BIM for Infrastructure: Road and Rail

Jimmy Lau, Technical Manager – Asia, Civil Design
High Speed 2 (UK)
Engevix Engenharia - Submerso - Santos Guarujá Tunnel

- Fabricação dos módulos em doca seca
- Vedação temporária
- Inundação da área

Be Inspired Awards 2014 Finalist

• Descartes
• OpenRoads
• MicroStation
• ProjectWise
• PowerCivil for Brazil
Sustaining the Infrastructure of ‘London 2012’

Leading AECO organizations, empowered by Bentley Systems software and services, have been instrumental in shaping and sustaining London’s infrastructure for close to 30 years. Among their contributions shown here are significant structures within London’s skyline and the facilities and transportation systems that helped make the London Olympics such a big success.

London exemplifies the United Kingdom’s steadfast commitment to infrastructure development as a key driver of long-term economic growth. And its leadership in the adoption of innovations such as BIM for managing construction information to help achieve full-life-cycle collaboration. Building Information Modeling by 2016, gains Bentley and AECO organizations’ efforts to advance the use of this information to improve the quality of life while increasing efficiency.

Crossrail
4D Modelling – utilising program data to manage risk
“BIM-enabled” Operations and Maintenance

Relationship with other publications

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3D / Spatial Challenges

Platform Cross Section / Zones

Alignment and Track
Aerodynamics and Ventilation
Rolling Stock
Signalling, Power and OHLE
Bulk Power and HV
Communications and Control Systems

Station Designer

C121

C122, C125
C164, C170

ARUP
Mott MacDonald
Parsons Brinckerhoff

PADDINGTON
BOND STREET
TOTTENHAM COURT ROAD
FARRINGDON
LIVERPOOL STREET
WHITECHAPEL
WOOLWICH
CUSTOM HOUSE

Aerodynamics and Ventilation
M&E in Tunnels
Bulk Power and HV
Communications and Control Systems

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Road/Tunnel Alignment

Road Tunnel Corridor Modeling

Underground Utilities

Tunnel Modeling

Integrated BIM Model

Tunnel Facilities

Road Furniture

Bridge/Viaduct

Rebar Detailing
“Building” Intelligent Model

GIS/Geospatial Data
Survey Data
3D Laser Scanning/Point Clouds
Resurfacing

Preliminary Design
Site and Road Design
Planning
Civil Infrastructure
Design to Construction
Rehabilitation
Operations and Maintenance
Construction

Engineering Models
Reality Models
Industry Standards
Automated Machine Guidance

Design & i-model
Coordinate Across Design Teams

Cross-Discipline Coordination Services using i-models

Shared Data Repository

Design Synchronizer

ON-DEMAND: Coordinate changes, track revisions, and compare versions
Federated Data Approach
Common Data Environment

- Access Right; Audit Trial; Versioning and Workflow
- Collaboration
- Find/Locate/Index
- Common Working Environment
Comprehensive Modeling Environment…
Comprehensive Modeling Environment…
Reality Modeling…

Physical Assets

Infrastructure Projects Need Context

Reality Modeling Services
Comprehensive Modeling Environment…

BIM for Infrastructures

ContextCapture

ConceptStation

OpenRoads ConstructSim

OpenRoads Navigator

OpenRoads Designer

LumenRT
Context Data Import

Do you want to add context data?
You should consider first adding the terrain and images data for optimal results.

- Import from local files
- Use GeoCoordination Services
- Skip

Don’t ask again
This can be changed in Settings.
Comprehensive Modeling Environment…
Comprehensive Modeling Environment…

- ContextCapture
- ConceptStation
- BIM for Infrastructures
- OpenRoads ConstructSim
- OpenRoads Navigator
- OpenRoads Designer
- LumenRT
- OpenBridge Modeler
Comprehensive Modeling Environment…

- ContextCapture
- ConceptStation
- BIM for Infrastructures
- OpenRoads ConstructSim
- OpenRoads Navigator
- LumenRT
- OpenRoads Designer
- OpenBridge Modeler
- OpenRail Designer
OpenRail/Power RailTrack: Design Modeling

- Track Design (HS, LR…)
- Electrification (OLE)
- Signaling
- Tunnels
- Dynamic Geometry
- Corridor Modeling
- Design Time Visualization
- Functional Components
- Dynamic Sectioning
- Drainage & Utilities
OpenRail/Power RailTrack: Design Modeling
It’s Really about Modeling
It’s Really about Modeling
Comprehensive Modeling Environment…
Preliminary Investigation

- Locate and review data for proposed site
- Develop drilling plan

Go / No Go decision

- Clearance on environmental
- Site access and archeological review
Site investigation operations

Laboratory testing

Material properties for design
Comprehensive Modeling Environment…
Subsurface Utilities Engineering and Design Analysis

• Create 3D utility models, including drainage and wastewater features
  – Pipes, cables, ducts of all sorts
  – Virtually everything underground

• Elevations from the 3D survey features or from terrain.
SUE Example – Leighton Road, Hong Kong
SUE Example – Guangzhou Metro
Shanghai Northern Cross Channel Construction Project
Shanghai, China
Shanghai Municipal Engineering Design Institute (Group) Co., Ltd.

Project Playlist
• PowerCivil for China
• Subsurface Utilities Engineering

2015 Be Inspired Awards Nominee
Innovation in Road
Comprehensive Modeling Environment…

BIM for Infrastructures

ContextCapture
ConceptStation
OpenRoads ConstructSim
OpenRoads Navigator
OpenRoads Designer
LumenRT
Comprehensive Modeling Environment…
Comprehensive Modeling Environment…
ConstructSim CONNECT Edition

Workface Planning

Construction Modeling
Construction Modeling

Virtual Model

Construction Drawings | Owner Quantities
Equipment | Specifications

Construction Modeling

Fabricate | Support Field Layout
Create Work Packages | Control Machines
Sequence Work

Fills the gap between what design creates and what construction needs.
Design Modeling

Interchange Design Model
Construction Modeling

Split design model into grading work areas

Work Package 1
Work Package 2
Work Package 3

Grading
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Not only Civil...
The entire federated model developed in a single application
The entire federated model developed in a single application
A unified, information & computational modeling application
“BIM-enabled” Operations and Maintenance

Relationship with other publications

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“BIM-enabled” Operations and Maintenance

PAS 1192-3:2014
Specification for information management for the operational phase of assets using building information modelling

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Asset Information Management

Asset Model

Asset Data Dictionary
CR501-CDR-0001: Wall
CR501-CDR-0002: Floor
CR501-CDR-0003: Door

Asset Database
Asset Tag Management Services

- Manage tags from a single master registry
- Distribute tags to contractors via managed, secure workflows
- Quickly and easily build up a complete information model
- Full Audit trail of changes made to tagged assets
“We are creating 2 railroads..”
- Malcolm Taylor (Head of Technical Information, Crossrail)

• Physical Railroad

• Virtual Railroad
Advancing BIM for TOTEX…

CAPEX
Project Delivery

MicroStation
Applications

ProjectWise
Collaboration

OPEX
Asset Performance

AssetWise
Operations

Comprehensive Modeling Environment

Connected Data Environment

Connected Performance Environment

The CONNECT Edition
Terima kasih