



AEC (UK) BIM Protocol for Nemetschek Vectorworks

*Additional detail and enhancements for implementation of the users of
Vectorworks Architect.*

Version 1.2

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Published as a supplementary document
to the generic AEC (UK) BIM Protocol v2.

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1 Introduction

1.1 Background

The AEC (UK) BIM Standard was released in November 2009.

Version 2.0 of the AEC (UK) BIM Protocol was published to improve the process of design information production, management and exchange.

The supplement provides specific application of those protocols for Vectorworks Architect.

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, provided credit is given to the committee.

1.2 The Committee

The Vectorworks sub-committee has representatives from architectural companies in the UK.

Committee

Steven Shorter (Chair)	Architect and BIM Consultant
Martyn Horne	Product Development Manager, Computers Unlimited
Olly Thomas	BIM Manager, The Design Buro

The BIM committee is working together to realise a unified, usable, co-ordinated approach to Building Information Modelling in design environment.

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.

None of the recommendations in this document are intended as a replacement for companies who already have an AEC (UK)-based or BS1192-compliant system.

This document is not a substitute for the appropriate training.

It is not within the remit of this document to determine company graphic standards. Any project specific graphic standards should be agreed by all parties concerned and enshrined in the Project BIM Execution Plan.

1.4 Scope

This supplement is intended to support all BIM work undertaken using Vectorworks Architect across a practice, or on a specific project, unless otherwise dictated by the client.

This document builds on the procedures and methodologies defined in the AEC (UK) BIM Protocol and should be read in conjunction with that document.

Terminology and reference to functionality is based around the Vectorworks platform.

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 Vectorworks sub-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
- PAS1192-2012
- BS8541-1 and BS8541-2:2011
- AEC (UK) BIM Protocol v2.0

- AEC (UK) CAD Standard for Layer Naming v3

1.7 Definitions

Component: A Vectorworks Plug-in Object, such as a Door or Wall, or a Symbol. In this usage, it should not be confused with the specific term Wall Component which describes the individual elements within a Vectorworks Wall Style.

2 Best Practice

2.1 BIM

Sub-divide models between disciplines, and within single disciplines where necessary to allow effective access to the data at all times. A typical reference file approach should be taken.

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

3 Project BIM Execution Plan

3.1 Roles and Responsibilities

3.2 Project BIM Execution Plan

3.3 Project BIM Meetings

4 Collaborative BIM Working

4.1 Common Data Environment (CDE)

4.1.1 Work In Progress (WIP)

4.1.2 Shared

4.1.3 Publication and Document Issue

Validation of the BIM data prior to sharing shall check that:
All extraneous references and elements shall be removed from BIM.
File format and naming conventions conform to the *Project BIM Execution Plan...*
Data segregation conforms to the green project BIM methodology.
Model files are up-to-date, containing all users' modifications.
Model is correctly assembled through visual inspection.
Any changes since the last issue are communication to the project team.

4.1.4 Archiving

4.2 Preparation for publication

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.

4.3 Legal Stuff

4.4 Data Security & Saving

4.5 Reviewing BIM Data

Outstanding issues shall be discussed at the project co-ordination meetings. Use appropriate non-proprietary IFC file viewers, such as Solibri Model Viewer, in all instances.

Untrained users shall not open the Vectorworks BIM directly. Instead the model may be viewed using the free Vectorworks Viewer, or by exporting to products such as CADFaster.

5 Interoperability

5.1 Introduction

5.2 Incoming CAD/BIM Data Management

5.3 Intended Use of Model

5.4 Data Transfer between Packages

All 3D model data shall be issued as IFC. All 2D model data shall be issued as DWG, unless otherwise requested. Native file formats should not be used.

6 Data Segregation

6.1 General Principles

A number of methods exist which 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.

A BIM model in Vectorworks may be as a single file containing all the modelled project data or make use of Vectorworks' referencing capabilities to enable collaborative working in a BIM environment.

This sections 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 Vectorworks subject of Workgroup Referencing, which is referred to herein as sub-models. The following practices shall be followed:

The methods adopted for data segregation shall take into account, and be agreed by, all internal and external disciplines to be involved in the modelling.

In line with the model development methodology, models shall initially be created as isolated, single-user files. A user can work in a single model to begin with and use referencing when the model needs to be subdivided as it becomes larger or additional member 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) i.e. do not edit third party data without taking ownership of the data.

Further segregation of the geometry may be required to ensure that model files remain workable on available hardware. However, hardware suitability should be reviewed periodically, particularly when new versions of the software are released.

It is recommended that Sheets should be created as separate files, and ideally, should not be stored as multiple sheets within a single container file, unless the project or package is sufficiently self-contained. More than one Sheet in each file will inhibit data tracking and drawing management.

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. This will also provide better DWG compatibility.

Otherwise, the relevant model files are referenced directly into a Sheet file, and Sheet Layer Viewports created, along with the (referenced) project drawing border, drawing titles and other drawing annotation, and a printed drawing produced.

6.2 Division

Division of the model in Vectorworks may be using Design Layers, and/or files. Both are referred to hereafter as 'Sub-Models'.

Workgroup Referencing allows multiple users to simultaneously work on the model data, via sub-models. Properly utilised, Workgroup Referencing can significantly improve efficiency and effectiveness on large and multi-user projects.

Appropriate sub-models shall be established and elements assigned, either 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 sub-models to avoid congestion in workflow. This also provides the means for adequate control over the efficiency of the model.

Sub-models shall be named according to the conventions for model file naming in section 8.4.

6.2.1 Saving on Multi-user Projects

6.3 Referencing

References of another discipline's data 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. For the latter, the following steps should be followed:

Users reference the information from the required file
The required elements are copied through into the active file and the Class remapped to identify new ownership

When first referencing the models together, the agreed project coordinates and orientation shall be used.

6.3.1 Inter-Disciplinary Model Referencing

When working on large complex projects it is advised to break down the model into a number of sub-models, the extents of which are to be agreed with the project team and documented within the BIM Execution Plan. A Model Matrix will be required to explain and communicate the referencing methodology with a key diagram to assist.

Referencing model files enables additional geometry and data to be referenced into a model. This may be either other parts of a project which are too big to manage in a single file, or data from another discipline or external company.

Some projects require that models of single building are split into multiple files and reference back together in order to maintain manageable model file size.

Key points to consider when referencing files are:

Task allocation shall be considered when dividing the model so as to minimise the need for users to switch between models.

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 Coordinator.

Division shall be determined by the lead architect/engineer in conjunction with the Coordinator.

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.

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 reference 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.

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 Coordinator shall be consulted in defining the project-specific strategy.

7 Modelling Methodology

7.1 Model Development Methodology

Standard templates should be created to facilitate a Model Development Methodology which shall be used to develop projects in early stages.

7.2 Graded Component Creation

Component level of detail should evolve with the project but should be appropriate to the stage of the project. The use of placeholders at early stages should be encouraged.

7.2.1 Model/Draughting in Detail

7.3 Drawing Compilation

7.3.1 Sheet composition direct from within the BIM

Drawing sheet composition from within a BIM environment shall be established through the creation of sheet layer viewports and drawing sheets fully within Vectorworks software.

7.3.2 Sheet composition from Views/Output files

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

7.4 Spatial Location & Co-ordination

As defined in BS1192:2007, shared BIM project data shall:

- Use real world co-ordinate systems.
- Be produced to true height above project datum.
- Adopt the established project coordinate system across all BIM files to allow them to be referenced without modification.

Before working with spatial location and co-ordination it is important that all employees understand the essential difference between the User Co-ordinate/Origin system and the Vectorworks Internal Origin. In short, the following two rules should be followed:

Firstly, models (and drawings) should always be constructed close to the Vectorworks Internal Origin (this will by default, be in the same place as the User Origin in a blank default Vectorworks file.) Secondly, the User Co-ordinate system and User Origin should be assigned real world co-ordinates to align the project with the OS grid (or local grid if not in the UK).

To do this, identify a known location on your project, ascertain the OS coordinates for this point, (or the local grid if the project is not in the UK) and use the Next Click Is setting within the Move Origin tool. Do not choose the corner of an existing building, unless you are sure it is not going to be demolished.

This should take place across all BIM data files to allow them to be referenced without modification.

Ideally, this should take place prior at the outset of the project and should also be applied beforehand to any data being imported into Vectorworks, but can be carried out post import. This shift shall also be agreed, consistent and documented in the Project BIM Execution Plan.

If it is a requirement to export data from Vectorworks in 'Real-World' co-ordinates, then the export operation must be performed from a design layer and not from a sheet layer. Real-world co-ordinates should then be re-established in the Vectorworks environment prior to issue/export according to the Project BIM Execution Plan.

Data exported from Vectorworks can be delivered in either real-world or local co-ordinates and whilst the majority of data will need to be delivered in OS co-ordinates for the purposes of collaboration and cross-referencing, some software (e.g. certain structural analysis software) requires data to be located at 0,0. For export to such software, local coordinate systems should be employed.

7.5 Units and Measurement

The working unit of WIP files is at the discretion of the user. All files prepared for export to IFC should, however, adopt project units.

8 Folder Structure and Naming Conventions














8.1 Introduction

8.2 Project Folder Structure

The standard office project folder structure may need to be amended to provide a logical place for the BIM and its associated data.

8.2.1 Central Resource Folder Structure

Standard corporate templates, title blocks, symbols and other non-project-specific data shall be held within the server based Central Resource Library, with restricted access.

-  <SERVER NAME>\Resources\
 -  Vectorworks
 - +  2012
 - +  2013
 -  Libraries
 -  Defaults
 - +  *Door Custom Leaves*
 - +  *Sheet Border Title Blocks*
 - +  *Reports~Schedules*
 - +  *Standards*
 - +  *Walls~Slabs*
 - +  Favourites
 - +  Objects

All locations for the storage of components shall be subdivided as per the standard Vectorworks Default Content folder.

All workstations should be linked to the central default content folder via the Workgroup Folder preference.

8.2.2 Local Project Folder Structure

8.3 General Naming Conventions

In general the folder structure of the Vectorworks Default Content folder should be kept, although files within the subfolders can be added to if required.

8.4 Model File Naming

8.5 Division Naming

8.6 Library Object Naming

Consideration should be given to naming all content in Vectorworks that appears in the Resources Browser.

8.7 Object Property Naming

8.8 View Naming

8.9 View List Scheduling

8.10 Data Organisation

8.11 Sheet Naming

9 Presentation Styles

9.1 Introduction

It is at the discretion of the individual or company to define its own graphic standards and it is not within the scope of this document to dictate how a drawing should look.

However, good practice should be adopted with respect to line weight hierarchy and information displayed, and class attributes should be used whenever possible.

9.2 AEC (UK) Compliant Materials

UK content is available as part of VSS, as well as the National Building Library.

9.3 Annotation

9.4 Text Assignment

Text Styles should be used wherever possible to create standardised text formatting for the company and project. Text Styles should be named as per all Library content.

9.5 Line Weights

Line Weights should be assigned by class wherever possible.

9.6 Line Patterns

9.7 Line Styles

Use the ISO line styles shipped with Vectorworks, or standard Vectorworks line styles as required. Custom Line Styles should be added as required to Default Content.

9.8 Hatching and Filled Regions

Hatching/patterning shall be created using the relevant tools available within the software. Default Hatches should be made available through Default Content.

Where possible, hatch patterns should be assigned to the relevant materials for the elements by class.

9.9 View Templates

9.10 Dimensioning

9.10.1 Dimension Style Naming Convention

Adopt the same naming convention as for all Library Content

9.11 Drawing Borders and Title Blocks

Corporate title blocks, should be made available through Default Content for use with the Sheet Border.

Alternative client-specific versions may also be available from the same location.

Project-specific title blocks shall be created and stored in the Project Resource folder and referenced to the Sheet files.

9.12 Symbology

Standard symbols such as North Point, Section Marks and Elevation Benchmarks are available from within the Dims/Notes toolset but may also be made available via Default Content.

9.12.1 Section and Detail Marks

Section and Detail marks are available from within the Dims/Notes toolset but may also be made available via Default Content.

Use numerical or alphabetic labelling as defined in the company drawing standards.

9.13 Copyright

10 Resources

10.1 Introduction

10.2 Software

10.3 BIM Content / Resource Libraries

Vectorworks Plug-in Objects are available via the Building Toolset and specific content should be made available via Default Content.

Any elements from the Default Content library which require modification prior to utilisation shall be copied to the Project BIM 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, templates, title blocks, symbols and other data produced in the process of completing the project shall be held within the Project BIM Resource Library (refer to Appendix 11.2).

10.3.2 Central BIM Resource Library

Content shall be segregated by software product and version. When content is updated for use in a 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 and 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 Callout Database should be created and accessible via Default Content.

A project specific Callout Database may be created using NBS Tools and the Annotator link plug-in.

Modifications to the project specific version are to be managed by the Coordinator.

10.5 Record Formats

Default Record Formats are found within the specific BIM tool, or should be attached to Symbol content. This should be maintained by the BIM Management Team.

When the creation of project specific content requires the use of Record Formats, they shall be created within the project's resource library. Once this content is approved for the corporate library, the content shall be included for future use.

10.6 Keyboard Shortcuts

A standard workspace should be available to all users without modification. A company workspace may be made available to all users.

Users may create their own workspace but should not be copied to the project or central library.

11 Appendices
























11.1 Model File Naming Codes





11.2 Project Folder Structure

The folders below are a suggested structure for the Project BIM Resources Library relevant to Vectorworks-based projects.

This is provided as an example only and should not be used in preference to or replace any internal company quality assured standard folder structures. Always consider your company processes and procedures, especially if ISO accreditation is involved before adopting change.

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

-  **[Project Folder]**
 -  BIM [BIM data repository]
 -  **01-WIP** **[WIP data repository]**
 -  CAD [CAD files (incl. 'Modified')]
 -  BIM [Design models (incl. 'Modified')]
 -  SheetFiles [Sheet/dwg files]
 -  Export [IFC, dwg or images]
 -  Resources [created during this project]
 -  WIP_TSA [WIP Temporary Shared Area (TSA)]
 -  **02-Shared** **[Verified Shared data]**
 -  CAD [CAD data/output files]
 -  BIM [Design models]
 -  CoordModels [Compilation models]
 -  **03-Published** **[Published data]**
 -  YYYYMMDD-Desc [Submission folder]
 -  YYYYMMDD-Desc [Submission folder]
 -  **04-Archived** **[Published data]**
 -  YYYYMMDD-Desc [Archive folder]
 -  YYYYMMDD-Desc [Archive folder]
 -  **05-Incoming** **[Incoming data repository]**
 -  Source [Data originator]
 -  YYYYMMDD-Desc [Incoming folder]
 -  YYYYMMDD-Desc [Data originator]

-  **06-Resource**
 -  Titleblocks
 -  Logos
 -  Standards
- | |
|--|
| [Project BIM Resources Library] |
| [Drawing borders/titleblocks] |
| [Project logos] |
| [Project standards] |

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.