FM226: The Asset Paradigm: Maximizing the Value of BIM for Facilities Management and O&M

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Class summary

As Building Information Modeling (BIM) has matured, we have gained the ability to link and integrate data from the BIM model to many other systems. This class focuses on integrating BIM with facilities management (FM) and operations and maintenance (O&M). The class describes how we include the FM team during design to enable full integration of systems, as well as integrating facility data to enable access to information from many standard FM products. We review an example of how we applied data to the BIM model and delivered it to the FM products, enabling a familiar interface for FM and O&M managers to manage the facility after construction. We also look at using virtual FM, which enables a facility to be tested during design and construction. This is a must-attend class for building owners and facility managers who want to maximize the benefits of BIM from design to asset management.

Key learning objectives

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

- Communicate your BIM vision to consultants and contractors
- Determine which information is important and structure a workflow that allows information flow
- Work with multiple parties to understand requirements for FM and O&M systems
- Integrate BIM data into facility data systems

About the Speaker

- Andrew is the Chief Operating Officer, Board Member and one of the founding shareholders of CSi Global Services. In this capacity he is responsible for all of the deliverables of a highly skilled team in relation to the implementation and adoption of BIM for construction and infrastructure projects globally. Andrew has been working with CADD & design technology for over 20 years starting out in the mechanical area before studying civil, structural and mechanical engineering. Andrew has lectured both at university and technical college in engineering and run the design teams for a large consulting engineering company in the mechanical, civil and structural disciplines. Andrew now works with some of the leading companies globally as well as owners and governments in a thought leadership capacity and has been recognised for this expertise in delivering process change management solutions to an international clientele.

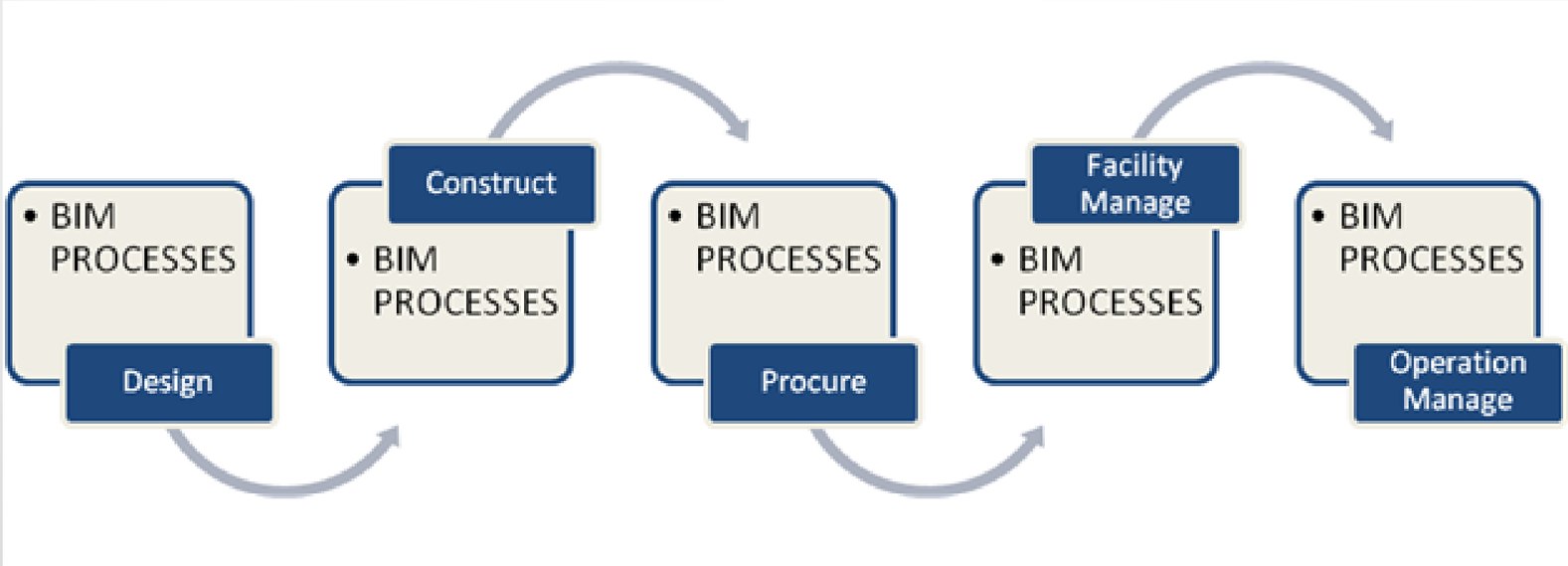
Communicating the BIM Vision

Communicating the BIM Vision

- Refrain from BIM 101
  - Design BIM
  - Construction BIM
  - Procurement
  - Facilities Management
  - Operations and Maintenance

Communicating the BIM Vision

- BIM processes will look very different for each distinct requirement
  - Be clear in what you are describing



Communicating the BIM Vision

- Outcomes will be different which is why you must define the:
  - Where (BIM will be utilized)
  - What (BIM means to the project or company)
  - Why (BIM is critical to success)

Communicating the BIM Vision

- Like any business would provide to clearly articulate BIM you need:
  - Mission Statement
    - This is the why we are doing BIM
  - Vision Statement
    - This is the how we are going to achieve our version of BIM

Communicating the BIM Vision

- Once the mission and vision are defined then:
  - Processes can be defined
  - Contracts can be formulated
  - Capabilities can be evaluated
  - The BIM framework can be completed

Communicating the BIM Vision

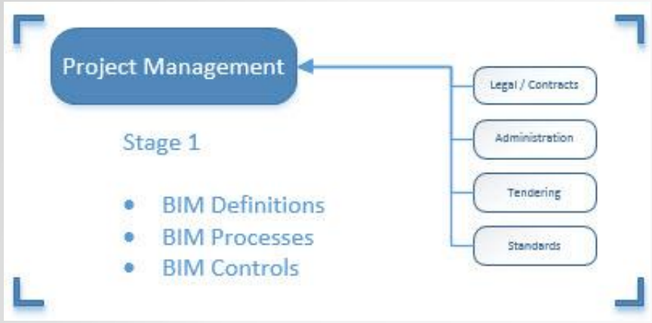
- To be fully successful there is more than just a vision for BIM
- 5 keys to successful BIM include
  - Vision
  - Skill
  - Incentive
  - Resources
  - Action plan

Communicating the BIM Vision

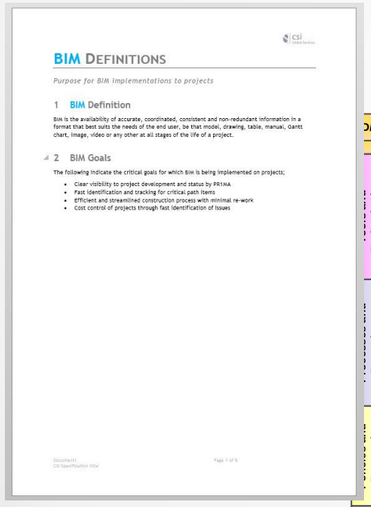
BIM Development

- With asset management in mind the BIM development in all phases still needs to consider the asset but be built succinctly for all BIM requirements

BIM Development – Stage 1



- BIM Definition
- BIM Processes
- BIM Controls



BIM DEFINITIONS

Purpose for BIM implementations to projects

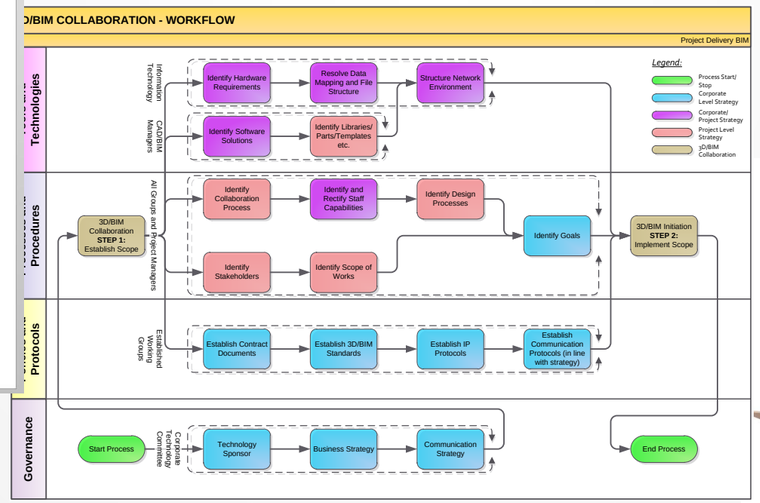
1 BIM Definition

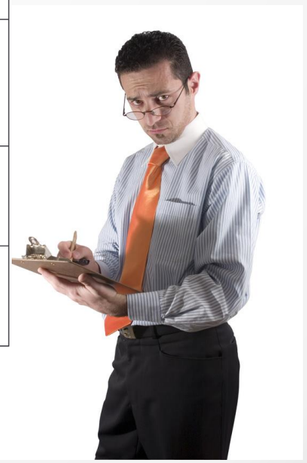
BIM is the availability of accurate, coordinated, consistent and non-redundant information in a format that best suits the needs of the end user, be that model, drawing, table, manual, Gantt chart, image, video or any other at all stages of the life of a project.

2 BIM Goals

The following indicate the critical goals for which BIM is being implemented on projects;

- Clear visibility to project development and status by PRIMA
- Fast identification and tracking for critical path items
- Efficient and streamlined construction process with minimal re-work
- Cost control of projects through fast identification of issues





Process Structure and Documentation

- Create
  - Corporate BIM playbook
    - Project setup
    - Delivery requirements
    - QA/QC
  - Technology Plans
    - Technology workflow
    - Model management
    - Collaboration management
    - Model Auditing

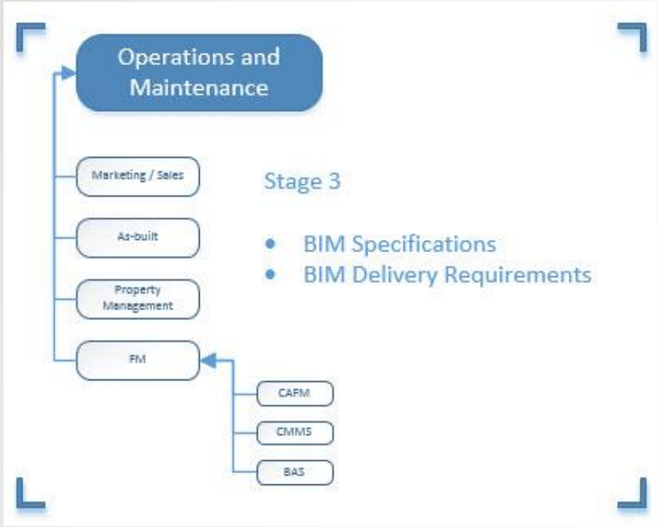
Process Structure and Documentation

- Create
  - Construction Model Plans
    - 4D time structure
    - 5D cost structure
    - Logistics planning
    - Clash and coordination control
    - Variance reporting structure
    - Construction coordination meeting structure

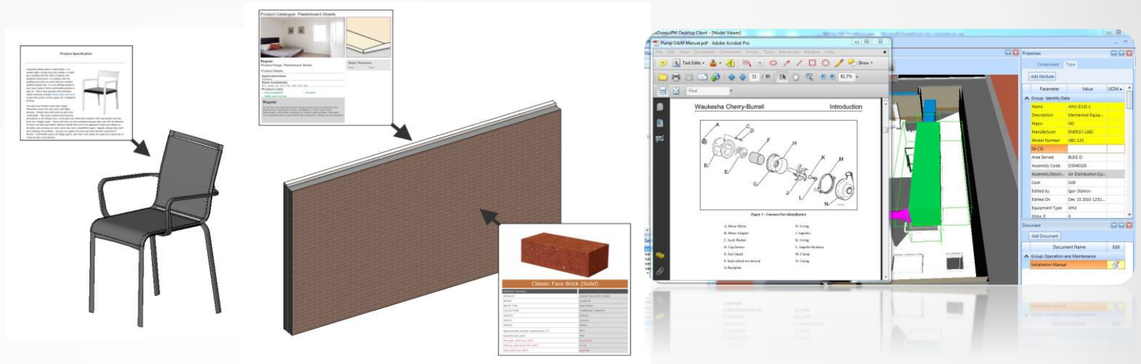
Process Structure and Documentation

- Create
  - Asset Management
    - Subcontractor data plans
    - FF&E requirements
    - Asset ID process
    - FM O&M process

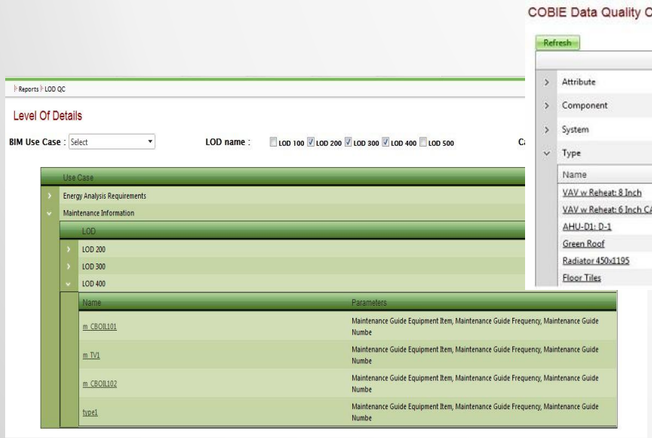
BIM Development – Stage 2

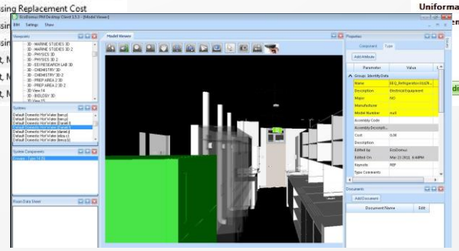


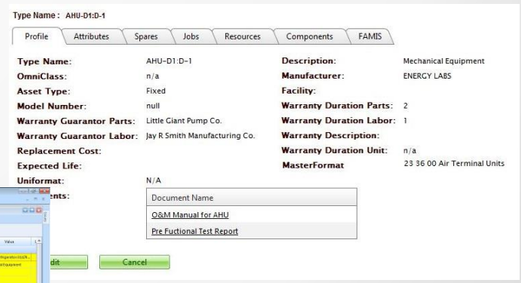
- BIM Specifications



- BIM Delivery Requirements

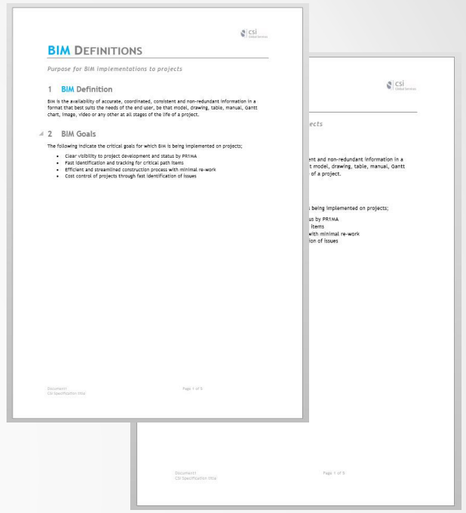


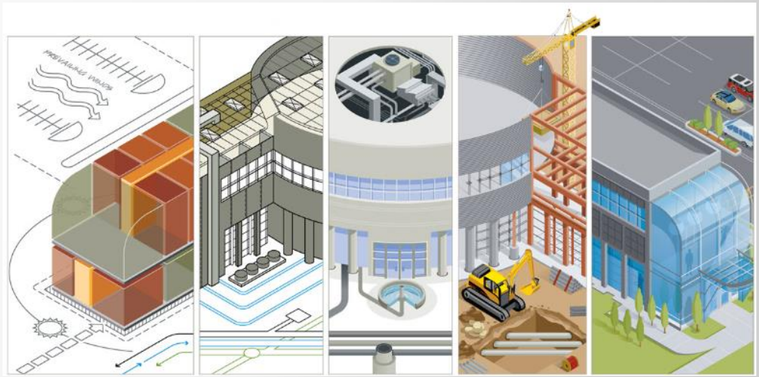




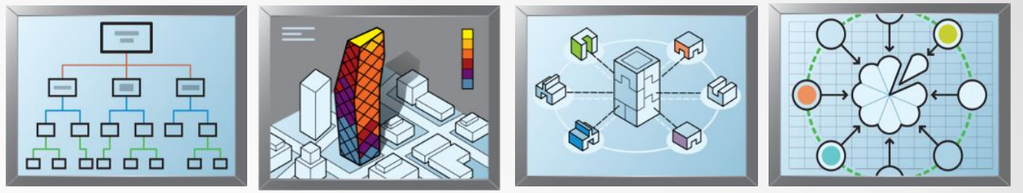
BIM Development - Deliverables

- Definitions
  - BIM definition
  - Critical Process List
  - LOD (Level of Development) definitions
    - LOD 100 – Conceptual Design
    - LOD 200 – Schematic Design
    - LOD 300 – Detailed Design
    - LOD 400 – Pre-construction and Fabrication
    - LOD 500 – Construction and As-built

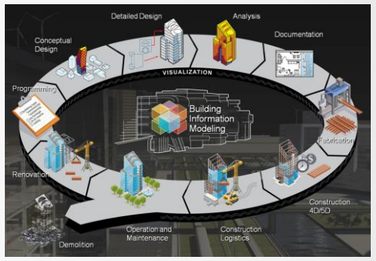


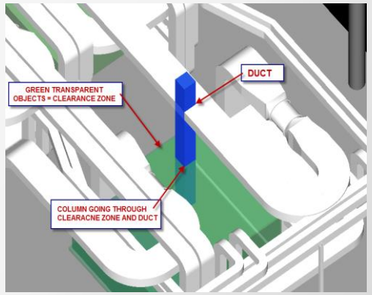


BIM Development - Deliverables

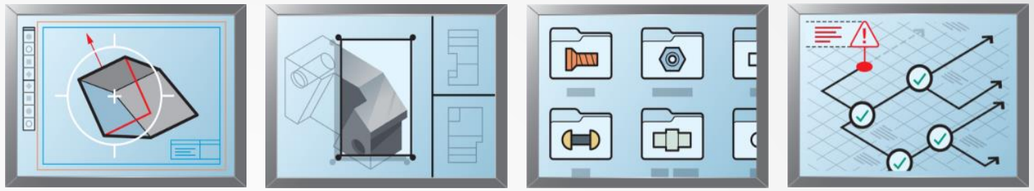


- Processes
  - Overall BIM project process
  - Detailed BIM process - Design
    - Project Start-up Process
    - Model development process
    - Model delivery process
    - Model auditing process
    - Data validation process
    - Spatial Coordination Process (Clash Detection)
    - Quantities and Costing process
    - Design Validation Review process
    - 4D sequencing process
    - Constructability review process
    - Unit sales coordination process
    - Design acceptance (BIM) process

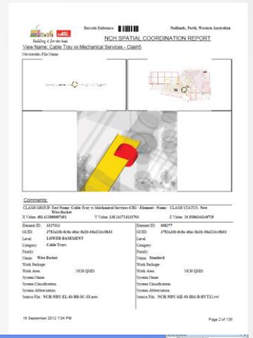


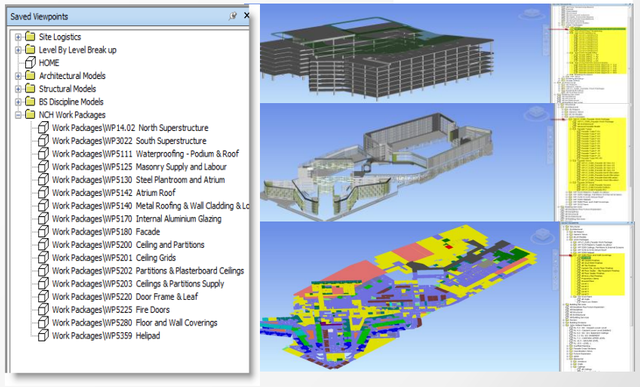


BIM Development - Deliverables

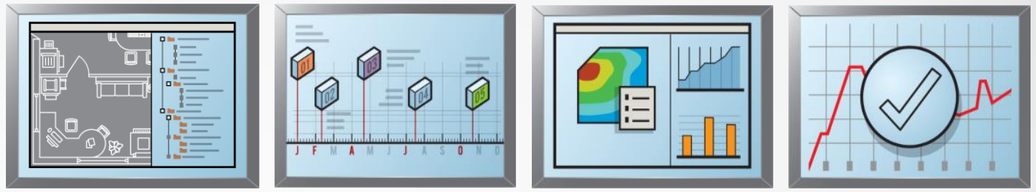


- Processes
  - Detailed BIM process – Preconstruction
    - Design model review and acceptance process
    - Model handover process
    - Fabrication model development process
    - Progress reporting process
    - Model auditing process
    - Data validation process
    - Spatial Coordination Process (Clash Detection)
    - Quantities and Costing process
    - 4D sequencing process
    - Constructability review process
    - Unit specification coordination process
    - Fabrication quality control auditing process
    - Preconstruction model acceptance process

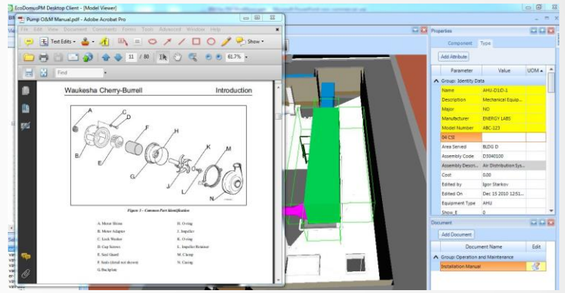




BIM Development - Deliverables

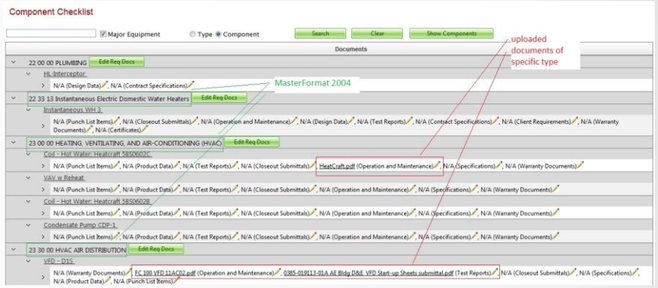


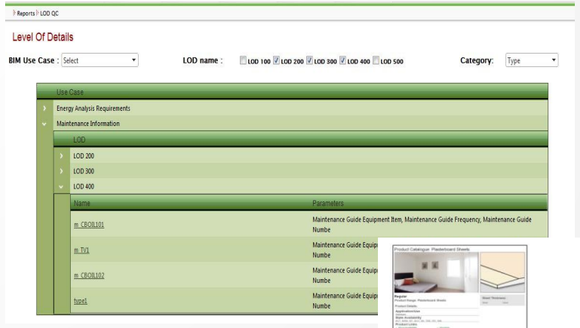
- Processes
  - Detailed BIM process – Construction
    - Logistics tracking and reporting process
    - As-constructed model development process
    - Progress reporting process
    - 4D sequencing process
    - Model auditing process
    - Data validation process
    - As-constructed model validation process
    - Quantities and Costing process
    - Construction quality control auditing process
    - Commissioning process
    - Trade closeout auditing process
    - As-built model delivery process

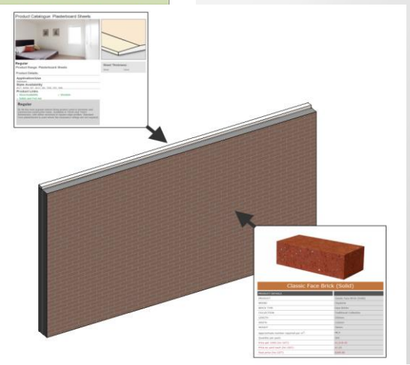


BIM Development - Deliverables

- Standards and Specifications
  - Overall Specifications
    - Downstream numbering and tagging
    - Work areas and work breakdown structure
    - QSID (Quantity surveying identification codes)
    - BIM content creation standards
  - Design Specifications
    - Model Setup and Set-out
    - Model development protocols
    - Model delivery specification
    - Model content specification
    - Clash coordination specification
    - Data and Documentation Requirements

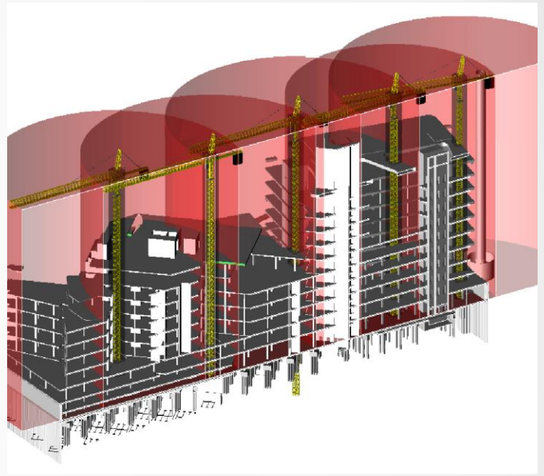


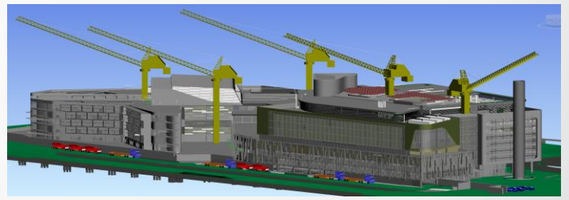


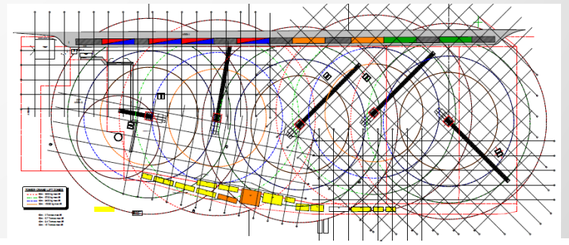


BIM Development - Deliverables

- Standards and Specifications
  - Pre-construction Specifications
    - Model handover
    - Model setup and set-out
    - Model development protocols
    - Model delivery specification
    - Model content specification
    - Clash coordination specification
    - Data and documentation requirements
  - Construction Specifications
    - Model handover
    - Data collection protocols
    - Specification for milestones and reporting
    - Specification for as-built to model validation
    - Model delivery specification







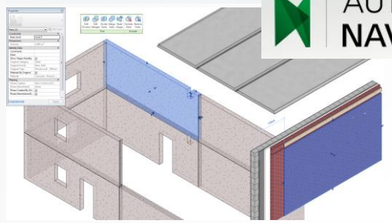
BIM Development – Stage 3

- Technology Plan

AUTODESK REVIT

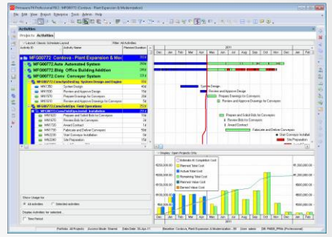
AUTODESK 360

AUTODESK NAVISWORKS

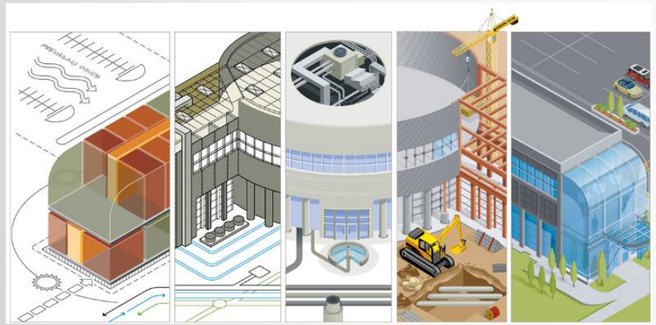


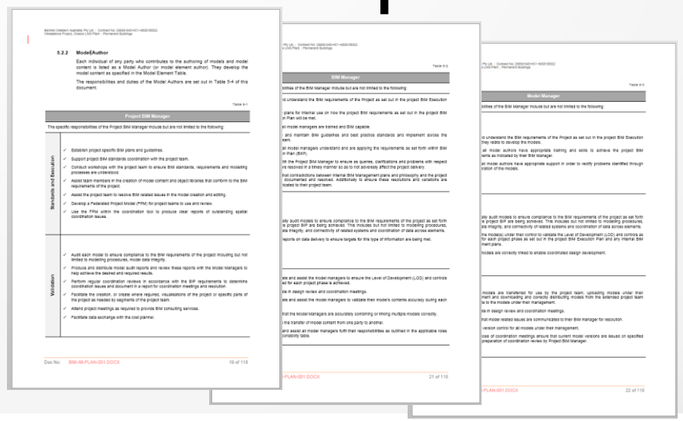
ORACLE PRIMAVERA

TEKLA



- BIM Milestones
- Roles and Responsibilities



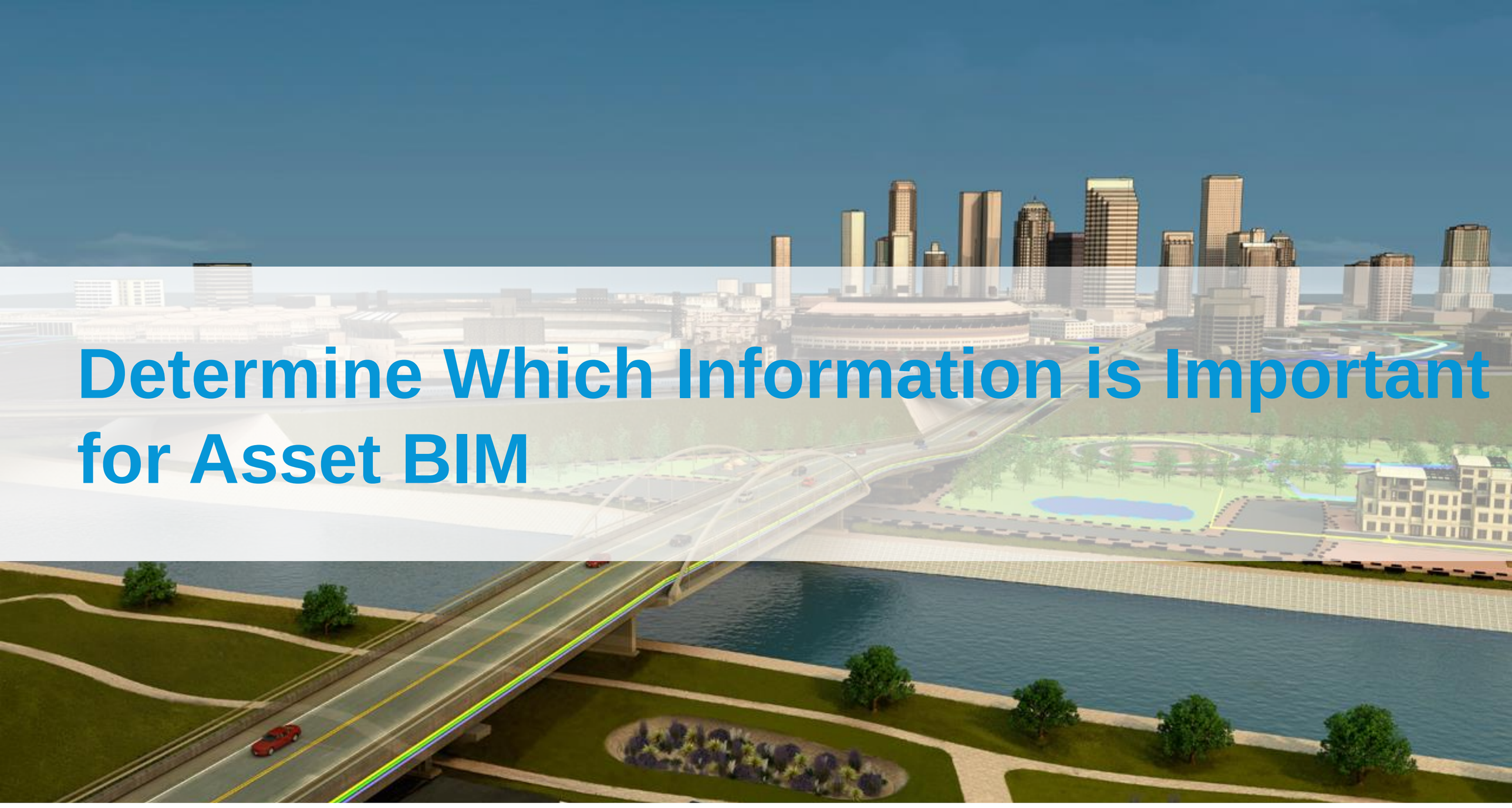


Tools and Technology

- Create
  - IT Requirements
    - Server level
    - Desktop level
    - Cloud level
  - Software
    - Selection process
    - Procedure manuals
    - Interoperability workflow

People

- Review
  - Skills analysis
  - Compatibility matrix
- Train
  - Corporate requirements
  - Processes
  - Technology
    - Management of technology
    - Use of technology



Determine Which Information is Important for Asset BIM

Determine Which Information is Important for Asset BIM

- The number one priority in ascertaining and structuring information and modeling requirements is inclusivity of all parties
- BIM requirements are often driven by the design consultants
- When considering the asset driven BIM model all parties need to be included whom drive the requirements for managing and maintaining assets

Determine Which Information is Important for Asset BIM

- Defining the true goals and objectives is critical to successful BIM to FM
- The only way this can be achieved is through a consultative approach “work back schedule”
- This requires input from all parties as to “what are we trying to achieve” or the end goal of the BIM deliverables
- If this is asset management then then particulars will need to be defined

Determine Which Information is Important for Asset BIM

	Planning	Design	Construction	Operations
Architect				
Struc Engineer				
MEP Engineer				
Procurement				
Constructor				
Facility Manager				

Determine Which Information is Important for Asset BIM

- Start with a simple spreadsheet
  - fill in all the requirements backwards ensuring all the operations information is included
  - The earlier information can be included the easier the flow of the BIM model will progress
- Successful BIM to FM transitions require an owner to be extremely specific in articulating their asset management goals and objectives

Determine Which Information is Important for Asset BIM

- The following are six questions that should be addressed in the beginning of any asset BIM process:
  - From a cross-departmental stand-point, do the real estate, facilities, and accounting departments have a cohesive vision of asset-related desired levels of service and key performance indicators?
  - Are there policies in place for cost-effective, prioritized, and data supported spending recommendations?

Determine Which Information is Important for Asset BIM

- How are current asset inventory records maintained within sensible thresholds?
- What is the procedure for modeling asset deterioration curves and determining associated renewal and repair costs?
- Are financial modeling tools in place for forecasting renewal and repair cost schedules and running budget scenarios?
- Depending on the size and scale of the project, will evaluation reports be produced for five, 10 and 30-year time horizons under current policies and procedures?

- In the mission to realize cost savings from BIM to FM transitions, answering these questions is crucial.

Determine Which Information is Important for Asset BIM

- an in-depth understanding of the existing systems is required.
  - All owners, have some system or tools to manage their facility
  - Some use highly customized software platforms, others use simple spreadsheets.
  - Understanding those systems and tools at a detailed level is critical to a meaningful BIM–FM transition.
  - Owners cannot mandate and gather BIM project data without understanding when, where and how internal systems will process information

Determine Which Information is Important for Asset BIM

- There is any number of questions from a project level need to be addressed
  - Does the owner require a specific project management and/or document management system?
  - Will that system be the single source of truth for all project information, or run in some form of parallel with the designer's and contractor's independent systems?
  - Does the owner-mandated system remain in play (and to what degree) once the project is complete and transitioned to operations?

Determine Which Information is Important for Asset BIM

- As a project nears completion there becomes other factors to be considered
  - Has the commissioning agent been engaged in terms of BIM?
  - Do their workflows and field tools acknowledge data links back to BIM data or geometry?
  - Does the owner have a separate system for maintaining as-built information at project close?
  - Is there overlap between the owner's project management software and the as-built documentation platform?

Determine Which Information is Important for Asset BIM

- Once into operations and maintenance,
  - does the owner utilize a computerized maintenance management system (CMMS)?
  - Is there a BMS requirement?
  - What platforms and tolls need to be integrated with?
  - What are the inputs of critical importance to the CMMS and/or BMS?

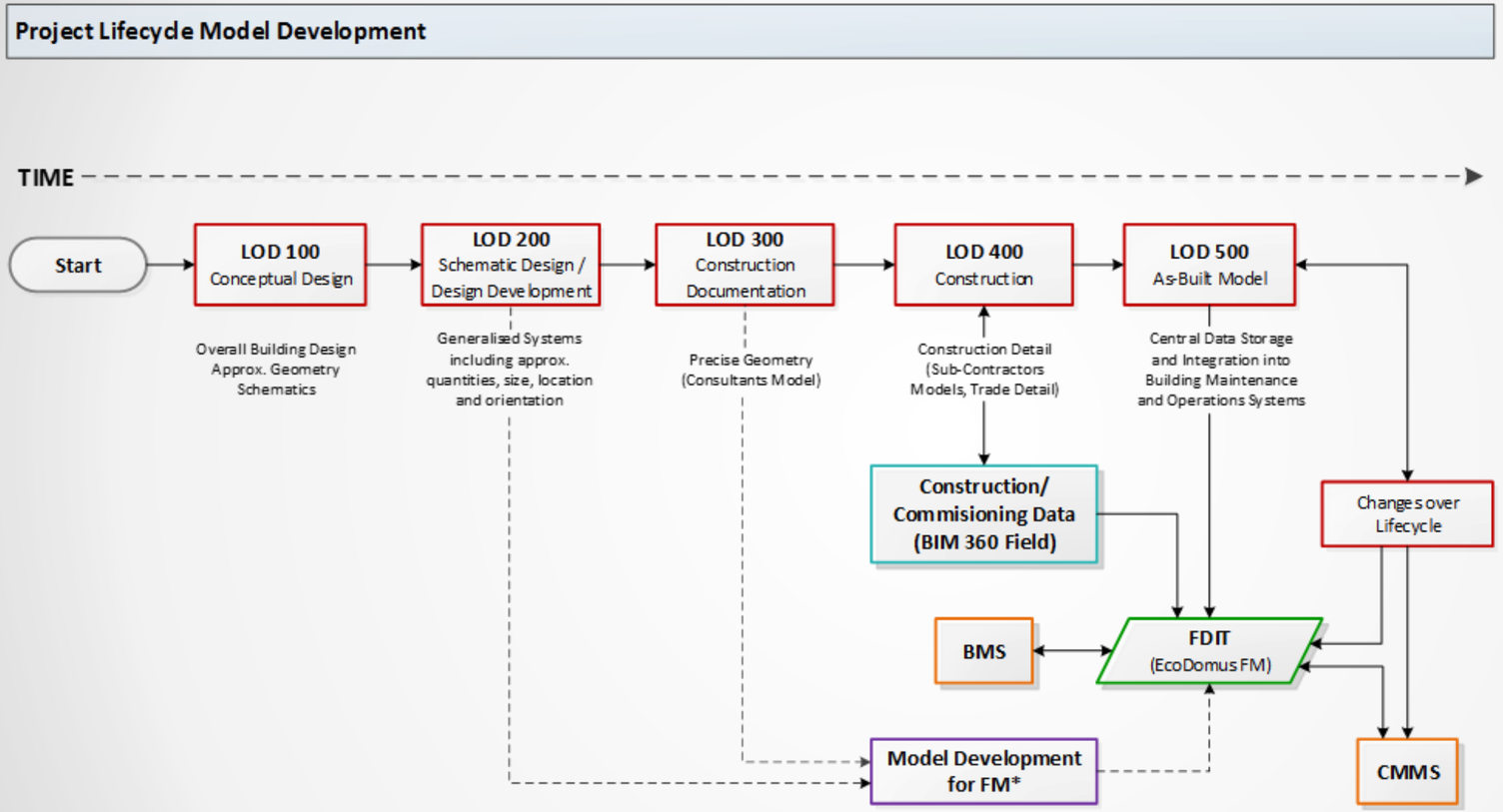
Determine Which Information is Important for Asset BIM

- Do emerging industry protocols suit all of the owner's end-user needs?
- Does the owner's finance and accounting department see any benefit from project BIM data to support depreciation systems and analyses?

Determine Which Information is Important for Asset BIM

- Development of the model development requirements
- LOD specification for each level is properly detailed in the BIM plan
- The earlier model information can be tested in the asset environment the easier it will be to make subtle changes
- This will allow for true model progression and the ability to have the assets evolve as the building does through design cycles.

Determine Which Information is Important for Asset BIM



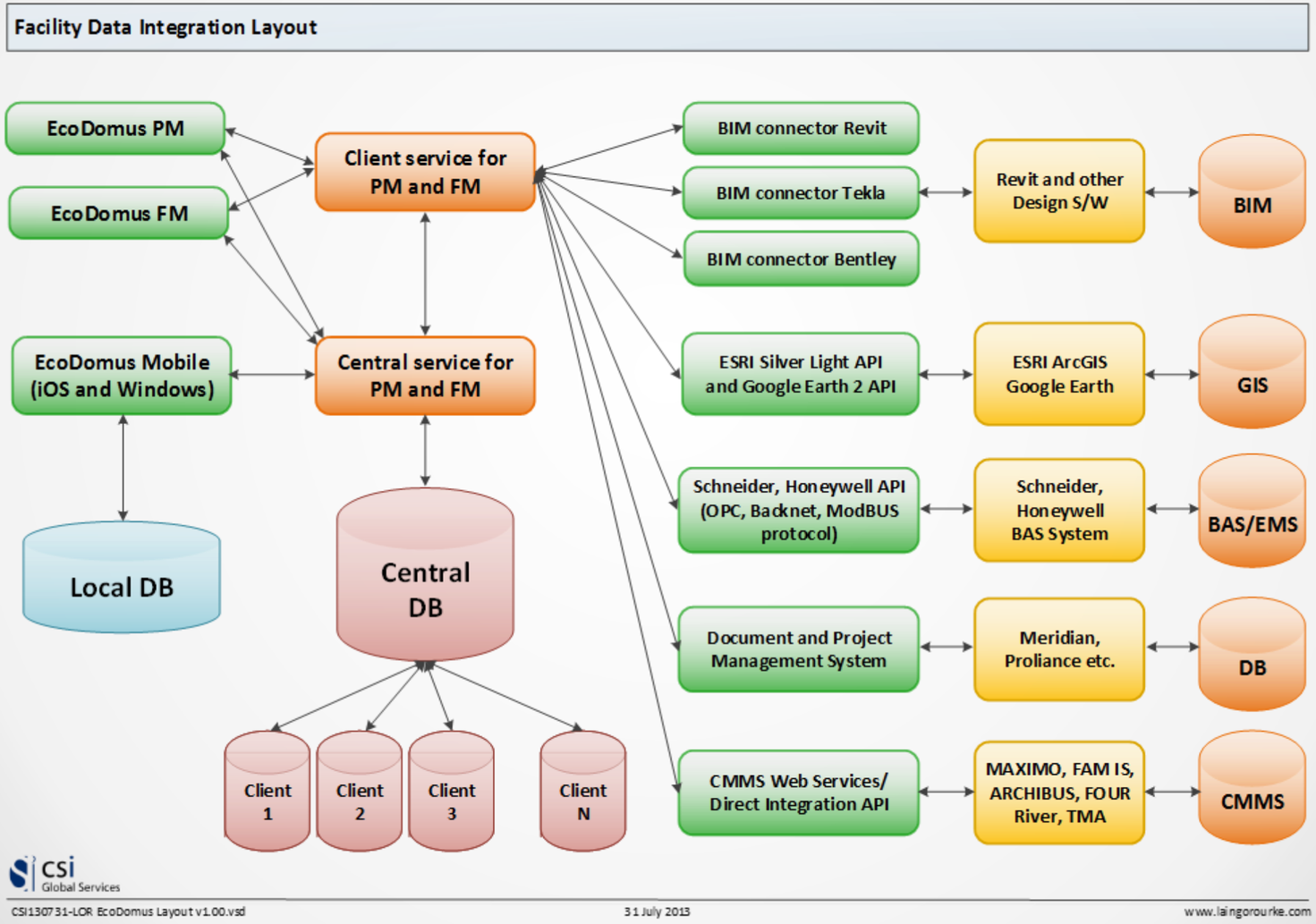
Determine Which Information is Important for Asset BIM

- Technology plans can be developed once all other integrations and workflows are completed
- Technology is only the enabler for BIM processes not the driver
- This needs to look at all aspects that will integrate with the BIM process

Determine Which Information is Important for Asset BIM

- Data integrations can now be built for each aspect of the project
  - This will enable the dissemination flow of information to each aspect of project delivery.
- Once all the workflows are progressed and the work back schedule completed then the requirements for each discipline can be assembled

Determine Which Information is Important for Asset BIM



Examples for Model Development Requirements

Model Requirements - Notes

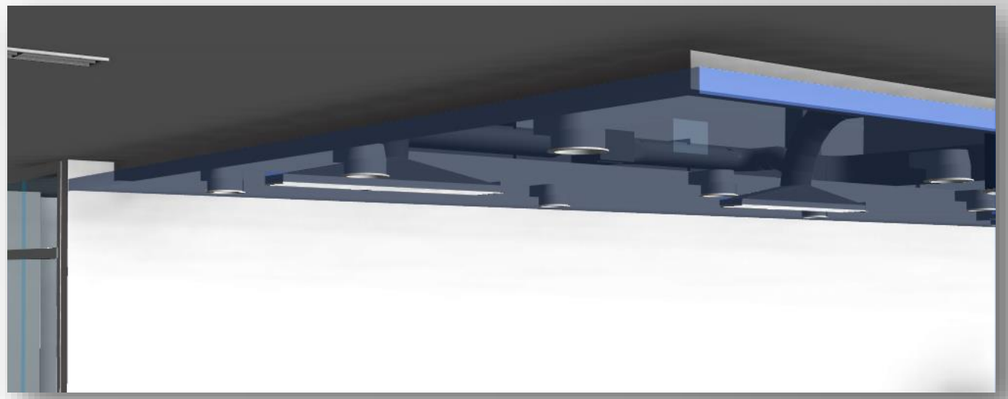
- Following pages describe requirements from live and completed projects
- Requirements are based on BIM uses on those projects
- Requirements related to interaction through specific technologies
- Requirements should be developed to the needs on each project

Development of models for multiple BIM uses

- Models progress through the project
  - Design – Fabrication – Construction – As Built – FM
- Planning of model development allows models to progress based on downstream needs
- Requirements broken down by;
  - Discipline
  - Project milestone
  - Model author party
  - Building element category

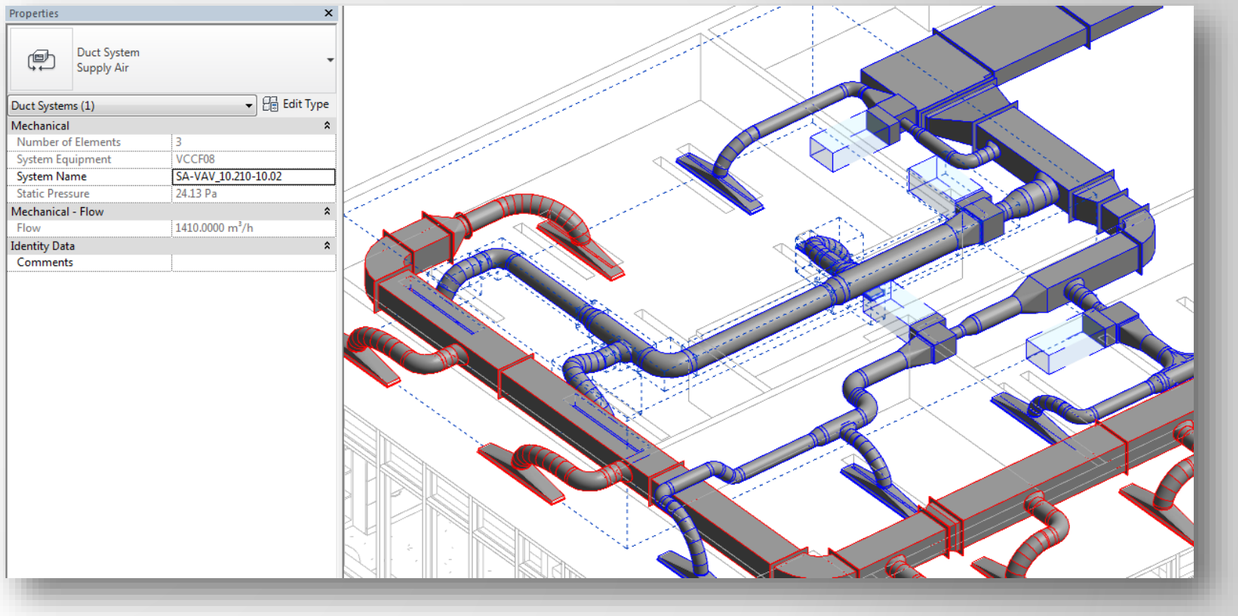
Model Requirements – Architectural Example

- Ceilings
  - Extent : Each ceiling plane should be modelled as a separate element
  - Bulkheads : The vertical section of the bulk-head is to be modelled as a Basic Wall Family Type. The vertical section of the bulk-head should only need to be modelled from 50% design development onwards
  - Insulation : Any ceiling that includes insulation should have the insulation modelled. This will allow effective spatial coordination with the above ceiling services.
- Ensures model matches expected construction (constructability)
- Insulation ensures ceiling space usage in clash



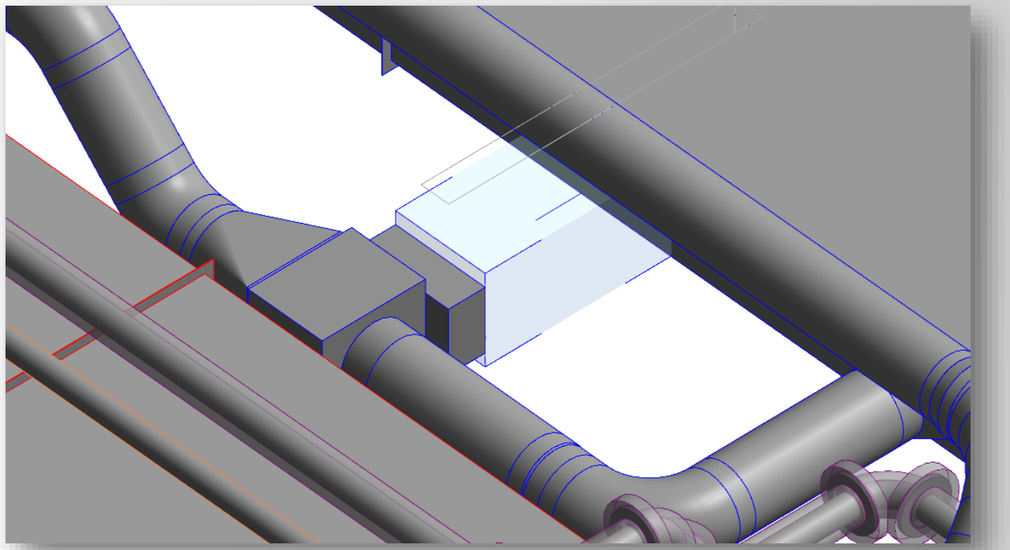
Model Requirements – MEP Example

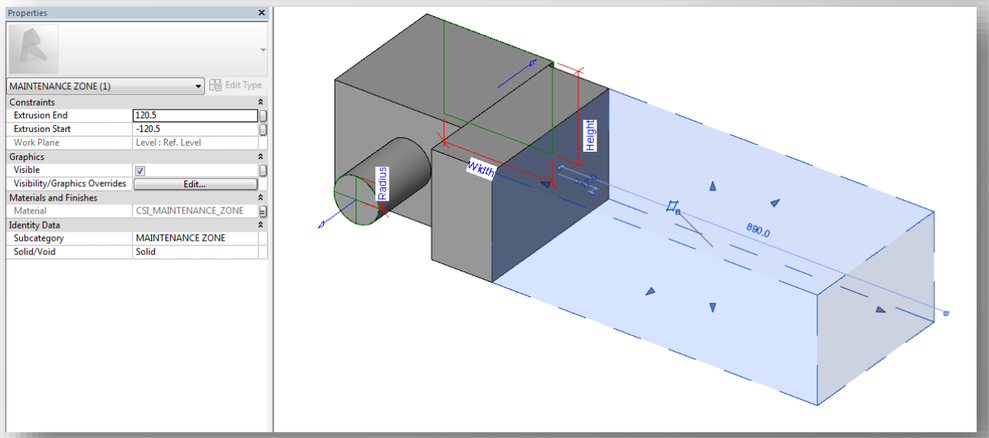
- System Names
  - Naming structure based on;
    - Equipment Identification
    - Space/Room served
    - Type of System
    - Service type (cable trays including switch board and location)
- Assist in understanding relationship of MEP components
- Streamlines transition from design to fabrication
- Critical for FM transition



Model Requirements – MEP continued

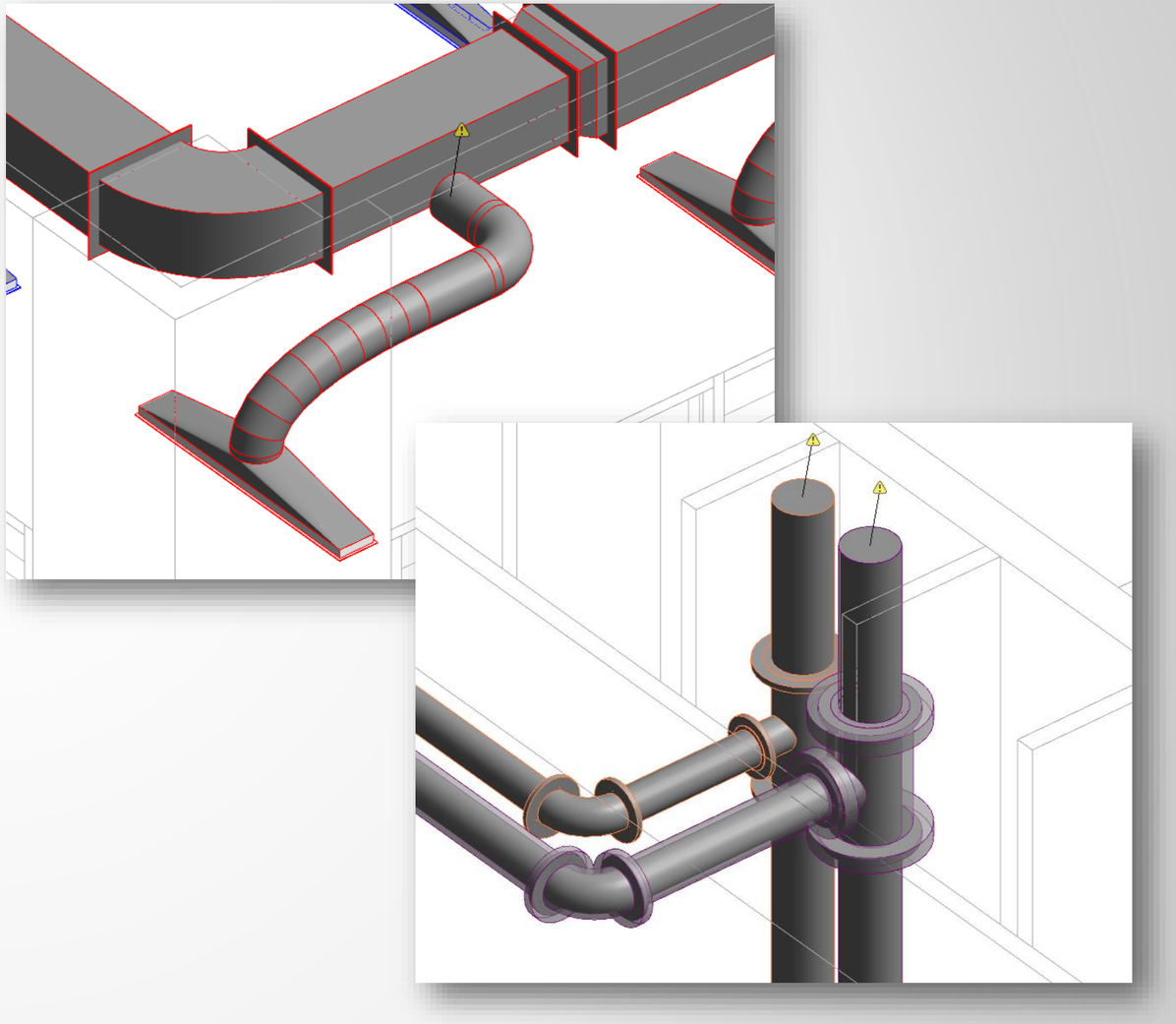
- Equipment clearance and access zones
  - Maintenance access modelled with component
  - Egress access modelled separately
  - Removal access modelled separately
- Ensures maintenance accounted for in design layout
- Ensures replacement accounted for as a part of design
- Increases safety for maintenance personnel





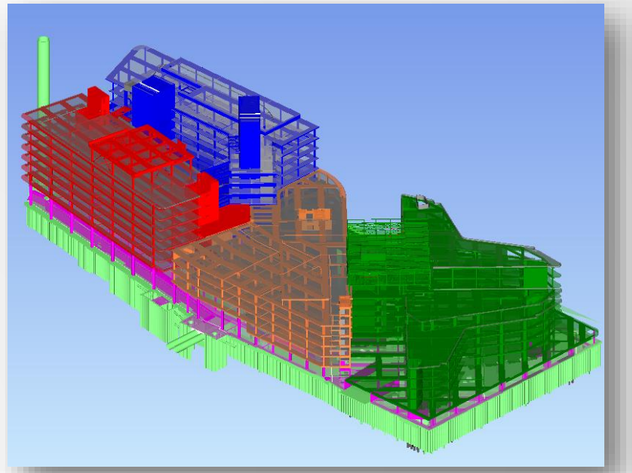
Model Requirements – MEP continued

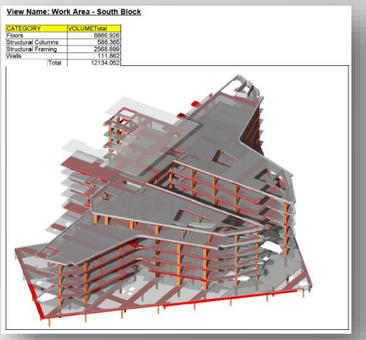
- Connected Systems
  - Ensure systems are correctly connected
  - Ensure systems are closed
- Connected and closed systems allow data flow between components
- Requirement not related to calculation functions
- Closed and connected systems assigns system data to assets automating FM transition tasks

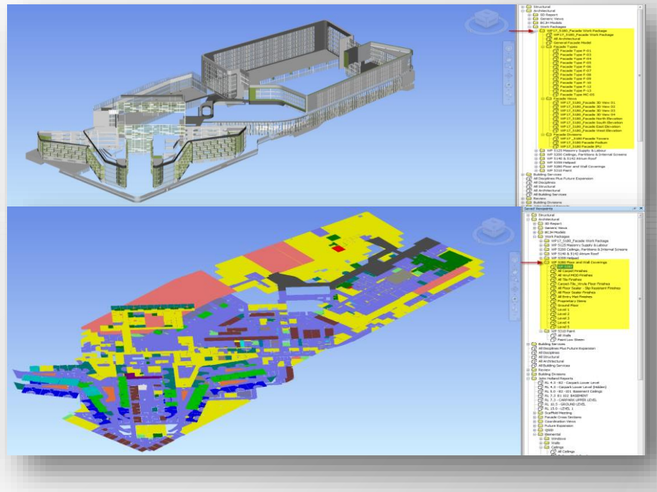


Model Data Requirements – Project Examples

- Identification data embedded in models for process mapping between systems
  - Building ID (For multi-building sites)
  - Level (standardisation of level data)
  - Construction Phase
  - Delivery Package (combines with construction phase to map program activity ID)
  - Classification (Omniclass, Uniclass, etc.)
  - QSID (quantity survey ID code)
- Applied to each component in every model



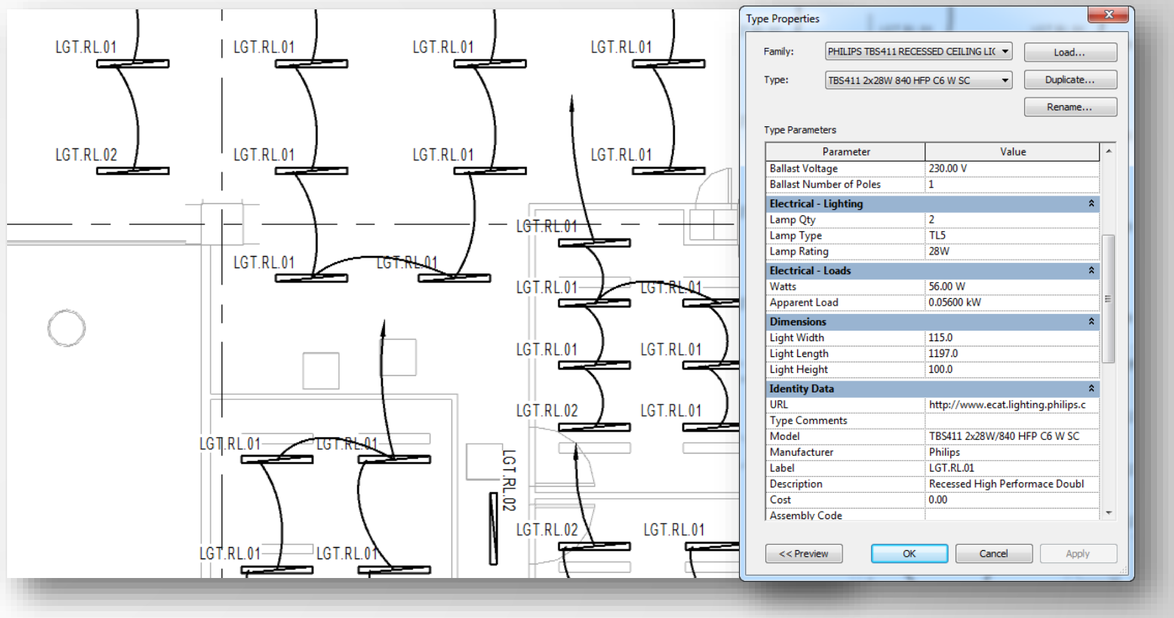




Model Data Requirements – “Minimum BIM”

- Data shown on drawings and schedules (on drawings) MUST be derived from model component data

- Ensures coordination of information
- Allows downstream users to identify component information



Luminare Schedule

Asset Type	Description	Lamp			Manufacturer	Model
		Qty	Rating	Type		
LGT.DL.01	2x18W Flouecent Recessed Downlight	2	18W	PL-C/4P	Philips	FBS261 2xPL-C/4P18W/830 HFP C W WH
LGT.DL.02	2x26W Flourecent Recessed Downlight	2	26W	PL-C/4P	Philips	FBS261 2xPL-C/4P26W/830 HFP C PI WH
LGT.RL.01	2x28W Flourecent Recessed Light Fixture	2	28W	TL5	Philips	TBS411 2x28W/840 HFP C6 W SC
LGT.RL.02	2x28W Flourecent Recessed Light Fixture with Battery Pack	2	28W	TL5	Philips	SmartForm TBS411 2x28W/840 HFP C6 W SC

Modelling for FM

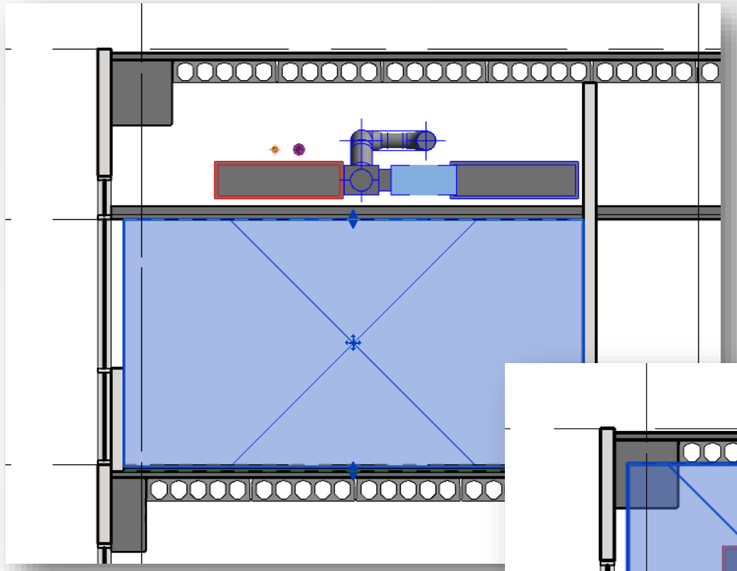
Modelling for FM - Notes

- Information shown here from live and completed projects
- Information based on the workflows of specific technologies
- Requirements may differ where other technologies used
  - Technologies used
    - Autodesk Revit
    - Ecodomus
    - Autodesk Navisworks

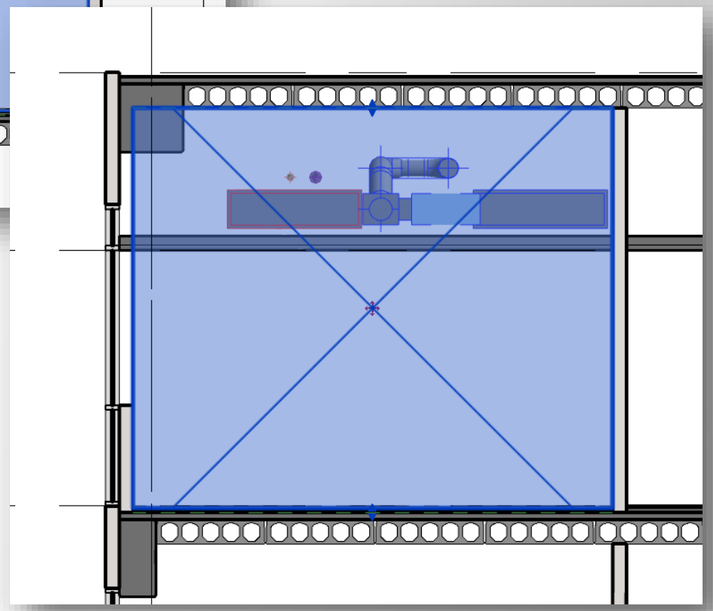
Modelling for FM – Rooms and Spaces

- Differences exist between rooms and spaces in design and spaces in FM
- Design rooms are floor to ceiling
  - Used for floor area
- Design spaces are floor to ceiling and separate above ceiling (plenum)
  - Used for heating/cooling calculations
- FM spaces are floor to above slab soffit
  - Used for asset location

Design Room

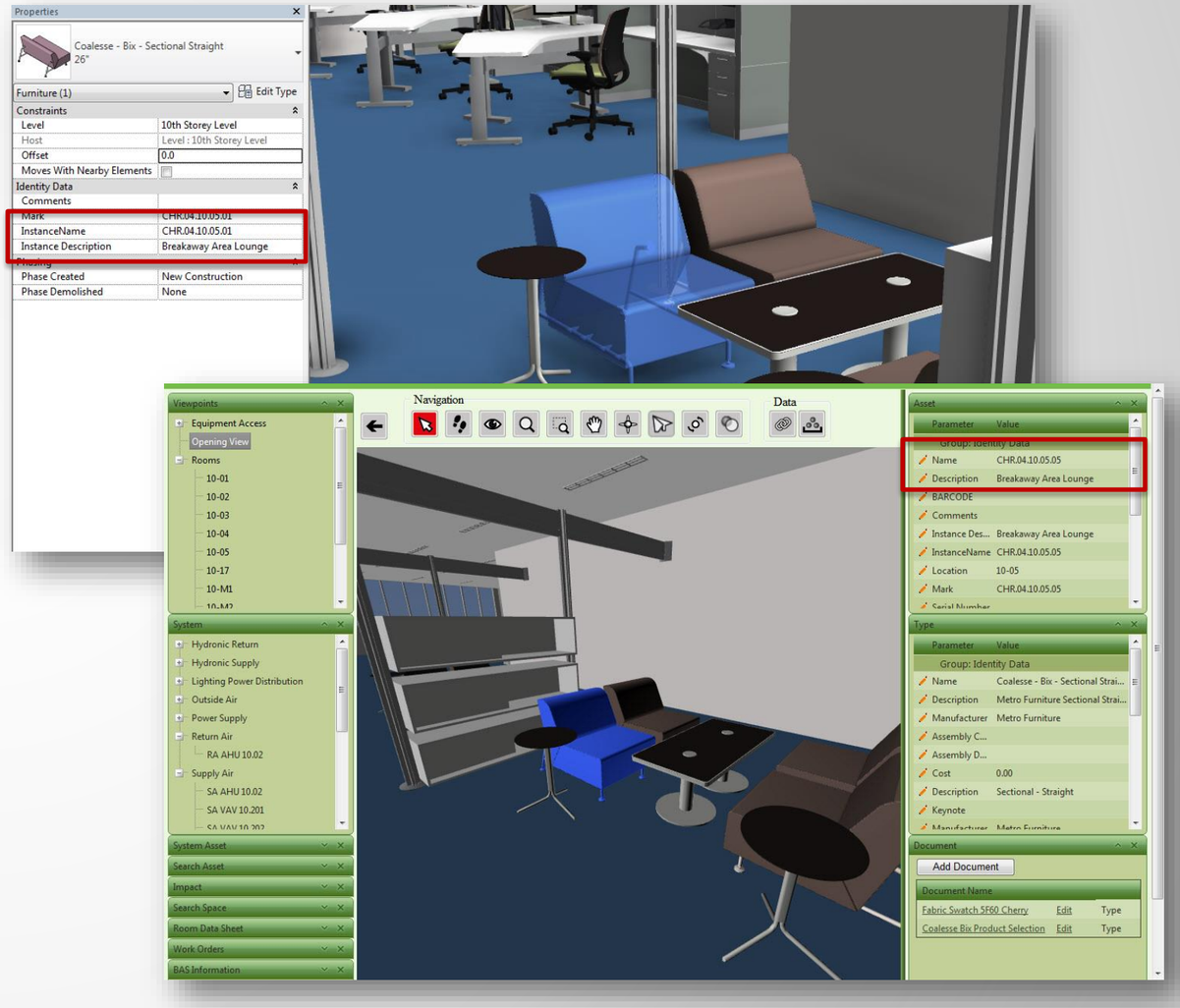


FM Room



Modelling for FM – Mapping Asset Data

- To avoid requiring family and type naming conventions for specific projects which are not practical to implement parameters are added to assets and asset types;
  - TypeName
  - TypeDescription
  - InstanceName
  - InstanceDescription
- These parameters map directly to the asset data
- Each type and instance must have a globally unique code



Modelling for FM - Summary

- Definition of As Built model and FM model
- Differences exist between As Built and FM models based on purpose
- FM model requirements may differ from design or construction models
- As Built is delivery for construction results
- FM model is delivery for asset data
- Planning is required to ensure FM model operates effectively.