The Present and Future of Making BIM Useful for Owners

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Implementation Consultant, Autodesk

Agenda

- Industry Challenges
- Owner-driven BIM Standards
- Autodesk BIM Ecosystem
- How to Proceed
- Autodesk’s Strategy

Industry Challenges

Gary Lane

VP Sales & Marketing Pavia Systems & Owner Specialist

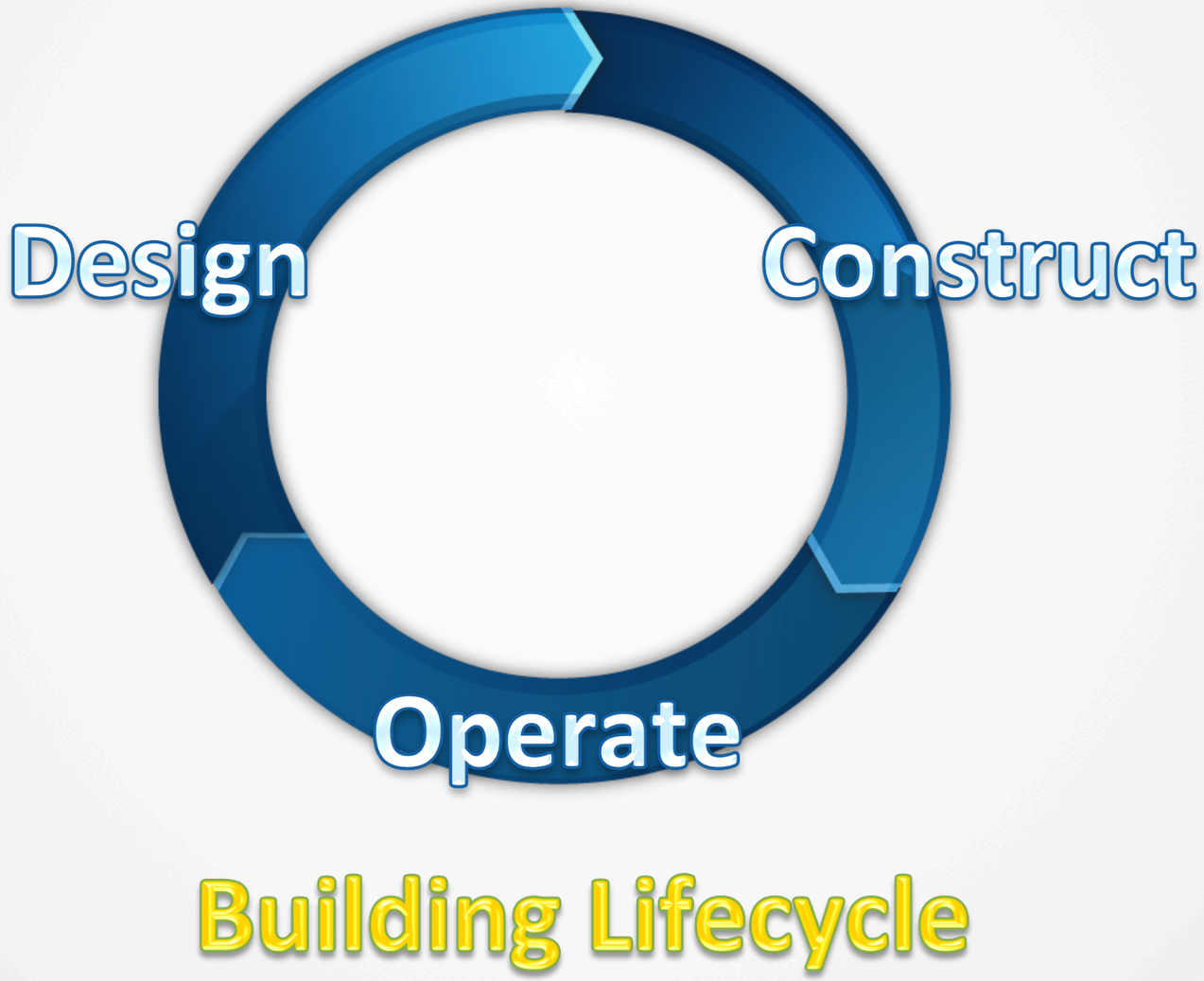
Industry Challenges

- Failure to maintain quality costs the U.S. construction industry over $15 billion a year in rework expenses alone. Additional costs for other quality failures may bring the total to more than twice that amount. https://www.construction-institute.org/scriptcontent/more/10_2_more.cfm

- Commissioning is arguably the single most cost-effective strategy for reducing energy, costs, and greenhouse gas emissions in buildings today. Although commissioning has earned increased recognition in recent years, it remains an enigmatic practice whose visibility severely lags its potential. http://evanmills.lbl.gov/pubs/pdf/cx-enef-mills.pdf
  (*Report includes numbers related to owner cost and savings*)

The Value of BIM in the Building Lifecycle

"an amount of time or a situation in which something can be done"



The Building Lifecycle

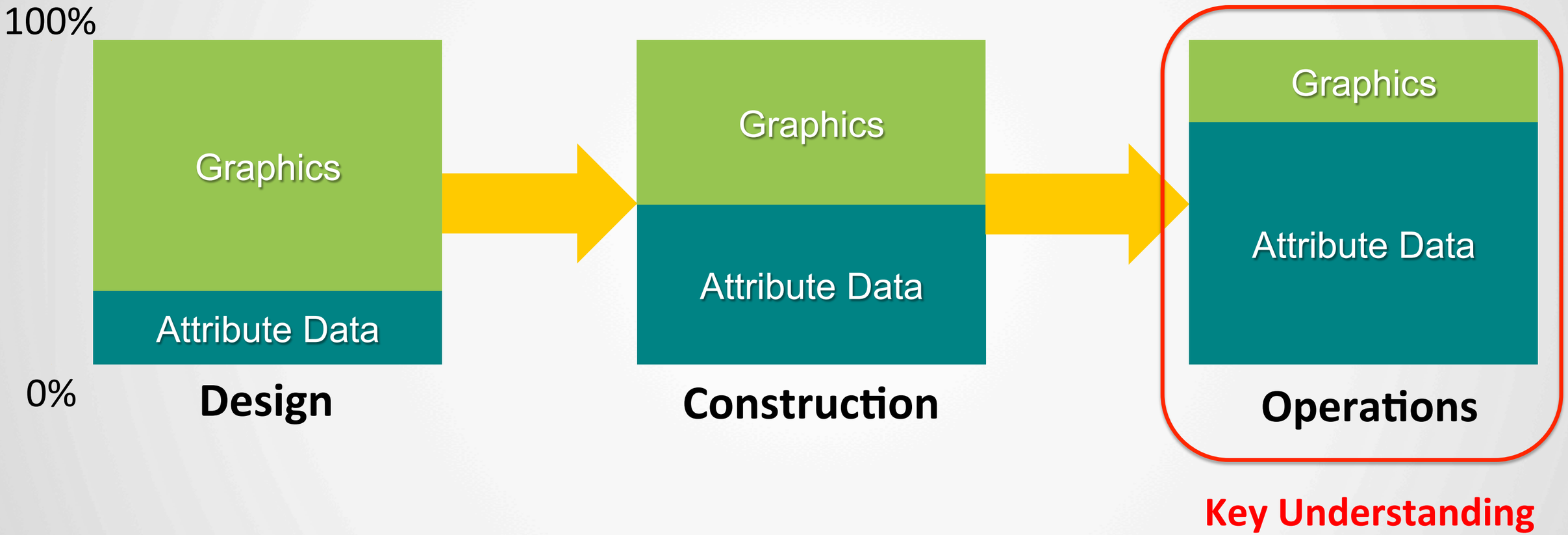
"a favorable juncture of circumstances"



Building Lifecycle Cost

Graphic / Attribute Data Importance

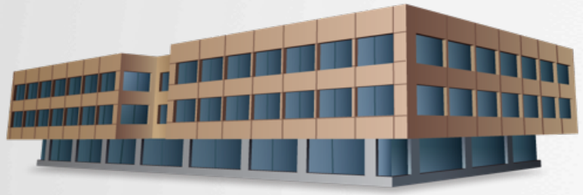
"a good chance for advancement or progress"



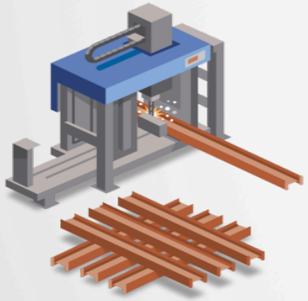
© 2015 Autodesk



Construction



Design Intent



Fabrication

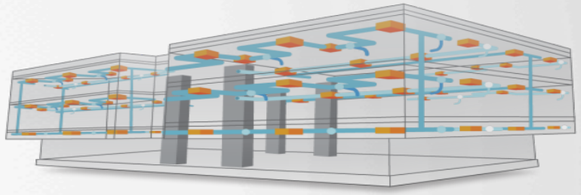
Owner Model



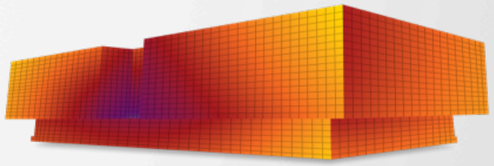
"As-Built"



Space Management



Maintenance Mgmt.



Energy Performance

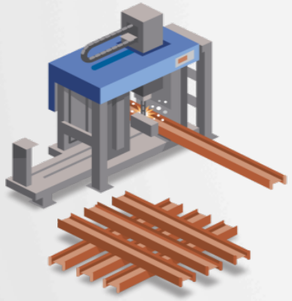
Design & Construct | **Handover** | **Operate**



Construction



Design Intent



Fabrication

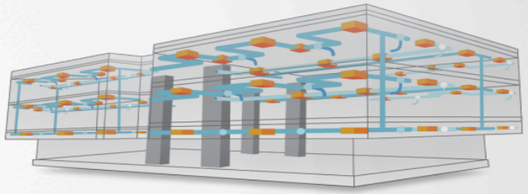
Owner Model



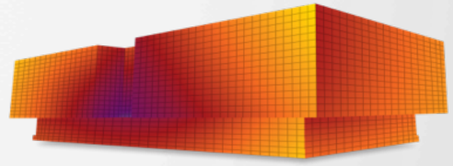
"As-Operated"



Space Management



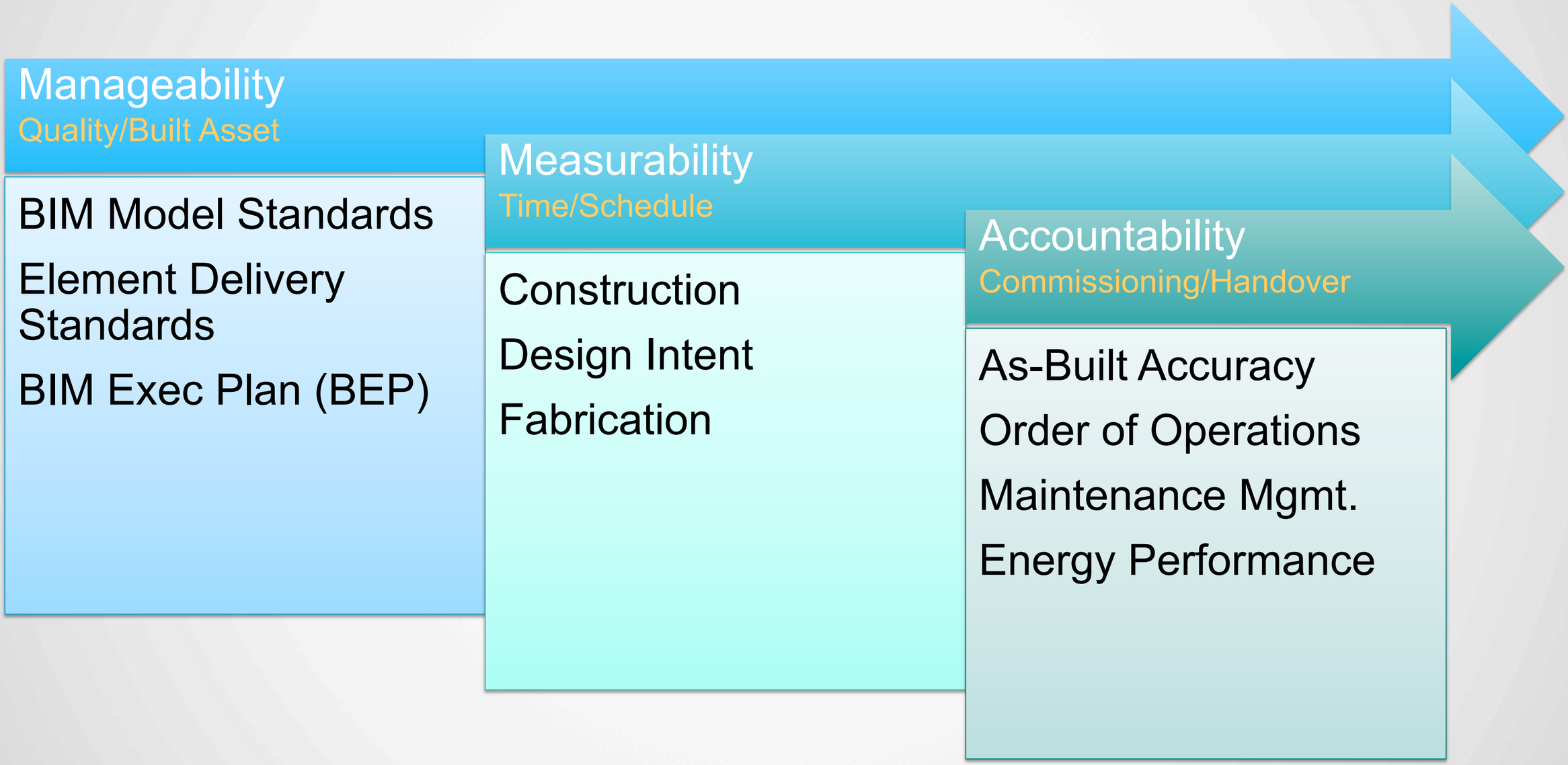
Maintenance Mgmt.



Energy Performance

Design & Construct **Operate**

Owner Workflow Rationale



Owner Challenges…

- **Design & Construction data not making it to Operations**
  - Causing: Warranty Claims, Potential Audit issues, Measurement & Verification, etc.
- **Maintenance and data not connected to the building model**
  - Disconnected workflow & information
- **Long cycle times & accurate data getting Asset data into FM systems**
  - Re-work or New Model required
- **Making models easy to access and use…anywhere by anyone**
  - Mobility, Generational Use & Adoption

3 things Owners can do…

1. Get BIM standards and requirements into your contracts

2. Require systems that deliver what you need

3. Partner with Autodesk to leverage existing industry best practices

The Owner-driven BIM Standards

Clive Jordan

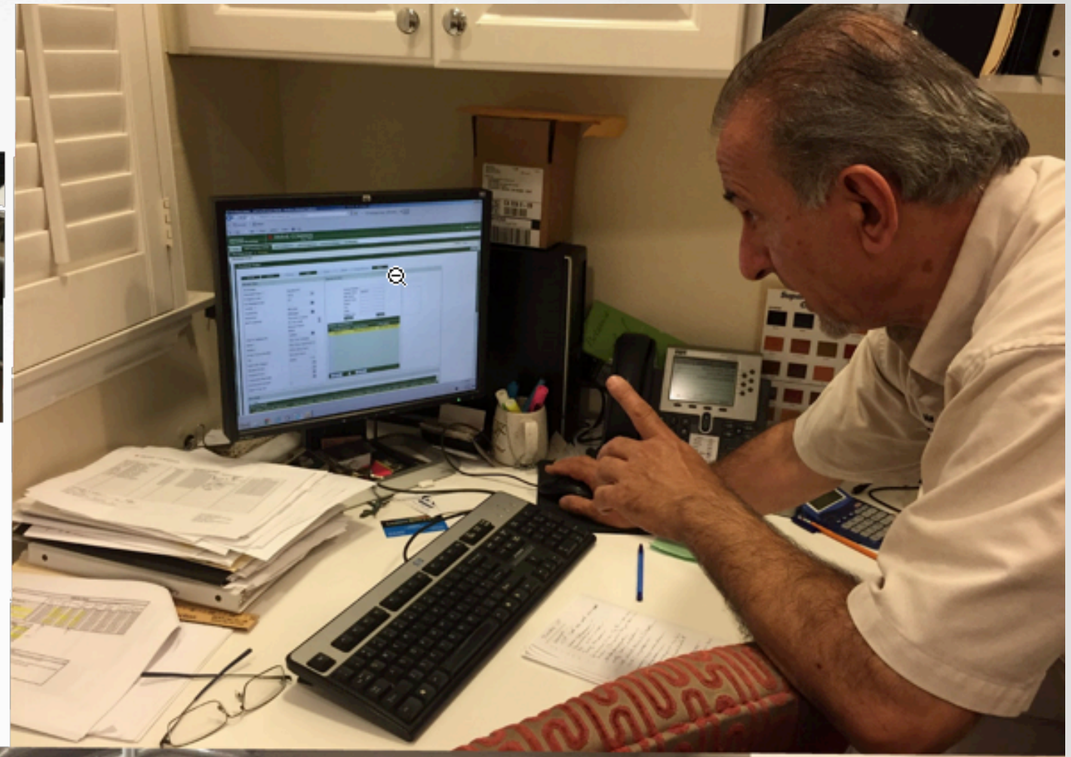
Vice President, The Irvine Company

What does an owner want?





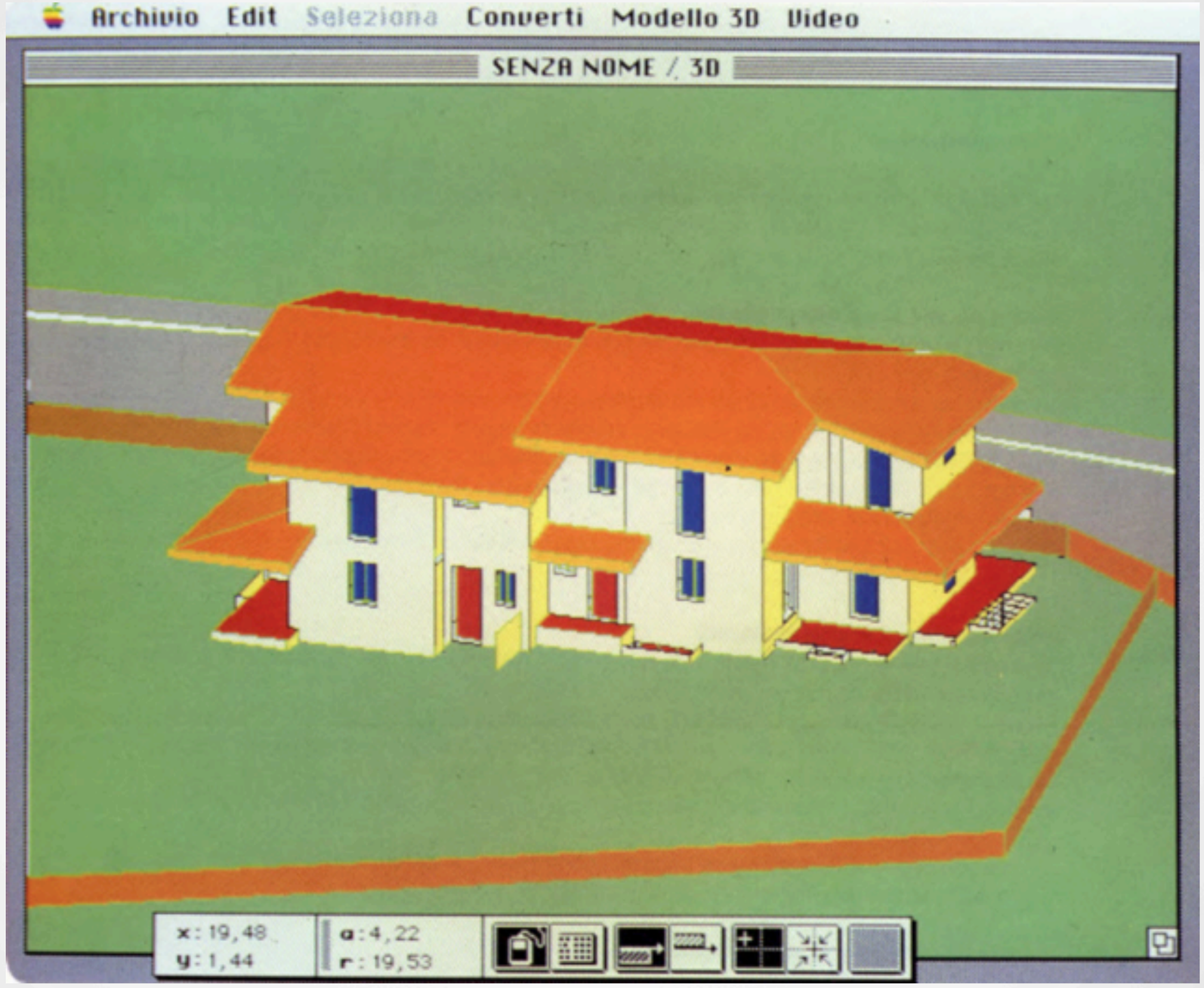




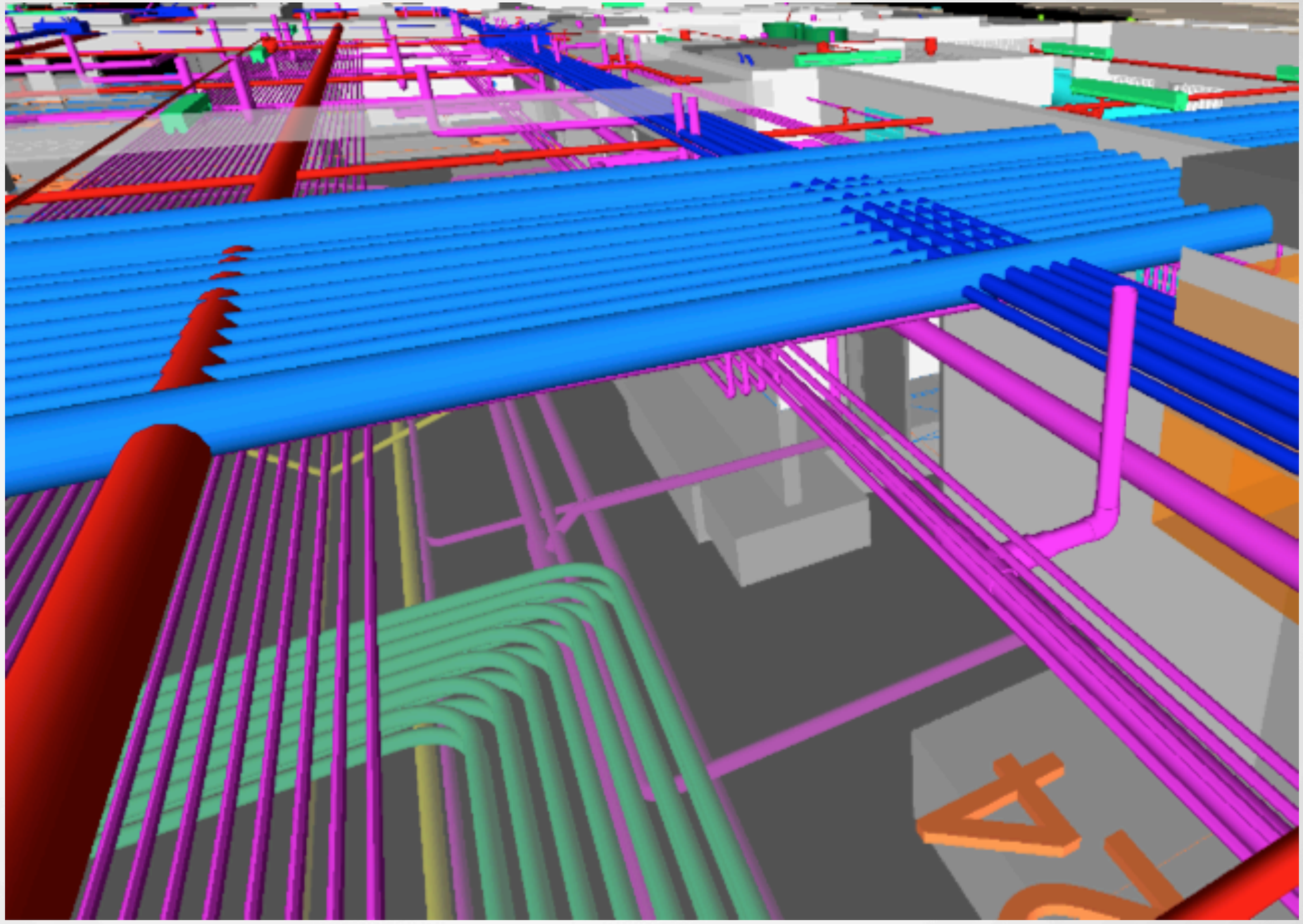




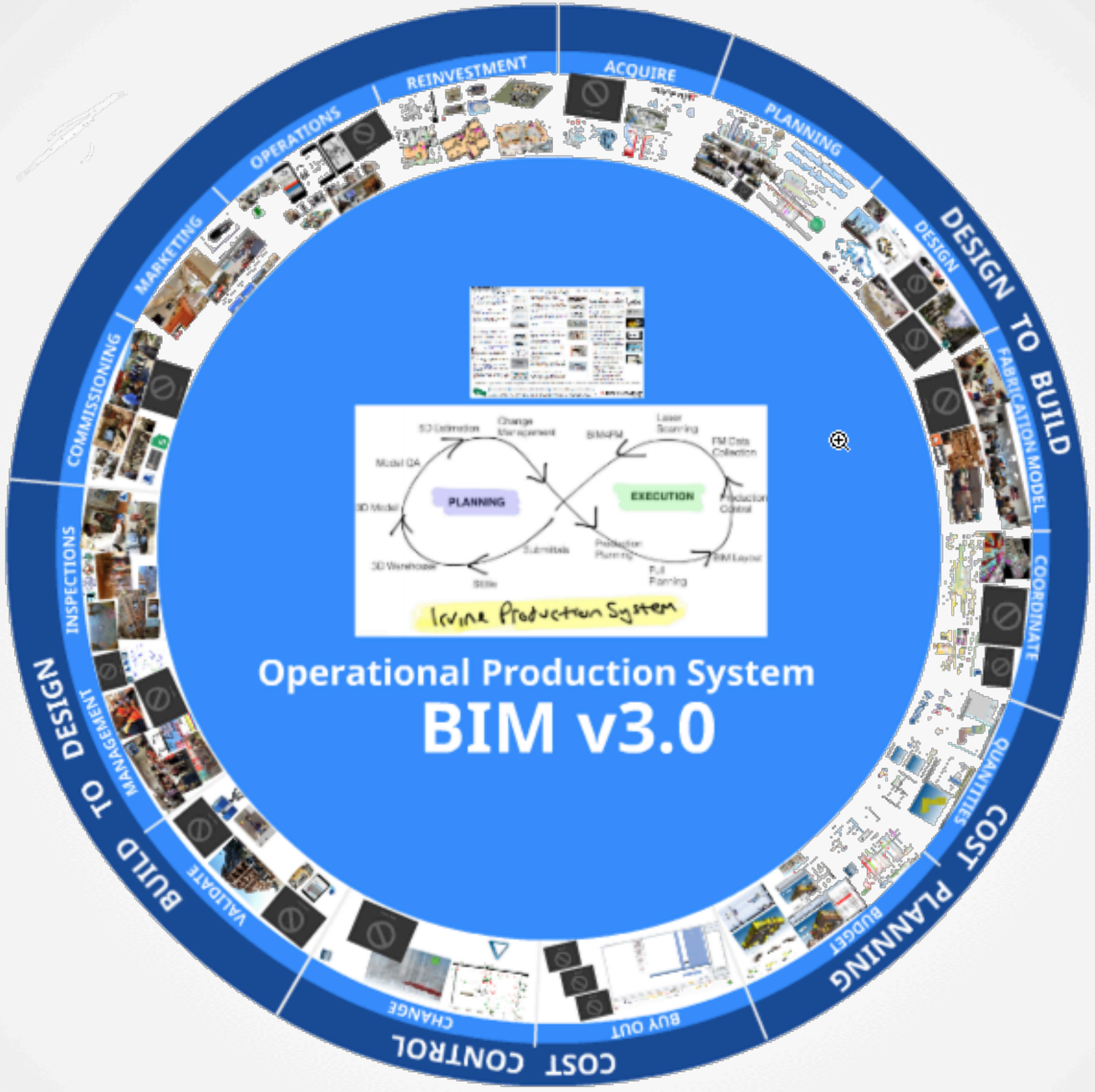
BIM v1.0:


Archivio Edit Seleziona Converti Modello 3D Video
SENZA NOME / 3D
x: 19,48
y: 1,44
a: 4,22
r: 19,53

BIM v2.0:



BIM v3.0:



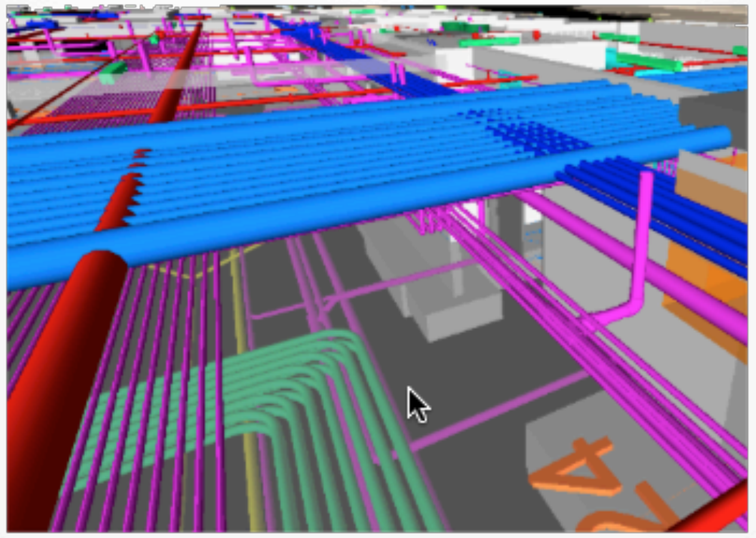
AUTODESK.

Moving to an Operational Production System

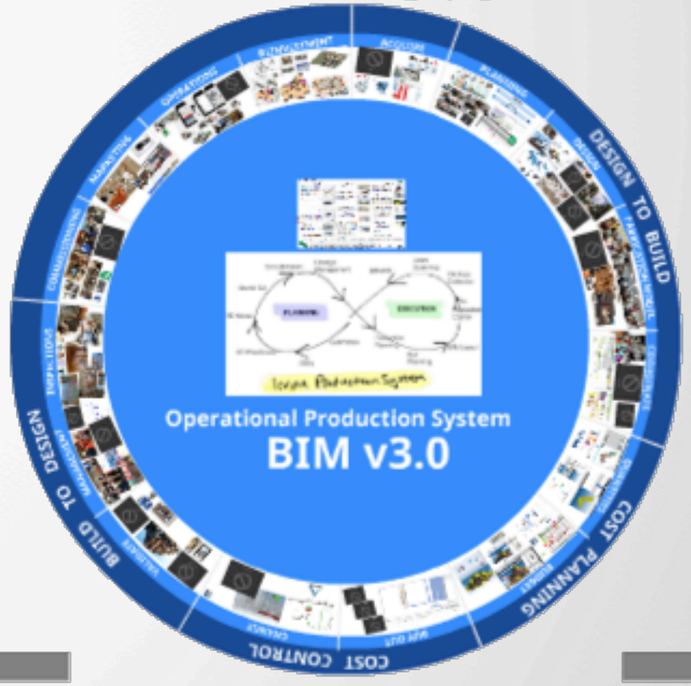
BIM v1.0

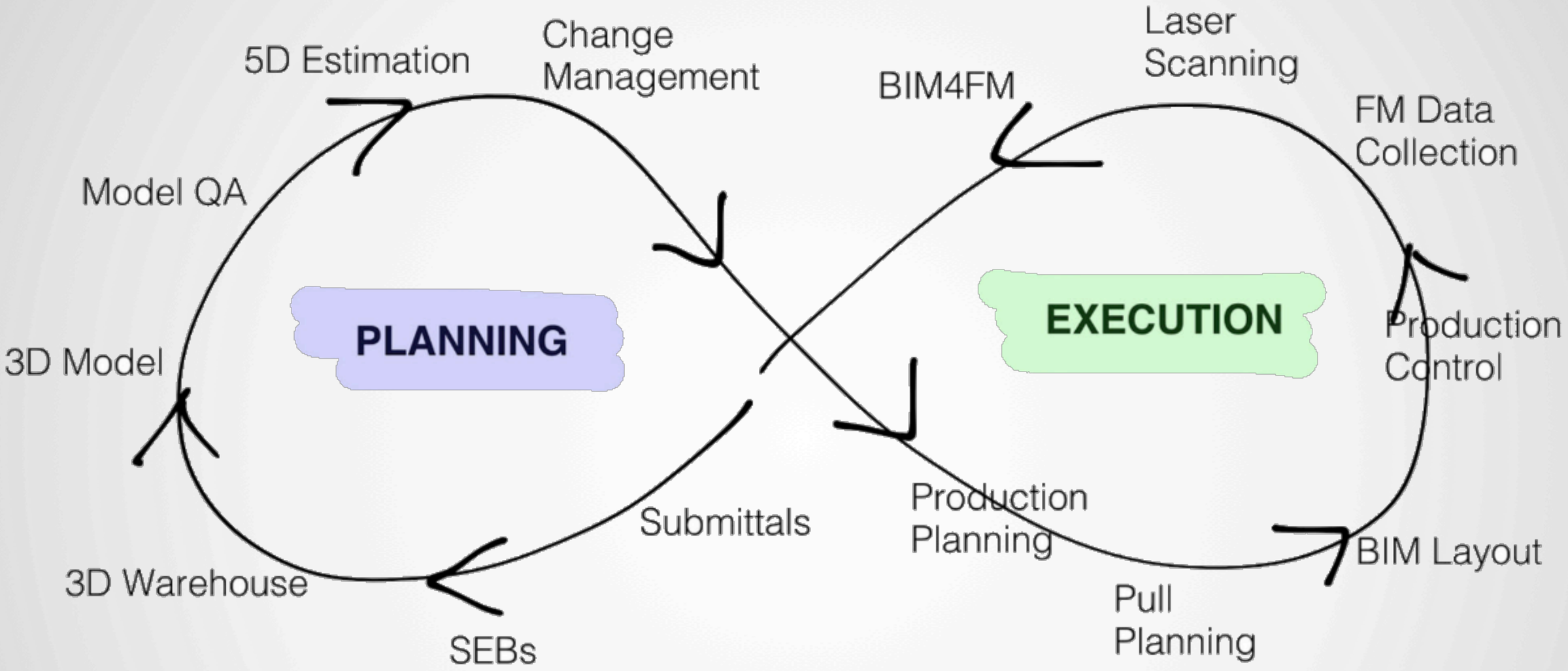


BIM v2.0



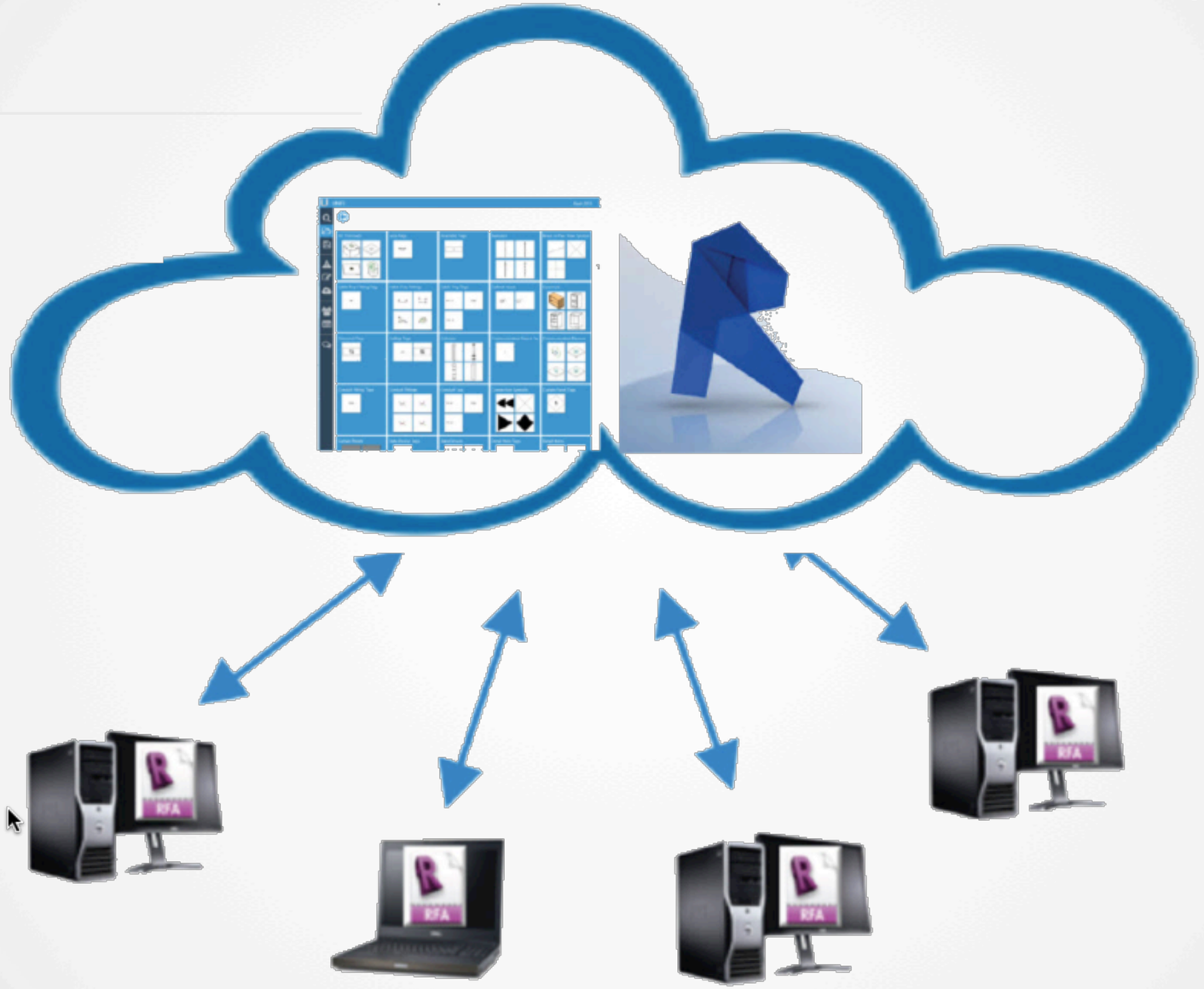
Operational Production System BIM v3.0



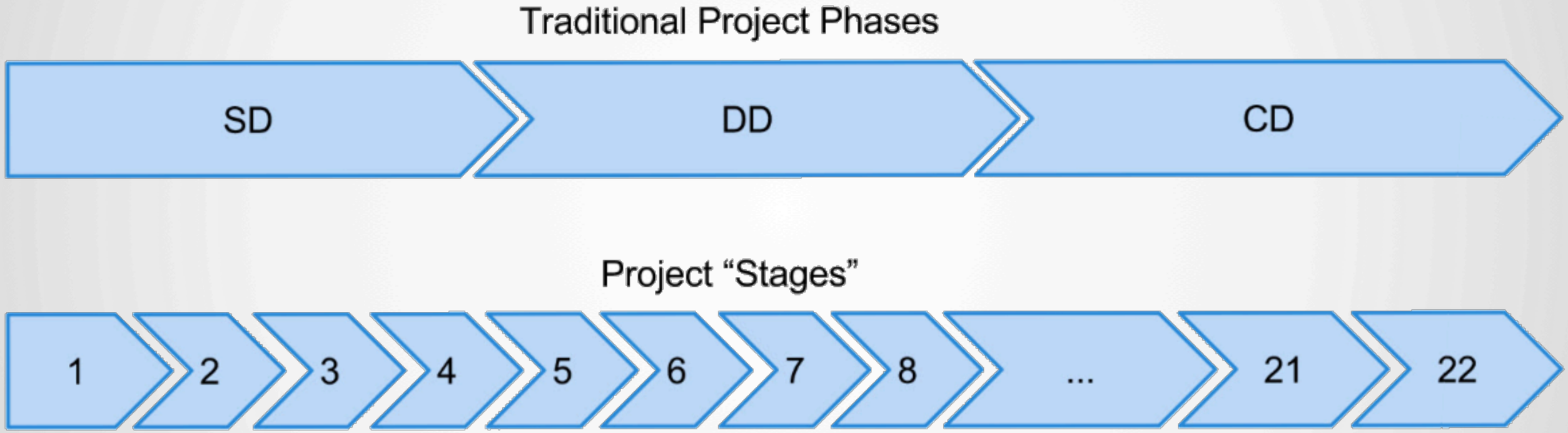


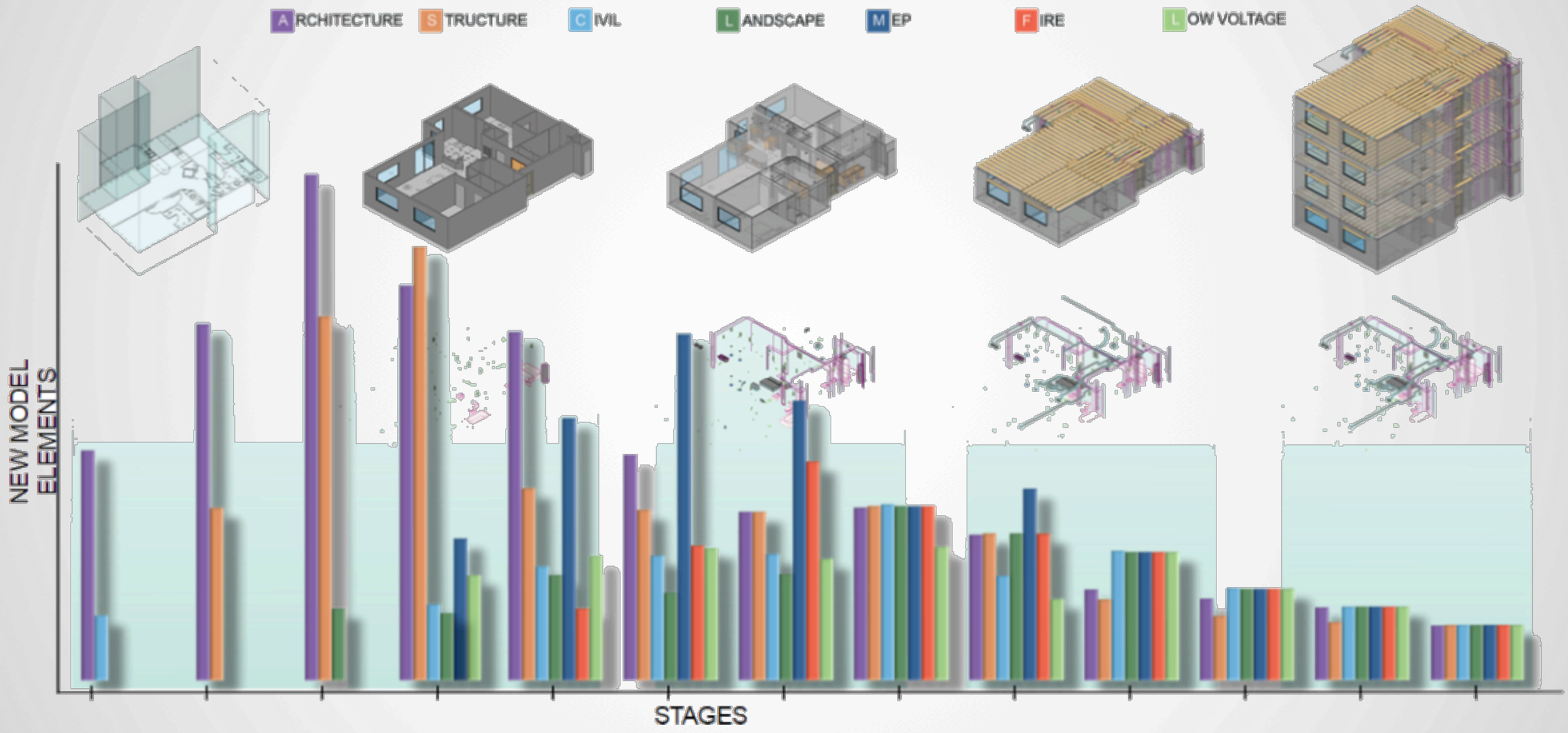
Irvine Production System




RFA
RFA
RFA
RFA

Phases vs Stages?

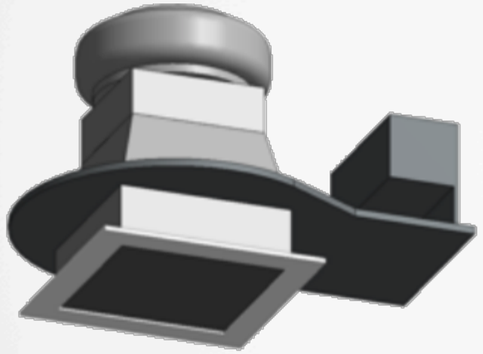


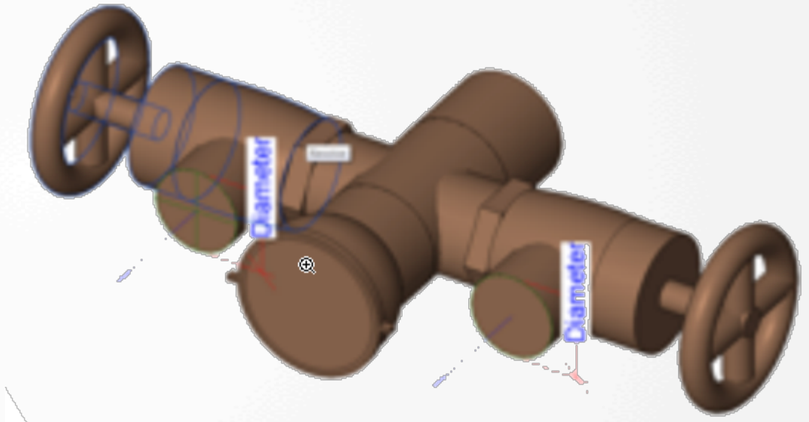

ARCHITECTURE
STRUCTURE
CIVIL
LANDSCAPE
MEP
FIRE
LOW VOLTAGE
NEW MODEL ELEMENTS
STAGES

Collaboration



Importance of standard content





Code and Description	
Assembly Code	Assembly Description
D2010110	Water Closets - Single
OmniClassNumber	OmniClassTitle
23-31 19 19	Water Closet

Product Information			
Manufacturer	Model	TypeDescription	URL
ProFlo	PF9301WH	Two-Piece Vitreous China Dual Flush Water Closet	http://www.proflo.com/proflo/showRecordDetail.do?R=PROD_3382540&search=true

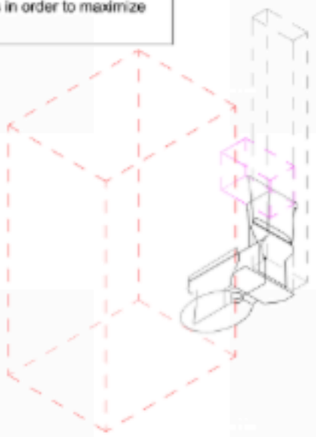
Object Data

Elements visible in plan oriented views will display 2D graphic representations of the 3D geometry



Plan View

Coarse views will be set to only show the 2D graphic representations in order to maximize graphic performance



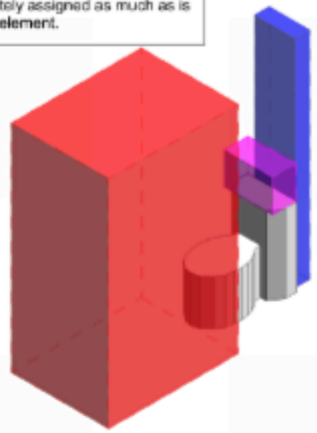
Coarse Detail Level 3D View

Elements visible in elevation and section will will display 2D graphic representations of the 3D geometry



Front and Side Elevation

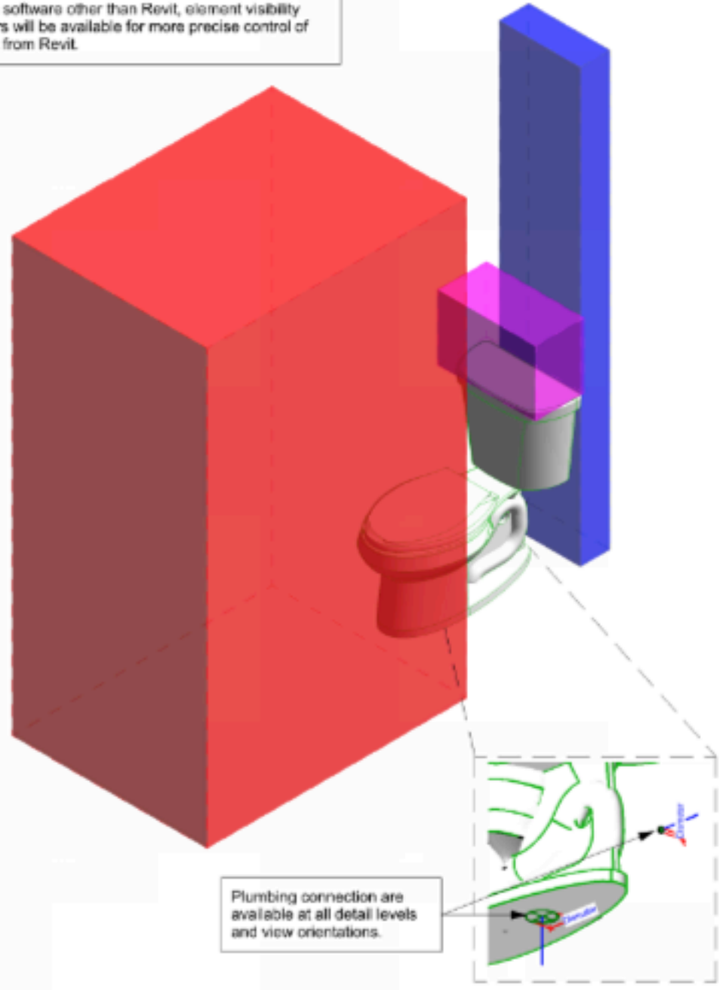
Medium views will begin to populate generic representations of elements in 3D. These generic representations will be modeled to the extents of the actual geometry and will be generated such that they will be adequate for design intent coordination. Materials will be accurately assigned as much as is possible for the type of element.



Medium Detail Level 3D View

Fine views will show the highest level of modeled geometry and will be suitable for final coordination as well as rendering. Materials will be applied as accurately as possible.

For use in software other than Revit, element visibility parameters will be available for more precise control of the output from Revit.



Plumbing connection are available at all detail levels and view orientations.

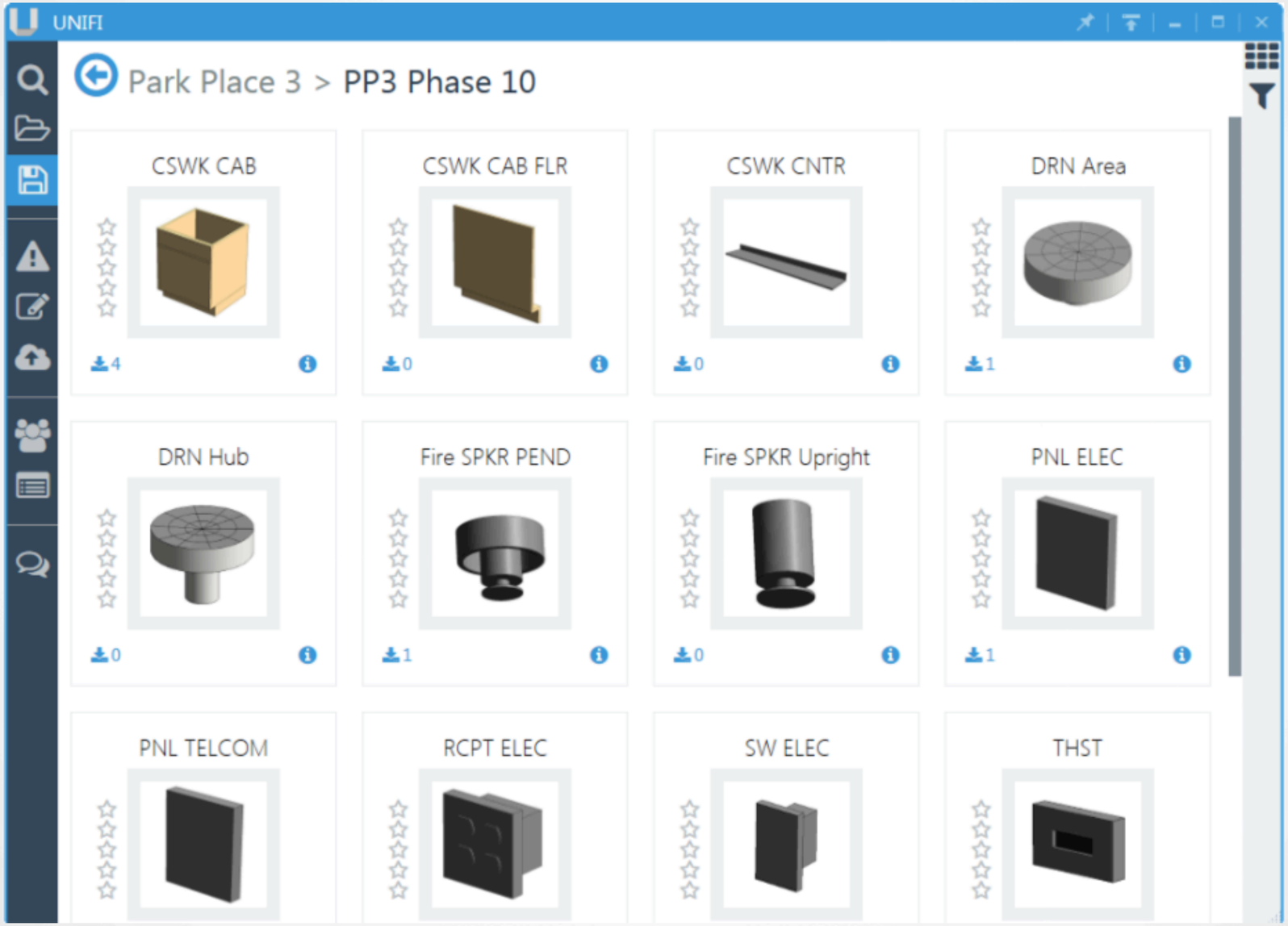
Fine Detail Level 3D View

Unnamed

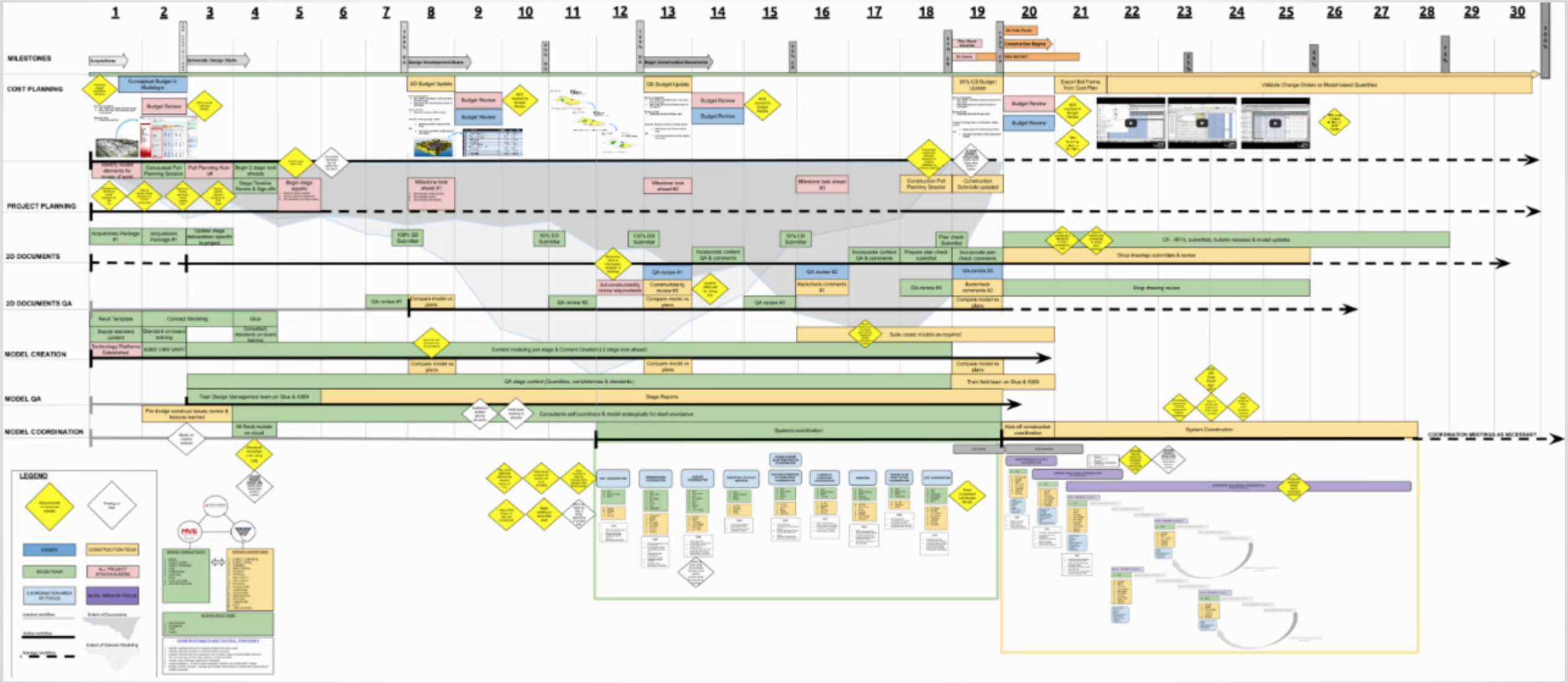
PF-2

9/17/2014 10:33:06 AM

Cloud-based - shared warehouse



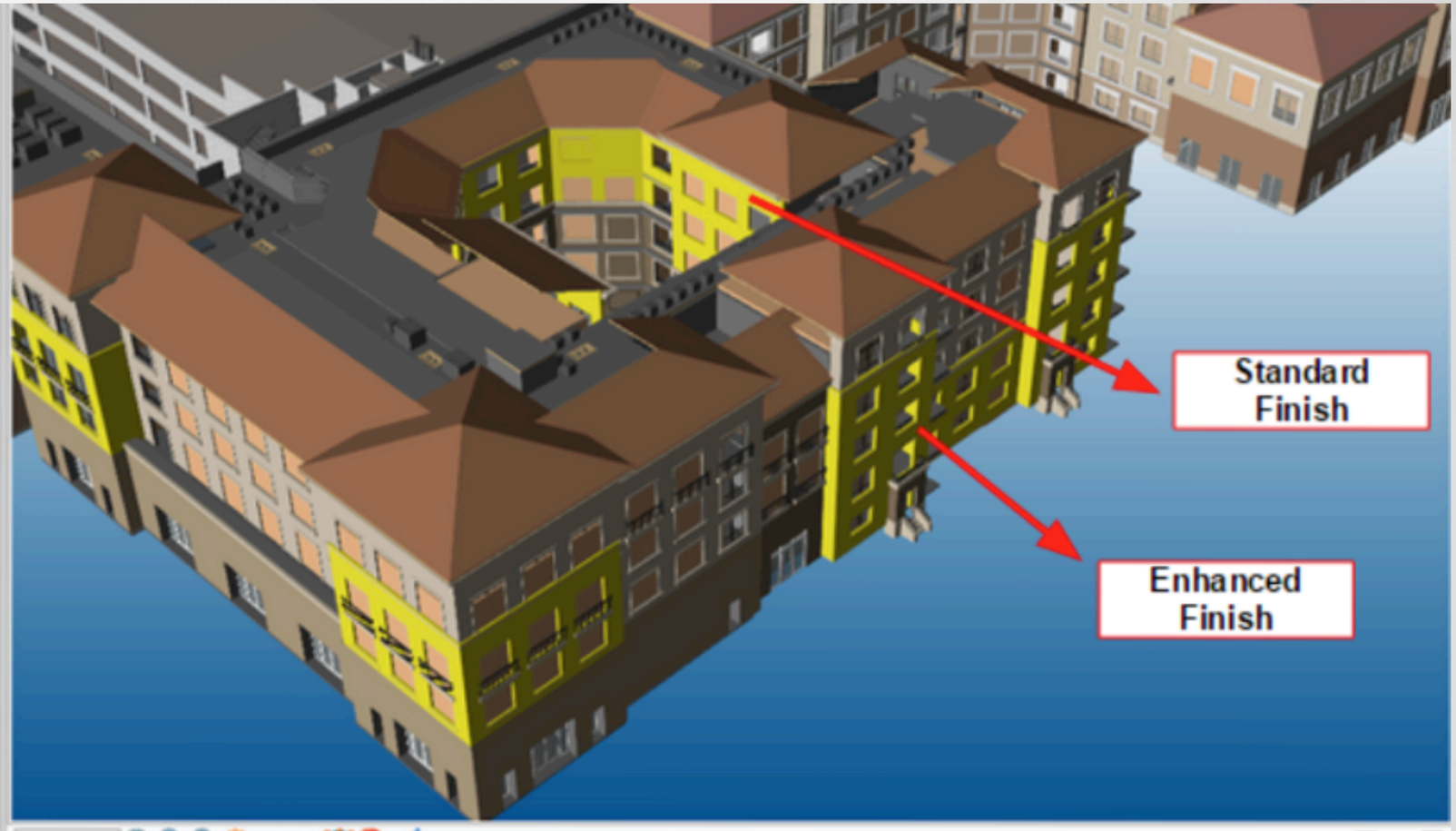
World Class Coordination




LEASING



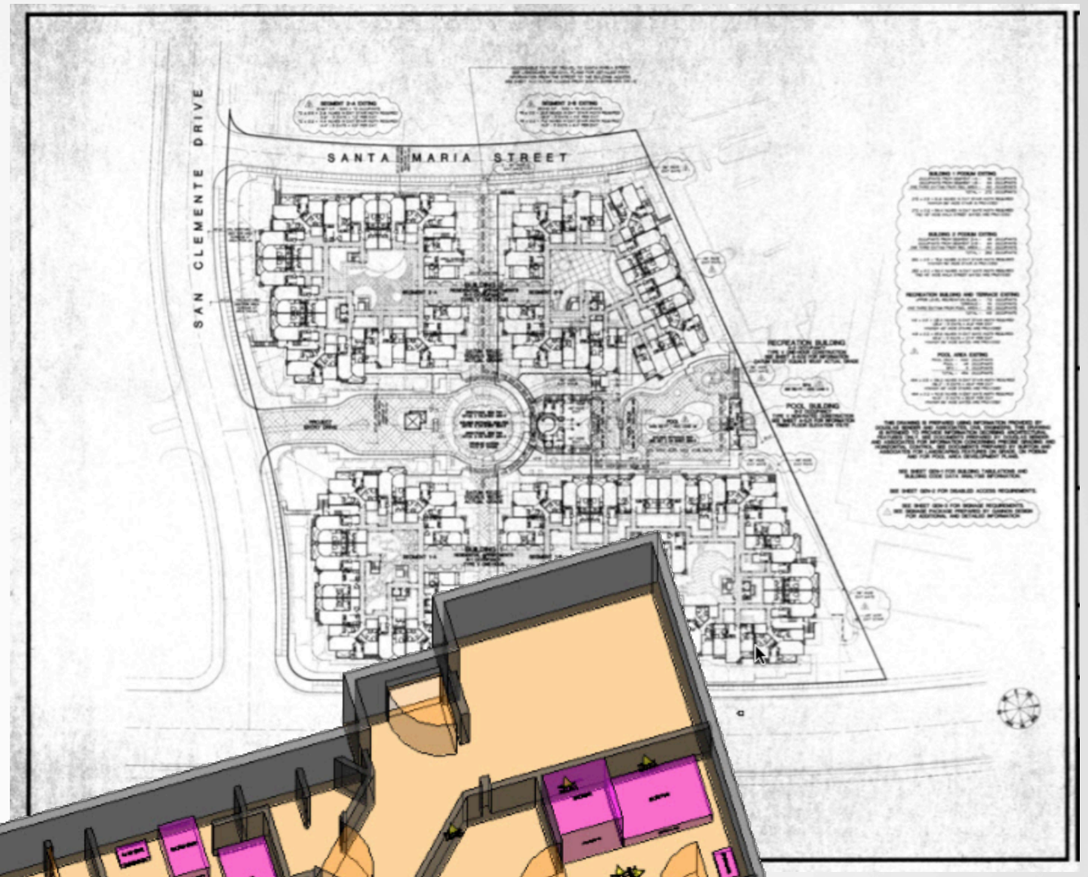
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		Basic Wall-EXT_M6(2)_PL_PA2		Yes	4
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		Basic Wall-EXT_M6_PL_FS1		No	0
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		Basic Wall-EXT_WZX6(2)_PL_PA1		Yes	1
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Code	Description	Source Q...	Consump...	Consump...	Waste	Qty	UOM	Unit Cost	Base Cost	Cost/P...
000	Santa Clara Square-Arch-Bldg1	1.00	1.000	1.000	1.000	1.00		0.00	0.00	
[0]	Stucco	1.00	1.000	1.000	1.000	1.00	-	0.00	0.00	
[1]	Exterior Plaster, Fine Sand & Smooth Trowel Finish (1)	1.00	1.000	1.000	1.000	1.00	-	0.00	0.00	
[2]	Standard Finish	1.00	1.000	1.000	1.000	1.00	-	0.00	0.00	
[3]	Enhanced Finish	17,568.24	1.000	1.000	1.000	17,568.24	SQ FT	0.00	0.00	
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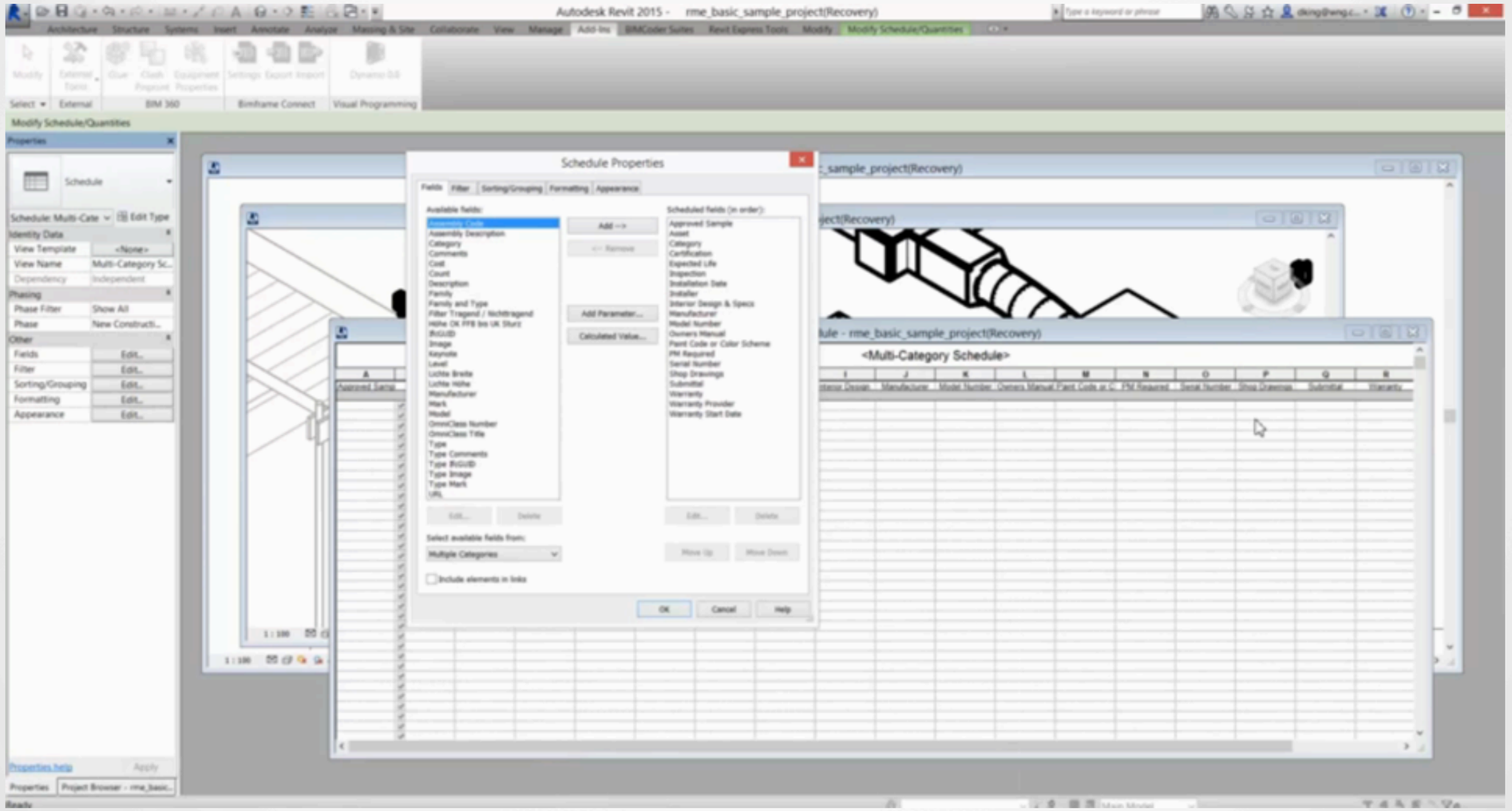
LOD


UNIT 5
2 - B102


SAN CLEMENTE DRIVE
SANTA MARIA STREET


UNIT 5
BUILDING 2 - 105

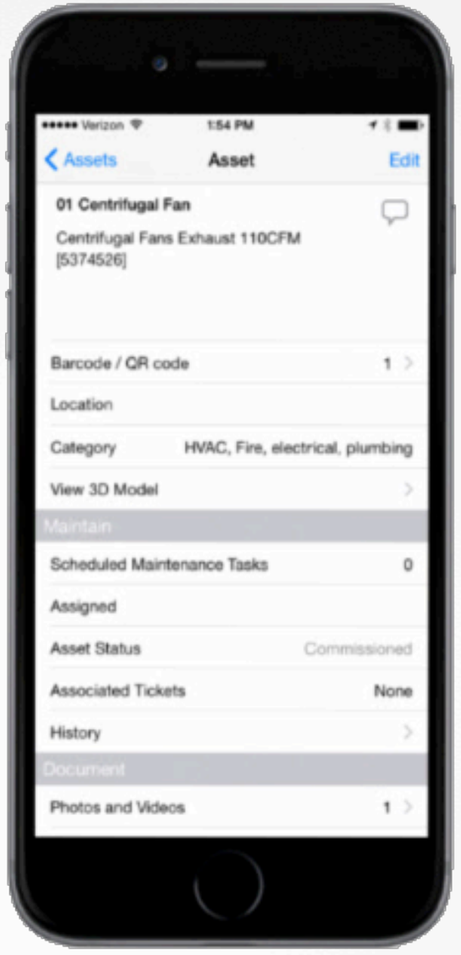
Meaningful data



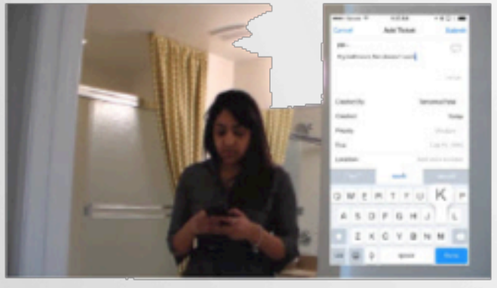

Verizon
1:44 PM
Park Place III
Park Pl, Irvine CA
all 6
new 0
upcoming 0
overdue 3
awaiting parts 0
completed 2
add ticket +

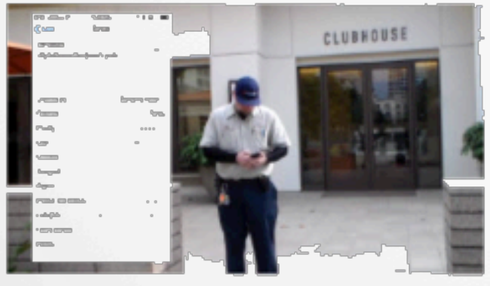


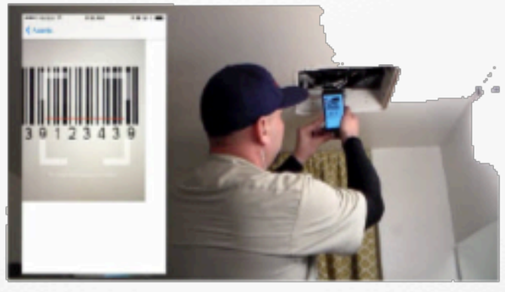


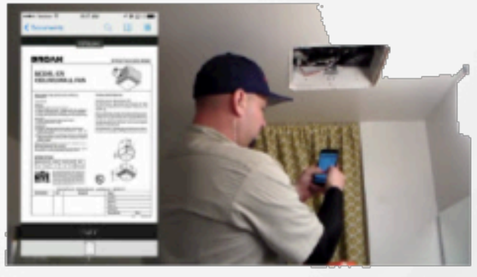

Verizon
1:54 PM
Assets
Asset
Edit
01 Centrifugal Fan
Centrifugal Fans Exhaust 110CFM
[5374526]
Barcode / QR code 1
Location
Category HVAC, Fire, electrical, plumbing
View 3D Model
Maintain
Scheduled Maintenance Tasks 0
Assigned
Asset Status Commissioned
Associated Tickets None
History
Document
Photos and Videos 1

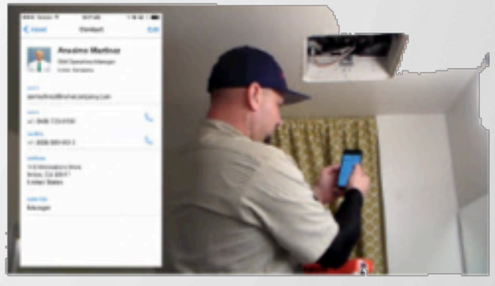

Verizon
1:54 PM
Asset
View 3D Model




CLUBHOUSE







Autodesk BIM Ecosystem

Sheryl Yang

Implementation Consultant, Autodesk

Autodesk BIM Ecosystem

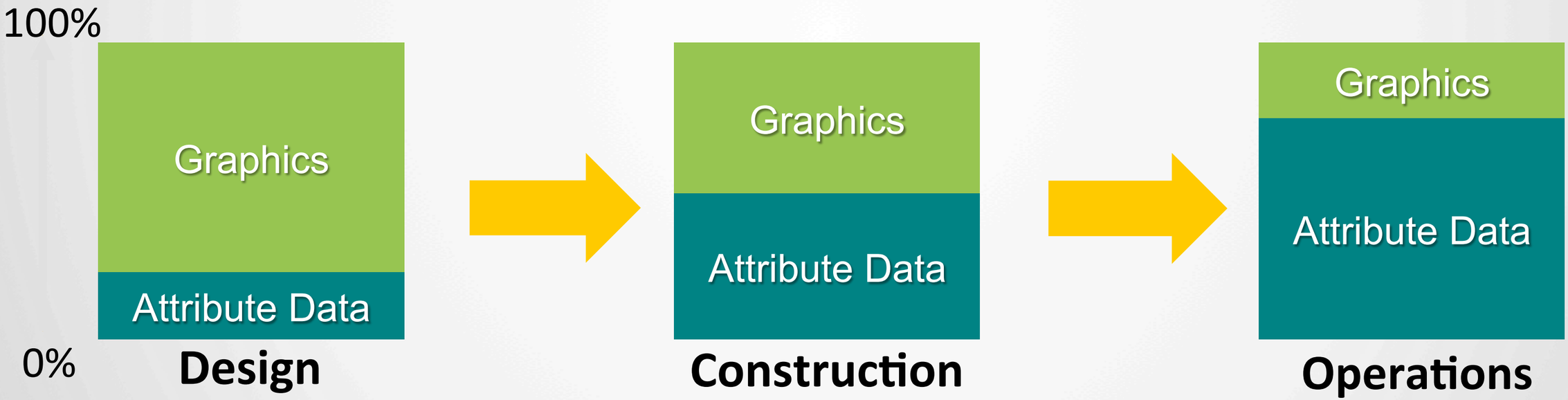






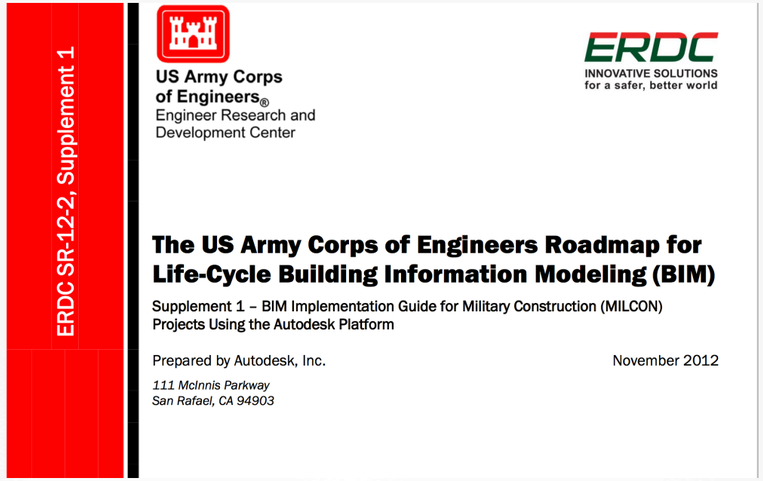




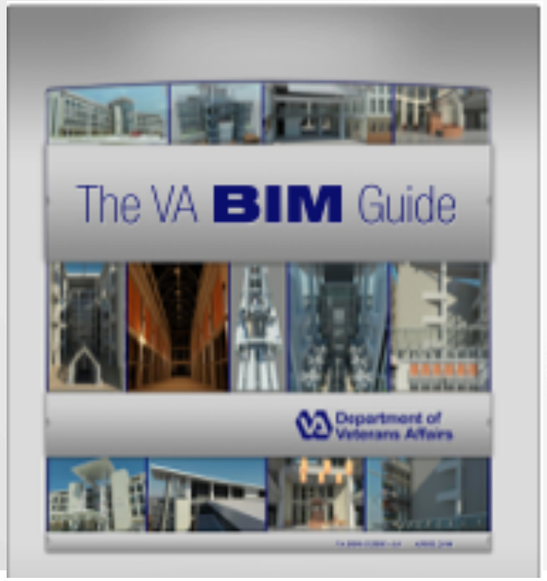


Define BIM deliverable information requirement



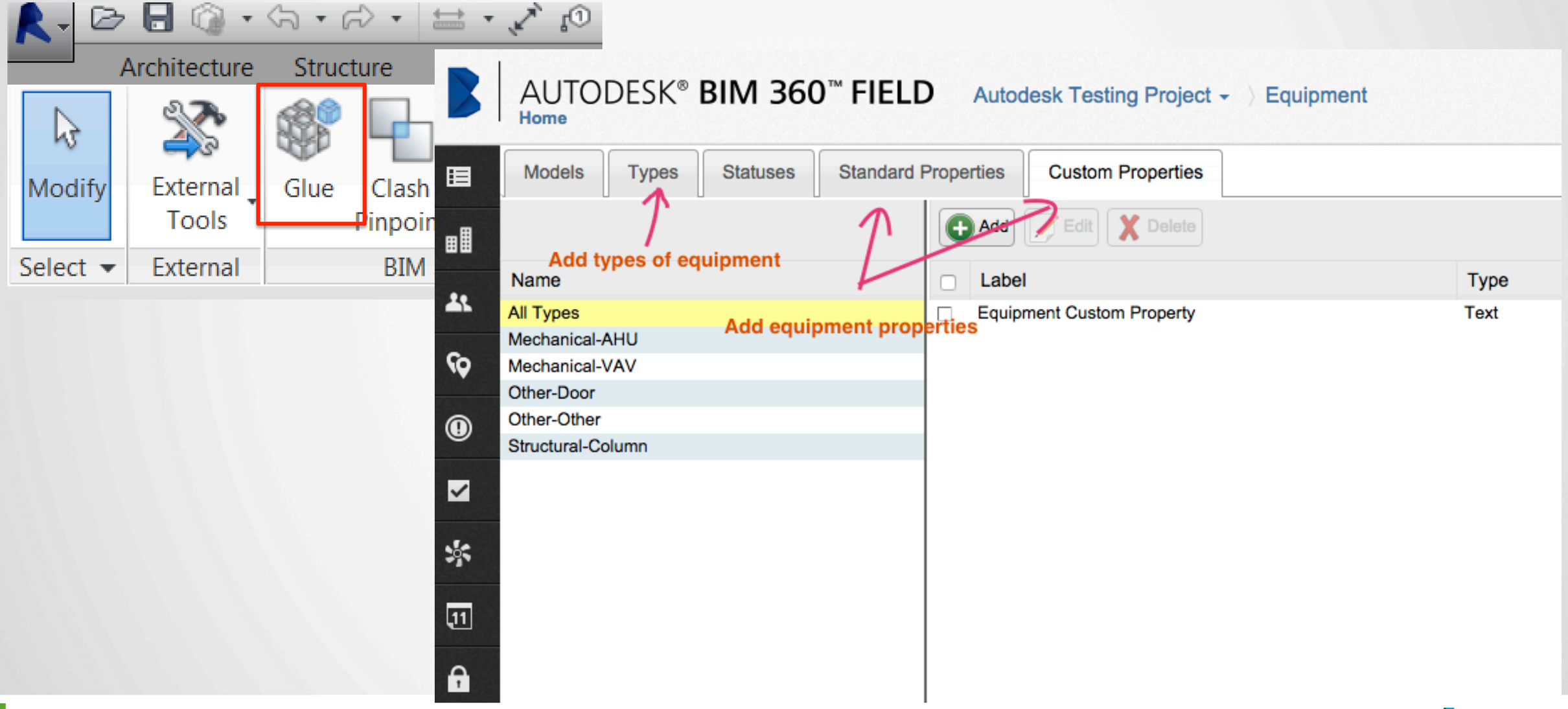








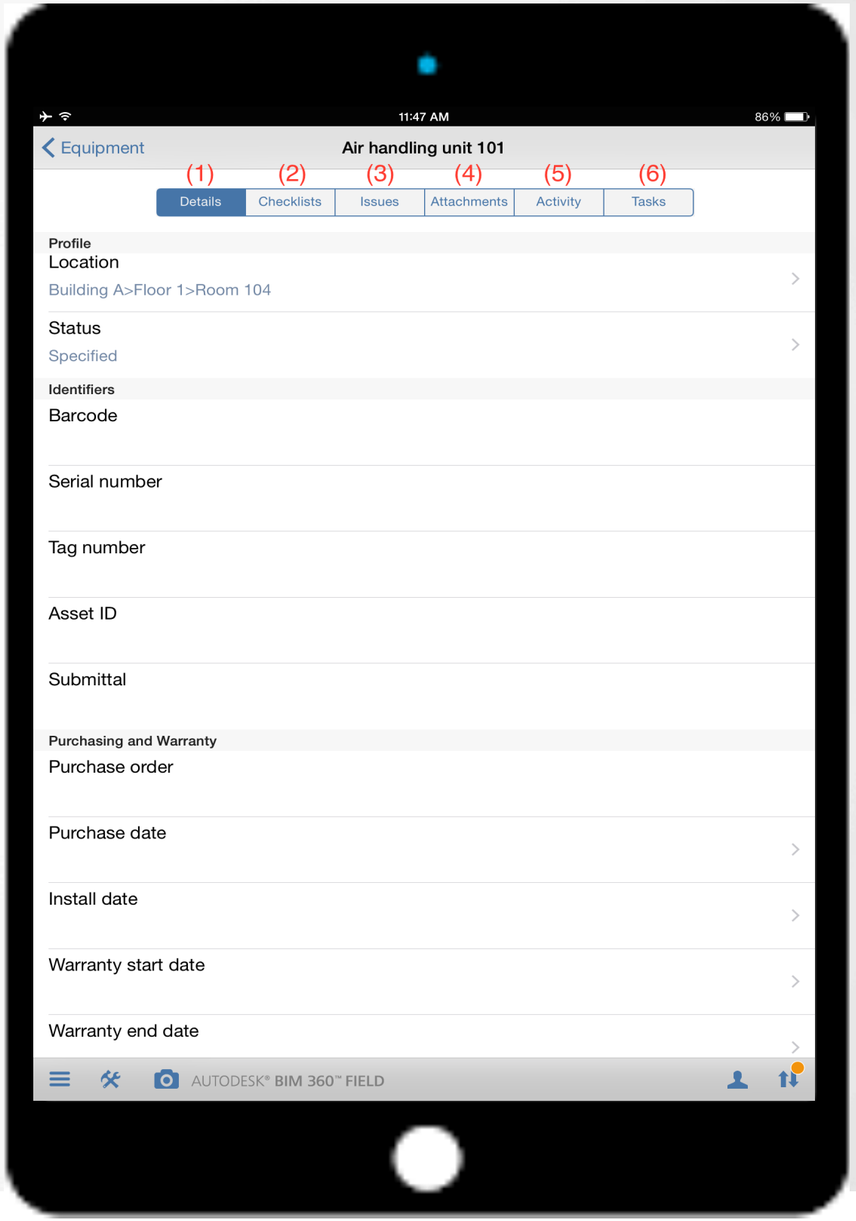
BIM 360 Field allows contractors to collect data digitally on the field



AUTODESK.

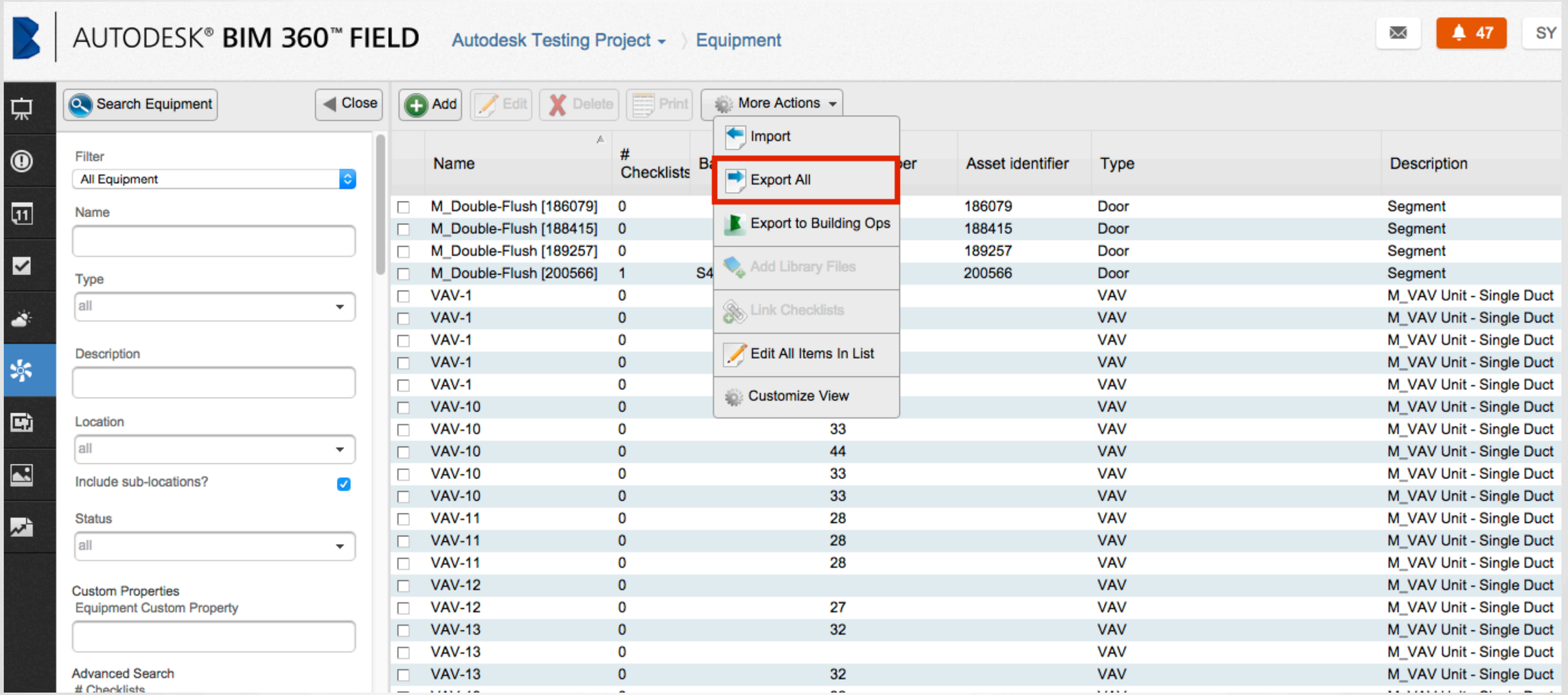
BIM 360 Field allows contractors to collect data digitally on the field





Understand BIM information deliverable formats

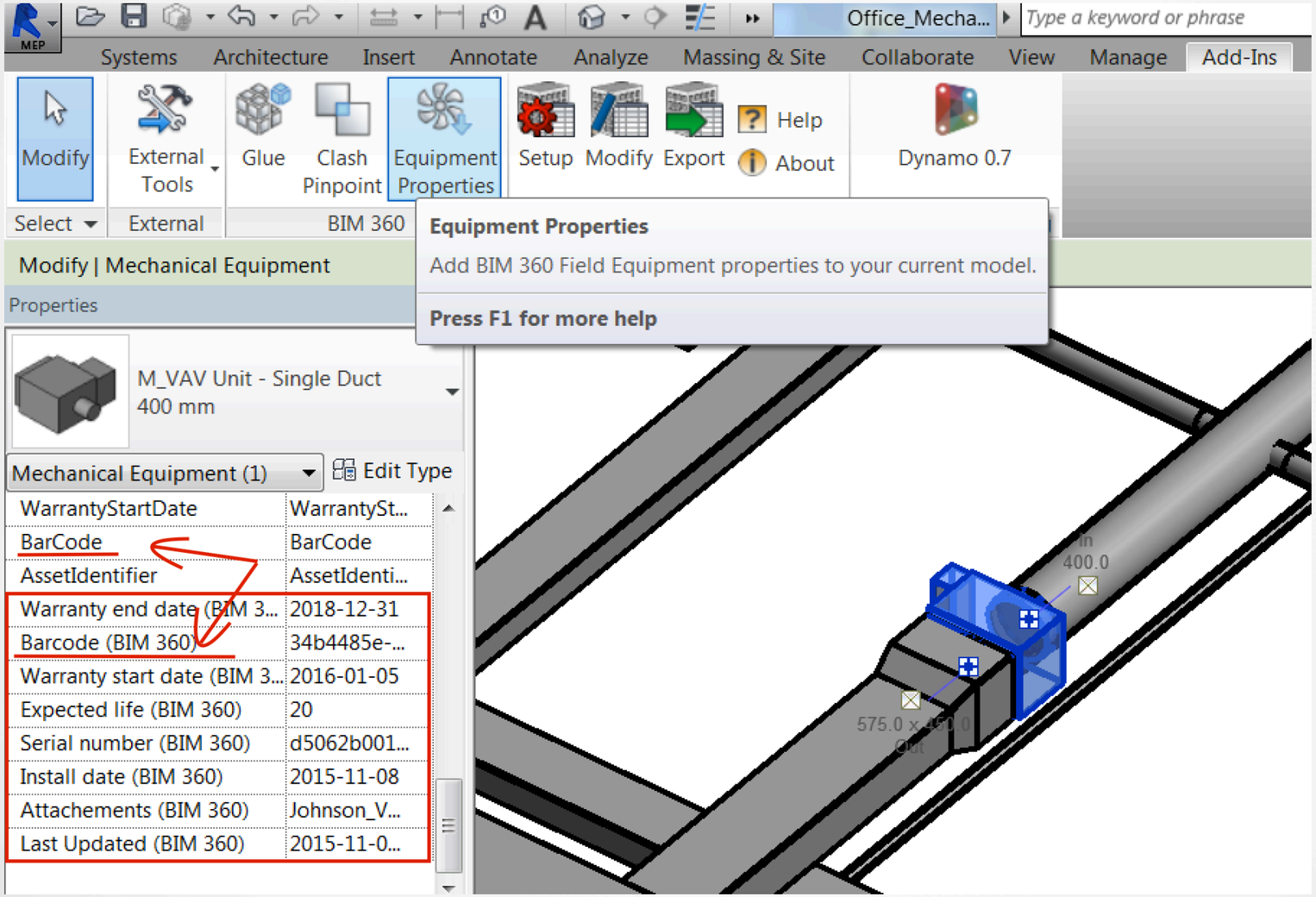
Deliverable as Excel



Deliverable as Model “Information”

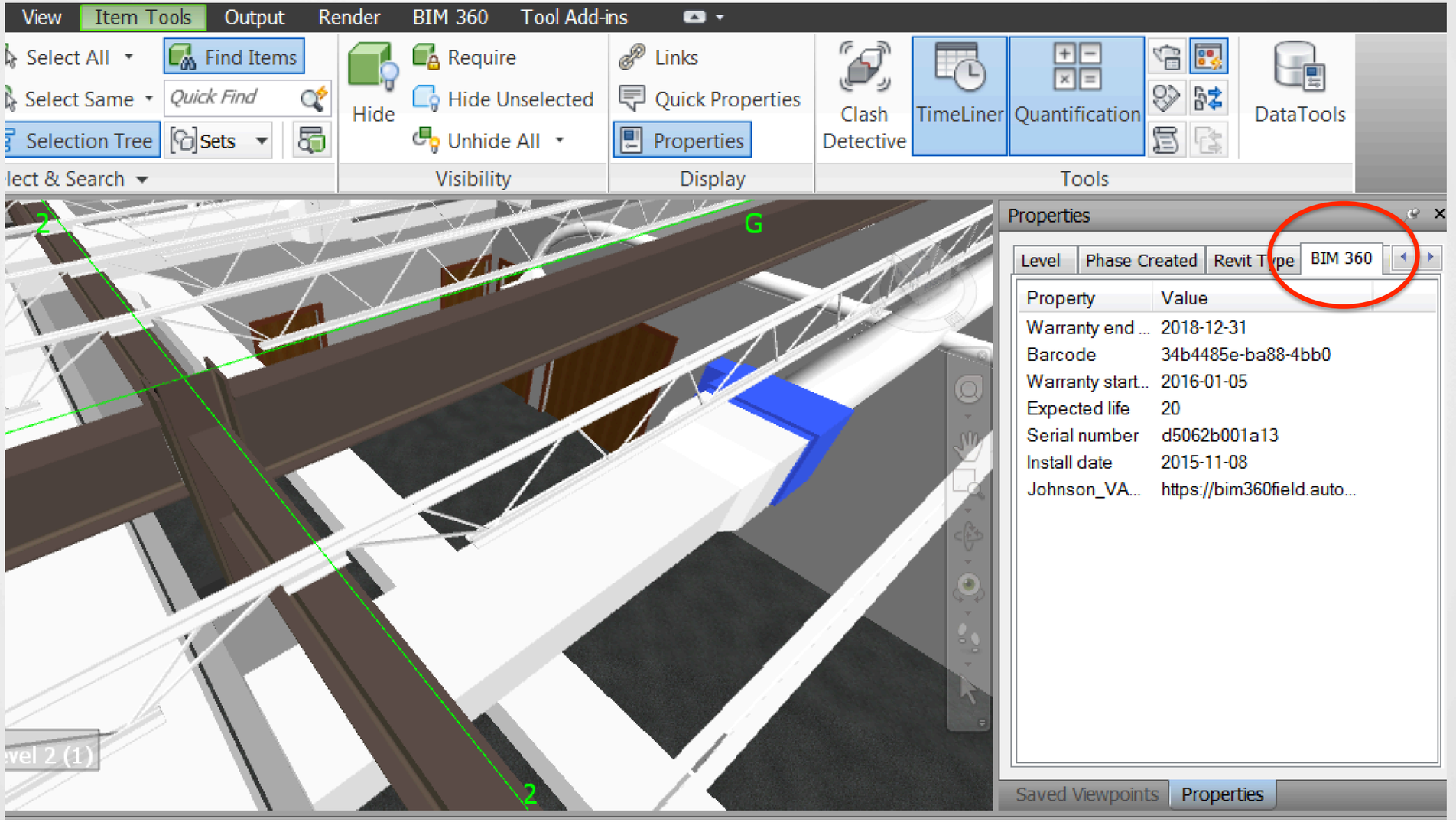
Understand BIM information deliverable formats

Deliverable as Revit file



Understand BIM information deliverable formats

Deliverable as Navisworks file

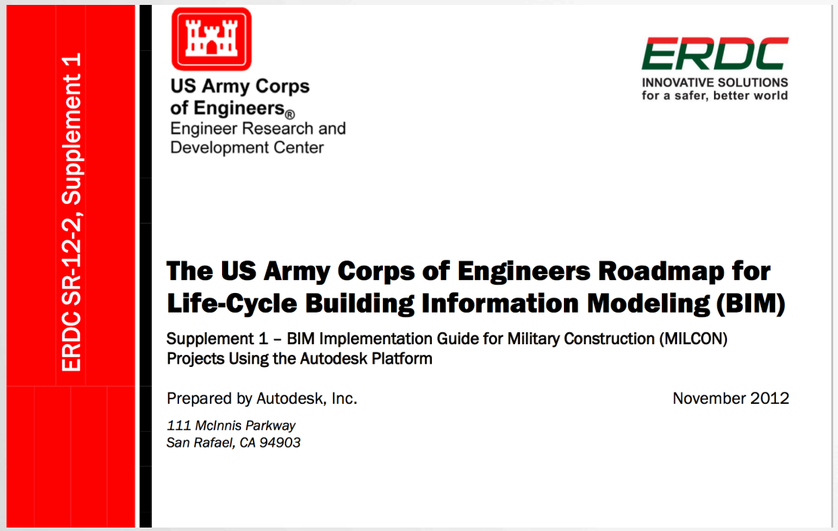


Deliverable in COBie Format

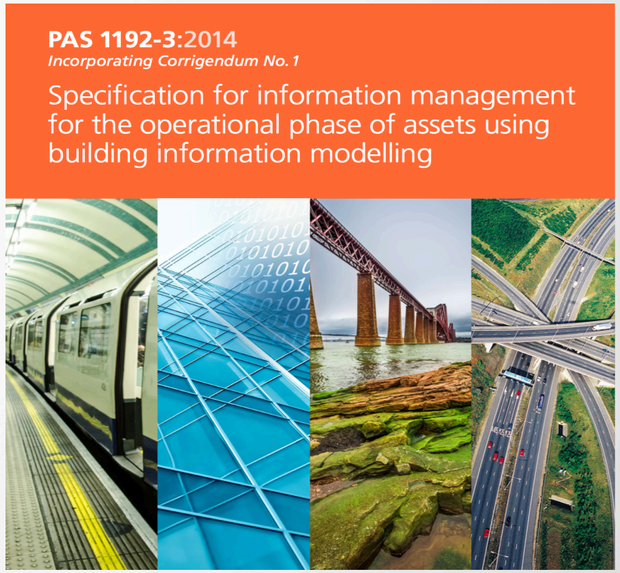
Understand BIM information deliverable formats

Deliverable in COBie format

- COBie Mandate
- Autodesk Involved with COBie since 2006
- COBie Extension for Revit
- COBie Solution for Autodesk Navisworks and BIM 360
- Autodesk BIM Interoperability

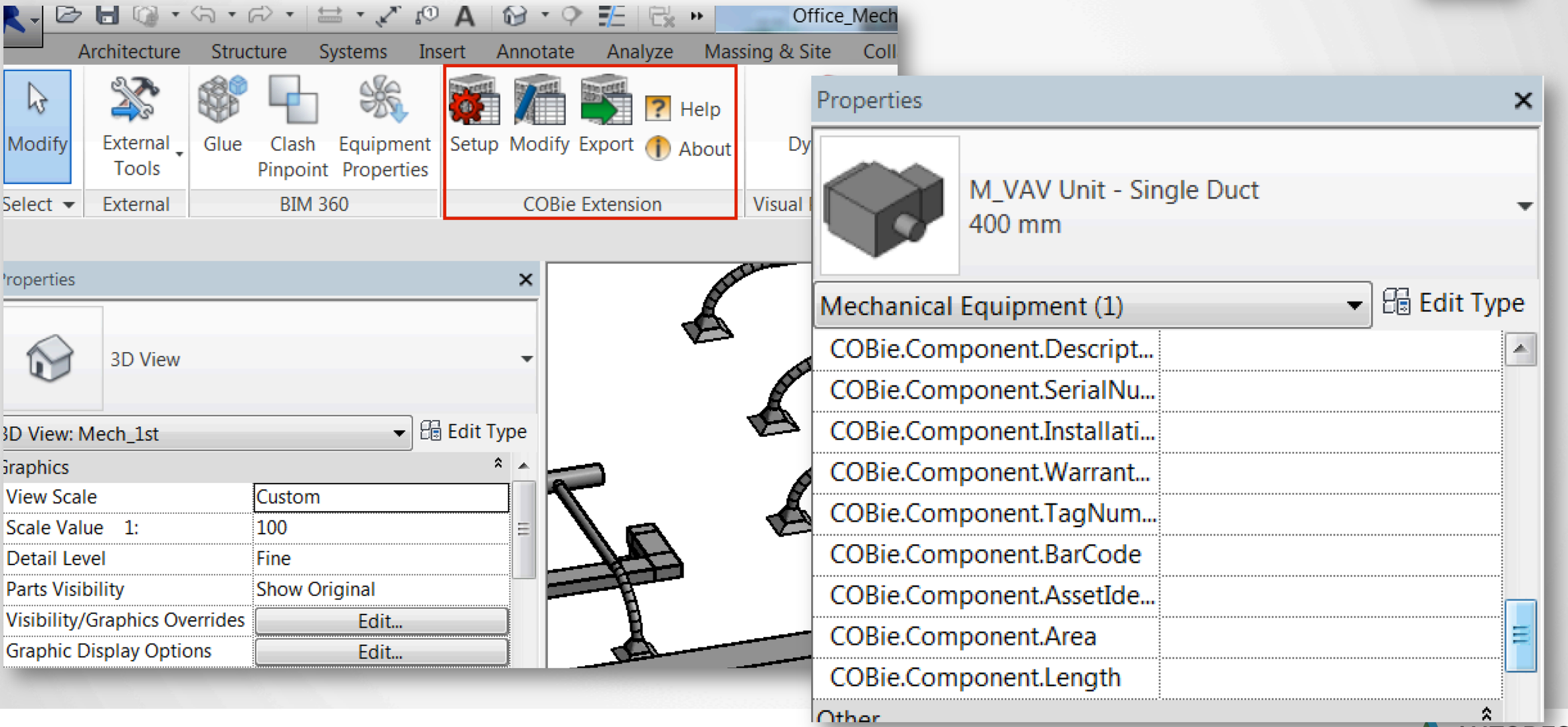






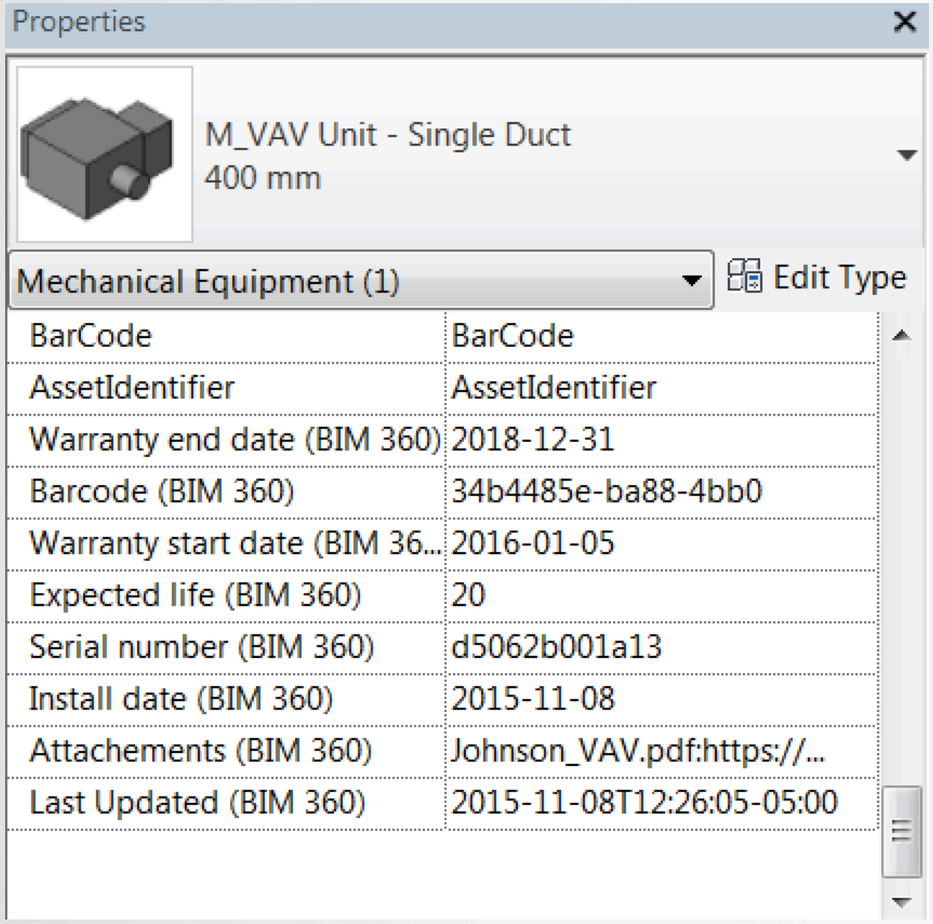
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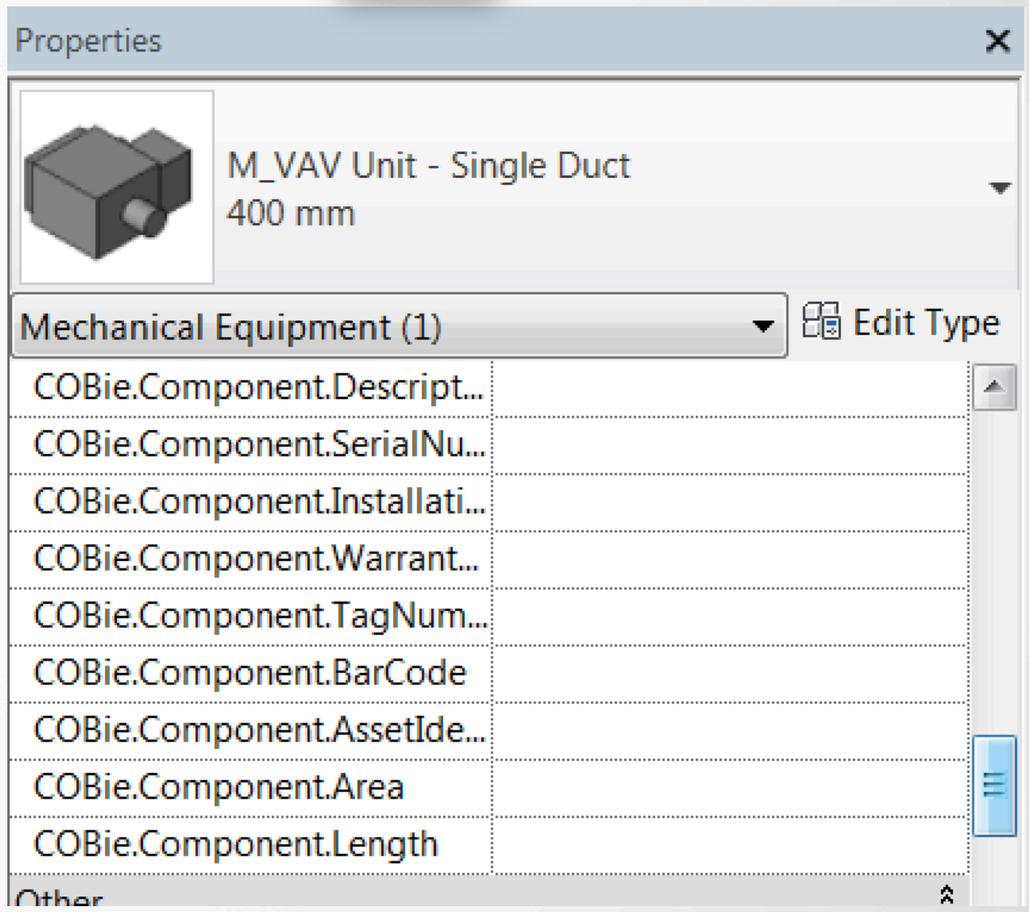
Deliverable in COBie format



Understand BIM information deliverable formats

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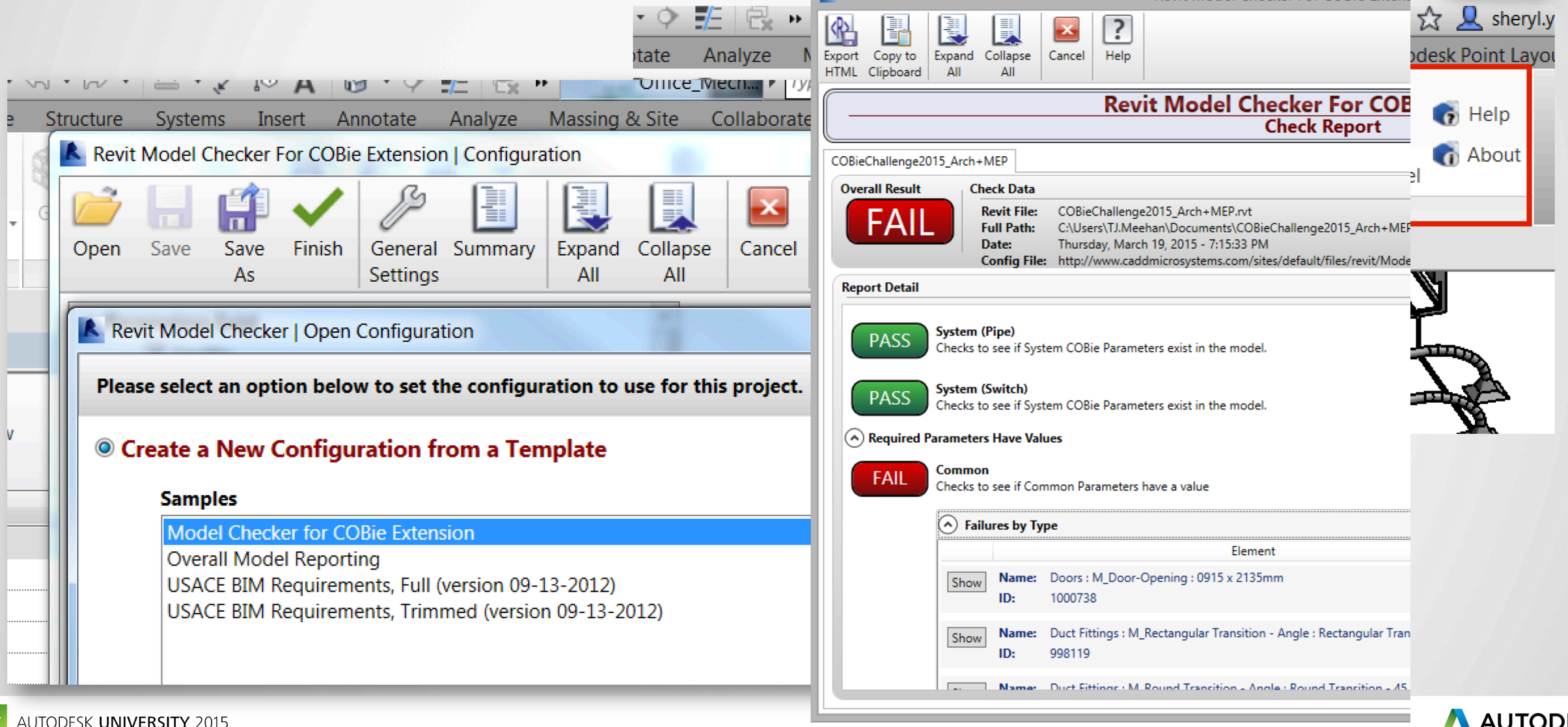




Use Dynamo to map BIM 360 Field properties to COBie fields

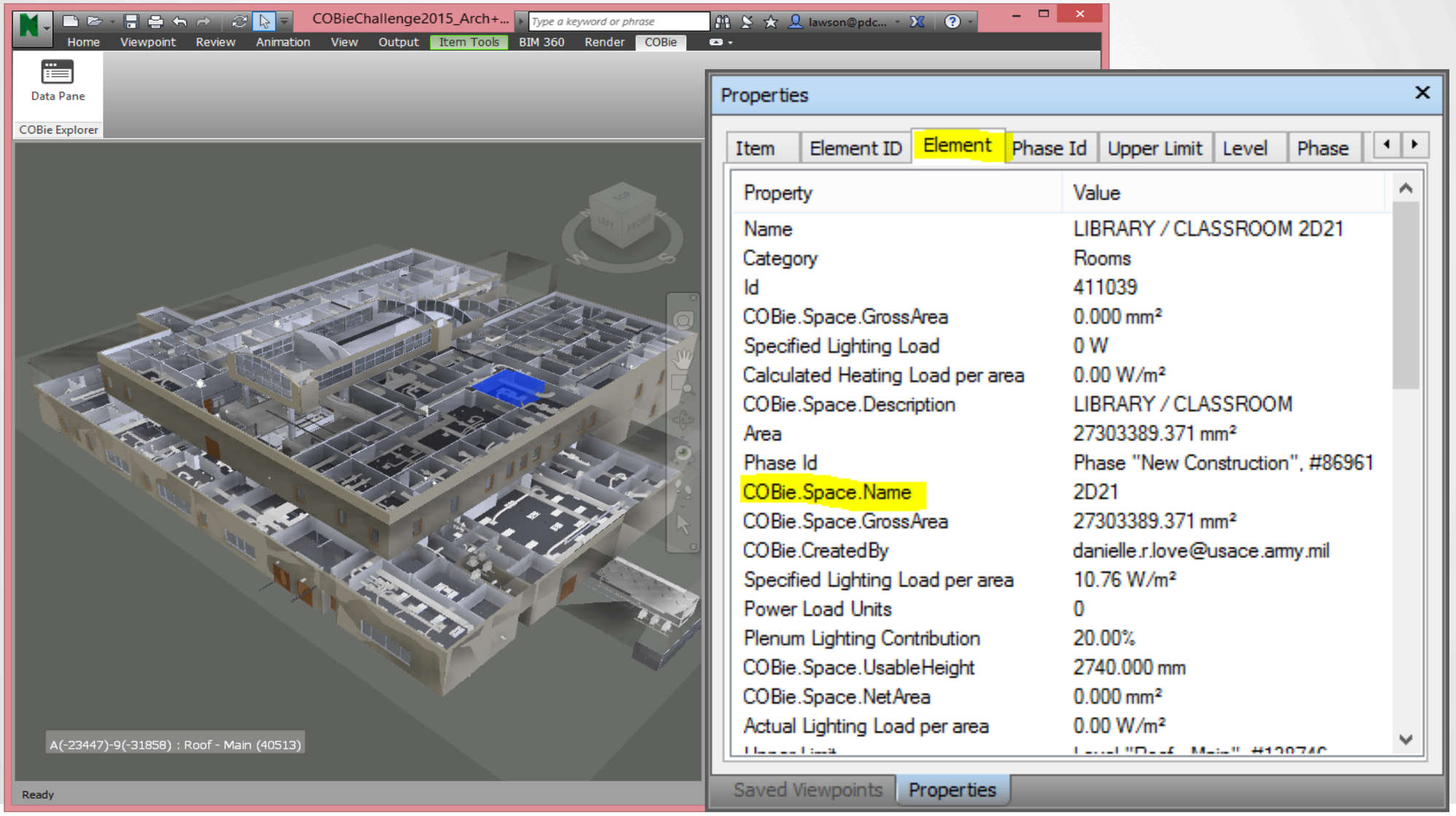
Understand BIM information deliverable formats

Deliverable in COBie format



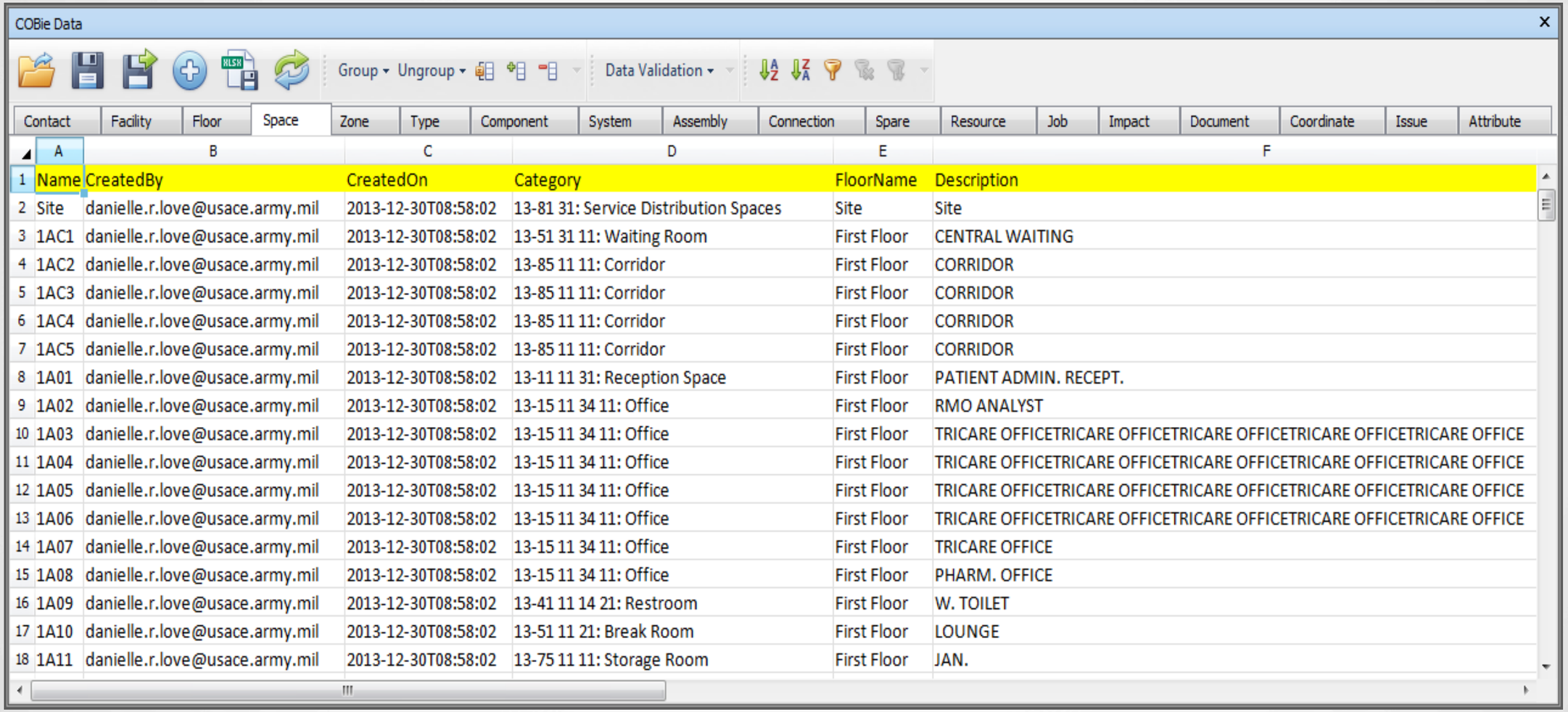
Understand BIM information deliverable formats

Deliverable in COBie format



Understand BIM information deliverable formats

Deliverable in COBie format



	A	B	C	D	E	F
1	Name	CreatedBy	CreatedOn	Category	FloorName	Description
2	Site	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-81 31: Service Distribution Spaces	Site	Site
3	1AC1	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-51 31 11: Waiting Room	First Floor	CENTRAL WAITING
4	1AC2	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-85 11 11: Corridor	First Floor	CORRIDOR
5	1AC3	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-85 11 11: Corridor	First Floor	CORRIDOR
6	1AC4	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-85 11 11: Corridor	First Floor	CORRIDOR
7	1AC5	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-85 11 11: Corridor	First Floor	CORRIDOR
8	1A01	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-11 11 31: Reception Space	First Floor	PATIENT ADMIN. RECEPT.
9	1A02	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-15 11 34 11: Office	First Floor	RMO ANALYST
10	1A03	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-15 11 34 11: Office	First Floor	TRICARE OFFICETRICARE OFFICETRICARE OFFICETRICARE OFFICETRICARE OFFICE
11	1A04	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-15 11 34 11: Office	First Floor	TRICARE OFFICETRICARE OFFICETRICARE OFFICETRICARE OFFICETRICARE OFFICE
12	1A05	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-15 11 34 11: Office	First Floor	TRICARE OFFICETRICARE OFFICETRICARE OFFICETRICARE OFFICETRICARE OFFICE
13	1A06	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-15 11 34 11: Office	First Floor	TRICARE OFFICETRICARE OFFICETRICARE OFFICETRICARE OFFICETRICARE OFFICE
14	1A07	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-15 11 34 11: Office	First Floor	TRICARE OFFICE
15	1A08	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-15 11 34 11: Office	First Floor	PHARM. OFFICE
16	1A09	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-41 11 14 21: Restroom	First Floor	W. TOILET
17	1A10	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-51 11 21: Break Room	First Floor	LOUNGE
18	1A11	danielle.r.love@usace.army.mil	2013-12-30T08:58:02	13-75 11 11: Storage Room	First Floor	JAN.

Integration

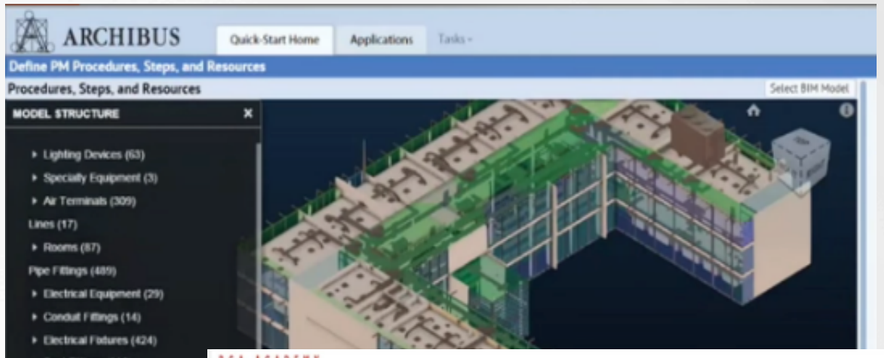


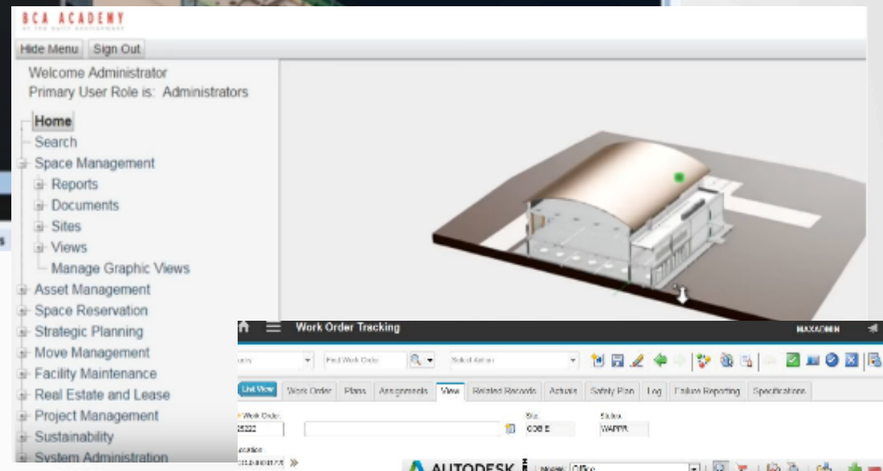
API

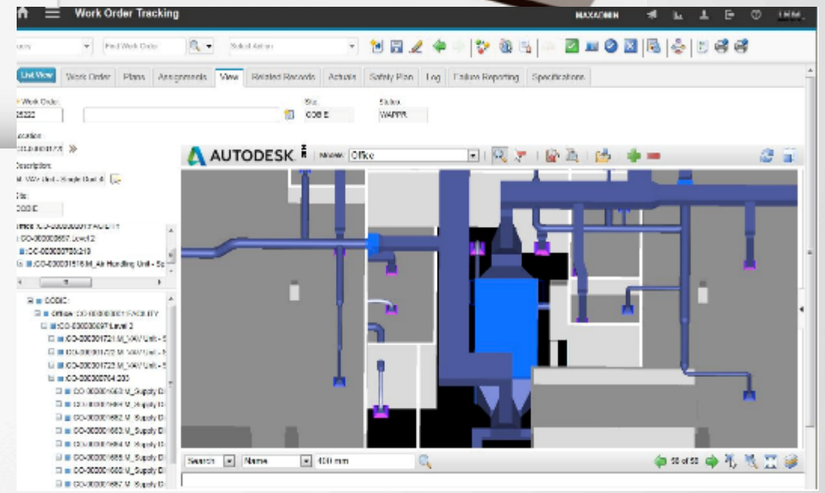
Operations & Maintenance

Data

Viewer



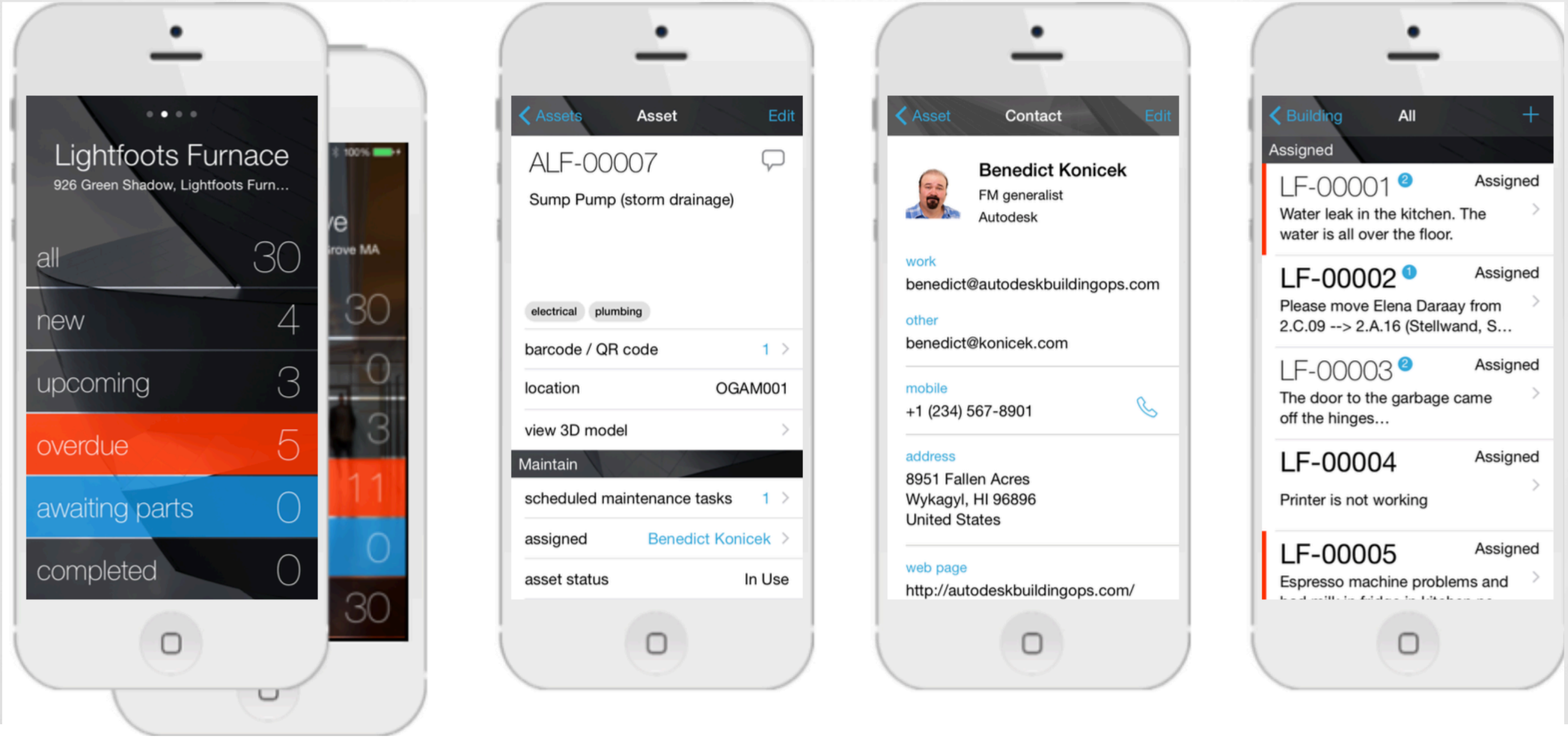




Deliverable as Ready-To-Use Asset Inventory

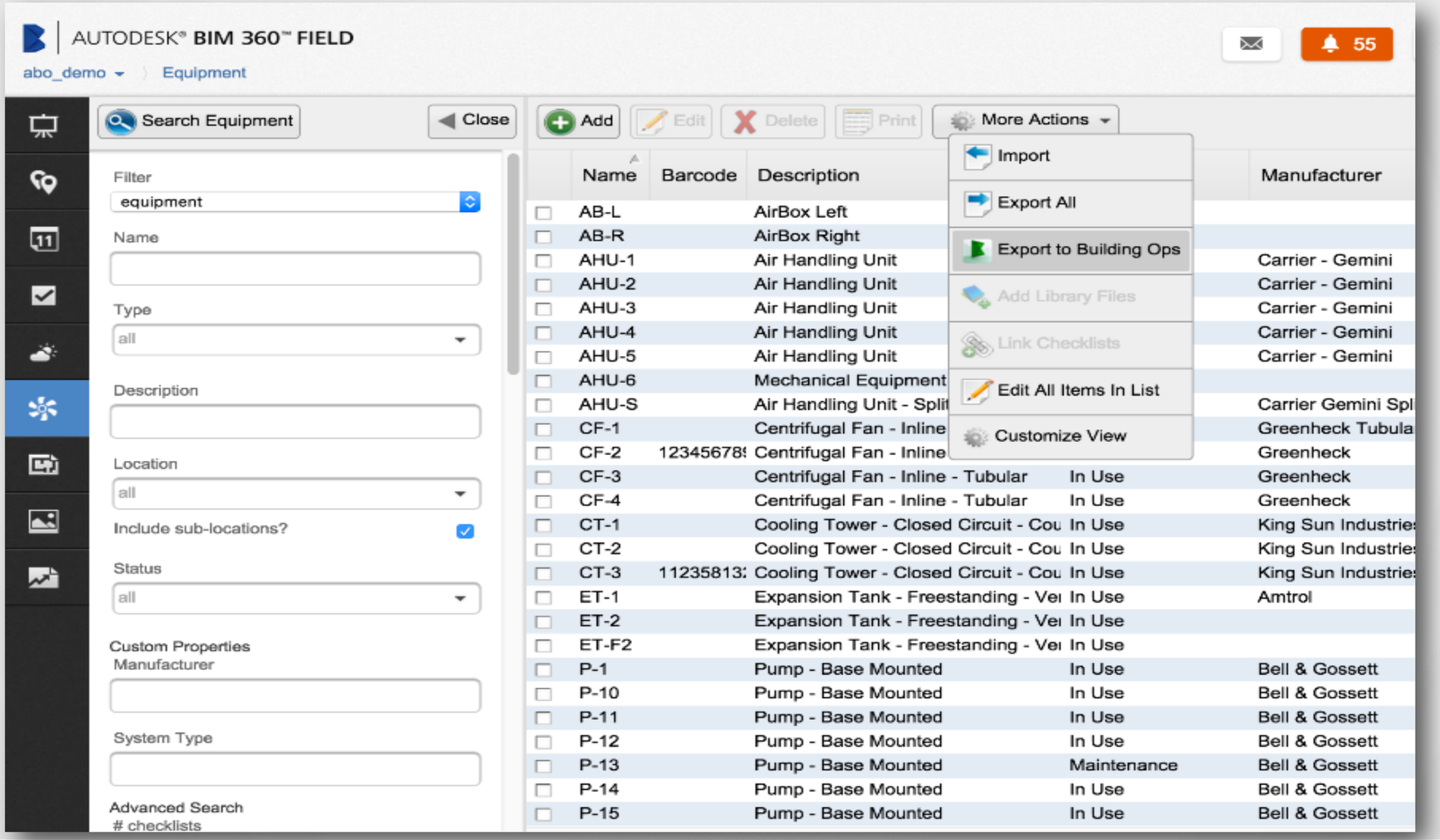
Building Ops

- Autodesk® Building Ops is a **mobile-first maintenance and asset management solution**.



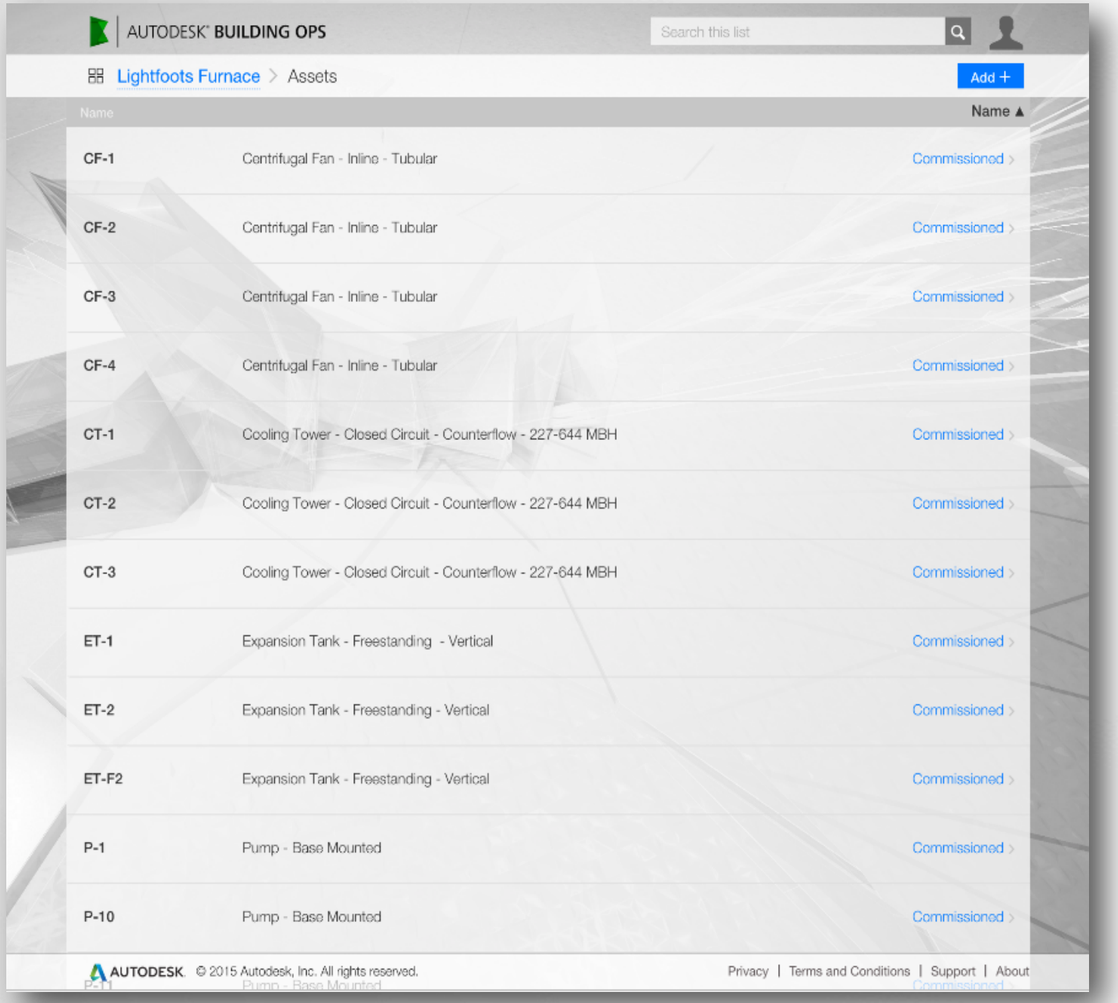
Understand BIM information deliverable formats

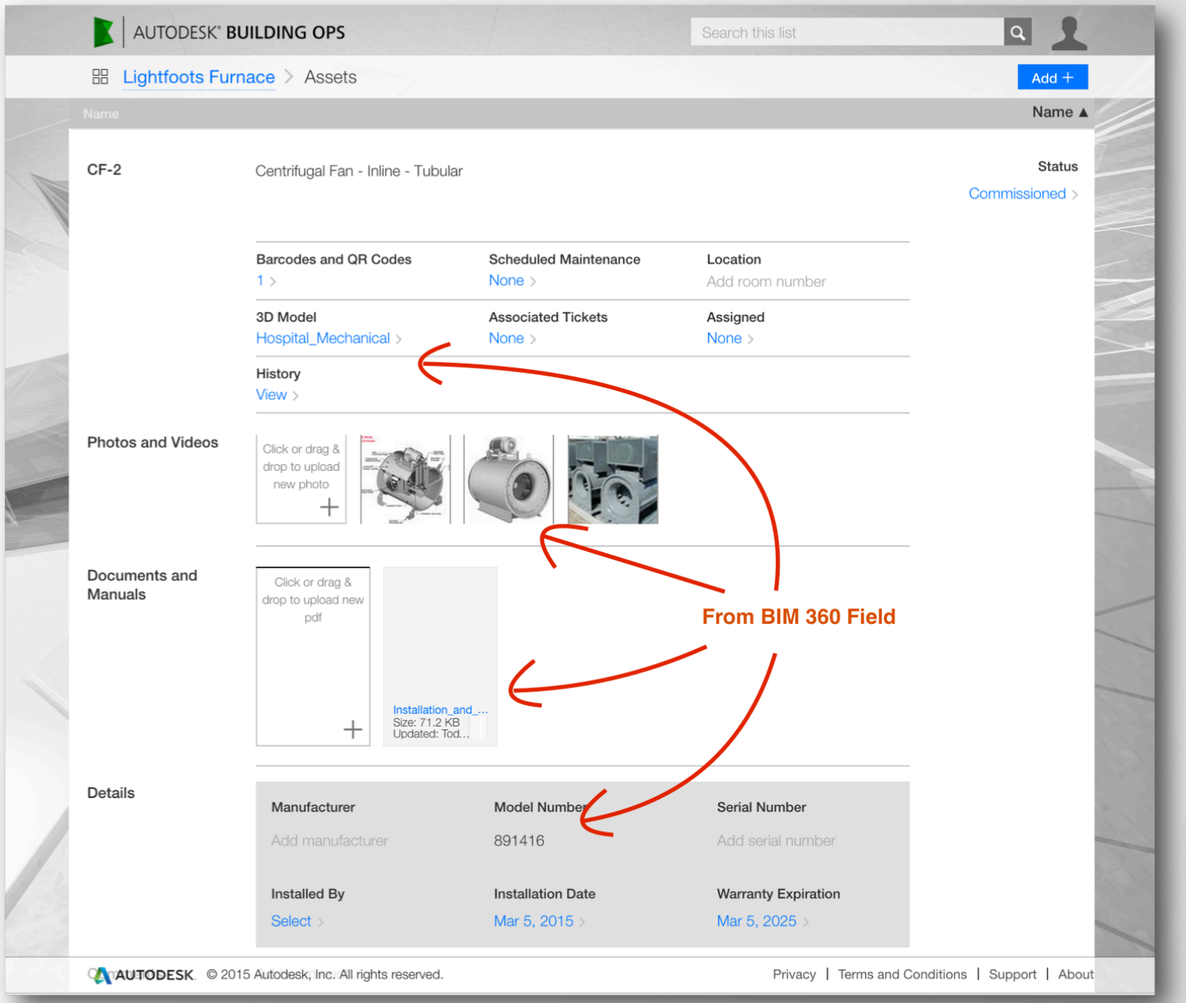
Deliverable as Building Ops Asset Inventory



Understand BIM information deliverable formats

Deliverable as Building Ops Asset Inventory

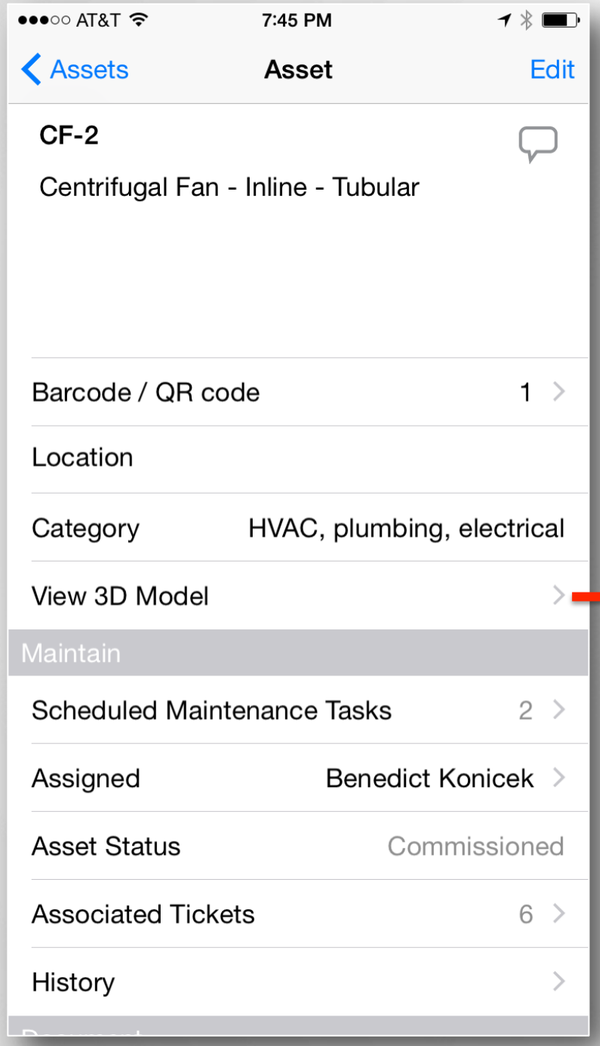


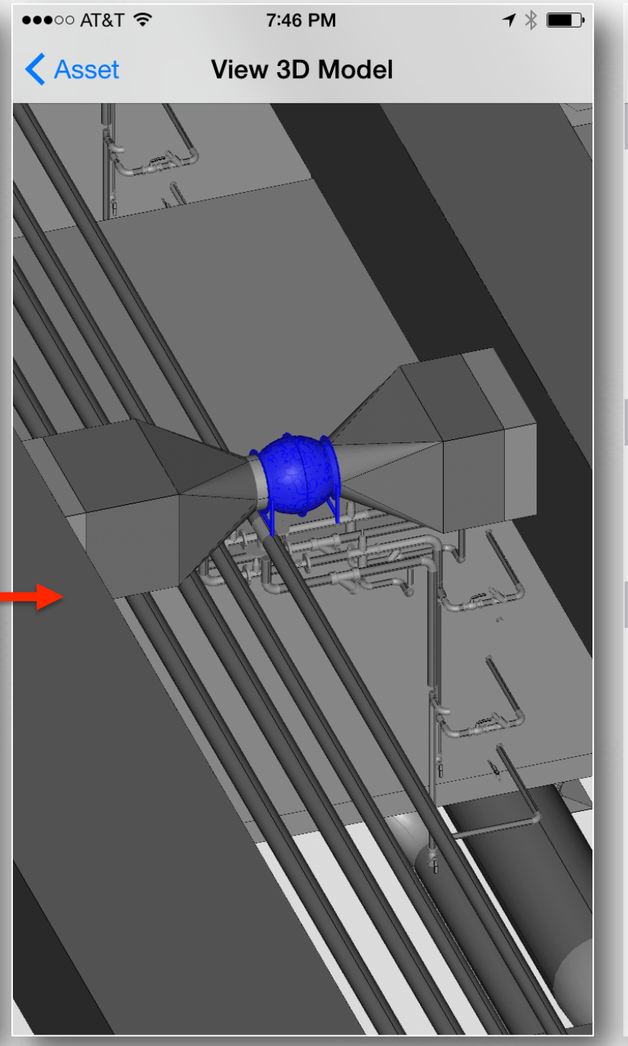


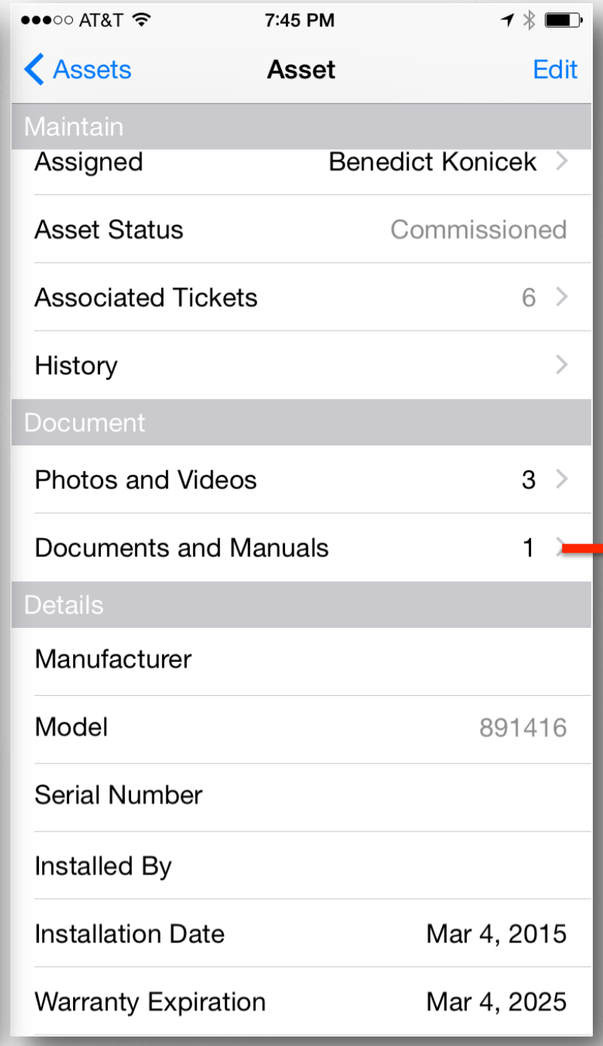
Use Mobile BIM for Facility Maintenance

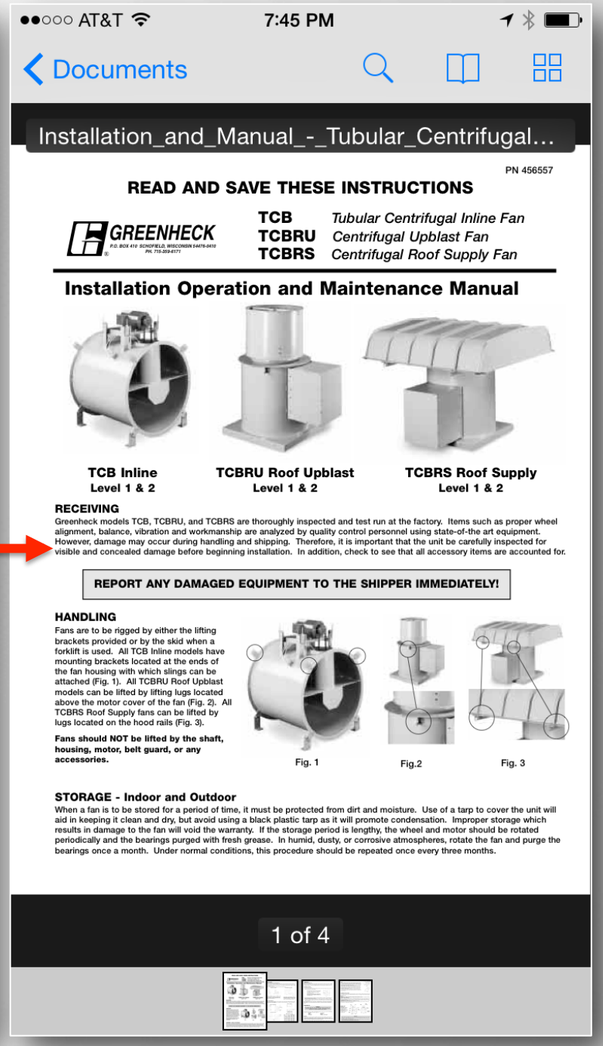
Building Ops











How to Proceed

Darren Dambly

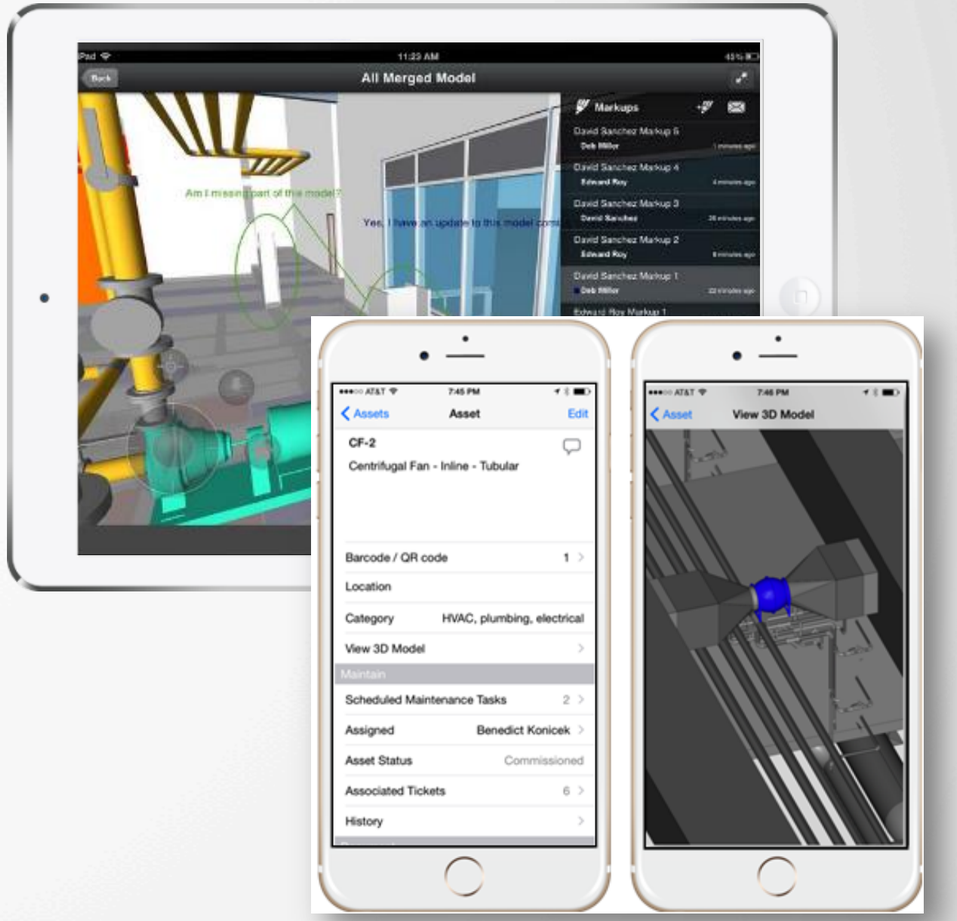
AEC/BIM Services Product Manager, Autodesk

How to get to BIM

Today

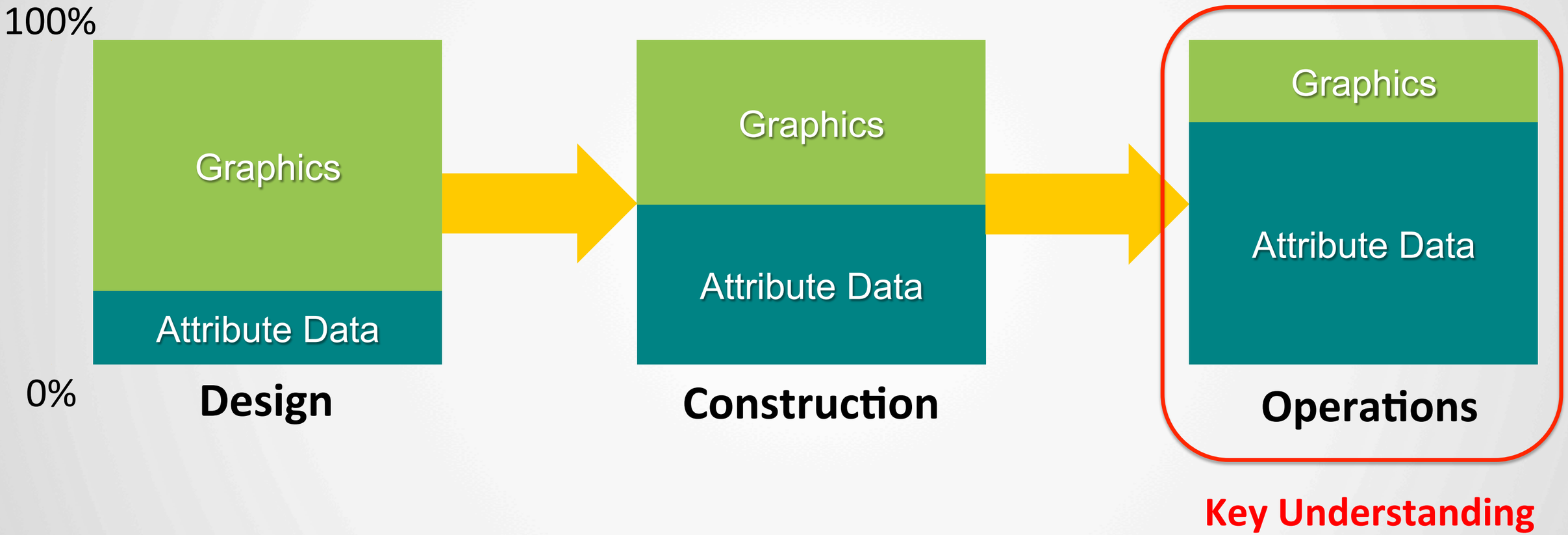


Target



Graphic / Attribute Data Importance

"a good chance for advancement or progress"

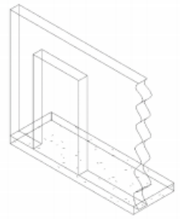
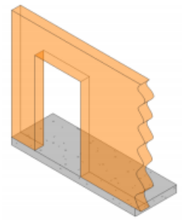


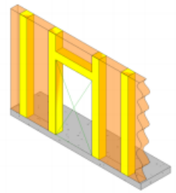
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BIM Standards

Level of Development

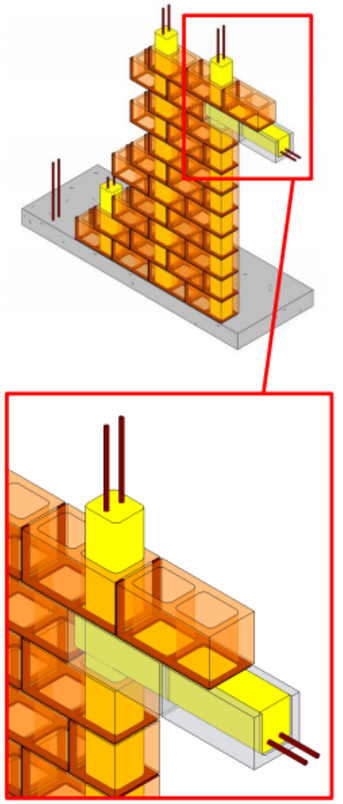
B1010.10 – Floor Structural Frame (Masonry Framing)

100	See B10	
200	See B10	 *30 B1010.10-LOD-200 Floor Structural Frame (Masonry Framing)*
300	Element modeling to include: • floor element with design-specified locations and geometries Required non-graphic information associated with model elements includes: • Member size, depth, and material with sloping geometry • Spacing and end elevations • Design loads • Deflection criteria	 *31 B1010.10-LOD-300 Floor Structural Frame (Masonry Framing)*

350	Element modeling to include:
	• Members modeled at any interface with wall edges (top, bottom, sides) or opening through wall
	• Any regions that would impact coordination with other systems such as but not limited to:
	  ○ Bond Beam & Lintel Regions
	  ○ Reinforcing & Embed Regions
	  ○ Jam Regions
		 *32 B1010.10-LOD-350 Floor Structural Frame (Masonry Framing)*

Level of Development
Specification
Version: 2014

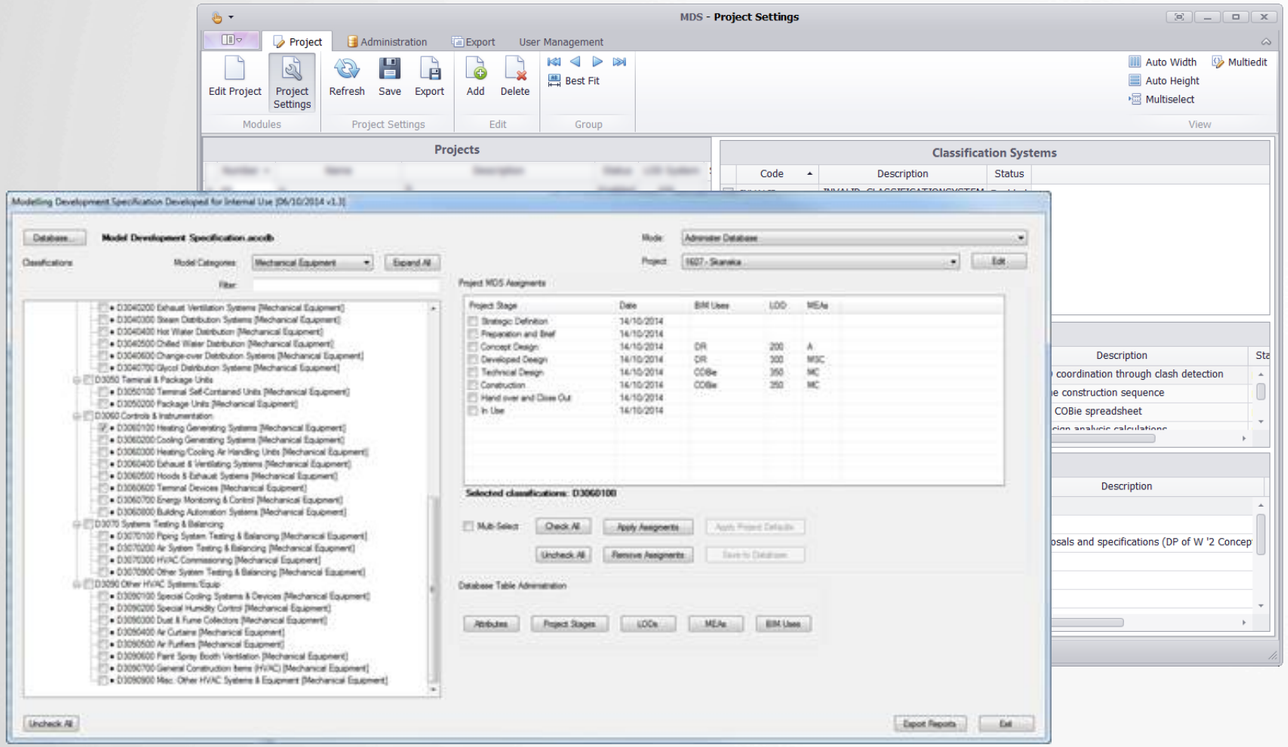
www.bimforum.org/lod

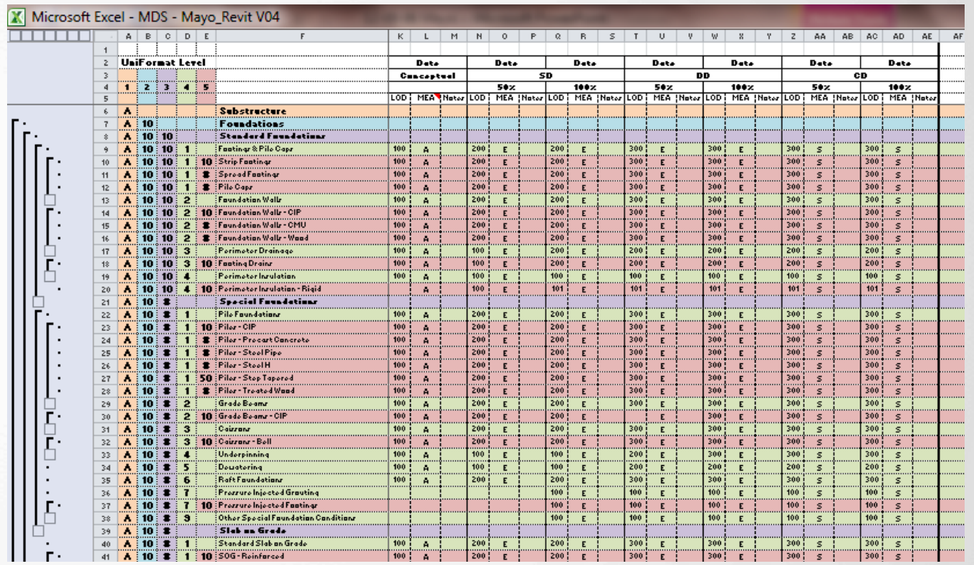
400	Element modeling to include: • Reinforcing • Connections • Grouting Material • Jams • Bond Beams • Lintels • Member fabrication part number • Any part required for complete installation	 *33 B1010.10-LOD-400 Floor Structural Frame (Masonry Framing)*

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A new way of specifying “BIM deliverables”

Model Development Specification



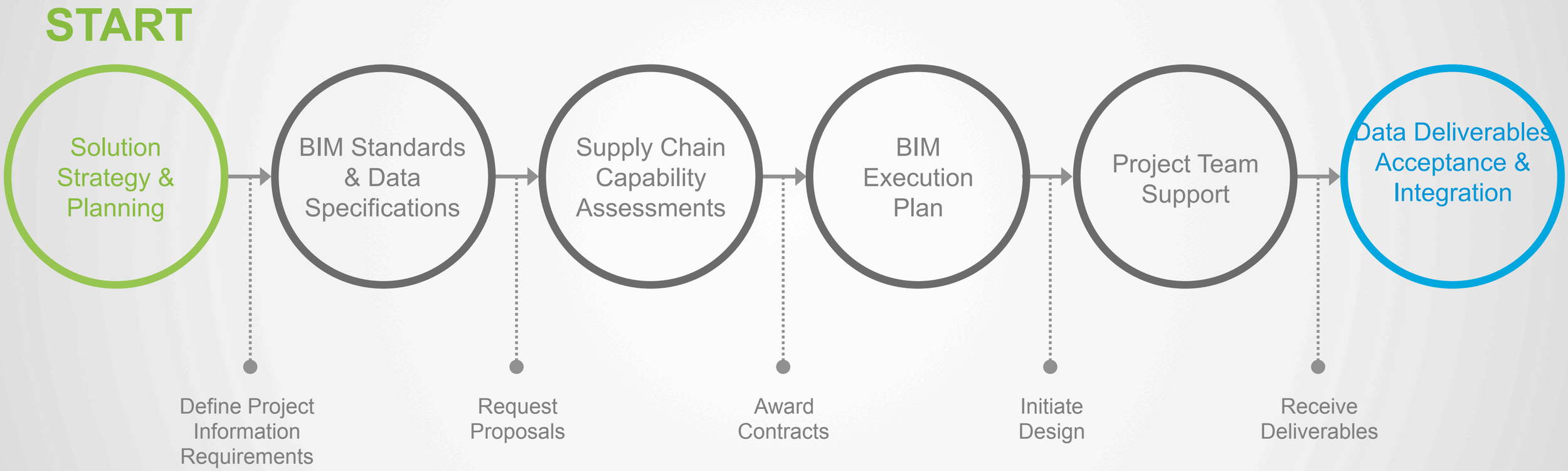


Potential BIM Creation Methods

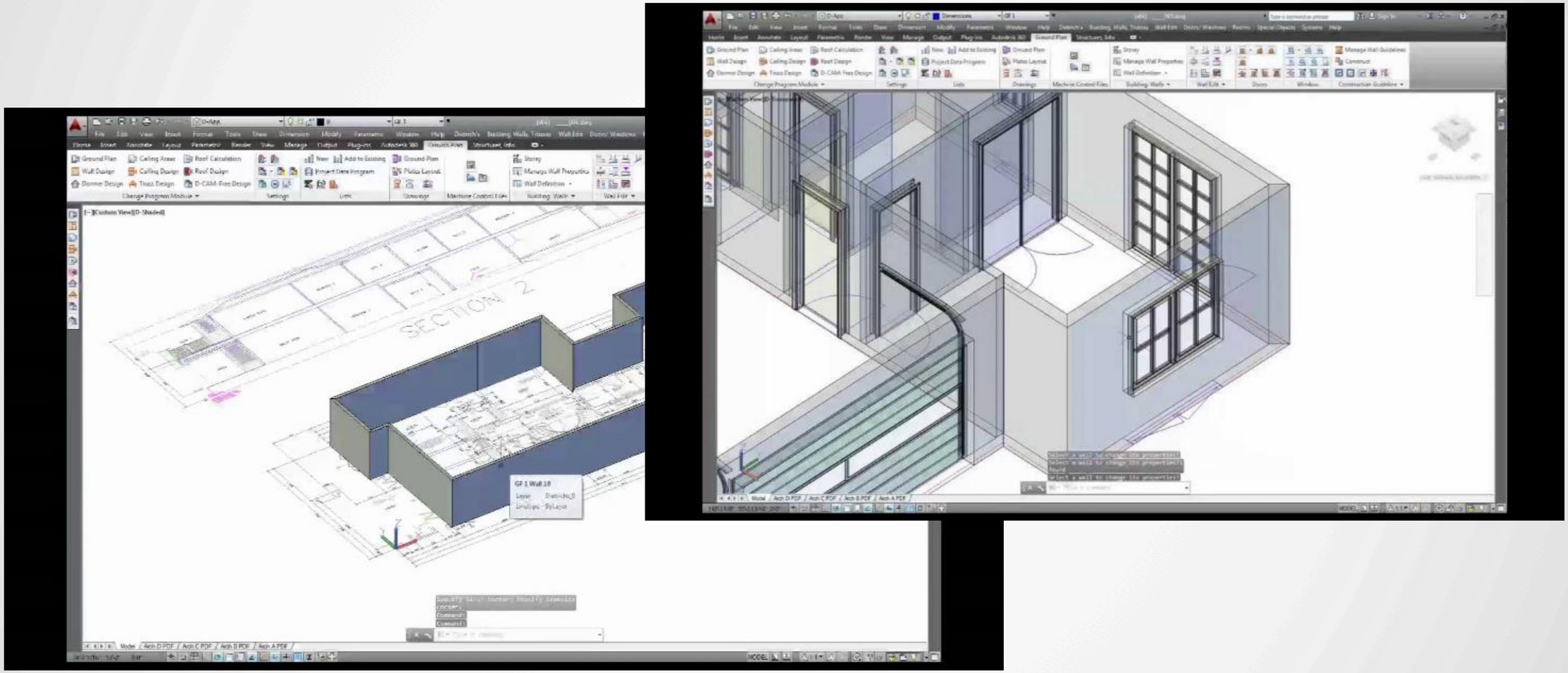
Leverage Capital Projects	• Build BIM requirement into projects • Low additional cost	• Timing dependent on projects • Captures only the project related area • Dependent on cooperation of CapEx team
Convert Existing Records	• Can be done as resources are available	• Separate cost item • Need to consider quality of existing records
Field Capture As-built Conditions	• Higher data accuracy	• Separate cost item • Only captures what you can see

Leverage Capital Projects

Specify BIM deliverables

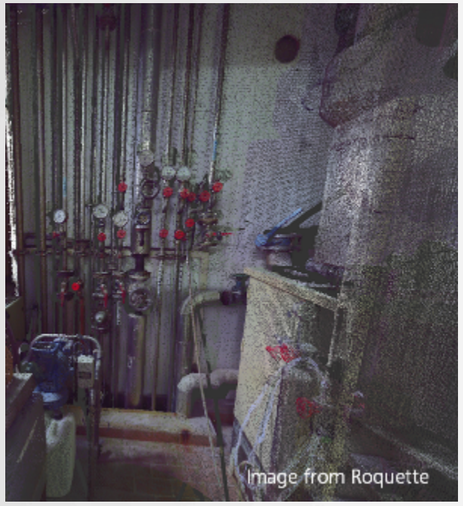


Convert Existing Records

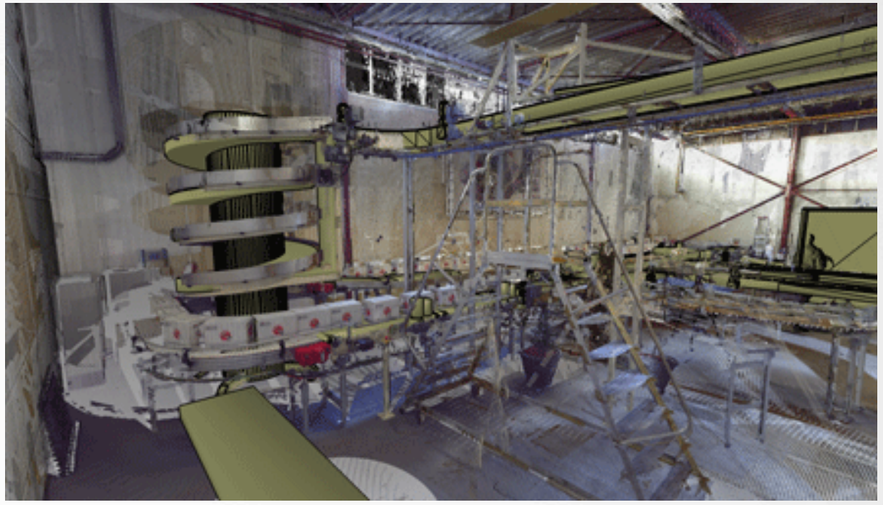


Capture Existing Conditions

Scanning and compute technology

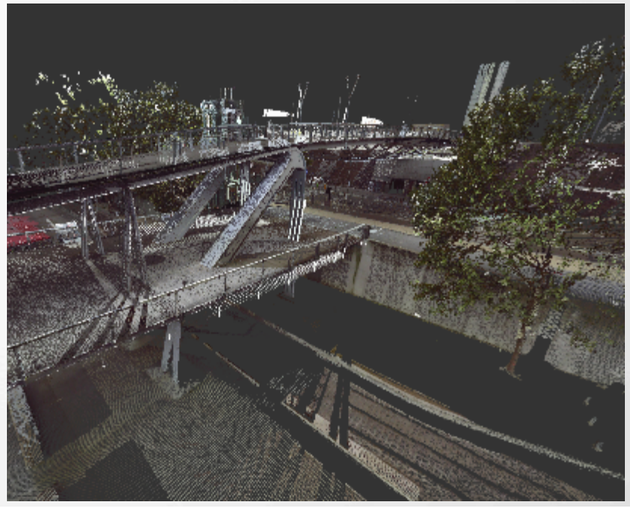










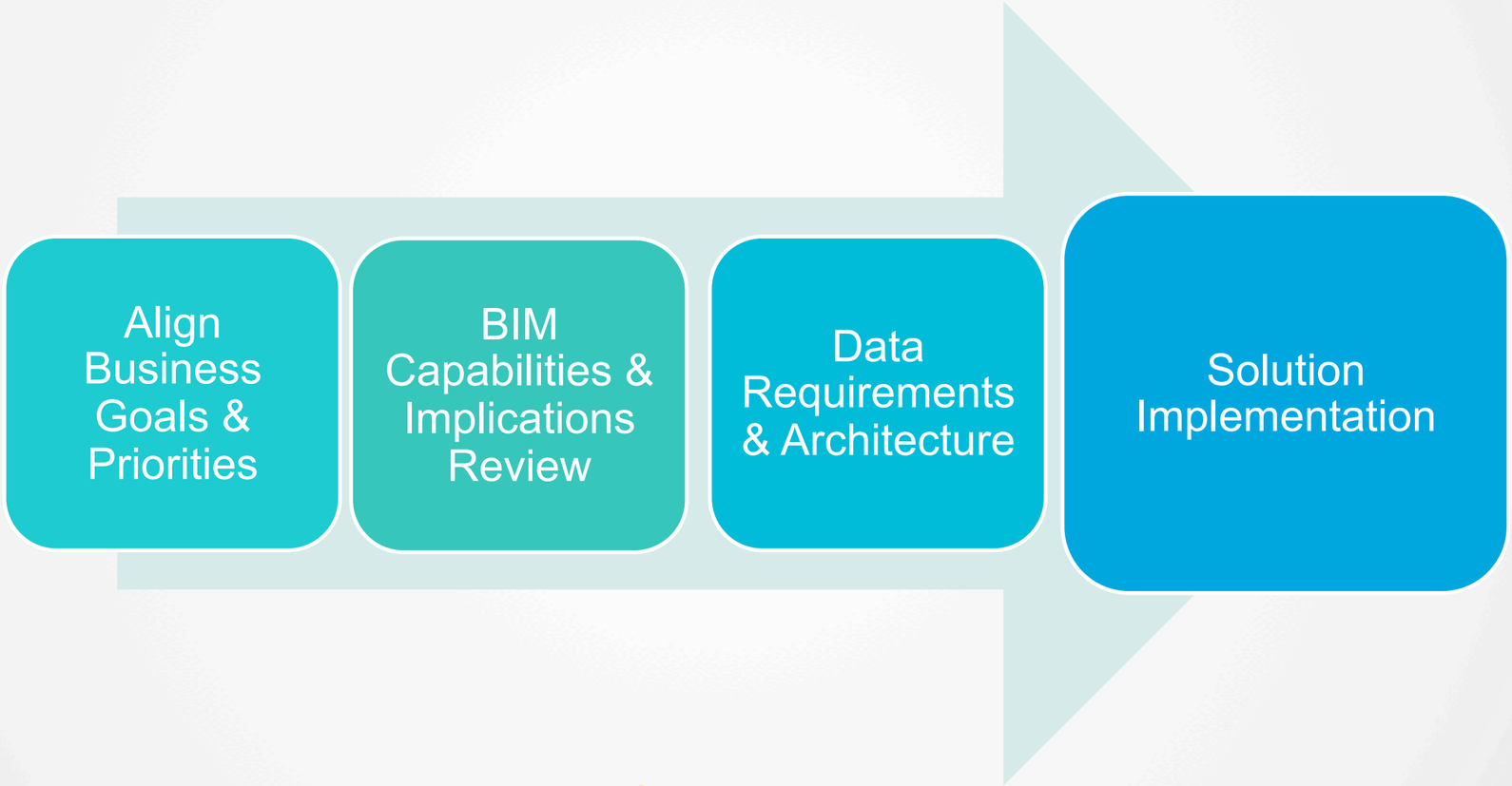


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AUTODESK.

BIM for Owners

First Step: Solution Strategy and Planning



How we can help

Today



Target



PRINCETON UNIVERSITY

BIM For Project Owners

"Having experienced the power of BIM in construction and design, we wanted to bring it into our facility management processes. Autodesk BIM 360 software and assistance from Autodesk Consulting made our vision a reality."

—William Bausmith, Jr.
Associate Director, Design and Construction, Princeton University

Challenges

Princeton University had several challenges in managing projects across the building lifecycle:

- Inability to access critical design and construction data in a timely manner
- Inefficient workflow for sharing as-built documentation with facility maintenance staff
- The need for a consistent way to integrate Building Information Modeling (BIM) models with as-built data
- Desire to bring system models and design documentation via handheld device to construction and maintenance staff without wireless connectivity

Solution

Princeton partnered with Autodesk Consulting to:

- Define its Autodesk® BIM 360™ strategy and create BIM standards
- Create BIM 360 workflows that extend BIM to facility management teams
- Structure a solution with the ability to integrate Princeton's existing facility management system with BIM 360 solutions

Results

Since rolling out its new BIM workflows, Princeton has:

- Begun integrating as-built Autodesk® BIM 360™ Glue® and Autodesk® BIM 360™ Field data with its facilities maintenance staff
- Improved as-built model accuracy using BIM 360 Glue during field validation
- Created workflow options with the potential to save the facility management team hours on every scheduled and emergency project by accessing data through BIM 360 Glue and BIM 360 Field

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Autodesk's Strategy

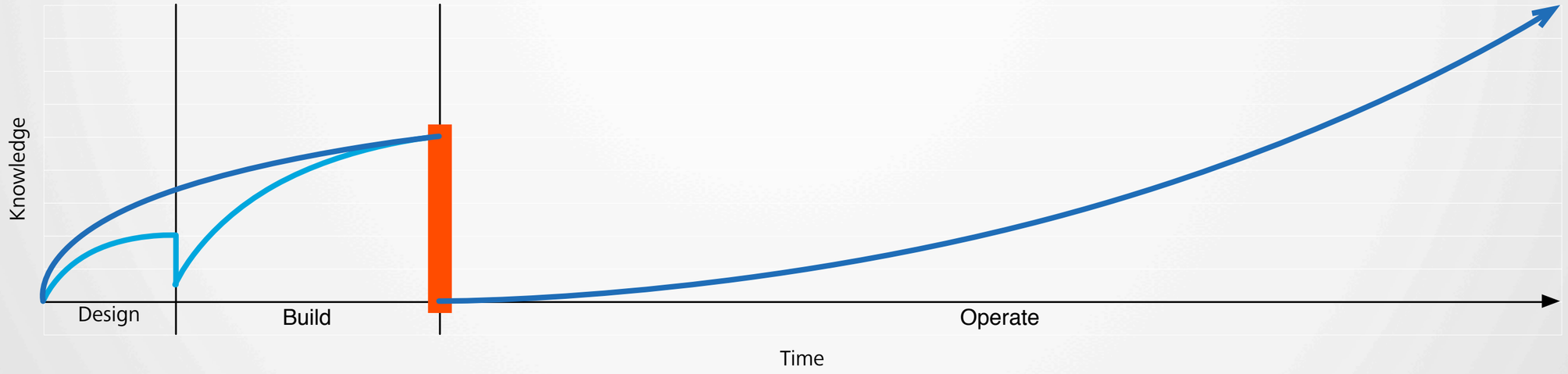
Jason Winstanley

Director, Building Ops, Autodesk

What happens after handover ?



Turning knowledge into insight, insight into action



Autodesk Building Ops

- **Mobile-first** asset and maintenance management solution with mobile and web clients
- For maintenance managers, **technicians**, and building occupants
- Connects **BIM asset data** to the people who need it most, when they need it, where they need it

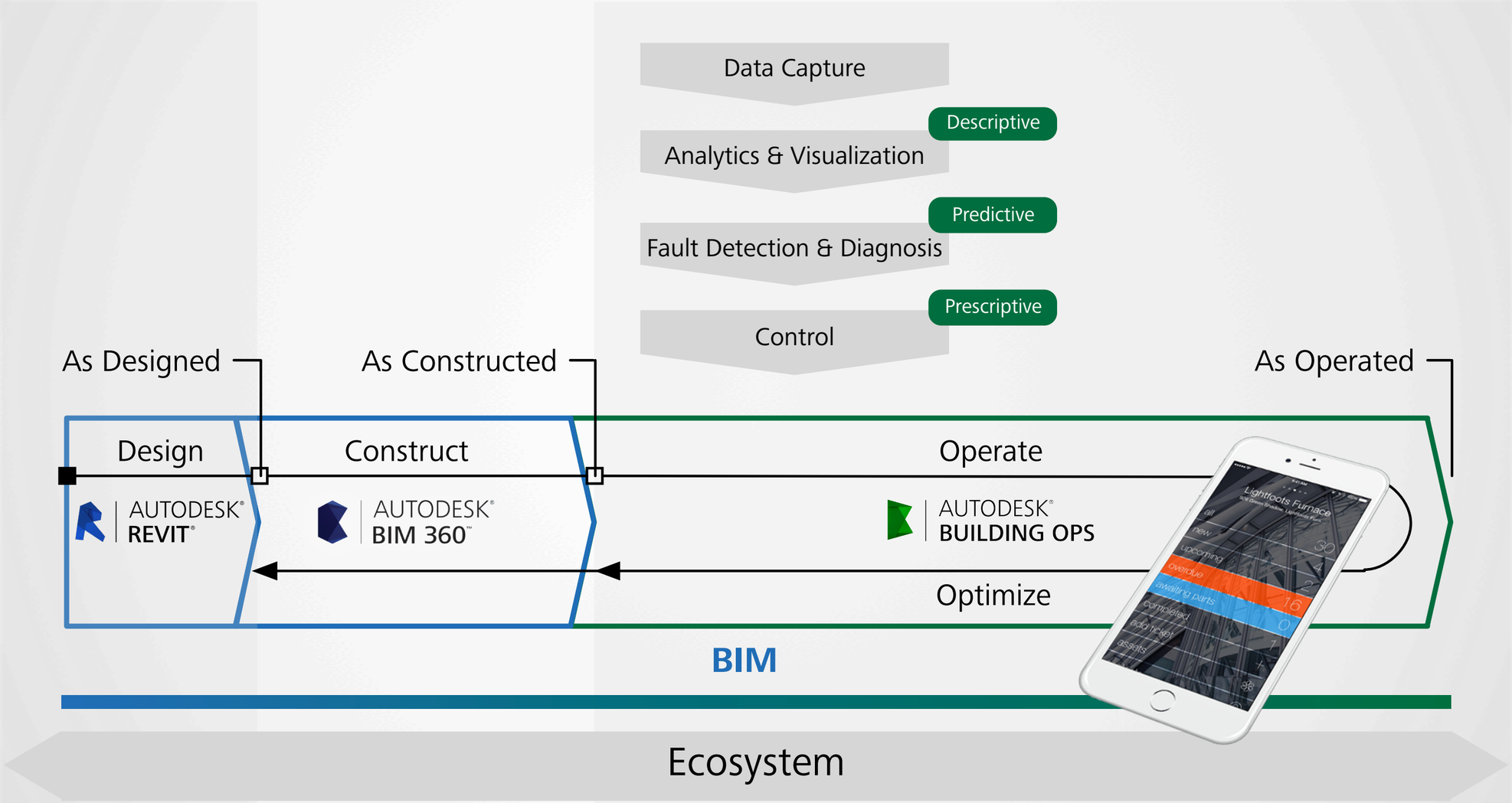


What Are the Benefits of Building Ops?

Building Ops benefits to both general contractors and owners

- **Improves the handover experience** by delivering building operations data from BIM 360 Field in a way that makes it immediately actionable and contextually relevant
- **Enables owners to begin operations on day one** with a turnkey maintenance and asset management solution
- **Helps contractors better service warranty requests** and reduce expenses from unmaintained equipment
- **Offers a simple and elegant mobile and responsive web interface** that meets the needs of the mobile maintenance workforce
- With **Panoramic Power**, makes **Predictive maintenance** accessible to everyone

Foundation for an Operational Model



Even more, coming soon…

Follow @AutodeskBldgOps on Twitter for updates

Key Takeaways

- Best practice of owner-driven BIM standards
- Autodesk BIM Ecosystem allows seamless data exchange
- Application integration opportunities
- Strategies to get to BIM
- Autodesk Building Ops

Q&A

Sheryl Yang
Implementation Consultant,
Autodesk Consulting
sheryl.yang@autodesk.com



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