Geotechnical Data Integration: The foundation of good Building Information Models (BIM)

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Bentley Systems

Bentley provides **software** and **professional services** for the lifecycle of the world's infrastructure.

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Plant  
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Geospatial
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- Utility Networks
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- Campuses
- Rail and Transit
- Water and Wastewater
- Communications
Agenda

• Defining what is BIM
• Understand key features, terminology and benefits
• What is the role of Geotechnical Information in BIM
• Examples of across discipline and environment delivery
What is BIM?

Building Information Modelling is nothing more than a multi-disciplinary collaborative, model based approach to the design, construction, commissioning, ownership, operation, maintenance, demolition of built assets.

The BIM model is a digital resource of reliable information for decisions from the initial conception to the final disposal of a facility or asset, founded on open standards for interoperability and integration.

Targeted at reducing costs

Not a ‘product’ it is a “process”
Why is BIM so important?
Government ‘Encouragement’

- Reduce costs by 20%
- Public Money
- Adoption within 5 years
- Competitiveness
Evolving BIM

LEVEL 0

LEVEL 1

LEVEL 2

LEVEL 3

2D

3D

BIM's

CPIC

AVANTI

BS1192 2007

User guides on each

2016

Building Lifecycle Management

iBIM

ISO BIM

IDM, IFC, IFD

Live Integrated, Interoperable data, database technology

Sharing uncontrolled CAD drawings

Models, object based collaboration

LEVEL 0

LEVEL 1

LEVEL 2

LEVEL 3

Bew & Richards 2008

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Sustaining Infrastructure
Key elements of BIM

- 2D and 3D data
- Federated data approach
- A collaborative work flow process
- Interoperability and data re-use
- Agreed data deliverables
- Culture
British Standards 1192

- Defines how to create a trusted **common data environment**
- Defines processes and conventions that make true data co-ordination and collaboration work
- BS1192 is based upon a federated approach to **Building Information Modelling/Management (BIM)**
Federated Approach

- Task driven
- Proprietary
- Dictatorial
- Local
- Unsustainable

- Process driven
- Open
- Democratic
- Distributed
- Sustainable
Federated BIM Data

Steel structure
Concrete structure
MEP services
Coordination
Combined Together
Contextual information
Integrated data model - BIM

Fully integrated BIM, “supply the correct information to the correct person at the correct time”!
Okay, so what are the benefits
Building Information Modelling

PLANNING
DESIGN
BUILD
O&M

ASSET KNOWLEDGE

PROJECT TEAM

Traditional Design Process
BIM Process

BIM BENEFIT!
Where BIM returns value?

- Reduce costs while improving productivity
- Improve quality while maintaining industry standards
- Improve your understanding of risk on projects
- Provides you with greater control
- Avoid time and cost over-runs
- Increase efficiency within your supply chain
- Increase your understanding of the asset
- Protect profit margins
The Role of Geotechnical Engineering in BIM

• Underpins all structures that exist on or above the ground
• Surrounds all underground structures
• Dictates the choice of design and costs related to the design
• Subsurface information acts as the source for all BIM models

If complacent, costs are cut, information is isolated or poorly managed ....... What happens!!!
The Role of Geotechnical Engineering in BIM
Geotechnical Data in BIM
Geotechnical Data in BIM

What kind of information should be made available to the BIM environment?

• Factual Information – hole location, lab, stratigraphy, geophysics, etc.
• Derived information – classification, reports, etc.
• Interpretive Information – sub-surface models
• Analysis and Design – GeoStructural Designs

All have importance when integrated into a multi-discipline environment
Geotechnical Data in BIM – Federated Approach

What does this mean for Geotechnical Information?

• Data resides where it was created and is managed
• Updated information reduces risk and gives a clear picture of the underlying challenges.
• Decisions are made through interaction not a snapshot in time.
Geotechnical Data in BIM – Federated Approach

**Little BIM** – often preferred by design teams who wish to adopt the BIM workflow.

- **Level 3 BIM compliance**
  - Database Technology
  - Oracle

- **Level 2 BIM compliance**
  - 3D Models
  - DWG
  - Bentley DGN

- **Level 1 BIM compliance**
  - Flat Files
  - AGS
  - DWG
  - Bentley DGN
Geotechnical Data in BIM – Federated Approach

Application Example – Road Design

Feasibility Study
Geotechnical Data in BIM – Federated Approach

Application Example – Road Design.

Addition of a more detailed survey
Geotechnical Data in BIM – Federated Approach

Application Example – Road Design

Iterative cycle
Geotechnical Data in BIM – Federated Approach

Application Example – Road Design

Completed Design
Geotechnical Data in BIM – Federated Approach

**Big BIM** – preferred by owner operators

- **Design**
- **Civil Engineer**
- **Rail Engineer**
- **Structural Engineer**
- **Road Designer**
- **Bridge Engineer**
- **Water Engineer**
- **Architect**
- **Etc.**

**Continued use of the model**

- **Operate & maintain**

**Procure & Construct**
Geotechnical Data in BIM – Federated Approach

Post build maintenance phase, reusing subsurface information
Sharing information through hand held devices
Geotechnical Data in BIM – Federated Approach

Post build maintenance phase, reusing subsurface information

Sharing information to Desktop and Web based GIS
Summary, what have we learned

• Geotechnical data adds considerable value to the BIM environment
• Subsurface conditions can be the defining parameters to the success of a infrastructure project.
• Supplying the correct information, to the correct person at the correct time, is an effective work practise (BIM)
• Do not be scared, it is only a process
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