BIM - An Information Resource for Future Generations

Chris Linning
Manager - Building Information

- Building Models: development, integration, interfacing, distribution
- Spatial Information: development, ongoing maintenance, integration
- Technical Library: maintenance, enhancement, accessibility

**BIM FOR FUTURE GENERATIONS**
Maintaining the history and records of an idea

- Brief background Sydney Opera House
- Variety & Volume of records held
- Rules and Conventions developed
- Life cycle of Sydney Opera House
- VAPS (Vehicle Access and Pedestrian Safety project)
- BIM utilisation & catch-up strategy
- BM4FM Initiative: PM (Facility Management Interface)

**BACKGROUND**
- Construction: 1958 to 1973
- Cost: $A102m (1973)
- Current Valuation: $A2.3b* (2013) * built asset, machinery, land value
- National & International Collaboration:
  - Denmark, United Kingdom, Sweden, Japan,
  - Austria, France, Germany, New Zealand,
  - Australia

**PERFORMING ARTS CENTRE**
- >1800 performances per annum – watched by 1.4m patrons / visitors
- 7 Performance Venues (6 internal + Forecourt)
- 78 Rehearsal / Dressing Rooms
- Recording & Broadcasting Studio
- Multi-media Suite
- 17 Internal TV Channels
- 8439 jobs (direct/indirect full-time equivalent jobs – Deloitte 2013)

**TOURISM VENUE**
- Prime Australian tourist destination
- 8.2m Site Visitors
- 17,500 tours per annum

**NATIONAL WORTH**
- $4.6b (source: Deloitte 2013)

**BUILDING**
- Operates: 24/7 x 363
- 6 Auditoria + Forecourt
- 17 levels / floors
  - from B5 to L10
- 2360 Spaces / Rooms
- 1641 Doors
- 78 Rehearsal & Dressing Rooms
- 6 Escalators
- 25 Lifts
- 2 Emergency Security Control Rooms + >250 Security Cameras
- 56 Plant Rooms & AHU: 12,000,000 litres of air / day
- 645km of electrical main / sub-main
- 150 UPS units
- Toilet Facilities: 24 public, 60 back-of-house

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3.6ha
250m
125m

Cost: Au$38m (2010)
Operating & Maintenance Manuals:
- 23 hard copy manuals = 1.5 shelves = 800Mb pdf data
- 55 Archive boxes = 9.0 shelves = 4,800Mb pdf data
- 6 DVD's Project Files @ 4.7Gb (min) = 28,200Mb data
Total Dataset = 33,800Mb data

On-line:
- Current
- Searchable

2010 Western Foyer Project – Documentation Set
Cost: Au$15m (2010)
- Operating & Maintenance Manuals
- 23 hard copy manuals = 1.6 shelves = 920Mb pdf data
- 55 Archive boxes = 9.0 shelves = 4,800Mb pdf data
- 6 DVD's Project Files @ 4.7Gb (min) = 28,200Mb data
Total Dataset = 33,800Mb data

BUILDING INFORMATION
- 30,000+ drawing sheets (velum, tracing etc)
- 80,000+ microfilm converted to pdfs
- 1900+ CAD files (since 2000)
- 150+ 3D model files (since 2004)
- 25,000+ Engineering Reports / Corporate Files
- 100,000+ photo library
- Indexed, uploaded to a
- SQL database – fully searchable with maintenance functionality
- On-site Technical Library (hard/soft)
INFORMATION MANAGEMENT
- 30,000+ drawing sheets (velum, tracing etc)
- 80,000+ microfilm converted to pdfs
- 1800+ CAD files (since 2005)
- 150+ 3D model files (since 2004)
- 45+ Operating & Maintenance Manuals
- 23,000+ Engineering Reports / Corp Files
- 150+ 3D model files (since 2004)
- SQL database – fully searchable with maintenance functionality
- On-site Technical Library (hard copy)

INTERNAL CONTROLS
- CAD Guidelines
- BIM Guidelines (Design)
- BIM Guidelines (Construction)
- Coordinated Grid System
- O&M Formatting Guidelines
- Standardised Space/Room Identification
- Technical Numbering (drawing numbers, engineering disciplines, area codes, levels, rooms, doors, lifts, steps)

INFORMATION COMPLIANCE
- Access Strategic Plan 2008
- BIM Guidelines 2009
- Building Standards Manual 2006
- Building Standard Specification 2004
- CAD Guidelines 2009
- Conservation Management Plan 2003
- Energy Master Plan 2006
- Heritage Asset Strategic Plan 2005
- Info Systems Strategic Plan 2006
- Mechanical Services Plan 2006
- Peter Hall Design Principles
- Strategic Building Plan 2008
- Sustainability Policy 2010
- Total Asset Management Plan 2009
- Utzon Design Principles 2002
- World Heritage Nomination 2006

CAD / 3D MODEL CONTROL
- Coordinated Controlled Survey Network (CCSN)
- 169 brass survey plaques
- SOH Grid (Map Grid Australia)
- Terrestrial Laser Scanning

2D MODEL CONTROL - SEP (BIM Execution Plan)
- Design & Construction Process in place (utilising BIM principles)
- Virtual Design Review / Virtual Construction Review
- Coordination & Collaboration
- Agreed BIM Methodologies
- Model Management Protocols
- Agreed Handover

BIM FOR FUTURE GENERATIONS
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70 Policy Documents
57 Safe Work Procedures
>45 Master Plans & Guidelines
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**Anticipated Life of Sydney Opera House?**
- 250 to 300 years

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- 50,000 heavy vehicle movements per annum
- 1800 events (performances) per annum
- 8m pedestrian movements per annum

SOLUTION: VAPS Project
Vehicle Access & Pedestrian Safety
Underground Loading Dock
Theatre access corridors

First full collaborative BIM project
concept – design – construction - handover

Existing Infrastructure:

- Harbour Tunnel
- Opera House Carpark
- Fire & Water
- Gas
- Electrical
- Sewer
- Stormwater Communications (events)
- Security

Mostly sourced from paper documents with minimal accuracy to their locations/depths

Collaboration Principles
Concept
Design
Tender
Construction (including fablised)
Commissioning (commissioned)
As-fab model
Documentation
Database linked

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Alternate Data Capture – Laser Scanning

The Scottish Ten captured the Opera House using cutting-edge laser-mapping technology. The team took more than 800 laser scans and 50,000 digital photos to produce the geospatially accurate point cloud of Sydney Opera House.

2.8TB file set delivered, currently being processed.

USA: South Dakota
Mt Rushmore Monument

India: Rani ki Vav
Royal Step Well

Scotland: Orkney Island
Skara Brae
Maeshowe

China: Beijing
Eastern Qing Tombs
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Common, compatible open standard…

Functional Requirements: Phase 1

- User access/controls
- Modelling views/scrolling
- Parametric elements, documents
- User field data imports
- Modular database control

Systems Alignment:

A seven year program to align all Building Management Systems to a common, compatible open standard...

- SACnet
- GLEENTR
- EAM
- Building
- DCM
- JDXL

XML
- Modbus
- DeviceNet
- BACnet

BIM4FM Initiative - FMI (Facility Management Interface)

- BIM4FM Initiative - FM (Facility Management Interface)

BIM4FM Initiative

Leveraging Building Information Modelling / Management (BIM) for Facility Management (FM)

Stage 1 - July 2013

EOI – Expression of Interest

Delivered Feb 2014

Stage 2 – Sept 2013

Stage 3 – Nov 2014

Delivering the FM Solution

Due by July 2015

Garnishment Implementation & Delivery

Stage 4 – Dec 2014

Tender 2: (invited)

Implementation & Delivery

Technical Specification

Delivered Feb 2014

Tender 1: (invited)

Stage 2 – Sept 2013

Tender 1: (invited)

Stage 1 – July 2013

BIM4FM – Accessing the Information

A lean, bespoke web-based graphical user interface accessing all of the building's digital datasets...

- Record modelling
- Maintenance systems/scheduling
- Building systems monitoring/analysis
- Security/fire management
- Space/event management
- Security/disaster planning

Internal Scanners / Printer / Plotter

- Hi Speed paper document colour capture
- Microfilm scanner b/w capture
- Large format document colour capture

Formats .jpgs, .pdfs,

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- Large format document colour capture

Formats .jpgs, .pdfs,

Resource Pool

5 AEC organisations

6 specialist consultants

21 potential candidates

9 specialist consultants

36 completed full assessment

84 participants from 8 countries

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THANK YOU

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Thank you