CAD+BIM+GIS+CMMS for Airport Facility Maintenance/Management: Making the best of each tool work - together

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Engineering & Design Director
TAV Construction
TAV Integrated Solutions
TAV Construction: ENR #1 in Airport Construction
TAV Integrated Solutions

Formalize and utilize the combined design, construction, and operation know-how of TAV Construction, TAV Airports and partners based on available tools and technologies created for the built environment industry: More than 6,500,000 m² of built environment with BIM...

**DESIGN & CONSTRUCTION**
- 3D model:
  - Coordination
  - BOQ extraction
  - Shop drawings
  - Visualization
  - Rendering
- 4D scheduling/logistics:
  - Trade coordination
  - Site coordination
  - Resource allocation
- 5D cost control:
  - Cost planning
  - Estimation
  - Variation tracking
  - VE / Energy modeling

**OPERATION READINESS & TRANSFER (ORAT)**
- Digital data delivery
- Familiarization:
  - Visualization
  - Staff training
- Virtual commercial planning
- Virtual walk through and stakeholder engagement
- Laser scanning and validation
- Immersive Virtual Reality
- Increased post-opening activities

**FACILITY MANAGEMENT & OPERATIONS**
- Navigation
- Asset management
- OEM documentation access
- Building management/automation system (BMS/BAS) integration
- Facility management system integration (i.e. CMMS)
- Energy performance validation
- Operation analytics and prediction
- Staff training
On-going TAV Projects with BIM Delivery

- Abu Dhabi Midfield Terminal
- Emaar Square Istanbul
- ADP Headquarters Paris CDG
- Bahrain Airport New Terminal
Case Study for BIM-FM @ TAV: Medina Airport
BIM-FM: WHY?

- Contractual requirements
- Information mobility
- Digitize and future proof data
- BIM is the most convenient way to capture coalesce information
- Information granularity
- Can’t manage what you do not know
- Extensive integration opportunities
BIM-FM Impact/Opportunities Throughout Lifecycle

CAPEX

- Construction

Design

OPEX

Business Operations

Maintenance

TIME

COST
bldgs = data
Construction documents – what's in it for FM?
BIM Lifecycle Management

BIM Lifecycle Execution Plan:

- BIM content and attribute definitions
- BIM asset element requirements
- Existing facility BIM model requirements
- New and future facility BIM model requirements
- BIM model update methodology
- Data management
- BIM hardware and software updates
- BIM Management workflows
BIM Lifecycle Management

FM / Operations

Project

Design

Construction

BIM System Execution Plan

Project A

Design BEP

Construction BEP

Sub-Contractor BEP

Sub-Contractor BEP

Sub-Contractor BEP

Project B

Design BEP

Construction BEP

Sub-Contractor BEP

Sub-Contractor BEP

Sub-Contractor BEP
### Content Preparation

#### Level of Development

<table>
<thead>
<tr>
<th>Information Category</th>
<th>Information Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Properties</td>
<td>Nominal Connection Size</td>
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<tr>
<td></td>
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<td>Sub-System Abbreviation</td>
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<tr>
<td>Annotation Properties</td>
<td>Fire Zone Abbreviation</td>
</tr>
<tr>
<td>Annotation Properties</td>
<td>Sprinkler Type</td>
</tr>
<tr>
<td>Quantification Properties</td>
<td>BDD Relevance No</td>
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<tr>
<td>Quantification Properties</td>
<td>ABS number</td>
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#### FAMILY TYPES

<table>
<thead>
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<tbody>
<tr>
<td>1 A1: Sprinkler 68 C Fast Response K=80</td>
</tr>
<tr>
<td>2 A2: Sprinkler 68 C Fast Response K=115</td>
</tr>
<tr>
<td>3 A3: Sprinkler 74 C Fast Response K=80</td>
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<tr>
<td>4 A4: Sprinkler 93 C Standart Response K=85</td>
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<tr>
<td>5 A5: Sprinkler 93 C Fast Response K=80</td>
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<tr>
<td>6 B1: Sprinkler 68 C Fast Response K=80</td>
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<tr>
<td>7 B2: Sprinkler 74 C Fast Response K=80</td>
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<td>8 C-Duvar Tip Sprinkler 68 C Fast Response K=80</td>
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### Column

<table>
<thead>
<tr>
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<th>BIM Object or Element</th>
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<tbody>
<tr>
<td>Item Category</td>
<td>Description: A 3D Element, Fire Protection System Sprinkler Element.</td>
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Element Tagging /Asset Code

There are several types of unique identifiers that can be used together to may be necessary to define/capture as attribute information within BIM models:

- Barcode tag numbers
- Equipment serial numbers
- As-built / shop drawing schedule mark
- Object ID compiled of several levels of coding
- GUID tags
- Classification Number: Omniclass [Masterformat, Uniformat] (US), Uniclass (UK), NL-SfB (NL), CoClass (SWE), etc…
Space Definition – all spaces where assets exist need to be defined to capture location
Medina Airport Passenger Terminal Building
Concourse section view from model showing defined spaces
System Definition
System Definition – One to many...
System Definition
Medina Airport Passenger Terminal Building
Concourse view from model showing sprinkler system of a given zone

Location of shutdown valve for fire sprinkler zone highlighted as a defined system within the BIM model.
BIM Lifecycle Management

Asset Data from BIM

Mobile Device

Asset Data from Site
BIM FM Implementation for Integration and Management

**PHASE - I**
**REVIEW & AUTHORING**
- BIM System Execution Plan for FM & Lifecycle Management
- Define BIM requirements for FM use
  - Attributes & documents
  - Room/Space definitions
  - System definitions
  - Zone definitions
- BIM modeling for existing facilities and infrastructure
  - As-built based modeling
  - Laser scanning
  - Site survey based modeling
- Review existing BIM models for FM use & compliance

**PHASE - II**
**CONTENT INTEGRATION**
- Federated BIM model and content reviews per requirements
- Remedial actions
- Integration platform review and deployment
- Asset and CMMS database content population/integration with BIM

**PHASE - III**
**PLATFORM MANAGEMENT**
- BIM + GIS UI use cases
- Operation analytics, reporting and management dashboard
- Integration with other FM systems
  - ERP
  - BMS
  - Security
- Platform Management & Staff training
- Platform models and database updating
BIM-FM System Integration Infrastructure
BIM Integration: Software (Viewer or Integrator?)
BIM-FM Data Integration using BIM
BIM-FM Integration: Model + Information
User Experience

[Map Screenshot]

Embassy Suites by Hilton...
The Venetian

27 min (1.3 mi)
via Sands Ave

[Google Maps Directions]

CAD+BIM+GIS+CMMS for Airport Facility Maintenance/Management – GeoDesign+BIM, Amsterdam, 23 November 2017
FIS: Contextualize BIM Content with GIS
Interactive Content

**BIM Building Information Models**
- 3D geometrical, material and content authoring
- Asset attribute authoring
- System modeling
- Asset + System documentation

**GIS Geographical Information System**
- Common content depository
- Dashboard and analytics
- Visual data reduction
- Content serviced as interoperable dynamic 3D/2D/data layers
- Access to extended visual and non-visual content
- Mobile data collection
Integrating BIM Asset Data with GIS

BIM

3D Content

GIS

2D Content

A360/AGOL

Mobile Data Collection & Access

CAD+BIM+GIS+CMMS for Airport Facility Maintenance/Management – GeoDesign+BIM, Amsterdam, 23 November 2017
Hybrid Modeling: Data Reduction

1-2 order of magnitude of reduction in model size
Create a calibrated energy model to compare:

design building performance

vs.

actual performance
BIM-FM Data Visualization and Business Intelligence
CAD+BIM+GIS+CMMS for Airport Facility Maintenance/Management – GeoDesign+BIM, Amsterdam, 23 November 2017
Thank You