Digital Twins

Wednesday 23rd September

The CitA Virtual Summit: **Changing the way we work**

UCSF Health

Building Digital Twins *for* Infinite Potential

Bruce Mace
Executive Director
Facilities & Support Services
UCSF Health

The vision becomes the road…

Defining your Digital Twin for Potential

Buzzwords that drive industries – solutions that generate real change. In this era of Artificial Intelligence, Machine Learning, Digital Twins and the Internet of Things, it is important to define target goals and paths forward with solution sets assembled to solve real-world problems. Overwhelmed by options on the horizon? Confused by technologies that didn't exist five years ago? Keep the threshold low enough to get over! Don't dance with the entire twin - instead build a foundation of doors left open to varying degrees and thus remain agile, poised for change and having not excluded any opportunity…

Let's talk about our twins and what they really look like…

UCSF Health BIM4FM
Digital Twin Process and Tools

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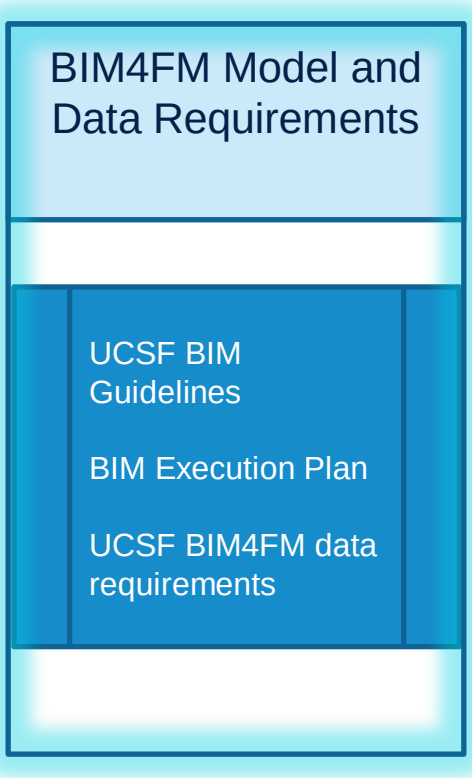
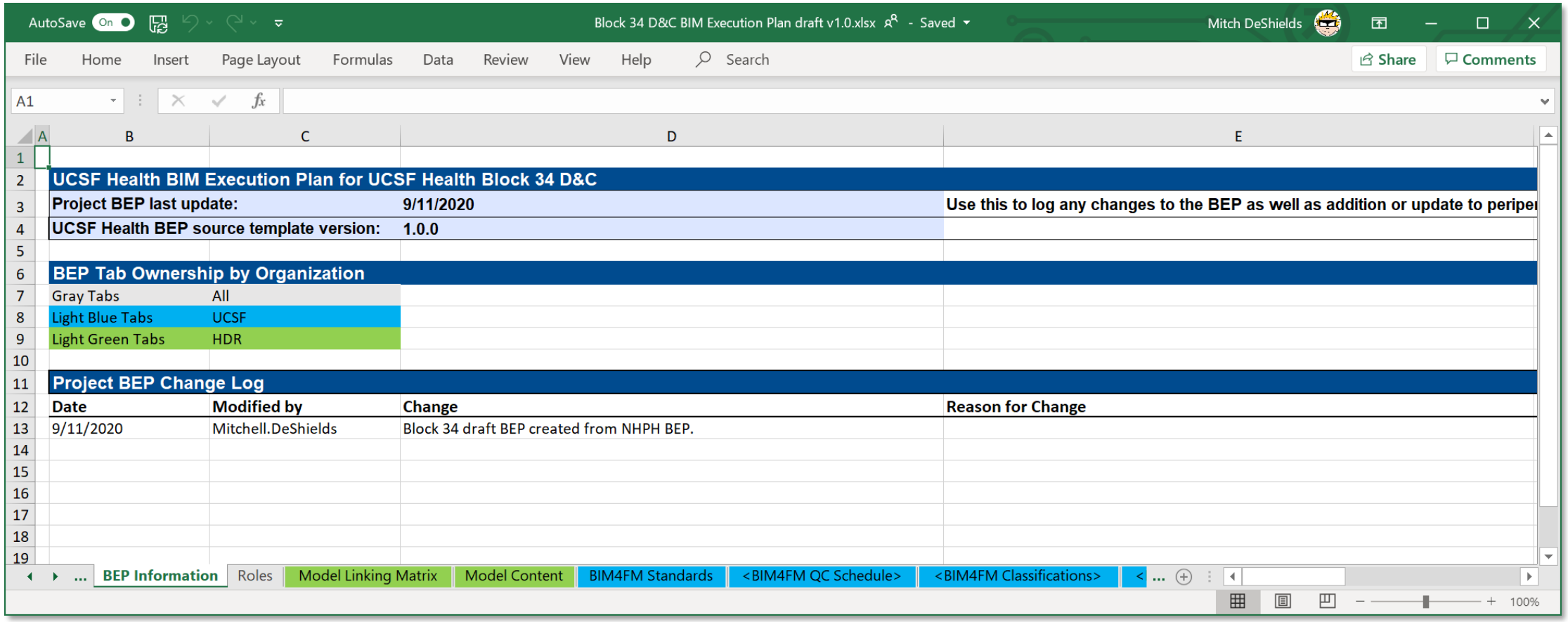
UCSF Health BIM4FM
BIM Execution Plan



- **Project-by-project iterative implementation of the *UCSF BIM Guidelines*.**
- **<u>Collaborative</u> authoring based on an evolving UCSF BEP template.**
- **Live document updated over the course of the project…**
- **Details document sharing platform (Autodesk BIM 360 Docs), modeling standards, model coordination, BIM data sources, and allowed exceptions.**
- **UCSF does not prescriptively mandate design and construction practices – only the output deliverables.**

UCSF Health BIM4FM
BIM Execution Plan



AutoSave On | Block 34 D&C BIM Execution Plan draft v1.0.xlsx - Saved | Mitch DeShields

File Home Insert Page Layout Formulas Data Review View Help Search Share Comments

A1

	B	C	D	E
1				
2	**UCSF Health BIM Execution Plan for UCSF Health Block 34 D&C**			
3	**Project BEP last update:**		**9/11/2020**	**Use this to log any changes to the BEP as well as addition or update to periper**
4	**UCSF Health BEP source template version:**		**1.0.0**	
5				
6	**BEP Tab Ownership by Organization**			
7	Gray Tabs	All		
8	Light Blue Tabs	UCSF		
9	Light Green Tabs	HDR		
10				
11	**Project BEP Change Log**			
12	**Date**	**Modified by**	**Change**	**Reason for Change**
13	9/11/2020	Mitchell.DeShields	Block 34 draft BEP created from NHPH BEP.	
14				
15				
16				
17				
18				
19				

BEP Information | Roles | Model Linking Matrix | Model Content | BIM4FM Standards | <BIM4FM QC Schedule> | <BIM4FM Classifications> | <

100%

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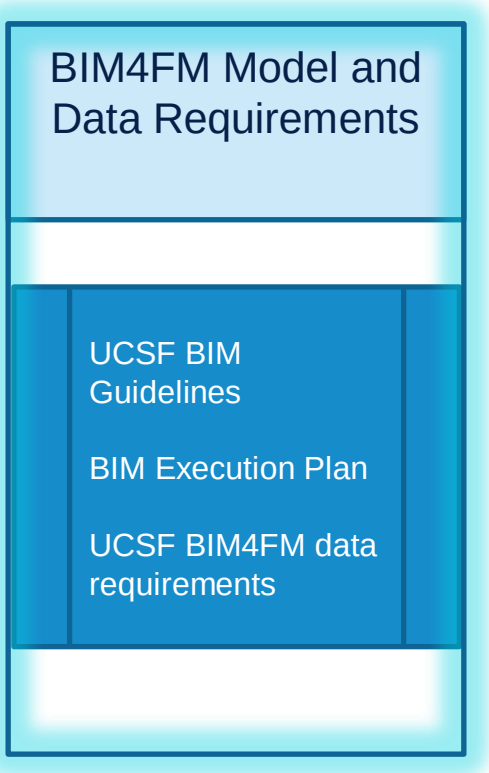
UCSF Health BIM4FM
BIM Data Requirements



- **Roughly 5-10% of assets/data are included in the UCSF Health BIM4FM requirements.**
- **The UCSF Health Data Dictionary includes ~250 Equipment Types/Families.**
  - **Most require only Manufacturer and Model information.**
  - **~75 Equipment Types/Families require serial number.**
  - **~85 Equipment Types/Families have additional requirements.**
- **A typical project has ~50 BIM4FM Equipment Types/Families.**
- **BIM data requirements can be customized for each project as needed.**
- **BIM data is validated progressively as the project approaches hand-over.**

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UCSF Health BIM4FM

Reference, Assessment, and Review Tools

BIM4FM Data QA/QC, Analysis, and Reporting

UCSF BIM4FM BIM Data Collection & Analysis Tools

- **UCSF Health BIM4FM Assistant for Revit.**
  - **BIM data requirements, facility specification, and project viewer.**
  - **Create ad-hoc BIM data assessments and review results.**
  - **Assign BIM data assessment to project milestones.**
  - **Integrated Security using Autodesk Revit username.**
- **UCSF Health BIM4FM Assistant for Windows.**
  - **BIM data requirements, facility, project, milestone, team, and user management.**
  - **Update BIM Execution Plan with latest milestone schedule and BIM data requirements.**
  - **Create BIM data assessments from COBie files.**
- **BIM Data Requirements Viewer for Windows.**
- **All tools support a ‘guest’ account with no login requirements.**

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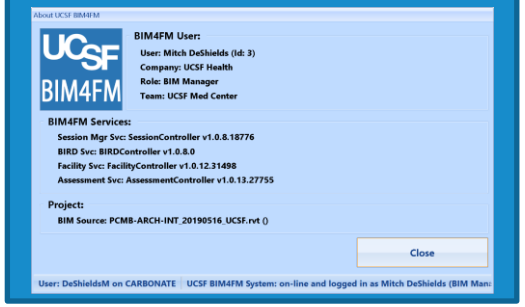
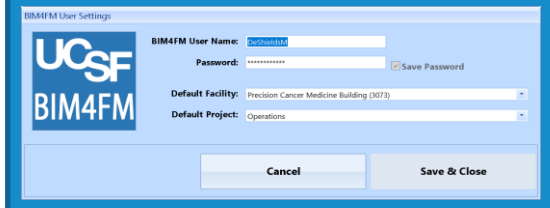
UCSF BIM4FM Assistant for Revit

BIM4FM System, user, and project status.



Integrated BIM4FM user, team, and role management including support for read-only (guest) users.

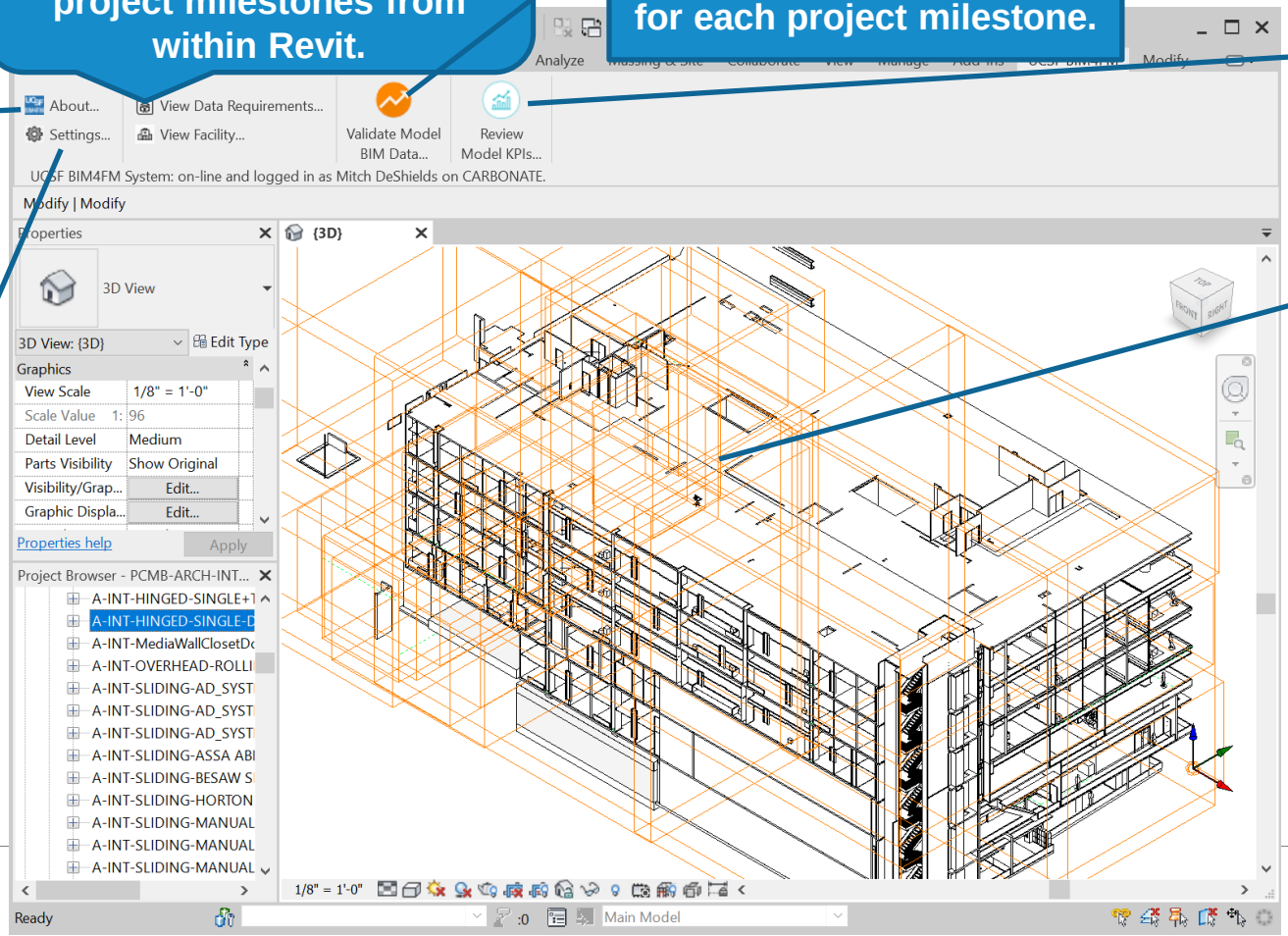


View BIM Data requirements, Facility specifications, and BIM4FM project milestones from within Revit.

Analyze and review BIM Data quality with requirements customized for each project milestone.

Review BIM Data quality history and KPIs throughout the project.

The *UCSF BIM4FM Assistant for Revit* does not update or change the model or BIM data in any way - it needs read-only access to the Revit file.



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UCSF Health Results, ROI and Digital Twin Lessons Learned

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BIM4FM Operations– ROI

Operations Efficiency

Emergency Response

Case Study

- Mission Bay Flood 2016
- Parnassus Flood 2017

Total Cost Savings

Appx. $2.8M

Productivity

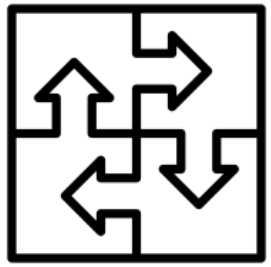
Research from Desktop

Case Study

- PCMB/MB : With BIM 3D Models
- Parnassus : No BIM Models

Total Cost Savings

Appx. $1.1M



Integrated System

Close-Out Management

Case Study

- Mission Bay : No BIM Specs
- PCMB FM Data : With BIM4FM

Total Cost Savings

Appx. $1.8M

Accuracy

CMMS System Upload

Case Study

- Mission Bay Data : No BIM Spec
- PCMB BIM Data : With BIM4FM

Total Cost Savings

Appx. $500K

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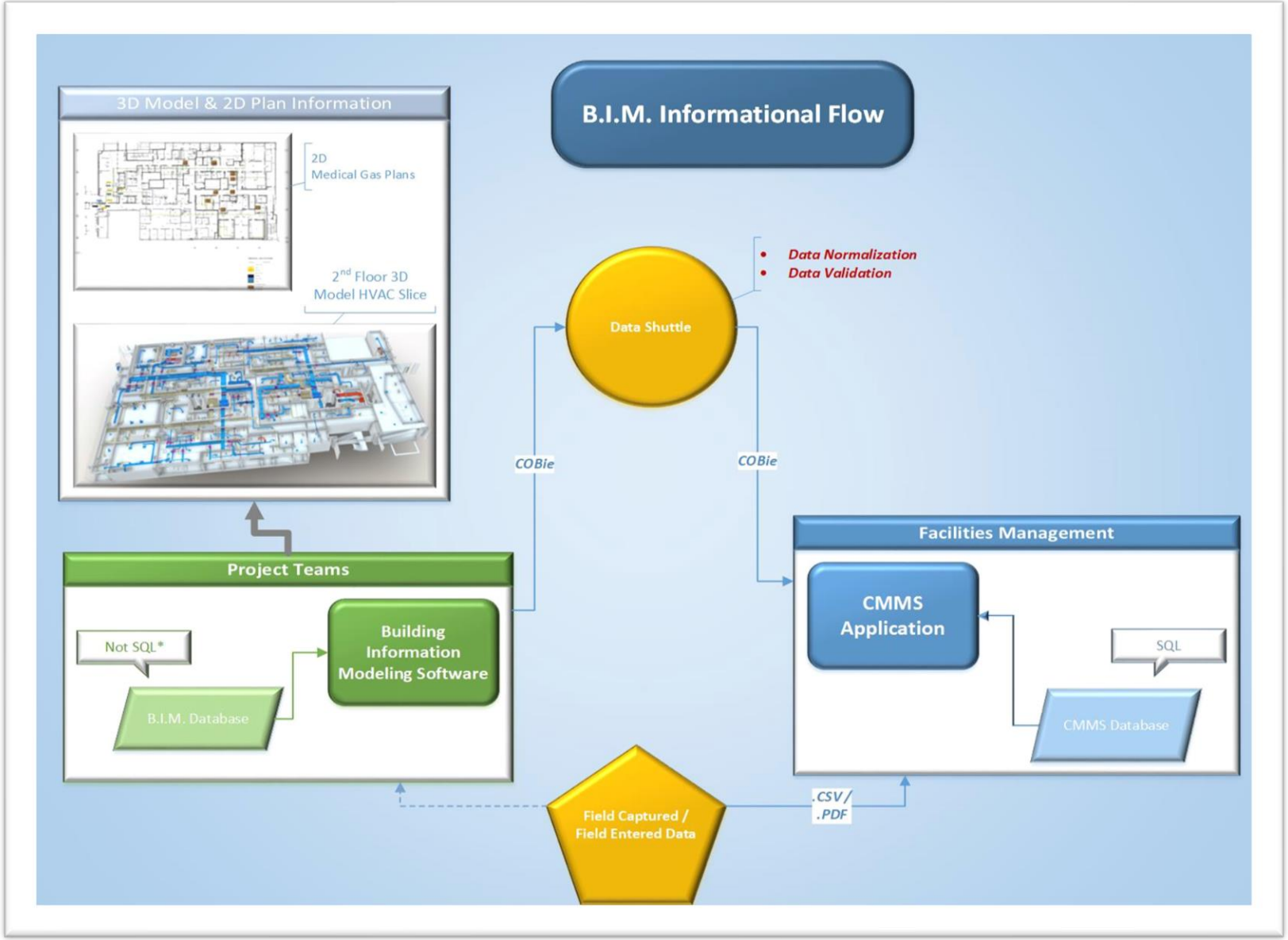
BIM4FM Lessons Learned

Project Teams	Include and coordinate BIM-FM timelines with construction schedule.	Coordination of Serial numbers with commissioning schedule.
Data Dictionary	Add Moveable Assets to the DD.	Naming criteria including Family Names and Tag Abbreviations must be provided and adopted by the project team early in Design.
Communication	Early Communication to the GC to present the vision & goals Early Engagement very critical to the process.	Allocate a collaborative channel project team to discuss and communicate technical solutions that are developed during the project.
BIM Guide	Data Delivery alignment with Milestone.	'How-To' guides for UCSF software & tools.
	Process map showing which model data being added, who is adding, who is validating.	Model Auditing practices adopted by Designers.

The Digital Twin in Operations



Digital Twin Information Process Flow

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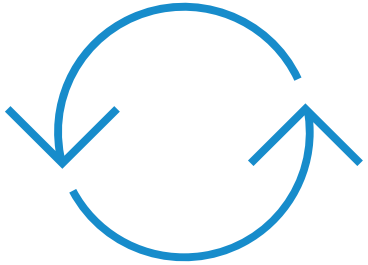
Regulatory Inspection Form



UCSF Maximo upgrade from version 7.5 to 7.6

Maximo upgrade offered native digital processes
- Opportunity to address a traditional legacy workflow and digitize

Efficient with the Maximo Work Order System
- Scalable to multiple Regulatory processes

“Electronification“ Digitalized Inspection Forms:

Electrical Safety Check Inspection Form
- A digital 'Birth Certificate' of an Electrical Asset in the twin…

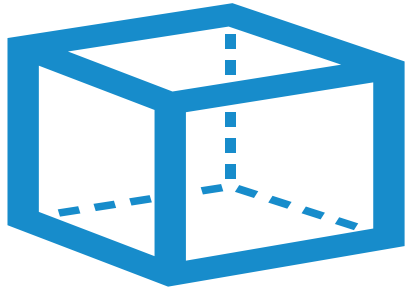
Emergency Generator Testing Meter Form
- Reduced handoff and data entry work hours for direct input

Field Walk Through Objectives

Facilities operations required to field validate equipment's physical position against BIM floor plans during project delivery!

Manufacturer | Model | Serial Number

UCSF – "USCAN" ID



Asset Coordinates & BIM Floor Plans

Field Walk Through the Digital Twin

Third Floor Pharmacy Example

- Room L3113
- 14 Pieces of Refrigerator Equipment

Process:

- Generate Maximo Work Order (asset specific)
- Verify equipment's position against:
  - Model | Manufacturer | Serial Number
- Validate USCANID (UCSF specific identification)
- Perform Regulatory Safety Check

Digital Twin Process Diagram (Facilities-centric)

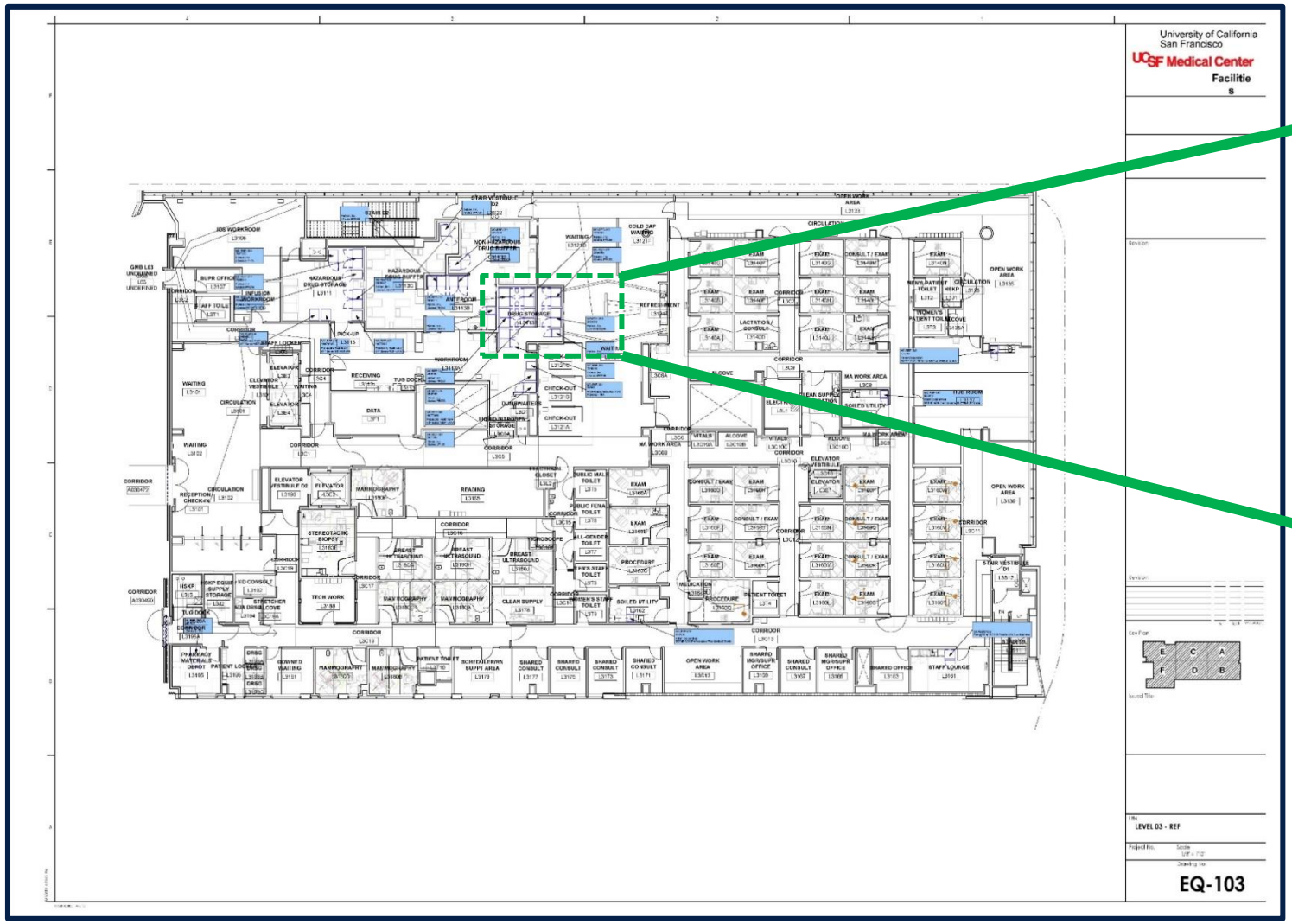
GENERATE ASSET SPECIFIC WORK ORDER

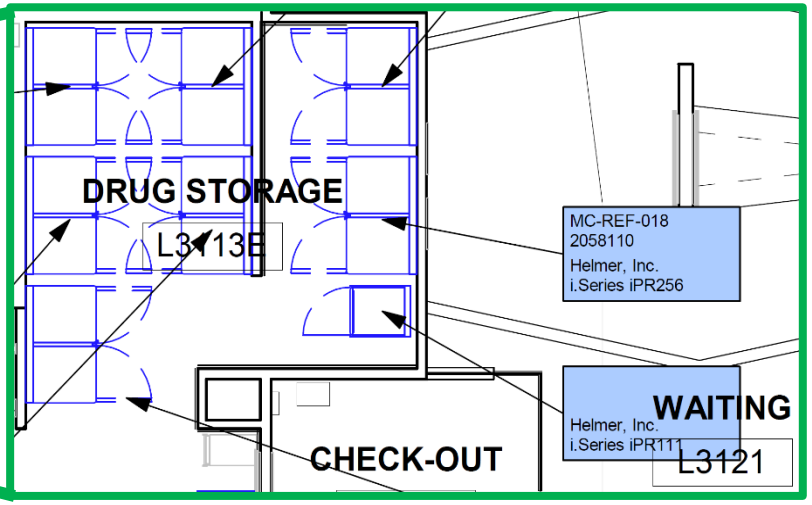
FIELD ENGINEER CONDUCTS INSPECTION

PERFORM ELECTRICAL SAFETY CHECK

FIELD ENGINEER COMMITS DATA TO MAXIMO DB

BIM Floor Plan: Slice of the Digital Twin





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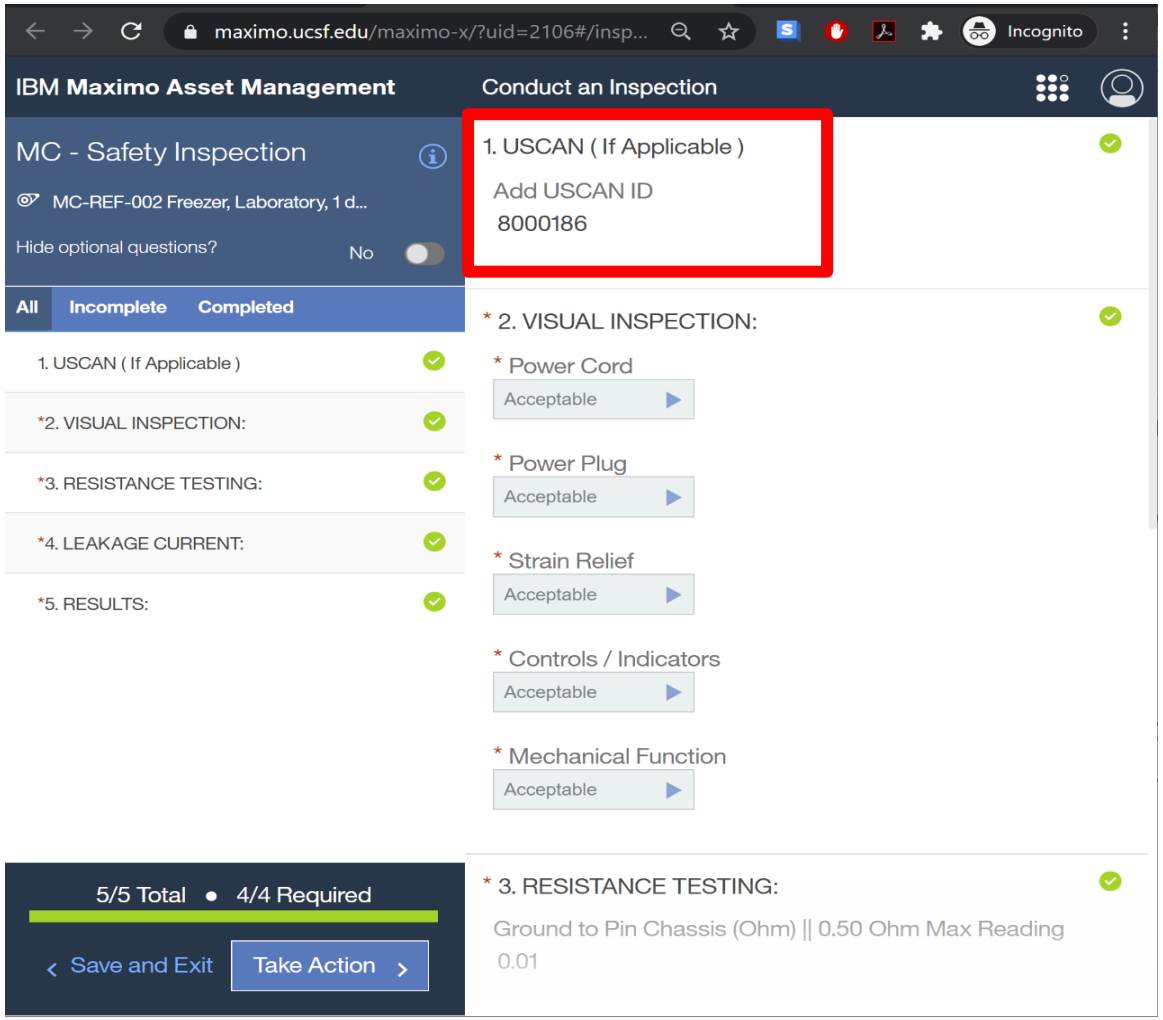
Electrical Safety Inspection Form



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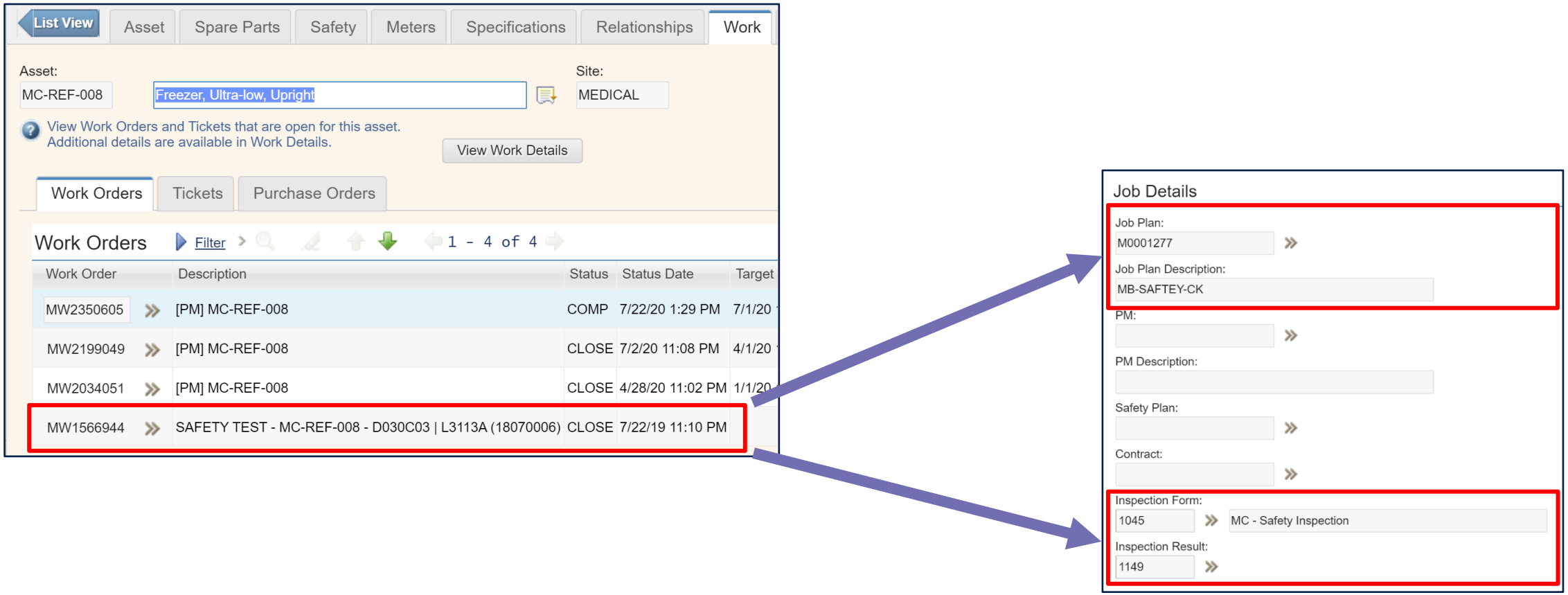
The Digital Twin has Maximo Asset History



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BIM4FM “Digital Twin” Operations Summary

UCSF Maximo v7.6 offered use of Inspection Forms

Integrating BIM data to facilities operations yielded new workflows

New digital workflows addressed legacy processes

Operations taking a digital step forward, on the ground level

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Redefining possible.™

Digital Twins

Thank you

The CitA Virtual Summit: **Changing the way we work**