BUILDING INFORMATION MODELLING (BIM)

PROJECT IMPLEMENTATION PLAN

David Philp – Chair, Scottish BIM Delivery Group
“BIM will be introduced in central government with a view to encouraging adoption across the public sector. The objective should be that, where appropriate, projects across the public sector adopt BIM level 2 by April 2017.”

Review of Scottish Public Sector Procurement In Construction

- Recommendation endorsed by Scottish Ministers
- Supported by 5 supplementary BIM recommendations
BIM should be introduced in central government with a view to encouraging adoption across the public sector. The objective should be that, where appropriate, projects across the public sector adopt BIM level 2 by April 2017.

The industry needs to be ready to embrace modern methods of construction, and new and emerging technologies such as Building Information Modelling.

57.1 Resources should be identified and a programme plan for Scottish BIM implementation by 2017 established.

57.2 When deciding if BIM will add value to a project public sector clients should undertake an assessment of the likely return on investment from its use.

57.3 Guidelines and advice on the use of BIM should be developed.

57.4 Suitable trial projects should be identified ahead of the 2017 target date and their management co-ordinated centrally.

57.5 Baseline information should be established to allow proper evaluation of the impact of BIM implementation.
In order to implement BIM Level 2, our plan considers the current BIM maturity of the Scottish Public Sector, a definition as to what projects will adopt BIM level 2 by April 2017 and finally how this will be implemented through a combination of focused actions including; pilot projects, guidance, awareness and training. The plan adopts the approach that the implementation of BIM within Scotland should align to existing Level 2 BIM components.

**ISSUES**
- Limited capacity within industry?
- Limited understanding of the client benefits.
- Development of industry expertise.

**APPROACH TO DELIVERY**
- Supported by Construction Scotland BIM group.
- Complete pilot projects.
- Develop a well informed strategy.
- Develop guidelines.
- Liaise with global experts.
- Demonstrate benefits.
Building Information Modelling (BIM) and Management, facilitates the virtual creation, analysis, assessment and optimised development of an asset in a digital environment simulating the understanding and behaviour of the solution. Ultimately BIM will help the Scottish public sector use data to better procure Scotland’s assets creating a more efficient built environment that is, more sustainable, with better places to live and with more intelligent infrastructure fit for a 21st century Scotland.

Key objectives for this implementation plan include:

**Roadmap**
- Provide a roadmap to the implementation of BIM Level 2 by April 2017 on Public Sector.

**Review**
- Addressing the recommendations of the Review of Procurement in Construction report in relation to BIM.

**Leadership**
- Providing experienced leadership and direction nationally, in the adoption of BIM for public sector projects within Scotland.

**Change**
- Focused Industry change and embracing new digital ways of working efficiently, effectively and maintaining our assets.

**Guidance**
- Preparing and publish guidance for procuring authorities to better equip them in adopting BIM Level 2.
Collaborative Procurement Workstream - Building Information Modelling (BIM)

Total asset life-cycle approach as the golden thread
Collaborative Procurement Workstream - Building Information Modelling (BIM)

<table>
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<td>PAS 1192-2:2013</td>
<td>Information Management - CIC guidance</td>
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<td>Digital Plan of Works</td>
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<td>BS 1192-4</td>
<td>Core Classification: Uniclass (latest format)</td>
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<td>BS 1192-5</td>
<td>(Learning outcomes framework V2.0)</td>
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</table>
The plan has been divided into 5 horizons which encompass specific work streams:

**BIM IMPLEMENTATION FOR SCOTTISH GOVERNMENT PROJECTS**

1. **HORIZON 1**
   - Plan & Launch

2. **HORIZON 2**
   - Mobilisation

3. **HORIZON 3**
   - Pilot Projects

4. **HORIZON 4**
   - BIM Guidance

5. **HORIZON 5**
   - Launch of BIM Level 2

**BIM IMPLEMENTATION PLAN**

**WORKSTREAMS**
- BIM Strategy
- Implementation Plan
- Capability Assessment
- Project Launch
- Define BIM Level 2

**WORKSTREAMS**
- Governance
- Communication
- Research
- Education & Training
- Resource

**WORKSTREAMS**
- Identify Pilot Projects
- Form Pilot Delivery Team
- Pilot Project Delivery
- Link to Guidance

**WORKSTREAMS**
- Review of BIM Wrapper for Scotland
- Draft Guidance
- Consultation
- Publish Final Guidance

**WORKSTREAMS**
- Communication
- Support
- Monitor Adoption
- Publish Final Guidance
### THEME – Collaborative Procurement Workstream - Building Information Modelling (BIM)

<table>
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<th>Planning &amp; Objectives</th>
<th>2015</th>
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<td>Launch of BIM Level 2</td>
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**HORIZON 1**
- Planning & Objectives

**HORIZON 2**
- Mobilisation

**HORIZON 3**
- Pathfinder Projects

**HORIZON 4**
- BIM Guidance

**HORIZON 5**
- Launch of BIM Level 2
Help Scotland to better procure and care for its assets, create a more efficient built environment that is, more sustainable, with better places to live with more intelligent infrastructure through the use of BIM and it’s data rich environment.

Ensure that Scottish Public Sector Clients can derive significant improvements in cost, value and carbon performance through the use of open sharable asset information and a focus on better whole life outcomes.

Help the growth of Scottish organisations both home and abroad through the development of new innovative and digital solutions which can be exported.

Better end user engagement.

Ensure that client data is bought only once with a better defined project brief.

Encourage a collaborative approach to the construction life-cycle.

Availability of validated useful information to improve the efficiency of clients and their delivery operations.
Helping improve the image of Scottish construction and attract new entrants.

Elimination of waste from the design, construction and commissioning process through visualisation and Lifecycle solution testing at the preconstruction stage.

Reducing risk allowances in target prices and lump sum bids through accurate and complete data improving quality of bids.

Better assessment of the impact changes at all stages in a project lifecycle through a model based environment.

Input of a populated asset data set into Computer Assisted Facilities Management (CAFM) systems and Asset Management Systems (AMS)

The application of BIM is Scottish Public sector projects is supported by an assessment of appropriateness on its benefits.
Early adopter Scottish Clients are already on their journey.
**HORIZON 1** – Define Key Milestones

**HORIZON 1**
Milestone: Concluding Planning Stage
- Sep 2015

**HORIZON 2**
Milestone: Conclude Mobilisation
- Nov 2015

**HORIZON 3**
Milestone: Commence Pathfinder Project(s)
- Nov 2016

**HORIZON 4**
- Milestone: Publish Draft Guidance
- Jun 2016
- Milestone: Consultation on Draft Guidance Complete
- Aug 2016
- Milestone: Publish Final Guidance
- Sept 2016
- Milestone: Consultation on Draft Guidance Complete
- 1st April 2017

**HORIZON 5**
Milestone: Launch Level 2 BIM to Public Sector Projects
- 1st April 2017

**Milestone:**
- Concluding Planning Stage
- Conclude Mobilisation
- Commence Pathfinder Project(s)
- Publish Draft Guidance
- Consultation on Draft Guidance Complete
- Publish Final Guidance
- Launch Level 2 BIM to Public Sector Projects
The plan should be tested to ensure that (similar to the report for the Government Construction Client Group by the BIM Working Party, 2011) that progress can be robustly verified via a key stage review.
Approach to the Implementation Plan

The plan should be tested to ensure that (similar to the report for the Government Construction Client Group by the BIM Working Party, 2011) that progress can be robustly verified via a key stage review. The undernoted approaches will be considered as part of the implementation plan:-

- **Valuable**: The Level 2 BIM process and data transactions aim to maximise the client value by increasing benefits at little or no extra cost. The value proposition will be measured across all early adopter projects using a series of agreed benchmark KPIs. Whilst there is no minimum threshold on Scottish BIM project intake there should always be a projected positive return on investment.

- **Understandable**: The Scottish BIM strategy will be mobilized and communicated in an understandable manner for both the asset procurer and the supply chain community.

- **General**: The strategy will be equally applicable to the various capital expenditure programmes in the Scottish public sector including buildings, infrastructure whether new build, refurbishment or adoption.

- **Creates Capacity**: The percentage of Level 2 BIM projects against public sector spend will be measured along with supply chain adoption levels to determine if digital capacity is growing at a suitable level.

- **Open**: The strategy will encourage all stakeholder participation irrespective of size or experience.

- **Non-Proprietary**: All requirements will be non-proprietary as to software applications and as to the required formats of deliverables. It is imperative that the supply chain be allowed to innovate and make their own technology choices that best suit their business.

- **Mandate for BIM Level 2 Adoption**: Wherever possible there are at least two solutions or methods available as to minimise market influence in terms of anti-competitive behaviour.
**VALUABLE**
The Level 2 BIM process and data transactions aim to maximise the client value by increasing benefits at little or no extra cost. The value proposition will be measured across all early adopter projects using a series of agreed benchmark KPIs. There should always be a projected positive return on investment.

**UNDERSTANDABLE**
The Scottish BIM strategy will be mobilised and communicated in an understandable manner for both the asset procurer and the supply chain community.

**GENERAL**
The strategy will be equally applicable to the various capital expenditure programmes in the Scottish public sector including buildings, infrastructure whether new build, refurbishment or adaption.

**COMPETITIVE**
Wherever possible there are at least two solutions or methods available as to minimise market influence in terms of anti-competitive behaviour.

**CREASES CAPACITY**
The percentage of Level 2 BIM projects against public sector spend will be measured along with supply chain adoption levels to determine if digital capacity is growing at a suitable level.

**OPEN**
The strategy will encourage all stake-holder participation irrespective of size or experience.

**BIM LEVEL 2 ADOPTION**

**NON PROPRIETARY**
All requirements will be non-proprietary as to software applications and as to the required formats of deliverables. It is imperative that the supply chain be allowed to innovate and make their own technology choices that best suit their business.
BIM MATURITY GRADING WORKFLOW

LEVELS OF BIM MATURITY

CAPEX / OPEX PROJECTS OVER £4.32M THRESHOLD

- Need for computer readable AMS or CAFM data
- The project will benefit from the 3D models and associated meta-data e.g. whole life decision making, stakeholder engagement
- Multiple disciplines will be engaged on the project

CAPEX / OPEX PROJECTS UNDER £4.32M THRESHOLD

- Prepare and issue a Level 2 exemption request report
- Screen for Level 1 Suitability
- Proceed as a Level 2 BIM Project

CAPEX / OPEX PROJECTS UNDER £4.32M THRESHOLD OR ABOVE £4.32M BUT HAVE FAILED LEVEL 2 TEST

- Digital information will be exchanged during the currency of the project e.g. CAD files and other electronic format deliverables
- Multiple disciplines will be engaged on the project

CAPEX / OPEX PROJECTS UNDER £4.32M THRESHOLD OR ABOVE £4.32M BUT HAVE FAILED LEVEL 1 TEST

- There will be limited exchange of digital information during the currency of the project
- A Common Data Environment (CDE) is unaffordable

LEVEL 2 BIM MATURITY

- Proceed as a Level 2 BIM Project

LEVEL 1 BIM MATURITY

- Exemption Approved

LEVEL 0 MATURITY

- Exemption Rejected
Horizon 2 Overview
Mobilisation
The key objective of Horizon 2 is a readiness phase to put in place key delivery tools to support the implementation. These include:

- **Governance**
  Governance arrangements and reporting.

- **Communication**
  Communication Plan

- **Research**
  Research Strategy

- **Training**
  Education and training strategy

- **Appointment Plan**
  Resource & Appointment Plan
2.1.2 Governance Structure

The governance and organisational structure for the implementation of BIM Level 2 is outlined within the diagram.
Construction Procurement Review Core Team

Remit – This is an existing team formed between SG & SFT. This body will translate the actions of the BIM Delivery Group into the required outcomes for the review of procurement in construction. This body will also approve the key stage reviews for the project.
BIM Delivery Group

- Deliver the “BIM Implementation of Recommendations” themes outlined in the through a staged programme and policy.
- Advise the Construction Procurement Review Delivery Team in meeting the objectives of the BIM Implementation Plan and associated progress against milestones.
- Guide, review and monitor the BIM implementation plan and programme.
- Ensure that the mandate and supporting strategy is appropriate to the Scottish Market Place.
- Develop a comprehensive wrapper for Scottish Level 2 BIM Maturity.
- Lead an appropriate communication and stakeholder management strategy.
- Support the creation of Scottish Public Procurement on-boarding programmes and monitor leading KPIs.
- Ensure that public procurers understand the Level 2 BIM Value proposition.
- Make certain that procurers comprehend their role in the BIM process and how they can unlock the value propositions offered by Level 2BIM.
- Steer and co-ordinate the SFT BIM Procurers working group.
- Ensure that an effective feedback loop is established.
Consultee Group

This group encompasses specific bodies, organisations and institutes upon which the BIM delivery Group are to consult with on an adhoc basis during the delivery of the implementation plan.
BIM Industry Forum

- Provide advice and guidance as appropriate to the BIM Delivery Group on the development of a strategic approach to Level 2 BIM and the development of a sustainable model for BIM activity in Scotland.
- Ensure a balanced participation with no single interest predominating.
- To review the feedback from the consultation process with the various working groups.
- To provide a critical steer and expert knowledge on emerging themes and issues.
- Providing advice on issues that may affect uptake and implementation in the Scottish marketplace.
- Provide an integrated forum for discussion on progress and deliverables.
- To help guide the development of recommendations or for further engagement.

Membership Organisations:
BIM Delivery Group – D Philp Chair
Supplier Group - Scottish Enterprise PM
Public Sector Buyer Group
Academia Group
Construction Scotland/ BIM 4 Group
Pathfinder Project Delivery Group

- Create a collaborative community of practice for Scottish public sector early adopters of Level 2 BIM to feedback to the BIM Delivery Group.
- Baseline and measure the implementation of the pathfinder projects in line with the evaluation criteria determined by the BIM Delivery Group.
- Ensure that the Scottish BIM strategy, its recommendations and value propositions are adequately tested.
- Provide contact, support and challenge for those implementing the pathfinder projects.
- Capture and record the experience and results achieved through the implementation of Level 2 BIM.
- Publish results and case studies that can be used to disseminate the acquired knowledge and ensure the roll out of successful approaches and practices across Scottish public sector procurers and wider industry.
- Where necessary, on the basis of the pathfinder project outcomes propose the refinement of the approaches to make them more practicable.

Membership –
Procuring Authorities, Project Team PMs, PM/BIM Consultants
BIM Public Sector Buyers Group

• Create a collaborative community of practice for members of the Scottish procuring organisations.
• Provide a managed forum for the BIM Delivery Group to present progress and milestone deliverables to relevant stakeholders from the BIM SGS community of practice.
• Provide a client side appraisal function for BIM artefacts and policies developed by the BIM Delivery Group.
• Help cascade published information from the BIM Delivery Group into the Scottish procurement authorities through appropriate and agreed communication channels.
•Lead an appropriate client side communication and stakeholder management strategy.
• Help determine appropriate guidance requirements for public sector procurement community.
• Help the Scottish public sector clients understand the Level 2 BIM Value proposition.
• Help raise awareness of the Level 2 BIM mandate and associated requirements within the Scottish procurement organisations.
• Help identify early Level 2 BIM adopter projects.
• Monitor on-boarding progress within the procuring organisations.
• Provide an effective feedback loop to the BIM Delivery Group.
BIM Supplier Group (Scotland)

- Create an inclusive BIM community of practice for members of the Scottish supply chain including organisations, institutes and trade bodies.
- Provide a secretariat role for members of the BIM SGS.
- Provide a managed forum for the BIM Delivery Group to present progress and milestone deliverables to relevant stakeholders from the BIM SGS community of practice.
- Provide a supply side appraisal function for BIM artefacts and policies developed by the BIM Delivery Group.
- Help cascade published information from the BIM Delivery Group into the Scottish Supply chain through appropriate and agreed communication channels.
- Lead an appropriate supply chain communication and stakeholder management strategy.
- Offer guidance on Scottish Supply Chain levels of BIM capability and capacity.
- Help determine appropriate guidance requirements for the supply chain community.
- Help the Scottish Supply Chain understand the Level 2 BIM Value proposition.
- Help raise awareness of the Level 2 BIM mandate and associated requirements within the Scottish Supply Chain.
- Provide an effective feedback loop to the BIM Delivery Group.

Chaired by Construction Scotland: BIM Group
BIM Level 2 Resource & Commissions

**RESOURCE & COMMISSIONS**

Resourcing for the project must be considered to ensure the project has sufficient resource to deliver the implementation plan.

The organisations involved in the governance arrangements, will be required to make specific commitments to the project.

In addition some consultancy support for individual exercises will be required which may include:

<table>
<thead>
<tr>
<th>Potential Commissions</th>
<th>Strategy</th>
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<tbody>
<tr>
<td>Development and refinement of BIM implementation strategy</td>
<td>Direct Appointment – David Philp, AECOM</td>
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<tr>
<td>Review of Level 2 BIM wrapper and amendments for Public Sector Projects</td>
<td>Open Tender</td>
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<tr>
<td>Managing, monitoring and reporting on outcomes of pathfinder projects</td>
<td>Open Tender</td>
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<tr>
<td>Administer and deliver training workshops to Public Sector Organisations</td>
<td>Open Tender</td>
</tr>
<tr>
<td>Appointment of BIM Project Manager for BIM Delivery Group</td>
<td>Strategy to be confirmed</td>
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</table>
Launch of (free) BIM capability assessment tool for the Supply Chain

Capability Assessment Results

**Analysis**

The 3-point spider chart shows your BIM Level 1 BIM capability and how you compare with others in your industry/sector. Combined with the 8-point spider chart you can see and compare your BIM Level 2 capability.

**Core Competency**

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<td>2.0</td>
</tr>
<tr>
<td>2.5</td>
<td>2.2</td>
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Horizon 3 Overview
Pathfinder Projects
Identify Pathfinder Project

The aspiration of this work-stream is that a minimum of three pilot projects are delivered. A Pathfinder Project Delivery Group will be formed to manage, monitor, and report on the progress and lessons learnt from the projects. In deciding upon the pathfinder projects the following considerations should be made:

- **Project Status** - As well as new projects, could a partly developed BIM projects moving into a construction phase be adopted to test certain data exchanges?

- **Type of projects**, testing of: vertical assets and infrastructure, different forms of contract.

- **IPI** - Can the pathfinder project incorporate integrated project insurance to inform future BIM delivery?

- **Project Value** - Consideration as to value of projects and ability to demonstrate BIM is deliverable on smaller value projects would be advantageous.

- **Project Sector** - Consider project against pipeline value and sector (Education, Transport, Health, Water). Supply chain involvement.

- **Consider opportunities** for adopting outcome based digital data aligned with PLQ needs in lieu of COBiE for interim (pre-handover) data exchanges?
Identify Pathfinder Project

- Consider opportunities for adopting Industry Foundation Classes (IFC) in lieu of COBiE for operation and asset model.
- Consider level of dimensions deliverables within the pilots. (3D parametric modelling, 4D time simulation and 5D cost dimension?)
- Propose one refurbishment project to demonstrate the benefits of laser scanning and reality data capture of existing buildings into the model environment.
- Project programme – consider any projects proposed programme timescales.

Early discussions, has identified willing procuring authorities, who would volunteer projects as pathfinders. The final decision on pathfinder projects, will be restricted by the projects available at the time of delivery. Through regular reporting by the Pathfinder Project Delivery Group, the pathfinders will inform the development of the Scottish Government BIM guidance and provide suitable case studies.
Identify Pathfinder Project

PATHFINDER PROJECTS & CONSULTATIONS

INFORMING GUIDANCE DEVELOPMENT

GUIDANCE DEVELOPMENT

Draft Guidance

Draft Guidance

Final Guidance
Horizon 4 Overview
BIM Guidance
The Scottish BIM Wrapper

Best after: April 2017

- Business Case, Case Studies
- Benefits Demonstrations
- Standard Templates, AIRs/EIRs etc
- Procuring: PQQ/ITT
- CDE Implementation
- Resource Skills Requirements
- Best Practice Identified

British Standard L2 BIM Suite

Strategic Goals – Scottish BIM Strategy
The BIM guidance will be developed in three stages.

1. Current BIM Guidance
   - Current BIM Guidance – (For use on Pathfinders only) Incorporates existing UK BIM Level 2 definitions and protocols and reference to existing BIM Best Practice Tools and guidance.

2. Draft BIM Guidance
   - Guidance to address key objectives listed within 4.1. UK Level 2 BIM definition documents to have legal review for application within Public Sector projects within Scotland.

3. Final SG BIM Guidance
   - Further refinement of draft guidance based on consultations & Pathfinder(s). Incorporation of pathfinder projects as case studies to guidance. Publish a minimum 6 months prior to April 2017.
HORIZON 4 – BIM Guidance Components

Potential areas of development include:

- A procurer overview guide to mobilising and implementing Level 2 BIM, including benefits cases and make-ready checklists.
- A Supply-Chain handbook with clear direction to getting ready for the Level 2.
- Standard templates for consistency of approach, including: Employers Information Requirements (EIRs).
- A suite of standard Scottish procurement “Plain Language Questions” (PLQs) and data exchanges that can be refined to suit the needs of each department or authority.
- A worked example of an exemplar Level 2 BIM project, including sample data set.
- Short overview videos and learning modules for the key strategic themes.
- Case studies and best practice templates.
- Standard BIM inclusion statements for RFP and ITT documents in the context of Scots Law.
- Common Data Environment (CDE) guidance for public sector clients.
- Ready reckoner tool to forecast the likely BIM return on investment (ROI).
Horizon 5 Overview
Launch of BIM Level 2
In the lead up to the launch of BIM level 2, procuring authorities should be made aware of and communications focussed on the following aspects:

<table>
<thead>
<tr>
<th>Scottish Government Strategy and Commitment</th>
<th>Published Level 2 BIM pipeline</th>
<th>Mandate and minimum requirements of BIM Level 2 by April 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Published Scottish Government BIM Guidance</td>
<td>Legacy provision and support</td>
<td>Key Contacts</td>
</tr>
</tbody>
</table>
PREPARING FOR LAUNCH
It is recommended that the following (minimum) make ready activities be undertaken and monitored with Procuring Authorities prior to launch:

- Authority BIM Champion identified (aligned with correct profile).
- The Authority’s BIM Strategy developed and in place (including data use cases and fit with CAFM systems).
- Level 2 BIM artefacts injected into processes (EIRs etc.).
- BIM requirements in all relevant tenders by 2017 where a positive ROI is forecast.
- Authority’s BIM forward pipeline issued prior to 2017.
- BIM introductory and discovery sessions undertaken.
- Common data environment (CDE) strategy and standard Information Requirements determined.
HORIZON 5 – Launch of BIM Level 2

MONITORING BIM LEVEL 2 IMPLEMENTATION

After the launch of BIM Level 2, Scottish Government should provide support for the early adopters of projects. There should also be an active role in monitoring the level of BIM adoption, efficiency gains and identify subsequent challenges and issues as they arise to inform future guidance.

Once BIM Level 2 has been implemented, a comprehensive lesson learned exercise should be completed and this should address:

- Lessons in the implementation of BIM.
- Measured increase in Scottish BIM capacity as a result of the mandate.
- Review of actual benefits either achieved or demonstrated.
- Identify areas not achieved/implemented and assess reasons for this and future actions required.

Consider areas of further education and training going forward.

Discussion and recommendation on if/how the Public Sector continue to develop their BIM maturity. Consider next steps to BIM Level 3. Level 3 will enable the interconnected digital design of different elements in a built environment and will extend BIM into the operation of assets over their lifetime. It will support the accelerated delivery of smart cities, services and grids.
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