Living a Happy Lifecycle with Building Information Modeling: Linking BIM to FM is Just the Beginning

Amber White, Design
Doug Betts, Operations
Chitwan Saluja, Construction
Grace Wang, Handover

Class summary

We have spent the past several years institutionalizing the standards and processes required to establish a “To Be Maintained” Building Information Modeling (BIM) Revit software model and link this Revit software model to a computerized maintenance management system (CMMS). The prevalent thinking was that this “BIM-to-CMMS” milestone was the ultimate BIM goal for an owner. Today we see that it is just the beginning of capitalizing on BIM in many areas of the facility lifecycle, and we understand that the owner expects the existence of the BIM to deliver measureable value in the operation and maintenance of the facility. Our panel will focus on the emerging uses of BIM after the completion of the Revit software model. We will discuss how you can utilize the model in asset management, real estate management, and building automation and performance optimization, as well as how the model impacts the total cost of facility ownership.

Class summary

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Key learning objectives

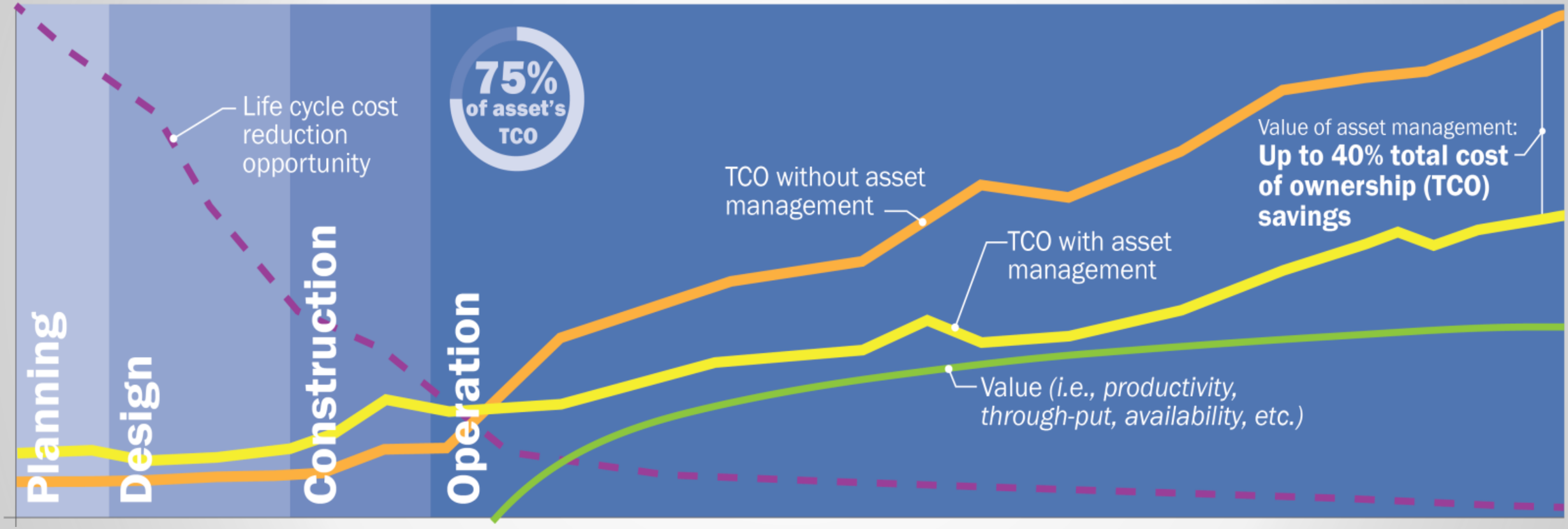
At the end of this class, you will be able to:

- Understand lifecycle BIM implementation
- Learn effective practices for implementing BIM-enabled FM on a project
- Learn about the emerging uses of BIM in facility management
- Become aware of the common misconceptions associated with 6D BIM

Happy Lifecycle

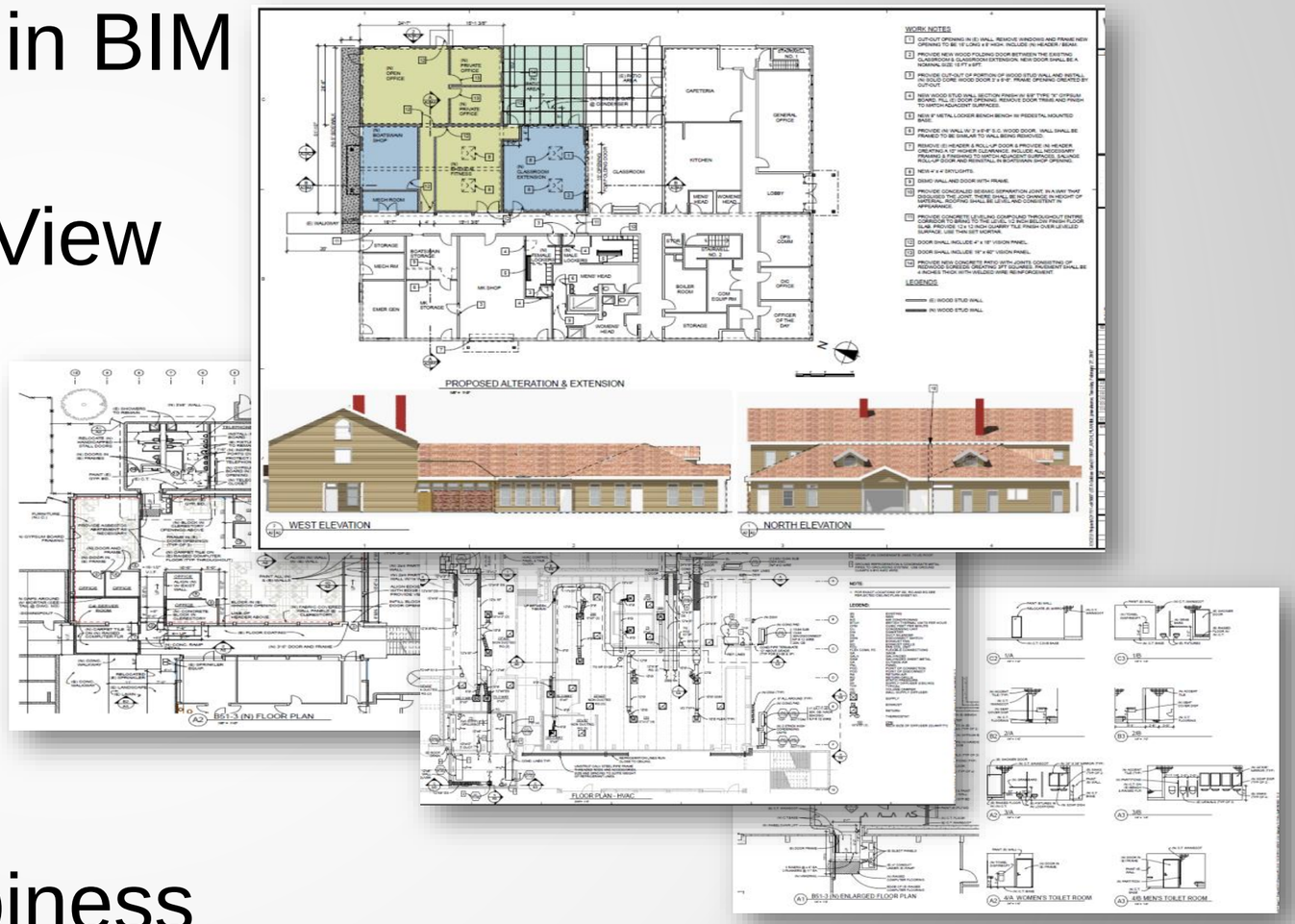
- What does a Facility Manager need? (Doug)
- From Design to CMMS – BMHR (Chitwan)
- FM Beyond CMMS (Grace)
- FM Beyond & back to design (Amber)
- What's Missing in my Life(cycle)?
  - Facility Operations Tools and Workflows
  - GIS
  - Asset Management Facility Lifecycle Tools and Workflows
  - Facility Engineering/Troubleshooting
  - Facility Specific CMMS Add-Ons (Data Centers, Labs, Hospitals)

What is Happy - FM to BIM View



What is Happy - FM to BIM View

- Not all that can be collected in BIM helps FMs
- Supply Chain Management View
  - Your Supplier's Supplier
  - Your Customer's Customer
- Delivering Value in BIM is knowing what the FM community needs (and why)This leads to happiness



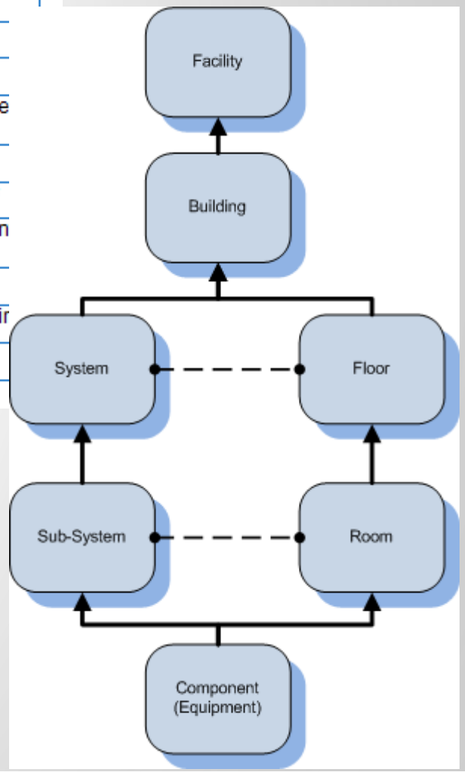
What do Facility Managers Need?

- Asset Registry
  - Assets, Components, Equipment, Space
- Configuration Data
  - Standards to define capability & performance
  - O&M Manuals, Warranties…
- Performance Data
  - Physical / Condition
  - Functional
  - Use & Utilization

12.9.1 AIR HANDLING UNIT (AHU)

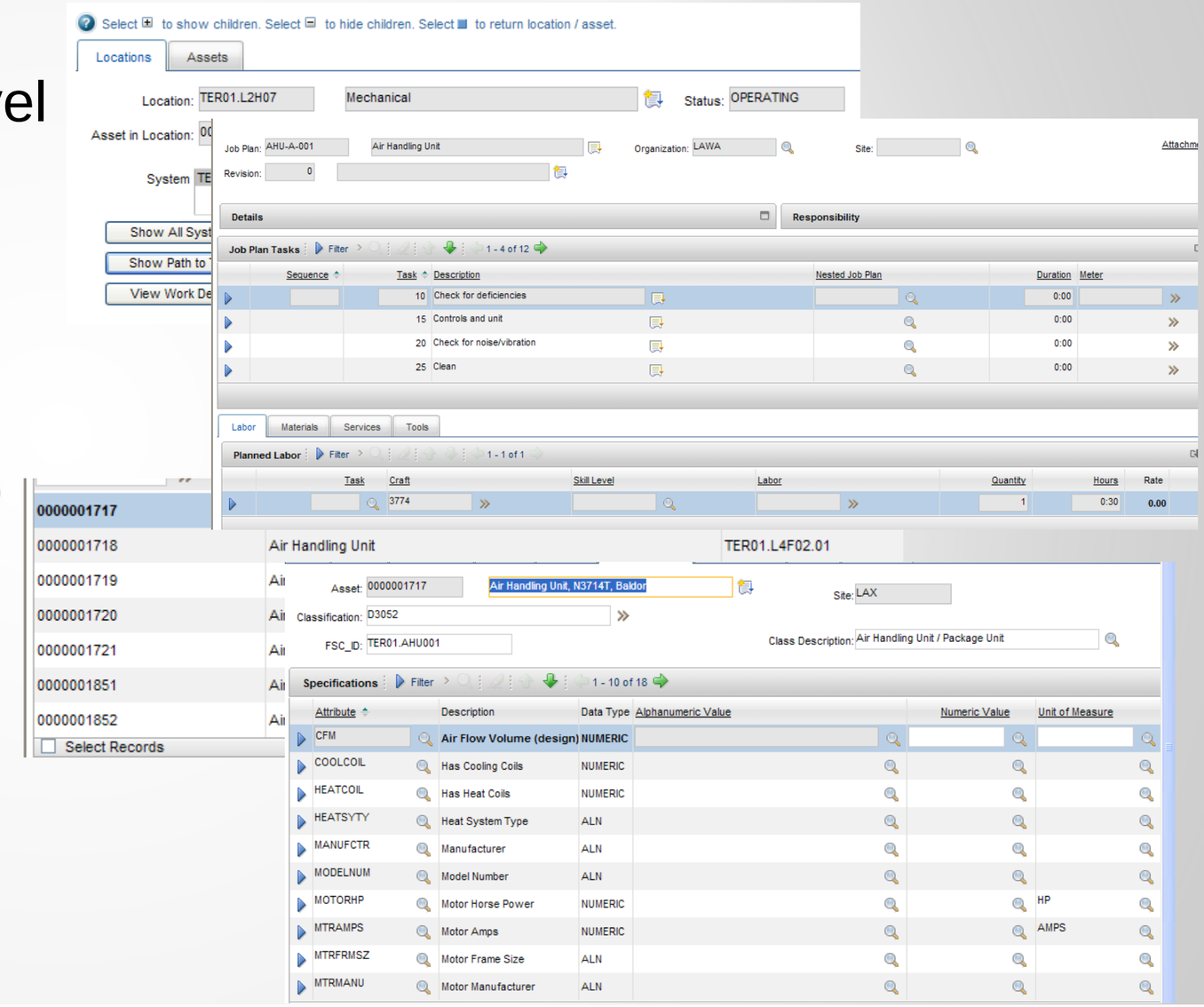
Hierarchical Level: Component
System Association: HVAC
Code: AHU
Description: A packaged assembly of air-conditioning equipment, such as coils, filters, humidifiers etc., which provide the treatment of air before it is distributed.

Attribute	Data Type	Unit	Domain / Range of Values
Component ID	Var	N/A	Unique id for the entity | AHU_###
SAP ID	Var	N/A	ID used to reference SAP Asset
Bar Code	Var	N/A	Bar code cross-reference
Component Description	Text	N/A	A narrative description of the entity
Component Type	Combo	N/A	Single Zone, Multi Zone
System ID	Var	N/A	The system ID that the component is associate to
Criticality	Number	N/A	1, 2, 3, 4, 5
Legacy Names	Var	N/A	Common name or previous name of the entity
Date Entered	Date	N/A	System date of when the record was entered in the database
Condition Rating	Number	N/A	Condition rating of the component
Inspection Date	Date	N/A	Date of the last inspection for the condition ratir
Year Built	Date	N/A	Year that the component was constructed
Design Life	Number	N/A	Design life



How Can BIM Help Facility Managers?

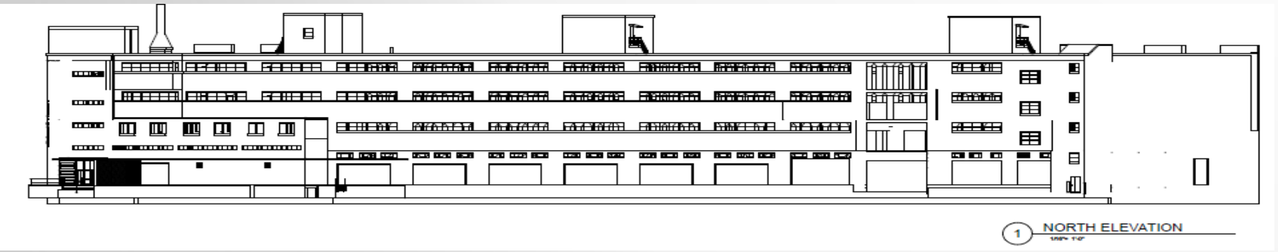
- Asset Registry
  - Provide information only to the level required
- Configuration Data
  - Information to directly inform resource management decisions
  - Time, Money, Scope – the real 3D
- Performance Data
  - Feed maintenance projections
  - Monitor operating performance
  - Simplify, Simplify, Simplify
  - Makes the organization better!



How to Start Leveraging BIM in FM?

- BIM'ers Must Know:
  - What is required
  - What is needed
  - When is it needed
  - In what formats

  and, importantly,
  - Why is it needed



- FM'ers Must Provide:
  - Asset Data Requirements
  - Configuration Data Specs
    - Physical Characteristics
    - Functional Characteristics
  - Performance Data
    - Operating Criteria
    - Warranties
  - A Plan to Integrate BIM
    - Where does information go and how it is used

Case Study – Bronx Mental Health Redevelopment (BMHR)

Bronx Mental Health Redevelopment – BIM LIFECYCLE

PLAN

Planning Model

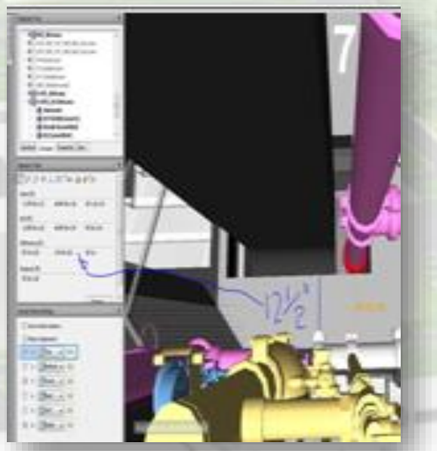
Establishment of Design BIM Standards

DESIGN

Design Revit Model

Periodically Audit Design Revit and Navisworks Model

CONSTRUCT



Navisworks Model

Construction Coordination workflow

iPAD implementation on-site

OPERATE

As-Built Model

BIM enabled FM (BIM-CMMS) Implementation

BRONX MENTAL HEALTH REDEVELOPMENT

BMHR Methodology for BIM Enabled FM

Step 1: Understand how the client will use BIM during operations of the facility;

Step 2: Document facility /asset /operational data;

Step 3: Link BIM data to Computerized Maintenance Management System (CMMS);

Step 4: Documentation, training and handover.

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JACOBS ROLE

- BIM to FM Implementation Plan
- Meeting with the Facilities to Decide on the Best Option given the Current O&M Systems
- Import Asset Information & Link to Facility Software and Tablet PC
- Link Equipment Product Data through BIM
- Coordinate Information from the Design & Construction Models to As-built model

Step 1: Understand how the owner will use BIM for operations of the facility

How are you managing your systems now?

Do you want to incorporate BIM into your existing strategy?

Is this an opportunity to formulate a new strategy?

How large is your portfolio of assets?

Are you in a position to use BIM during O&M?

ASSET MANAGEMENT

WORK ORDER MANAGEMENT

PREVENTIVE MAINTENANCE

DOCUMENT MANAGEMENT

SPACE MANAGEMENT

PROJECT MANAGEMENT

FINANCIAL MANAGEMENT

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FINANCIAL MANAGEMENT

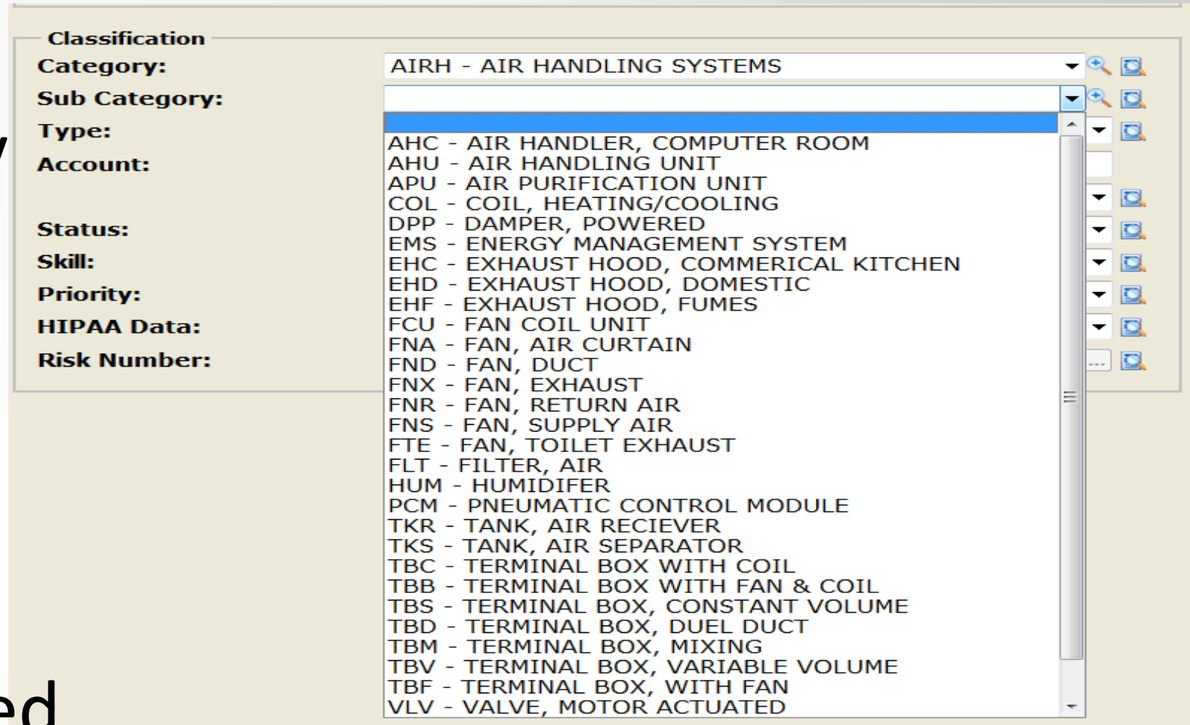
Step 2: Document facility/asset/operational data

Which facility elements are currently being monitored by the existing facility management system ?

What additional information would be beneficial to track?

What attributes need to be documented for each identified facility element?

Who is collecting this information and feeding to the model?

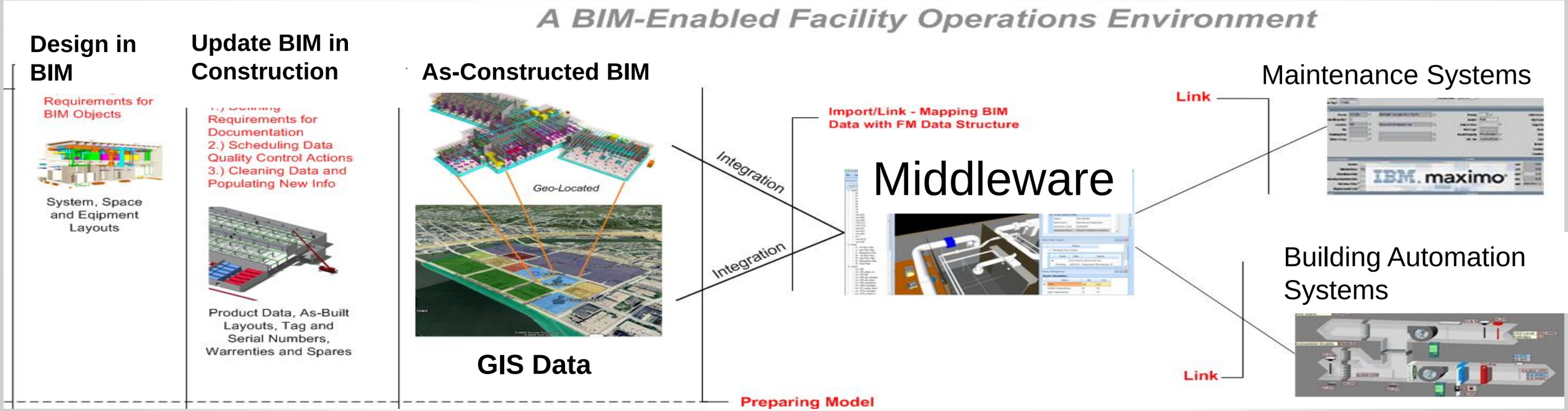


	A	B	C	D
1	ASSET	PARAMETER	ATTRIBUTE [Example]	
3	BOILER and ANCILLARY EQUIPMENT			
4				
5	BOILER	Equipment ID No.	Boiler No.	Main / Classification
6		Space Served	Bldg No. / Floors / Floor Sections	Detail / UDF 1
7		Boiler Type	Cast Iron Sectional, Water Tube, Fire Tube / Hot Water, Steam	Detail / UDF 2
8		Location	Bldg No. / Room No.	Main / Location
9		Boiler Manufacturer		Main / Manufacturer
10		Boiler Model No.		Main / Model No.
11		Boiler Serial No.		Main / Serial No.
12		Fuel Type	No. 2 Fuel Oil, Natural Gas	Detail / UDF 3
13		Capacity, Nominal	BHP	Detail / UDF 4
14		Fuel Consumption	GPH / CFH	Detail / UDF 5
15		Maximum Working Pressure	PSIG	Detail / UDF 6
16		Blower Motor Manufacturer		Detail / UDF 7
17		Blower Motor Model No. / Serial No.		Detail / UDF 8
18		Blower Motor Specifications	HP / Volt / Amps / Phase	Additional Info.
19		Power Panel Name, Source	Panel ID No.	Detail / UDF 9
20		Breaker Number, Source	Breaker No.	Detail / UDF 10
21				

Step 3: Link BIM data to CMMS

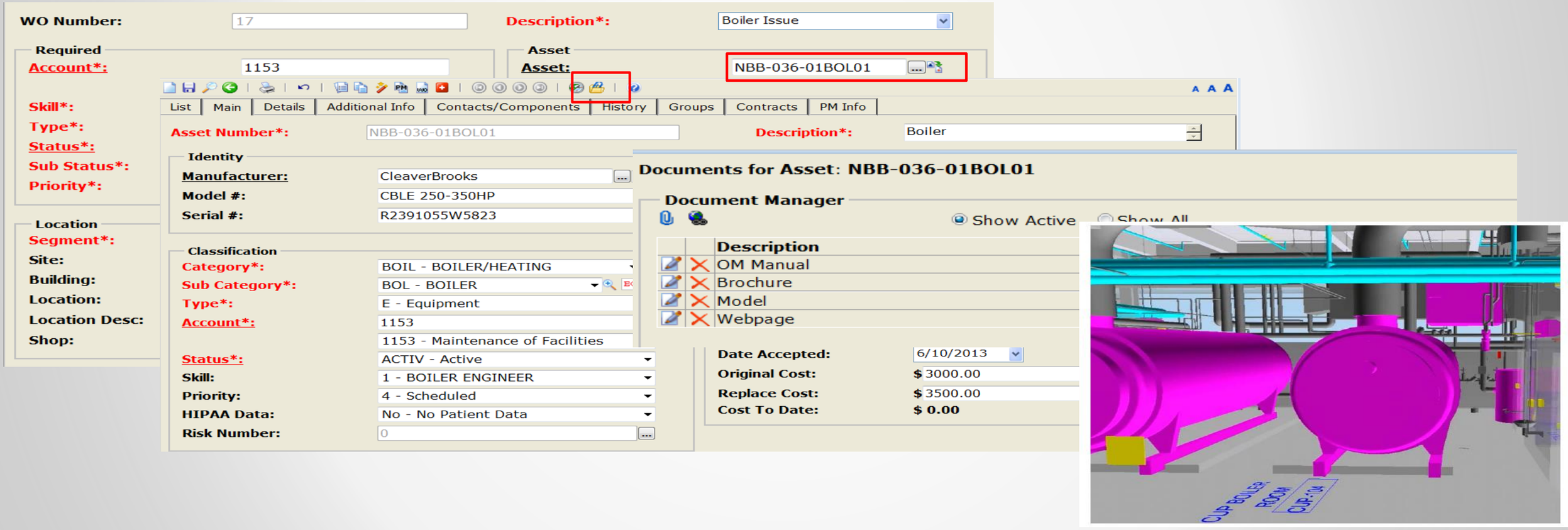
Export to Facilities Management Program

- Four Rivers (Client's CMMS) Integration Framework



Step 4: Documentation, training and handover

BIM to FM Implementation Plan documents how the system works.



Bronx Mental Health Redevelopment (BMHR)

Include Facility Managers in all meetings, discussions

Asset Naming: CH-1 vs. BNX-038-01CHL01

Collect asset information throughout all stages of a project. Don’t wait till project handover.

Facility information requirements should be summarized and included within project procurement language.

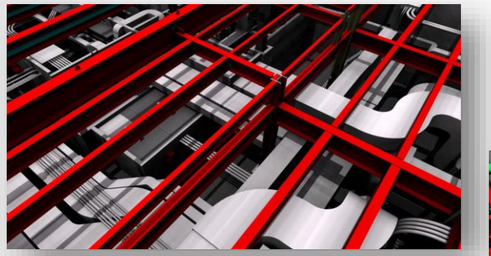
Found out that we need to fix some organizational issues before we can implement new technologies.

Happy Lifecycle

The New Normal: BIM to CMMS

Handover

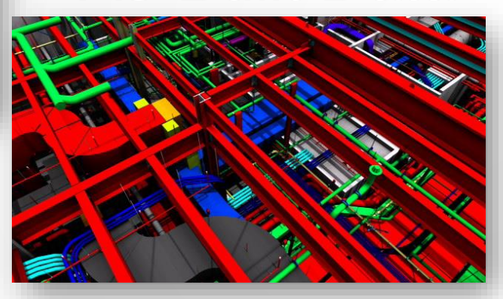
Record Model



REVIT MODEL

LOD 500?

As-Built Data



NAVISWORKS
Specs
Submittals
Cx data
Close out Docs

Import/Link

Bi-Directional

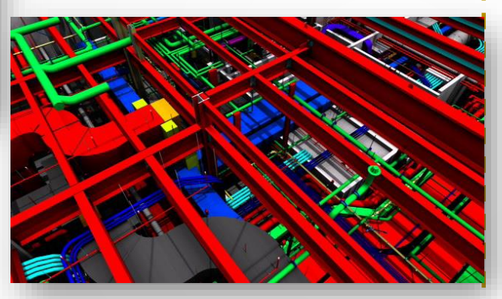
CMMS

Functionality:
Work Orders
Inventory Management
Preventive Maintenance
Equipment Inspection
Purchasing
System Testing
Safety Plans

Happy Lifecycle

The New Normal: BIM to CMMS

Revit



3D Models
Revit
LOD500
Data

Handover

Bi-Direction

RIM
AIM
BAS
GIS

Facility Ops Tools

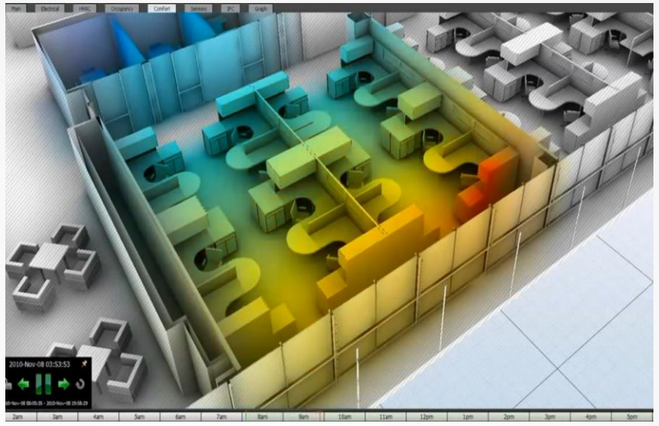
CMMS

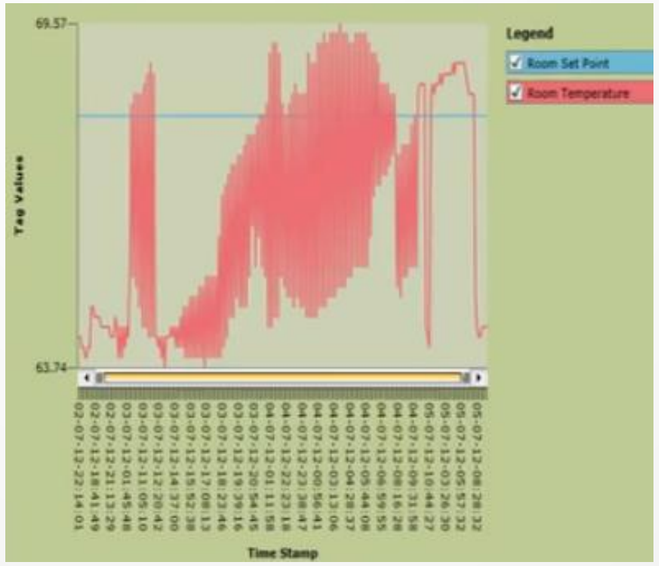
Engineer
Manage
Churn

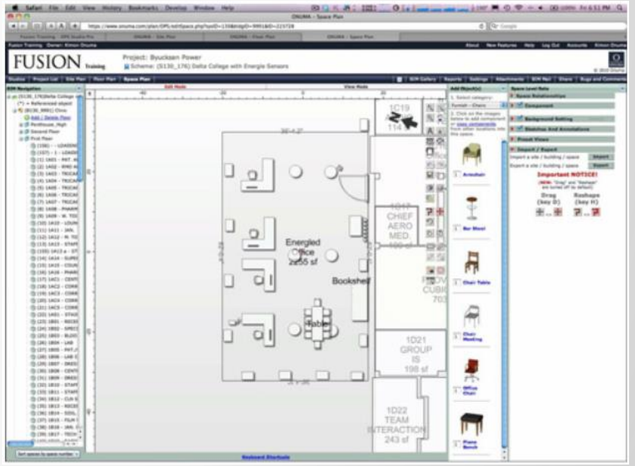
Facility Lifecycle Workflows

Happy Lifecycle
BAS

- Building are the primary cause of GHG
- Data in BAS usage not maximized
- Full lifecycle BIM
- BIM & BAS integration examples



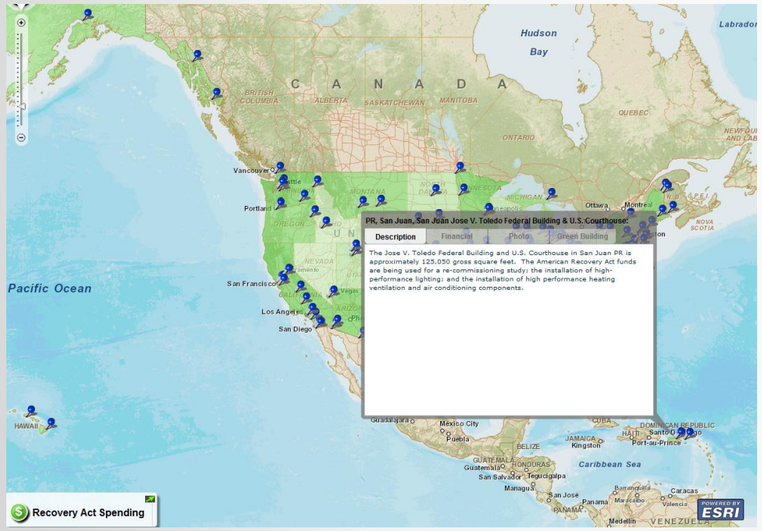




Happy Lifecycle

GIS

- Real Estate Property Management
- Asset Management
- Space Management and Tracking
- Fund Spending Tracking



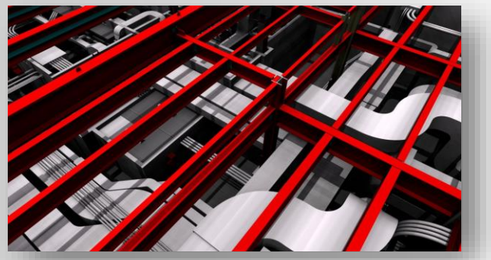
Facility data queried and displayed over geographical layers

Happy Lifecycle

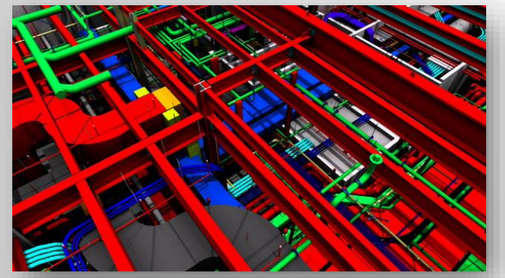
Facility "Churn"

Client Expectation: *"Within 5 years of facility completion we will repurpose this facility and need to renovate. The planning process will start 2 years in advance of the Renovation. What are the planning, analysis, simulation and assessment tools that they use to interact with the BIM as-built/record model?"*

Record Model



As-Built Data



Planning Tools

Analysis Tools

Simulation Tools

Materials Management

BIM-Based Design

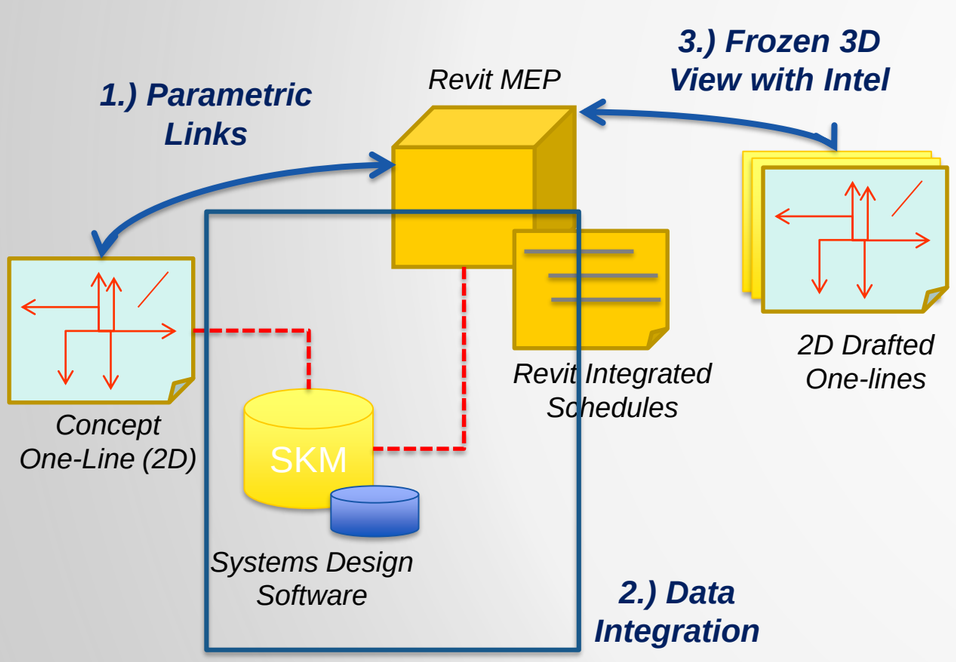
BIM-Based Facility Churn

- Planning and Capacity analysis
- Phasing and Sequence
- Engineering Analysis
- Demolition and Materials Management

Happy Lifecycle

Facility Engineering

Client Expectation: “I manage & troubleshoot this facility using system diagrams (not the plans or a model)”. How do we strengthen the intelligence & parametric of system diagrams, & increase their integration with BIM - making diagrams an effective management & troubleshooting tool.

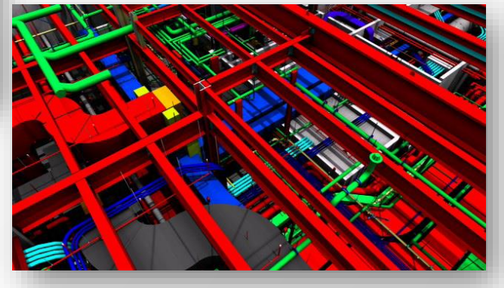


BIM Design

Record Model

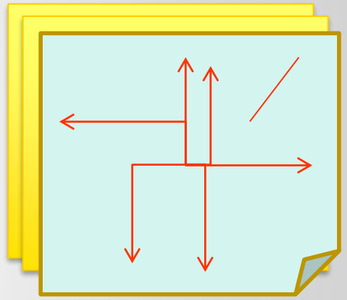
Revit

Asbuilt Data



3D Models, Revit
LOD500
Specs
Submittals
Navis

BIM Handover



Smart, Integrated One-Line Diagrams

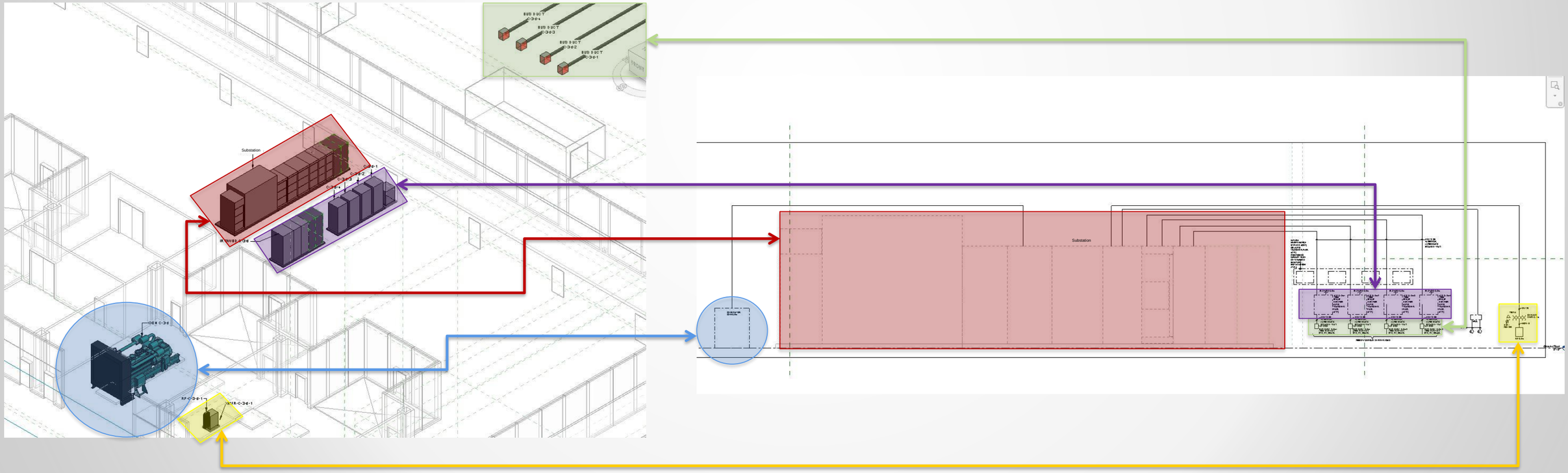
BIM Operations

Happy Lifecycle

Facility Engineering

Concept: *Linking the parameters from the intelligent families in Revit to 2D Components.*

3D Diagrams → Creating Parametric Links to → *Riser Diagrams*



Happy Lifecycle

Review:

- Understand lifecycle BIM implementation
- Learn effective practices for implementing BIM-enabled FM on a project
- Learn about the emerging uses of BIM in facility management
- Become aware of the common misconceptions associated with 6D BIM

Happy Lifecycle

So what's next?

- What is missing in your Life(cycle)
- Where are the tools failing us now?
- What challenges & solutions have you come across in your environment?
- Working groups & how to get involved.

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