure conformance of levels.

Floor Manager is used to set the working planes of the building in the Z axis.

A project is divided into Buildings or Zones and Floor Manager should be set up to reflect the same demarcation with the same coding designation used for the naming of Buildings as used in the file naming.

Within a building , the primary floor levels should be set up as Structural Slab Level (SSL).

Floors will be named according to the AEC (UK) naming conventions.

i.e.

B2	Basement Level 2
B1	Basement Level 1
00	Ground Floor
01	First Floor
02	Second Floor
etc...	

Between each primary floor Reference Planes may be set up as required to meet the design needs of the building. These may include, but are not exclusive to, the following:

Finish Floor Level (FFL)

Net Usable Level (NUL)

Suspended Ceiling Level (SCL)

Under Structural Slab (USL)

Name	Relative Elev	Elevation	Rotation
Building01			
RF	19000.00	19000.00	0.00°
04	15500.00	15500.00	0.00°
03	12000.00	12000.00	0.00°
02	8500.00	8500.00	0.00°
01	4500.00	4500.00	0.00°
01-SCL	3700.00	8200.00	0.00°
01-FFL	250.00	4750.00	0.00°
00	0.00	0.00	0.00°
B1	-3500.00	-3500.00	0.00°
B2	-7000.00	-7000.00	0.00°
Building02			
Building03			

- Ownership of elements shall be properly communicated and tracked through the project time-line (e.g. floors may be created by the Architectural team, but are then adopted by the Structural team to form part of the load-bearing structure).
- Each discipline shall be conscious that referenced data has been produced from the perspective of the author and may not be modelled to the required specification for other purposes. In this case all relevant parties, with input from the BIM Manager(s), shall convene to discuss the potential re-allocation of ownership.
- Should a team develop a 'starter model' for a partner discipline, such as defining the structural model in conjunction with the architecture, this shall be done in a separate model which shall then be referenced as required.
- This starter model may be passed to the partner discipline who shall then assume ownership of it. The partner discipline shall open this starter model and reference, by World Coordinates, the originator's model.
- With models produced for Building Services, several disciplines may be collated in a single model, as a single piece of equipment may require connection to various services. In this scenario, the model may be split in various ways. The BIM Co-ordinator shall be consulted in defining the project-specific strategy. In all instances the contents must be clearly identified through the model name.

# 7 Modelling Methodology

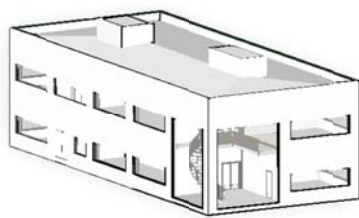
This section defines the methodologies for BIM working that enables efficient use and re-use of BIM data.

## 7.1 Model Development Methodology

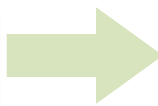
An AEC (UK) Dataset and DataGroup catalogs are being created to facilitate a Model Development Methodology. This Dataset will assist to develop projects in early stages as it enables rapid model development and allows for very large models to be created with low hardware requirements.

- The templates provide only one example of each element, such as 'Doors'. These concept (Grade 1 - see *section 7.2*) elements shall be used to form categorised place-holders in the model.
- As the design develops, and precise materials and components are chosen, these concept objects shall be swapped, individually or en-masse, for more specific Grade 2 or Grade 3 variants.
- For structural analytical components, simple columns and framing members which are representative of steel or concrete elements shall be provided in the sections files.

The frame shall be constructed from these placeholders. If the section size is known from an early stage it can be chosen from the libraries, but no assumptions shall be made by opting for the default section.



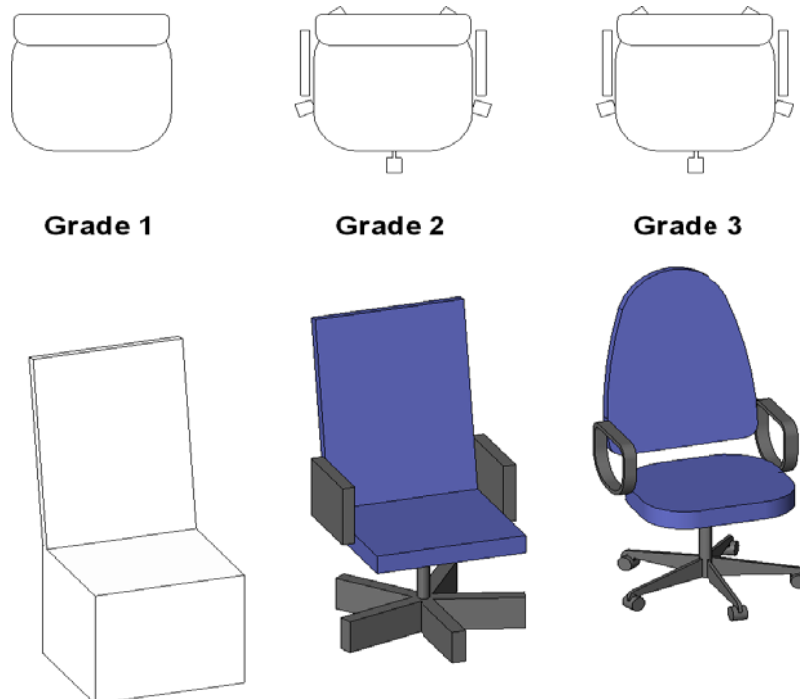
Model initially created using concept grade components.



Concept components substituted for Grade 2 or 3 components as design progresses.

## 7.2 Graded Component Creation

In line with the Model Development Methodology, all components created, or otherwise obtained shall be graded, named and stored accordingly in the project or central folder structure. Elements shall be graded as follows:



### Component Grade 1 – Concept

- Simple place-holder with absolute minimum level detail to be identifiable, e.g. as any type of chair.
- Superficial dimensional representation.
- Generic in terms of manufacturer information and technical data.
- Created from consistent material: either ‘Concept–White’ or ‘Concept–Glazing’.

### Component Grade 2 – Defined

- Contains all relevant meta-data and technical information, and is sufficiently modelled to identify type of chair and component materials.
- Typically contains level of 2D detail suitable for the “Preferred” scale.
- Sufficient for most projects.

### Component Grade 3 – Rendered

- Identical to the Grade 2 version if scheduled or interrogated by annotation. Differs only in 3D representation.
- Used only when a 3D view at a sufficient scale deems the detail necessary due to the object’s proximity to the camera.

### Important!

When in doubt, users should opt for less 3D geometry, rather than more, as the efficiency of the BIM is largely defined by the performance of the components contained within.

Adherence to the above grading and Model Development Methodology may result in multiple versions of the same element existing at different grades. This is accommodated in the object naming conventions defined in Section 8.6.

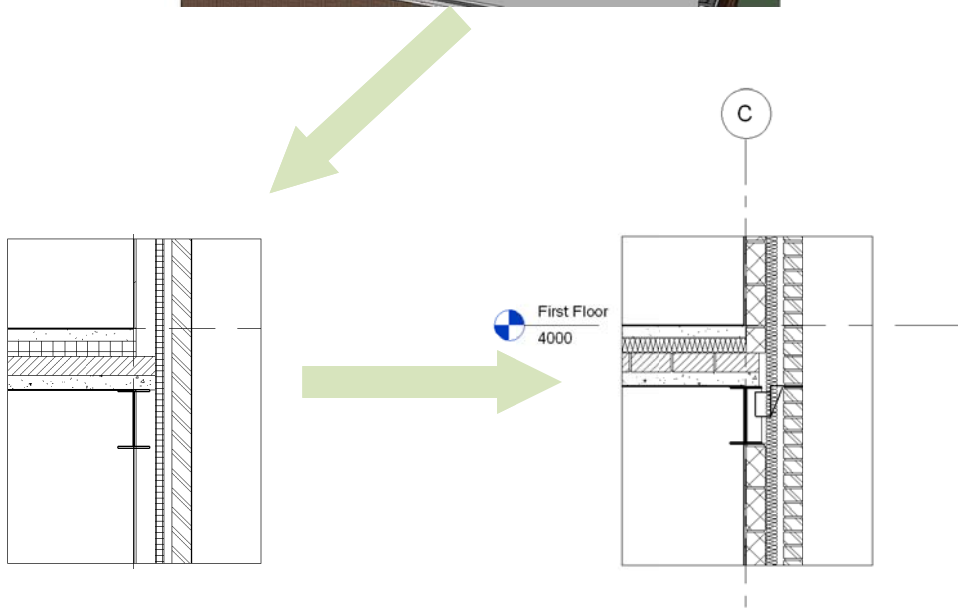
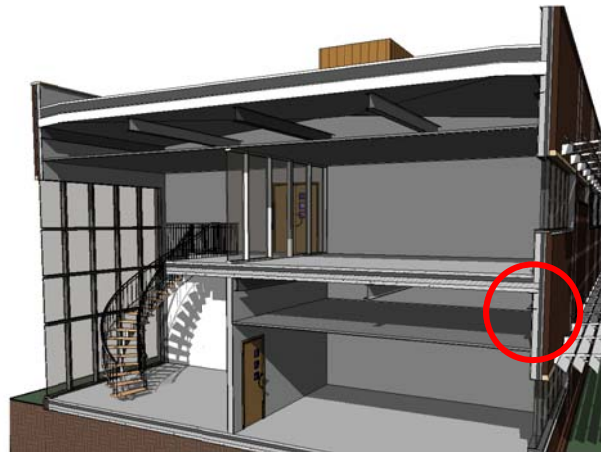
- Further purposes of the BIM will lead to additional specifications of the content, which should be built to suit the purposes of the deliverables.
- In addition to the grading, a component may make use of Coarse, Medium and Fine levels of detail to control graphical representation.
- Objects generated in the development of a project will be stored in the WIP area of the project folder structure.
- The BIM Co-ordinator will assess and verify minimum quality compliance before submitting new objects to the corporate library stored in the central resource folder.
- The intended purpose of the components shall be considered and the results checked and verified prior to large scale use. For instance, structural analysis applications may require elements with certain naming conventions or other criteria, without which they will not be recognised. Different applications may have different requirements.
- A corporate or project-shared DataGroup is encouraged in order to maintain consistency of variable naming during content creation. (Refer to Section 10.5)
- Cells should be placed as Normal Cells with their Instance Data. The use of Shared Cells should be avoided as Instance Data cannot be attached to a Shared Cell therefore the object cannot be scheduled and metadata such as Specification Code cannot be applied to the object.

### 7.2.1 Model / Draughting Detail

At the outset of the project, consideration shall be given to the maximum level of detail to be included in the BIM. Too little and the information will not be fit for purpose; too much and the model may become unmanageable and inefficient.

- The BIM Co-ordinator shall dictate the point at which 3D geometry ceases and 2D detailing is utilised to prepare the published output.
- Intelligent 2D linework shall be developed to accompany the geometry and enhance the required views without undue strain on the hardware. 2D linework is not exclusive to detailed/fabrication information.
- Detailing and enhancement techniques shall be used whenever possible to reduce model complexity, but without compromising the integrity of the model.

3D modelling is carried out to a maximum accuracy of approximately 1:50.



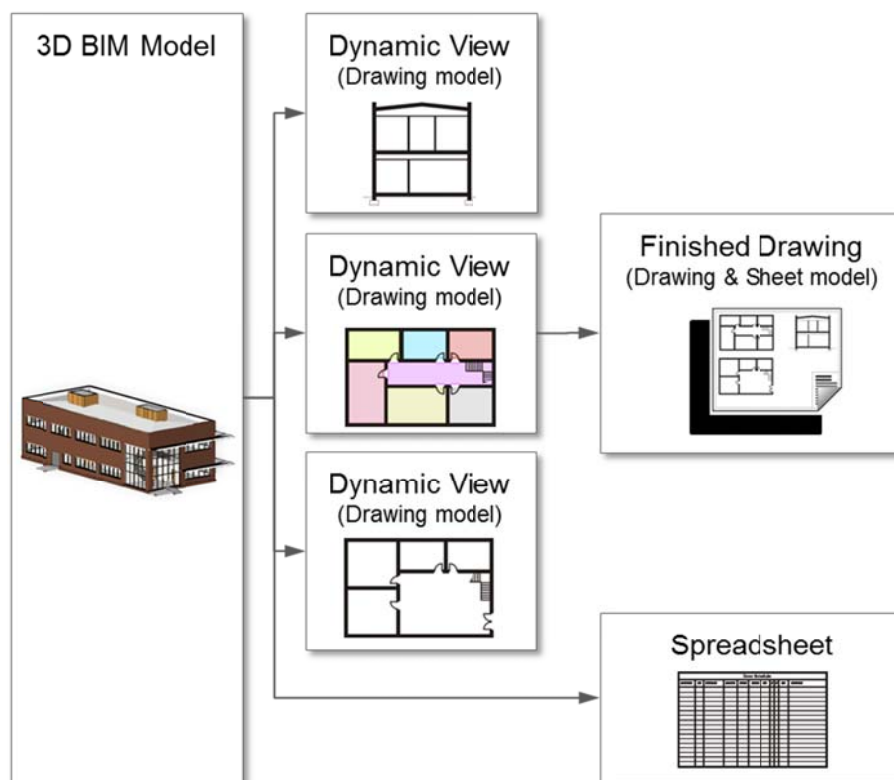
2D information produced directly from views within the model.

The View / Drawing model is referenced into a 2D design file.

Detail information, hatching, custom linestyles, clip/mask boundaries, Tags, Keynotes, text and dimensions are used to enhance the finished image.

## 7.3 Drawing Compilation

Drawing compilation and preparation for publication should be carried out using fully assembled compilations of views and sheets within the BIM environment (preferred) using Dynamic Views.



1. The model is compiled from its various references as a single container, specifically created for creating Views.
2. Dynamic Views are created for each plan, section and elevation in the container. These should be used to create an individual DGN files using the file creation tools available in Bentley Building products. These should comprise a single Drawing Model with a single View referenced in, for control of reference and level display, as well as the addition of manual annotation as required.
3. The Drawing Model should not be referenced directly to a Sheet, but instead referenced into the “Modelspace” of the Finished Drawing at 1:1. The “Modelspace” should be a Drawing Model to allow additional annotation as required.
4. The “Modelspace” is then referenced into the Sheet Model at a reduced scale to fit onto the sheet, and clipped using a non-plotting shape.

Notes:

- Exporting views in order to ‘finish off’ in CAD negates the advantages of the BIM data for coordination purposes and should be avoided where possible.
- The BIM Co-ordinator shall decide if the team composition or other factors dictate that the BIM methodology is not appropriate.
- When CAD or BIM data is Linked into a project, the design teams shall ensure that the latest validated / checked design information is accessed directly from the Project Shared area when composing sheets.

### 7.3.1 Sheet composition direct from within the BIM

Sheet composition from within a BIM environment shall be established through the creation and referencing of callouts, saved views and sheets fully within Bentley Building software but utilising reference files wherever possible.

Care shall be taken to ensure that any reference data is available and visible prior to the publication of documentation from the BIM.

### 7.3.2 Sheet composition from Views/Output files

Output files are created from the BIM using Drawing Extraction Manager or by exporting saved views to merged files. MicroStation can then be used for further non-dynamic editing and sheet compilation. When this method is used, a plain border should be used which clearly indicates the following:

- The data is provided for information purposes only
- Details of the origin of the data
- The date of production or issue

Where output files are exported from the BIM for further 2D detailing in MicroStation, originators shall ensure that changes occurring within the BIM are correctly reflected and updated within the CAD files used to produce the final drawing.

If it is a requirement to export data from Bentley Building in ‘Real-World’ co-ordinates, then the export operation must be performed from the Drawing Model (such as a floor-plan) and not from a compiled Sheet file.

**Warning:**

The integrity of exported views/output files from within a BIM environment must be checked for accuracy and content prior to drawing compilation.

## 7.4 Spatial Location & Co-ordination

As defined in **BS1192:2007**, BIM projects shall:

- Use real world co-ordinate systems:

- Be produced to true height above project datum.
- Adopt the established Project Shared Coordinate system across all BIM data files to allow them to be referenced without modification.

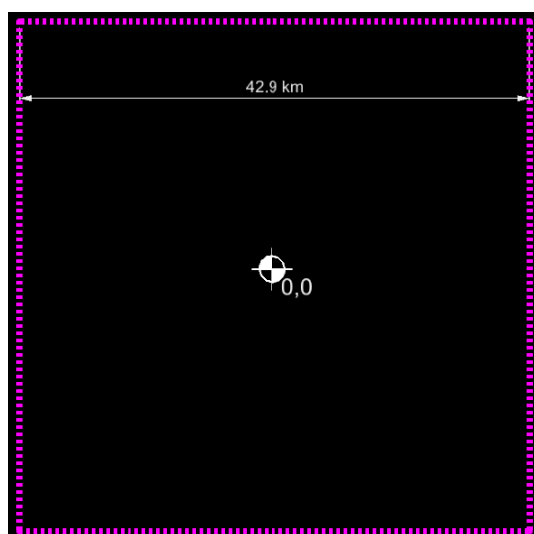
BIM data modelled more than 21.45km from the origin (in any plane) shall be shifted to 0,0,0 prior to importing or referencing into Bentley Building products to avoid accuracy issues. This shift shall be agreed, consistent and identified in the Project BIM Execution Plan.

**Note:**

Some software (e.g. certain structural analysis software) requires data to be located at 0,0. For export to such software, alternative coordinate systems shall be established within the BIM data.

#### 7.4.1 Setting the coordinate system

When starting any BIM project, it is critical that the information falls within a certain area of the DGN file. The “Solids Working Area” is approximately 42.9km around 0,0.



If the project is drawn to Real World Coordinates, it will, more than likely, fall outside of the SWA. This can cause errors when copying information, it may be noticeable to a very small degree that measurement is inaccurate, but Drawing Extractions and Views may be inconsistent.

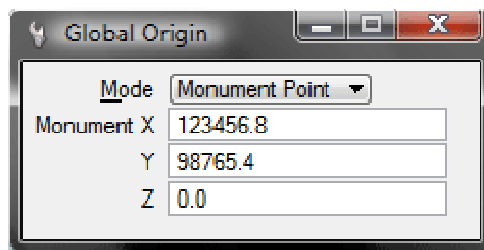
So that you have accurate elements and your information is set out to the survey, we recommend you follow the instructions below to set up the correct location and coordinate systems for your project:

1. Identify a known location for your project. This may be a grid intersection, a site setting out point, a survey station, or a physical object such as the corner or a building.

2. Ascertain the OS coordinates for this point, or the local grid if the project is not in the UK.
3. You need to reassign the 0,0 point in your seed file to these coordinates.
4. Keyin "GO=" (or "active origin") to reposition the file's "Global Origin".

The Global Origin is exactly in the centre of the Solids Working Area. By default this is labelled 0,0. All we are effectively doing is changing the label (the X and Y coordinates) of that point.

5. In your Tool Settings window, make sure Mode is set to Monument. Enter the X, Y and Z co-ordinates of your setting out point.



6. Your status bar prompt will now read:  
Global Origin > Identify the monument at x,y,z in the design.
7. Snap onto the setting out point and click to accept. The Global Origin will be repositioned to suit this setting out point.
8. Save settings.

Your project will now be accurate and also set out to the correct site coordinates.

The project will now be physically located at the centre of the DGN file. Other files will still be in the old location, which means the information may not line up when referenced. You either need to reposition the information in every file (which may not be practical) or tell MicroStation to use the coordinates to align your references.

When attaching a survey file you will need to make sure that you use Coincident World method to align the global origins.

This can be set up to always attach references Coincident World by default using the configuration variable:

```
MS_REF_DEFAULTSETTINGS > attachMethod=world
```

Use > in case you have other values for MS\_REF\_DEFAULTSETTINGS defined elsewhere.

## 7.5 Units and Measurement

- Models shall use consistent units and measurement across the project. **Master units** and **sub units** shall be millimetres with two decimal places in order to display accuracy when using the measure tools.



Master unit: millimetres  
Sub unit: millimetres  
Accuracy: 0.12  
Resolution: 100 per Distance millimetre

- Dimension styles in the associated datasets utilise different accuracy settings, so whilst the temporary dimension might read **3000.00** (*design file settings*), the permanent dimension will read **3000** (*dimension style in design file*).
- Switching between imperial / metric units shall be avoided where possible in order to maintain proper or conventional measurements, such as 50mm rather than 50.8mm.
- CAD data should always be attached at True Scale when referencing into the BIM environment.

# 8 Folder Structure and Naming Conventions

## 8.1 Introduction

This section defines storage of BIM data within the project filing system along with the naming conventions associated with aspects of BIM working.

## 8.2 Project Folder Structure










The defined structure follows the principles of **BS1192:2007's** 'Work In Progress (WIP)', 'Shared', 'Published' and 'Archived' segregation of data within a designated set of folders (see section **Error! Reference source not found. Error! Reference source not found.**).

Where a project comprises of a number of separate elements such as multiple buildings, zones or areas, the BIM structure shall be maintained within a set of designated sub-folders representing the various project elements or using clearly defined file naming where multiple folders are not desirable.

All project data (with the exception of a user's Local copy of a Central file) shall be held within the standard project folder structure located on central network servers or appropriate Document Management technology. This includes all WIP components or assemblies.

### 8.2.1 Central Resource Folder Structure

Standard seeds, titleblocks, datagroup catalogs and other non-project-specific data shall be held within the server based Central Resource Library, with restricted access.

-  <SERVER NAME>\Resources\Bentley\V8i
  -  Workspace
    -  BuildingDatasets
      - +  *Bentley Dataset*
      - +  *Company Dataset* [Refer to Section 8.2.4]
    - +  Interfaces
    - +  Projects
    - +  Standards
    - +  Users




























To configure this correctly, point `_USTN_WORKSPACEROOT` to this location.

### 8.2.2 Local Project Folder Structure

Not used in Bentley Building projects.

### 8.2.3 Project Folder Structure

The following folder structure is provided as an example arrangement, designed to encourage compliancy with the strategies contained within this standard.

-  <b>[Project Folder]</b>	
-  BIM	[BIM data repository]
-  <b>01-WIP</b>	<b>[WIP data repository]</b>
-  CAD_Data	[CAD files (incl. 'Modified')]
-  BIM_Models	[Design models (incl. 'Modified')]
-  Sheet_Files	[Sheet/dgn files]
-  Export	[Export data e.g. gbXML or images]
-  WIP_TSA	[WIP Temporary Shared Area (TSA)]
-  <b>02-Shared</b>	<b>[Verified Shared data]</b>
-  CAD_Data	[CAD data/output files]
-  BIM_Models	[Design models]
-  Coord_Models	[Compilation models]
-  <b>03-Published</b>	<b>[Published Data]</b>
+  YYMMDD_Description	[Sample submission folder]
+  YYMMDD_Description	[Sample submission folder]
-  <b>04-Archived</b>	<b>[Archived Data repository]</b>
+  YYMMDD_Description	[Archive folder]
+  YYMMDD_Description	[Archive folder]
-  <b>05-Incoming</b>	<b>[Incoming Data repository]</b>
-  Source	[Data originator]
+  YYMMDD_Description	[Incoming folder]
+  Source	[Data originator]
-  <b>06-Resource</b>	<b>[Project support files]</b>
+  Titleblocks	[Drawing borders/titleblocks]
+  Logos	[Project logos]
+  Standards	[Project standards]
-  ProjectDataset	[Bentley Building Designer (BD) datasets created during this project (See 8.2.4)]

No spaces are to be used in the folder naming as this can potentially interfere with certain file management tools and collaboration across the internet.

## 8.2.4 Component Library Sub-Folders

All locations for the storage of the company- or project-specific dataset items shall be sub-divided as follows:

-  **Company Dataset**
  -  Architectural [Architectural BD components]
  -  Electrical [Electrical BD components]
  -  Mechanical [Mechanical BD components]
  -  Structural [Structural BD components]

The individual disciplines shall then be broken down as follows, with new sub-folders added as required by additional functionality in the software.























To add company-specific data to the configurations of Bentley BuildingDesigner, create a `COMPANY_DATASET` variable to point to this location. You will need to prepend or append the standard configurations such as `BB_LEVEL_DGNLIBLIST`, `DG_CATALOGS_PATH` or `TFDIR_PART` to include this dataset.

`PROJ_DATASET` can be used to include project-specific items.

Refer to Bentley documentation for full details on configurations.

### 8.2.4.1 Architecture Components


Only use the folders that will contain custom data. Do not leave empty folders in your Component Library.

-  **Architectural**
  - +  Cell
  - +  Comp [Components for quantification]
  - +  CPart [Compound Part definitions]
  - +  Data [section tables & configurations]
  - +  DatagroupCatalogs
  - +  DataGroupLayouts [Template spreadsheets for reports]
  - +  DataGroupSystem
  - +  Dgnlib
  -  Frame
    - +  Casework
    - +  Doors
    - +  Shelving
    - +  StairComponents
    - +  Windows
  -  Guide [Grid .bxg files]
  -  Keynote
  -  Macro [MBE content]
  -  Materials [Rendering materials & dgnlibs]
  -  Part
  -  Rules [Resymbolisation rules]
  -  Seed

-  Setting
-  Text [Specification templates]
-  VBA [Visual Basic content]

#### 8.2.4.2 MEP Components

As Architectural, with the additions:

-  **Electrical**
- +  Metadata [Non-graphical definitions]
- +  symLibs [.bmp & .cel for diagrams]

#### 8.2.4.3 Structural Components

As Architectural.

#### 8.2.4.4 Non Discipline-Specific Components

Not required for Bentley Building.

### 8.3 General Naming Conventions

- Use only letters A-Z, hyphen, underscore and numbers 0-9 for all fields.
- All fields shall be separated by a hyphen character “-” Do NOT use spaces.
- Within a field, either CamelCase or an underscore “\_” shall be used instead of a space to separate words.
- A single period character “.” shall be used to separate the file name from the extension. This character should not be used anywhere else in the file name.
- The file extension shall not be amended or deleted.
- An “XX” shall be used if the file does not refer a single specific zone or level.
- The scheme for zone and level sub-division shall be agreed with the other project professionals at the outset and defined in the Project BIM Execution Plan.
- For example codes for discipline, zone and level see Appendix 11.1
- Where custom files are created for configuration of Bentley Building products, they shall adopt the naming convention of existing elements and prefix with a 3-character abbreviation to identify corporate author.

Examples:

Existing name	Custom name
Standards.cfg	ABC_Standards.cfg
Sheetsizes.def	ABC_Sheetsizes.def
bb_annotation.cel	ABC_bb_annotation.cel

## 8.4 Model File Naming

Naming of model files shall be based on BS1192:2007. For full compliance, recommended character restrictions should be adopted:



Field 1: **Project** (*Recommended 3 characters*)

An abbreviated code or number identifying the project.

Field 2: **Originator Code** (*Recommended 3 characters*)

An abbreviated code identifying the originating stakeholder.

Field 3: **Zone/System** (*Recommended 2 characters*)

Identifier of which building, area, phase or zone of the project the model file relates to if the project is sub-divided by zones).

Field 4: **Level** (*Recommended 2 characters*)

Identifier of which level, or group of levels, the model file relates to if the project is sub-divided by levels.

Field 5: **Type** (*Recommended 2 characters*)

Document type, which will be **M3** for 3D model files.

Field 6: **Role** (*Recommended 2 characters*)

2 character discipline identifier code. Refer to the generic AEC (UK) BIM Standards.

Field 7: **Description**

Descriptive field to define the type of data portrayed in the file. Avoid repeating information codified in other fields. Can be used to describe any part of the previous fields, or to further clarify any other aspect of the contained data.

Examples:

Model File Name	Description
<b>1234-ABC-A-ZZ-M3-E-CON.dgn</b>	Job No. 1234, ABC architect's Container model of Building A.
<b>GHQ-QRS-XX-03-M3-S-Steel.dgn</b>	QR Structures 3rd floor Steel model for General Head Quarters project – no zones.
<b>999-ABS-Z1-15-M3-M-HVAC.dgn</b>	Acme Building Services HVAC model for job 999, Zone 1, 15th floor.

## 8.5 Workset Naming

Not required for Bentley Building projects.

## 8.6 Library Object Naming

Library object naming provides a unified approach to the identification of objects across the dataset and associated tools.

Each field should be separated by a hyphen character “-“. Hyphens should not be used anywhere else in the object name.



### Field 1: **Role** (*Optional*)

Identifies the owner of the object. Normally this would be omitted as objects are generic; ownership is inferred by file/layer containing the object.

### Field 2: **Classification**

Uniclass code to classify the object. This is positioned at the start of the name to allow easier listing of all specific object types. e.g. all furniture regardless of manufacturer.

### Field 3: **Description**

CamelCase description based on Uniclass/AEC descriptions e.g. ExternalFinishCladdingConcrete.

### Field 4: **Originator/Manufacturer** (*Optional*)

Used if a proprietary object is required to represent specific manufacturer.

### Field 5: **Size / Originator item code** (*Optional*)

Used to further define the object type by specifying dimensions or the manufacturer's item code. The latter can be used to help link objects directly to a specification, brochure or procurement.

### Field 6: **Type**

This field uses a code to describe the intended “view” of the object. Basic codes to use are:

M3	3D model
E	2D elevation
P	2D plan
R	2D reflected ceiling
S	2D section

### Field 7: **Grade / Level of detail**

Specifies the intended graphical scale and how much detail is contained in the object (e.g. 1:100, 1:20).

- G0 Symbolic (not representative of the physical object)  
This might be used for electrical symbols or an object which is modelled the same regardless of scale
- G1 Low resolution conceptual placeholder (e.g. 1:500, 1:200)
- G2 Medium resolution detailed component for design/construction (e.g. 1:100, 1:50 max)
- G3 High resolution, fully detailed object. Typically only used for visualisation.

Examples:

Object File Name	Description
<b>G25-WallBrick-102.5-M3-G2</b>	Brick wall, 102.5mm wide, 3-dimensional, grade suitable for up to 1:50 models (e.g. no brick bond defined or wall ties)
<b>G322-DoorInternal-M3-G1</b>	Generic internal door, not specifically sized, 3-dimensional, grade for schematic modelling purposes of ~1:200.
<b>G322-DoorInternal-826-P-G2</b>	Internal door of 826mm wide, intended for plan use at up to 1:50 scale.
<b>G322-DoorInternal-Primdor-63990-838x1981x35-M3-G3</b>	Internal door made by Primdor, model reference 63990 (838 x 1981 x 35mm), 3-dimensional, fully detailed with ironmongery.
<b>S-G2613-B01-Westok-1160x267x134CUB-M3-G2</b>	Structural owned steel beam, described as a "B01" (structural engineering naming for a beam type 1), made by Westok, with a section size of 1160 x 267 x 134 CUB, 3-dimensional, grade suitable for 1:50 models.
<b>E-G6432-PowerOutlet-P-G0</b>	Electrical symbol representing a plug socket, intended for plan use.

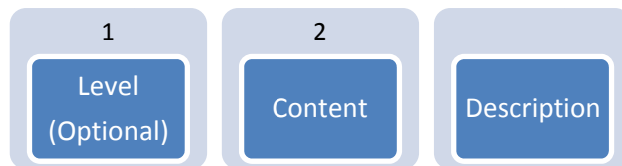
## 8.7 Parameter Naming

To be confirmed in next release.

## 8.8 View Naming

Conventions in the naming and use of views are necessary to coordinate team activity and prevent inadvertent changes in the output documents.

- View naming shall be consistent across all references to that view. Renaming of views shall be carried out with care as any changes will update any use of that saved view in a reference file.



Field 1: **Level** (*Optional*)

Concise description of the content and purpose of the view. This is based on the AEC (UK) standards and should follow the example codes below.

Field 2: **Content**

Where appropriate, further clarification of the location of information shown

Field 3: **Description**

Not included as part of the view name, the description field should always be completed to assist in clarification of the view's purpose.

Examples:

Name	Description
<b>01-Plan</b>	First floor plan
<b>01-RCP</b>	First floor reflected ceiling plan
<b>03-DetailPlanElevator1</b>	Third floor detail plan at elevator 1
<b>AA</b>	Section A-A along gridline 4
<b>BB</b>	Section B-B along gridline 7
<b>NS-Section</b>	North-South full building section
<b>EdgeSection</b>	Typical edge section showing slab, beam and wall
<b>S-Elevation</b>	South Elevation

- Creation of temporary working views is encouraged. The filtering described in Section 8.10 will ensure these remain in the top 'views' section of the Project Explorer.

### 8.8.1 Special Views

Additional views, such as axonometric or specific camera views, may be set up as using the same conventions as standard Saved Views.

Examples:

Name	Description
<b>AA-Axonometric</b>	Axonometric section A-A
<b>NW-Perspective</b>	North-West perspective

### 8.8.2 Callout Views

Detail views, including views which are used only as a container for a linked MicroStation detail, are named with the same general conventions as other views.

However, where the view refers to a fabrication detail of a common component, it may be pertinent to adopt a naming convention which refers to the Uniclass code associated with that element.

Examples:

Name	
<b>A810</b>	<b>Waterproofing System</b>
<b>A820</b>	<b>Exterior Concrete</b>
<b>A910</b>	<b>Interior Partitions</b>
<b>A915</b>	<b>Interior Firestop-Penetration</b>

## 8.9 View List Scheduling

Not used in Bentley Building Designer.

## 8.10 Project Explorer Organisation

The Project Explorer in MicroStation provides an organisational structure to the views and files within the BIM environment. The following rules should be adopted to help organise, identify and share the BIM model effectively:

- Design files should contain only one Design Model. Multiple models can lead to confusion and are not able to be worked on by more than one person at a time.
- Drawing files should be kept in a separate folder, away from the production information. That way manual changes to the data can be avoided, maintaining the efficiency of the Dynamic View / Hypermodel concepts.
- Drawing files should contain only one Drawing Model.
- If Drawing Models are created manually, the model name should be identical to the view that it will contain.
- All Sheet files should be kept in a separate folder.
- All Sheet files should contain only one Sheet Model, representing the single drawing that will be printed from that file.
- All Sheet Models must be named to match the drawing number it contains. There should never be models named "Sheet" or "Untitled Sheet". Refer to 8.11 below.

## 8.11 Sheet Model Naming

Sheet models shall be named based on the Document and Drawing Numbering protocols established for the project. These names must match the text as it appears in the title block and any schedules.

# 9 Presentation Styles

## 9.1 Introduction

This section defines the criteria which ensure the plotted appearance of drawing output from the BIM is consistent and of the highest quality. These criteria are embedded within the associated discipline-specific template files which accompany this document.

**Note:**

It is not the remit of this standard to dictate aspects covered by existing national draughting standards, and covers only those aspects which are important in delivering high quality, consistent drawing output from within a Bentley BIM environment.

### 9.1.1 Monochrome & colour drawings

Black & White drawings will always be produced using MicroStation's Level Overrides. These should be set to colour 0, white, and turned on in the Sheet where monochrome output is required.

Colour areas should be displayed by turning the override off for that level.

## 9.2 Templates (seed files, dgnlibs and datasets)

Two discipline-specific Bentley project templates will be made available as part of this Standard. They can be obtained from the [www.aec-uk.org](http://www.aec-uk.org) web site and are maintained by the AEC (UK) BIM committee.

Additionally, a generic UK dataset, Dataset\_GB, is provided by Bentley as part of the Bentley Building Designer product. These datasets provide an alternative basis for new parts and datagroups, consistent with BS1192, Uniclass and the content of this standard.

Where client requirements deviate from those expressed in this standard, project-specific templates shall be created. These shall be stored within the Project BIM Resource standards folder.

## 9.3 Annotation

Text style shall be **ARIAL NARROW** using font file **ARIAL NARROW.TTF**

- The Height and Width of text should be equal.
- The appearance of text shall be consistent across a set of drawings.
- Annotation shall be legible, clear and concise.
- An opaque background should be considered as an aid to clarity.

- Text shall remain legible when drawings are plotted at reduced size. Wherever practical lettering shall not be placed directly on top of lines or symbols.
- Text Styles shall be defined once only for the required final plotted annotation height. Annotation Scale should be used to scale the style to the required text height

**Note:**

Parametric annotations shall be used wherever possible (e.g. KEYNOTES, FIELDS, etc.) For example, using the SPACE tools instead of adding text, allows room data to be scheduled to give area plans, finish schedules etc.

## 9.4 Text Assignment

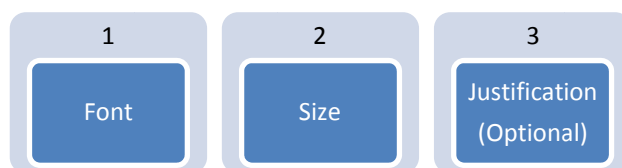
All text shall be restricted to the following sizes:

Text height (mm) Plotted full size	Usage
1.8	General text, dimensions & notes – used on A3 & A4 size drawings
2.5	General text, dimensions & notes
3.5	Sub-headings; general text, dimensions, notes – A0 drawings
5.0	Normal titles, drawing numbers
7.0	Major titles

Alternative text sizes shall not be used without the consent of the BIM Co-ordinator.

Where annotation is placed in 2D or 3D Design Models or Drawing Models, Annotation Scale should be applied.

Text Styles should be named using:



Examples:

Arial 1.8mm Left Top

Arial 2.5mm

Arial 2.5mm Center Center

## 9.5 Line Weights

Line weights control the graphical display of on-screen data as well as all published output. Line weights should not be assigned to 3-dimensional model elements.

There are 32 model line weights. Each can be given a plotted thickness across the range of drawing scales as defined in appendix 11.8 by using .pltcfg files.

- The plotted appearance of modelled components shall be consistent across the project.
- Line weights are assigned project-wide ByLevel and can be overridden by view or per sheet. Overriding should be kept to a minimum to aid consistency.
- The plotted appearance of modelled components shall be represented in a manner that provides 'depth' to the drawing and allows for adequate differentiation of elements cut in section, profile view and priority elements.

## 9.6 Line Patterns

Not used in Bentley Building products.

## 9.7 Line Styles

Linestyles will be defined in the associated dataset's dgnlibs as a company or project default. Typically only standard MicroStation styles 0 – 7 should be used for BIM models. Any additional custom linestyles shall be created by the BIM Co-ordinator and named according to the naming conventions described in Section 8.3.

## 9.8 Hatching and Filled Regions

- Fill Patterns shall be used only with the approval of the Project BIM Co-ordinator.
- Hatching/patterning shall be created using the relevant tools available within the software.
- Where possible, patterns and fill should be created using the relevant Part definition, rather than created as 2D hatching/patterning.
- Care shall be taken to ensure that the priority and transparency settings of filled shapes are appropriate to the situation so as not to cover required graphical information.

## 9.9 View and Drawing Model Seeds

The associated datasets will have a number of pre-defined view and drawing model seeds. Where these are not suitable:

- Project-specific view templates shall be created to maintain consistency across published output.
- Adjustments to the settings of the view seeds and drawing models shall be carried out only with the agreement of the BIM Co-ordinator.
- Where critical to the consistent appearance of output, Saved Views created prior to view seed modifications must have view attributes re-applied or be recreated completely in order to display changes.

## 9.10 Dimensioning

Default dimension styles will be provided in the accompanying datasets and new styles shall be added only if authorised by the BIM Co-ordinator.

- Where practical, all dimensioning shall be created using relevant software dimensioning tools. The dimension text shall not be exploded or overridden, but can be appended to e.g. “\* (Typ.)”.
- Where practical avoid duplicate dimensioning either within a drawing or within a set of drawings.
- Where practical, dimension lines shall not be broken and shall not cross other dimension lines.
- In general, dimensions shall be placed on a drawing so they may be read from the bottom or right-hand side of the drawing.
- In general, dimension text shall be placed above the dimension line and shall be clear of other lines so that they are legible.
- In general, dimension styles shall adopt standard engineering style dimensioning using:
  - Closed filled 3:1 arrow head for unconfirmed dimensions
  - 45° diagonal slash for confirmed dimensions
- Dimension units shall be predefined within the style.
- Default dimension styles shall not be overridden.

### 9.10.1 Dimension Style Naming Convention:

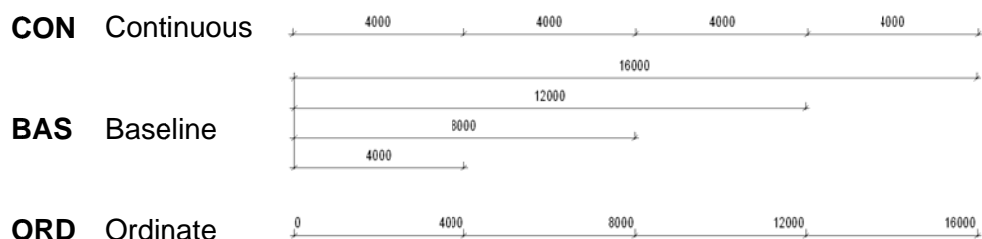


**Field 1: Text Size**

Size of text used on the dimension in the appropriate units. By default this shall be 2.5mm Arial Narrow.

**Field 2: String Type (Optional)**

Dimension String Type



**Field 3: Tick Mark**

Description of the tick mark used on the dimension style such as Dot, Arrow or Diagonal tick marks.

**Field 4: (Units)**

The reporting units of the dimension style.

**Field 5: Description (Optional)**

Provision for distinguishing specific dimension styles

Examples:

1.8-Con-Arrow-(mm)

2.5-Con-Diagonal-(mm)-Centreline

2.5-Arrow-(deg)

## 9.11 Drawing Borders and Title Blocks

- Corporate borders are available from the 'Border' folder of the central Workspace.
- Title blocks are available from the 'Cells' folder of the central Workspace.
- Alternative client-specific versions may also be available from the same location.
- Project-specific borders and title blocks shall be created and stored in the Project Resource folder.

## 9.12 Symbology

Standard symbols such as north point, section marks and call-ups will be available from within the discipline-specific dgnlibs and shall be used by default. See Appendix 11.3 for standard drawing navigation symbols.

### 9.12.1 Section and Detail Marks

Section and Detail marks shall be accessed from within the Detailing Symbol Styles dgnlib of Bentley Building's default dataset, the company Workspace or the project resources.

- Section and Detail marks used shall be as defined in appendix 11.3.
- All **Sections** shall be numerically labelled.
- All **Details** shall be alphabetically labelled.
- Where practical, sections shall be listed consecutively, from left to right and from top to bottom on the drawing on which they are drawn.
- All sections and details shall be correctly cross-referenced in both directions i.e. cross reference to where the section/detail is actually drawn. Drawing cross referencing shall not include the revision code.

## 9.13 Copyright

All drawings, sketches or figures containing copyright information shall display the relevant permission to use that data.

For example with Ordnance Survey mapping:

Maps reproduced by permission of Ordnance Survey on behalf of Her Majesty's Stationary Office © Crown copyright and database right 2009. All rights reserved. Ordnance Survey Licence Number 123456789

# 10 Resources

## 10.1 Introduction

To increase efficiency of BIM working, and to ensure a consistent and high quality output, resources and content shall be shared across the practice.

Certain projects may require deviations from this standard: these shall be defined in the Project BIM Execution Plan.

## 10.2 Software

- A consistent software platform will aid the collaboration potential of BIM projects and is recommended. Interoperability between applications should be checked and verified at the outset of the project.
- Where 3rd party applications are used, originators shall ensure the standards defined within this document are complied with, unless situations make this impractical.
- Any potential implementation of software upgrade during the course of a live project shall be reviewed for its appropriateness by the BIM Co-ordinator who shall raise recommendations for upgrade through the relevant senior manager for approval.
- Implementation of any upgrade shall be in line with corporate CAD / BIM software strategy.

## 10.3 BIM Content / Resource Libraries

Content libraries hold families and other items for use within BIM.

- Creation of project-specific content is encouraged but shall be coordinated by the project BIM Manager ensuring content is developed in accordance with this standard and the associated best practice guidelines.
- No content shall be stored on users own hard-drives, but shall be shared in a controlled manner through the Project BIM Resource Library to provide access across the project team.
- Project content shall be reviewed periodically by the BIM Co-ordinator for inclusion in the Central BIM Resource Library / Workspace which is read-only.
- Bentley Building supplied datasets are available through the Central Resource Library / Workspace as read-only. Any elements from this library which require modification prior to utilisation shall be copied to the Project Resource Library.

### 10.3.1 Project BIM Resource Library

This shall be the repository for the storage of project specific standards where deviation from this standard is required due to project or client requirements.

- Standards, seeds, title blocks, parts, datagroup catalogs and other data produced in the process of completing the project shall be held within the Project BIM Resource Library (see *section 8.2 - Project Folder Structure*).
- Additions or modification to content held within this resource shall be carried out in a controlled manner and be at the approval of the BIM Co-ordinator.

### 10.3.2 Central BIM Resource Library

Standard templates, title blocks, parts, datagroup catalogs and other non-project-specific data shall be held within the server based Resource Library / Workspace, as defined in Section 8.2.1.

- Additions or modification to content held within this resource shall be carried out in a controlled manner and be at the approval of the BIM Co-ordinator.
- Content shall be segregated by software product and version.
- When content is updated for use in newer product version:
  - The original data shall be maintained,
  - The updated version of the content shall be created in the appropriate location for that product & version. This avoids 'forwards incompatibility' when using content with the version of the software for which it was originally created.

## 10.4 Keynotes

- A default Keynote file is provided with Bentley Building and can be found in the BuildingDatasets 'keynote' folder within the Workspace.
- Refer to NBS Building for UK-specific keynotes.
- Modifications to the project-specific version, are to be managed by the BIM Co-ordinator.

## 10.5 DataGroup Definitions

- The corporate DataGroup Definitions files are held in the DataGroupSystem folder within the central resource. This is maintained by the BIM Management Team (App 11.15).
- When the creation of project-specific catalog items requires the creation of custom definitions, a file shall be created within the project's resource folder. This is especially important in the case of list type definitions, otherwise Bentley Building will attempt to create them in the central dataset's enumlookups file.  
Once this content is approved for the corporate library, the associated .xml files can be added to the central dataset.

## 10.6 Keyboard Shortcuts

Only delivered Bentley keyboard shortcuts shall be used.

# 11 Appendices

## 11.1 Model File Naming Codes

Discipline Codes	
<b>A</b>	Architect
<b>AL</b>	Landscape Architects
<b>B</b>	Building Surveyors
<b>C</b>	Civil Engineers
<b>CB</b>	Bridge Engineers
<b>CD</b>	Drainage & Sewage Engineers
<b>CR</b>	Road/Highway Engineers
<b>CW</b>	Water/Dam Engineers
<b>D</b>	Spare
<b>E</b>	Electrical Engineers
<b>F</b>	Facilities Managers
<b>G</b>	GIS Engineers & Land Surveyors
<b>GA</b>	Aerial Surveyors
<b>H</b>	Heating and Ventilation Engineers
<b>I</b>	Interior Designers
<b>J</b>	Telecommunications
<b>K</b>	Client

Project Zone Code Examples	
<b>01</b>	Building or zone 1
<b>ZA</b>	Zone A
<b>B1</b>	Building 1
<b>CP</b>	Car park
<b>A2</b>	Area Designation 2

Project Level Code Examples	
<b>00</b>	Ground floor
<b>01</b>	First floor
<b>B2</b>	Basement 2
<b>M1</b>	Mezzanine 1
<b>RF</b>	Roof
<b>PL</b>	Piling
<b>FN</b>	Foundation

<b>L</b>	Lift Engineers
<b>M</b>	Mechanical Engineers
<b>ME</b>	Combined Services
<b>N</b>	Spare
<b>P</b>	Public Health Engineers
<b>Q</b>	Quantity Surveyors
<b>R</b>	Railways
<b>RS</b>	Railways Signalling
<b>RT</b>	Railways Track
<b>S</b>	Structural Engineers
<b>SF</b>	Façade Engineers
<b>SR</b>	Reinforcement Detailers
<b>T</b>	Town & Country Planners
<b>U</b>	Spare
<b>V</b>	Spare
<b>W</b>	Contractors
<b>X</b>	Sub-Contractors
<b>Y</b>	Specialist Designers
<b>YA</b>	Acoustic Engineers
<b>YE</b>	Environmental Engineers
<b>YF</b>	Fire Engineers
<b>YL</b>	Lighting Engineers (Non-Building Services)
<b>Z</b>	General (Non-Disciplinary)

## 11.2 Uniclass Table Reference

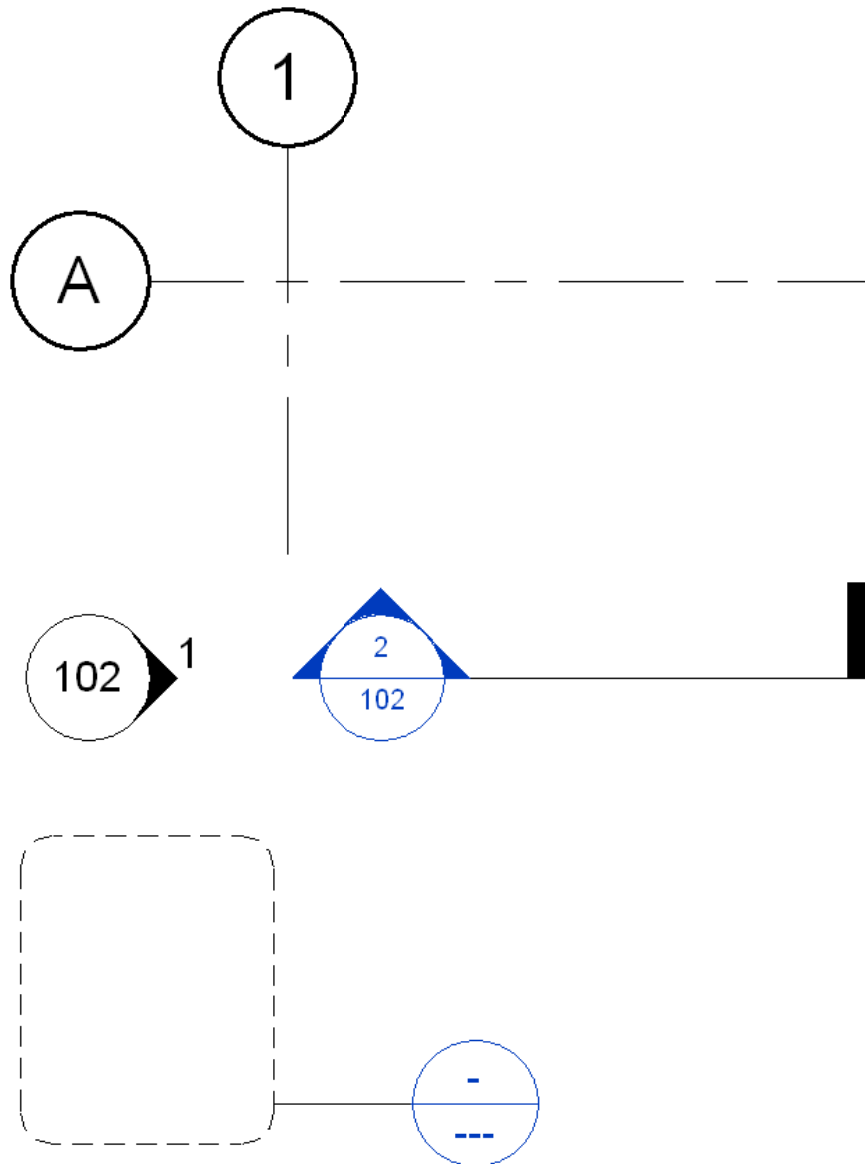
Uniclass Table	Used for
<b>F</b>	Definitions of “spaces”
<b>G</b>	Building objects (normally physical/graphical)
<b>H</b>	Civil engineering objects
<b>J</b>	Detailed classification of non-graphical objects used for specification
<b>P</b>	Non-specific material definition

Alternative classification systems to Uniclass, such as CI/SfB have followers within the industry. It is beyond the remit of this standard to suggest which of these is more or less suitable. CI/SfB is no longer maintained and as such it was discounted from promotion herein.

The full Uniclass tables are available on-line at:

[www.cpic.org.uk/en/publications/uniclass-listing.cfm](http://www.cpic.org.uk/en/publications/uniclass-listing.cfm)

### 11.3 Standard Drawing Navigation Symbology



**1** **West Elevation**  
1 : 100

FFL 4.000 m

 **Level 1**

## 11.4 Model Patterns

To be completed following release of Bentley Building UK dataset.

## 11.5 Draughting Patterns

To be completed following release of Bentley Building UK dataset.

## 11.6 Line Patterns

Not used in Bentley Building products.

## 11.7 Linestyles










Not specified in the AEC (UK) BIM Standard for Bentley Building.

## 11.8 Line Weights

Defined by the.pltcfg files in the associated datasets.

### 11.8.1 ISO Standard Metric Line Widths

The following line widths are ISO compliant and have been incorporated into the above line weights.

0.13mm	
0.18mm	
0.25mm	
0.35mm	
0.50mm	
0.70mm	
1.00mm	
1.40mm	
2.00mm	

## 11.9 Object Styles Annotation

Not used in Bentley Building products.

## 11.10 Object Styles – Model

Not used in Bentley Building products.

## 11.11 View Seeds

Settings to be confirmed following release of Bentley Building UK dataset.

## 11.12 View Filters

Not used in Bentley Building products.

## 11.13 Keyboard Shortcuts

Refer to Bentley documentation and shortcut.txt for details.

## 11.14 Category Abbreviation Codes

Not used in Bentley Building products.

## 11.15 Shared Parameters

To be confirmed in next release.