CIBSE West Midlands – Developments in BIM

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A brief introduction

- BIM / CAD Manager for Midlands buildings team near Solihull
- Manager of Revit content team producing templates and content used for project delivery across the UK
What enables good BIM?
What enables good BIM?

- Arup BIM Maturity measure used to 1300+ projects
- Clear link between EIR’s/BEPs, Virtual Design Reviews, Common Data Environments and high scores
Before I get carried away…

Core BIM Level 2 Standards:

**BS1192:2007+A2:2016**: Collaboration (document naming and sharing)

**PAS1192-2:2013**: Information management with BIM during CAPEX

PAS1192-3:2014: Information management with BIM during OPEX

**BS1192-4:2014**: COBie (structured information exchange)

**PAS1192-5:2015**: Security minded BIM

**PAS1192-6:2018**: H&S (not yet released)

**BS8541 suite**: Object standards (naming, symbols, parameters etc.)

**CIC BIM Protocol**: Contract addendum that enables BIM

**Uniclass 2015**: Classification system to define what an object represents
Key Project Documents

Figure 3 – The relationships between the contract and the associated documents

What the client has asked for

How we’re going to deliver it

Image from PAS1192-2:2013, © Mervyn Richards
3. OBLIGATIONS OF THE EMPLOYER
3.1.1 arrange for a protocol in substantially the same terms as this Protocol and for the obligations set out herein to be incorporated into all Project Agreements; and

4. OBLIGATIONS OF THE PROJECT TEAM MEMBER
4.1.2 subject to events outside its reasonable control, (including the acts or omissions of the Employer, Other Project Team Members and any third party but excluding the Project Team Member’s sub-contractors), use reasonable endeavours to:

   a deliver the Specified Models at the Level of Detail specified in the Model Production and Delivery Table at the Stage specified therein and in accordance with the Information Requirements;

6. USE OF MODELS
6.2 Any rights (including but not limited to any copyright) subsisting in the Material and any proprietary work contained in the Material shall, as the case may be, vest or remain vested in the Project Team Member.

2. PRIORITY OF CONTRACT DOCUMENTS
2.2 In the event of any conflict or inconsistency between a Model prepared and delivered in accordance with this Protocol and any document or information extracted from such Model, except where the Information Requirements states otherwise, the Model shall prevail.
# The BIM Protocol

## Levels of Detail and the Model Production and Delivery Table

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*Image of a building section showing a Submersible Boom with dimensions and notes on proprietary waterproofing membrane.*
5.3 Contents of the employer’s information requirements (EIRs)

The EIR shall include the following contents, as a minimum:

a) information management:

1) levels of detail – e.g. requirements for information submissions at defined project stages. This is needed to populate the Model Production and Delivery Table required under the Protocol;
2) training requirements – not likely to be mandatory;
3) planning of work and data segregation – requirements for bidders’ proposals for the management of the modelling process (e.g. model management, naming conventions, etc.);
4) co-ordination and clash detection – requirements for bidders’ proposals for the management of the co-ordination process;
5) collaboration process – requirements for bidders’ proposals for the management of the collaboration process;
6) HSE/CDM – requirements for bidders’ proposals for BIM/CDE-supported H&S/CDM management;
7) a schedule of any security and integrity requirements for the project;
8) a schedule of any specific information to be either excluded or included from information models;
9) a schedule of any particular constraints set by the employer on the size of model files, the size of extranet uploads or emails, or the file formats that can define the size of a volume;
10) compliance plan – requirements for bidders’ proposals for the management of the co-ordination process;
11) a definition of any co-ordinate origin/system (3 dimensions) that the employer requires to be used to place graphical models, for example Ordnance Survey locators, geospatial and location with respect to an agreed origin;
12) a schedule of any software formats, including version numbers, that shall be used by the supply chain to deliver the project;

b) commercial management:

1) exchange of information – alignment of information exchanges, work stages, purpose and required formats;
2) client’s strategic purposes – details of the expected purposes for information provided in models (See Figure 7 at 6.1.5);
3) a schedule of any software formats, including version numbers, that shall be used by the supply chain to deliver the project;
4) an initial responsibility matrix setting out any discipline responsibilities for model or information production in line with the defined project stages;
5) a schedule of the standards and guidance documents used to define the BIM processes and protocols to be used on the project;
6) a schedule of any changes to the standard roles, responsibilities, authorities and competences set out in the contract;

c) competence assessment:

1) details of the competence assessment which bidders must respond to;
2) changes to associated tender documentation (e.g. PQQ, PEP, tender questionnaire, tender evaluation plan);
3) BIM tender assessment details.

Defined prior to appointment of supply chain
Employers Information Requirements (EIRs)

• What are we being asked to do?

I want BIM Level 2

No BIM Protocol
No EIR

PAS1192-2:2012 p.ix
• Produce models
• EIR’s available
• Capability assessment
• Produce BEP
• Use a CDE
• Implement standards
• Produce PDF’s
• Produce COBie

I want exactly this:

EIR : 450+ pages
Compliance with 10 standards : 750+ pages
10 Cross-referenced standards : 380+ pages
Summary : 1500+ pages

Result:

Multiple document naming systems
Multiple LOD systems
Multiple classification systems
Conflicting asset information requirements
We’re asked to fulfil clients obligations
Employers Information Requirements (EIRs)

- What are we being asked to do?

EIR:

The following information is required for each Supplier Information Exchange:

- Native BIM model files
- Exchange BIM model files
- Responses to Plain Language Questions and their required supporting information
- COBie-UK-2012 export

BSRIA Design Activity Summary:

<table>
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<th>BSRIA</th>
<th>PRO-FORMA 2: CONCEPT (RIBA STAGE 2)</th>
<th>Allocated to .... (one party only)</th>
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<td>Ref</td>
<td>Design activity in connection with building services</td>
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<tr>
<td>2.9.1</td>
<td>Deliverables – including drawings, specifications, reports</td>
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- 2.9.1 Provide report on building services issues as part of concept design report, including:
  - desk study on material effectiveness

- 2.9.8 Provide high-level metering strategy

- 2.9.9 Provide COBie-UK-2012 tables for Information Exchange 2.

- 2.9.10 Sign off the concept design report.
Employers Information Requirements (EIRs)

- How do we resolve this?
  - Obvious answer no.1 : Talk to the client!
    - Did they write the EIR? Have they even seen it?
    - Are the EIR’s aspirational corporate standards?
    - What do they actually need?
  - Don’t leave it to the ‘BIM guy’
    - Working out what we are contracted to deliver needs input from the project leadership
  - Where possible focus on essentials and use current industry standards:
    - BS1192:2007+A2:2016 for document naming and exchange
    - Uniclass 2015 for classification
    - COBie UK 2012 for data drops
    - PAS1192-2 Role Definitions
  - Don’t bury your head in the sand
The BIM Execution Plan (BEP)

- The BEP sets out how we will deliver the project

a) management:
   1) roles, responsibilities and authorities;
   2) major project milestones consistent with the project programme;
   3) project information model deliverable strategy (for example the CIC Schedules);
   4) survey strategy including the use of point clouds, light detecting and ranging (LiDAR) or global navigation satellite systems (GNSS);
   5) existing legacy data use;
   6) approval of information; and
   7) PIM authorization process;

b) planning and documentation:
   1) revised PIP confirming the capability of the supply chain;
   2) agreed project processes for collaboration and information modelling;
   3) agreed matrix of responsibilities across the supply chain;
   4) TIDP; and
   5) MIDP;

c) the standard method and procedure:
   1) the volume strategy;
   2) PIM origin and orientation (which may also be ge-references to the earth’s surface using a specified projection);
   3) file naming convention;
   4) layer naming convention, where used;
   5) agreed construction tolerances for all disciplines;
   6) drawing sheet templates;
   7) annotation, dimensions, abbreviations and symbols; and
   8) attribute data;

d) the IT solutions:
   1) software versions;
   2) exchange formats; and
   3) process and data management systems.

Source: PAS1192-2:2013
The BIM Execution Plan (BEP)

- Making the BEP work:
  - The BEP is *our* document
    - It should not be provided by the client, it doesn’t sit in the contract docs
    - It should respond to the clients needs, and our needs
    - It is our responsibility
  - It needs to be owned by the entire delivery team
    - Should we include the QS? (yes!)
    - Typically led by lead designer at stages 0 to 3, contractor stages 4 to 6
  - The BEP sets out *how* we will deliver the project
    - Be explicit
    - Avoid options
    - It’s not a ‘what is BIM’ guide
  - It needs to be used
    - Provide a summary of key information
    - Keep it up to date
How can we make project delivery smoother?
Great Expectations

- Deliverables
- Programme
- Budget
Great Expectations

Deliverables

Programme

Budget
Great Expectations

Deliverables

Programme

Budget
Great Expectations

 Deliverables

Faster delivery
50%
reduction in the overall time, from inception to completion, for newbuild and refurbished assets

Budget

Lower costs
33%
reduction in the initial cost of construction and the whole life cost of built assets
What are we doing to make this work?
Our strategy

- Put the model at the heart of what we do and make it work for us

**Consistent Training**

Dynamo? Isn’t he a magician?

**Consistent Workflows**

How can I give it a power supply?
How can I validate the information?

**Consistent Data**

What is it?
Who made it?
How much power does it need?
Consistent Data

- Make standard content available

![Consistent storage of information across library](image)

Pre-set what we can, make it clear to users when there’s something they need to do!
Consistent Data

- Embrace the standards

BS8541-1 naming

Consider downstream uses

Eliminate repetitive tasks and enhance collaboration
Consistent Workflows

- Make it easier to use standard content to do more
### Consistent Workflows

- **Standardise delivery**

| XXX-ARUP-ZZ-XX-SH-Z-0001 MDP and TIDP |
| XXX-ARUP-ZZ-XX-SP-Z-0001 BIM Execution Plan |
| XXX-ARUP-ZZ-XX-SP-Z-0002 MDPT |
| XXX-ARUP-ZZ-XX-SP-Z-0003 Clash Detection Matrix |

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   - 5.2 Common Data Environment (CDE)
   - 5.3 Model Uses
   - 5.4 PMT Authorisation Process
   - 5.5 Model File Best Practice
   - 5.6 Security

6. **Coordination**
   - 6.1 Functional Issues
   - 6.2 Clash Detection
Consistent Training

- BIM for Leaders training
  - The language of BIM
  - Impact on contracts
  - Effect on team structure

- Custom tools guidance

- Software essentials
How did we do this?

Centralise your BIM Development
Discussion

**Figure 3 – The relationships between the contract and the associated documents**

- **What the client has asked for**
- **How we’re going to deliver it**

**Deliverables**

- **Programme**
- **Budget**

**BIM ‘Enabler’**

- Contract documents
  - Contract
  - Protocol
  - Appointment
  - Employer’s requirements
  - Contractor’s proposals
  - Scopes of service
  - Project outputs

**Directors, Engineers, Technicians**

- Architecture, Structure, MEP

**Consistent Training**

**Consistent Workflows**

**Consistent Data**

*Image from PAS1192-2:2013, © Mervyn Richards*