Lessons Learned While Uploading Data to BIM 360 Ops

Michael B. DuLaney

BIM Manager – UCHealth

William Carney

BIM Director – BSA LifeStructures

Christopher Boal

Sr. Integrated Construction Manager – Mortenson Construction

About the speaker

Michael B. DuLaney, CM-BIM

Michael B. DuLaney is the BIM Manager for UCHealth – a ten hospital healthcare provider. Mike is implementing BIM 360 Ops and Archibus based on Revit models. Prior to UCHealth Mike was VDC Manager for a major building company. One of his projects won the AGC Washington, D.C. chapter “Best use of BIM Projects Greater than $150M” (it was $940M) award. Mike obtained his Bachelor of Science degree (summa cum laude) in information systems management from University of Maryland University College.

uchealth

About the speaker

William Carney

William Carney is the BIM director at BSA LifeStructures where he is responsible for overseeing the firm’s use and implementation of design related technology solutions. As an efficiency enthusiast, William seeks to find ways to use technology to streamline BSA LifeStructures multi-disciplined BIM Playground. He is also an Adjunct Professor at Washington University, an Author for LinkedIn Learning/Lynda.com, is actively involved with the St. Louis Revit User Group as one of its steering committee members, and a site moderator for the LinkedIn group “Revit Users”.

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BSA

About the speaker

Bryan Fairchild

A 13 year BIM/VDC industry veteran who specializes in managing large scale building system coordination. Recent projects include the 2 million square foot Gaylord Rockies Hotel & Convention Center and the 758,000 square foot Westin Hotel & Transit Center at Denver International Airport. Bryan has a master’s degree in architecture & community design from the University of South Florida.

Mortenson®

Introduction

This presentation will cover the lessons learned for uploading data to BIM 360 Ops using two workflows:

- Revit FM model to upload directly to BIM 360 Ops
- Trade contractors files uploaded via BIM 360 Glue to BIM 360 Field and finally to BIM 360 Ops.

Introduction *(history)*

Longs Peak Hospital

- UCHealth’s first attempt to utilize the models for facilities maintenance
- Started just prior to BIM 360 Ops entering the market
- Utilized BIM 360 Glue and BIM 360 Field
- BIM 360 Field is used by the technicians in lieu of BIM 360 Ops
- Overkill for use as a facilities maintenance application but it was available at the time
- Other organizations were using it for facilities maintenance as well

360
FIELD

Short Term & Long Term Goals

Short Term Goals

- Building Information Models in the field
- Introduce field to mobile applications
- Manage data
- Evaluate best methods and technologies

Long Term Goals

- Building Information Models become foundation for facilities maintenance (FM) applications
- Integration with other systems such as Archibus
- Mine data (mean time before breakdown, energy consumption, etc.)
- Refine processes and rely on field feedback

Why two workflows?

- The UCHealth Greeley Medical Center provided funds for the FM BIM and the intent was to Revit for the FM model.
- Funds were not provided for an FM BIM on the Highlands Ranch Hospital project so trade contractor models were used.

Highlands Ranch Hospital

Highlands Ranch Hospital consists of the following:

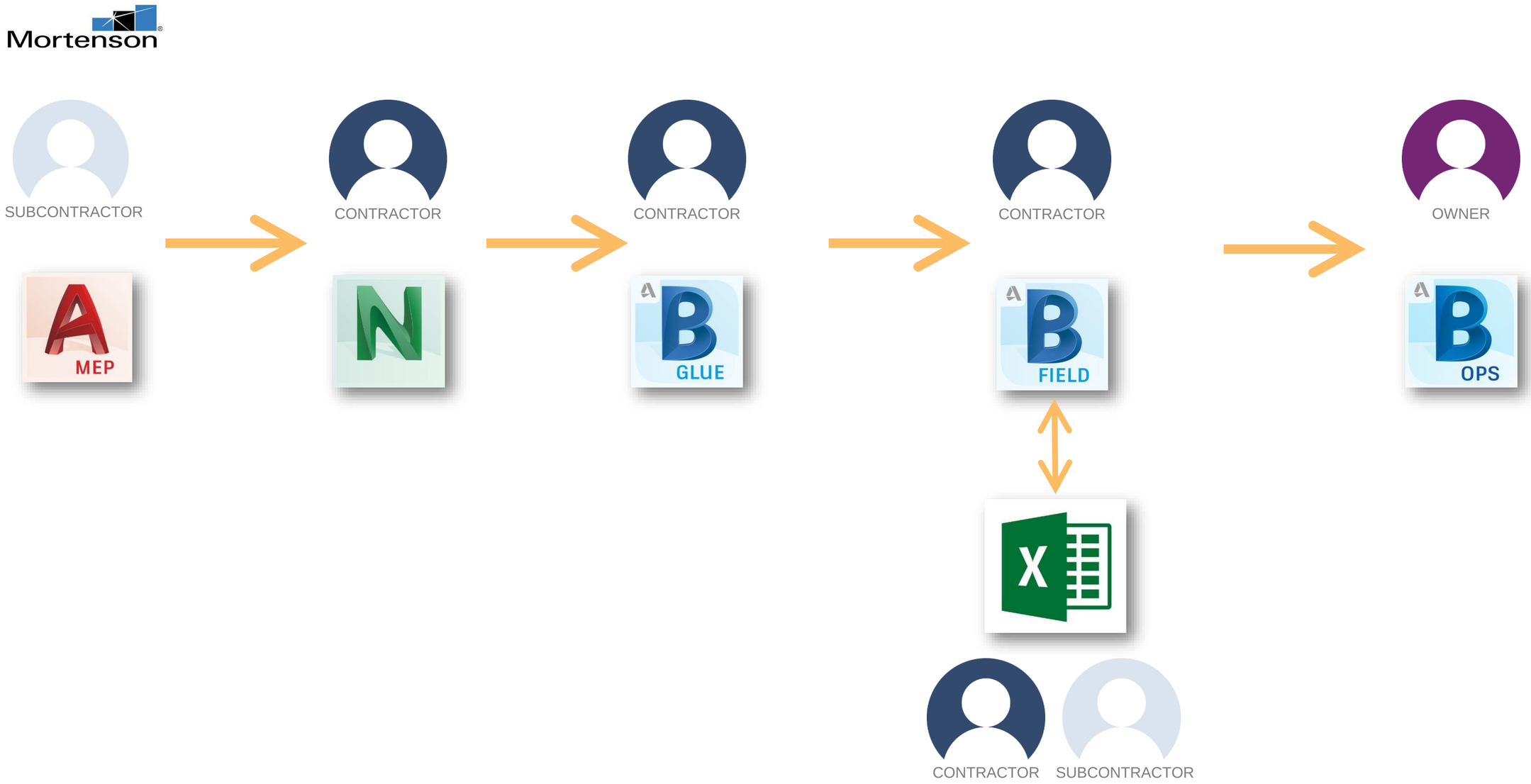
- Hospital (358,000 SF)
- MOB (85,500 SF)
- CUP
- 73 Beds
- 77 Beds in shell spaces (future)
- Construction Duration

Architect – EYP (Hospital), Altus Design Studios (MOB)

CM/GC – Mortenson

- Model management and uploading to BIM 360 Ops
- BIM 360 Ops Field QR coder and data collection

BIM 360 Glue/BIM 360 Field/BIM 360 Ops Data Flow



BIM 360 Glue/BIM 360 Field/BIM 360 Ops Summarized Process

1. Subcontractor inputs EQ tag and description in designated property fields within CADmep or other native software
2. Subcontractors export to Navisworks .nwc files and Contractor aggregates all .nwc files into FM .nwf as-built turnover model
3. The Navisworks file is saved as a .nwd and upload to BIM 360 Glue
4. Open FM model in BIM 360 Glue and execute Share with Field command
5. Open BIM 360 Field in Admin mode and add the BIM 360 Glue FM model
6. Create EQ Types/Categories in BIM 360 Field to match Selection sets created in Navisworks
7. Create any Custom Property fields and associate model objects with BIM 360 Field map sets (from Navisworks)
8. Add all properties that need to appear in EQ lists and save mapping
9. Save Mapping and in non-admin mode add any additional property data
10. Link O&Ms and submittals and upload them to the BIM 360 Field Library
11. Open portfolio in BIM 360 Ops and obtain export code
12. In BIM 360 Field execute Export to BIM 360 Ops and enter export code
13. In BIM 360 Ops verify assets exported

Lessons Learned – Clearly Define Items in Subcontractor Models

- **Clearly define items to included in the contractor models for BIM 360 Ops**
- **Develop Component Data Matrix**
- **Frequently meet with subcontractors to verify progress!**

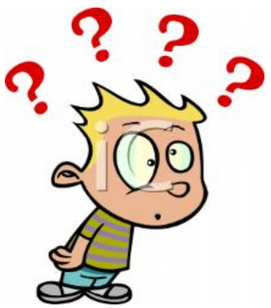
COMPONENT	VOLTAGE	AMPS	SIZE	FUSIBLE LINK	FIRE RATING
DAMPERS	X	X	X	X	X
COMPONENT	**MANUFACTURER**	**MODEL NAME**	**MODEL NUMBER**	**TYPE**	**VOLTAGE**
WATER HEATER	X	X	X	X	X
COMPONENT	**VOLTAGE**	**AMPS**	**PH**	**HP**	**SCCR**
CABINET UNIT HEATERS	X	X	X	X	X
UNIT HEATERS	X	X	X	X	X
COMPONENT	**SERVICE**	**VOLTAGE**	**AMPS**	**PH**	**HP**
PUMPS	X	X	X	X	X
COMPONENT	**LOCATION**	**SERVICE**	**CFM**	**PRE-FILTER**	**FINAL FILTER**
PACKAGED AIR HANDLING UNIT (AHU)	X	X	X	X	X
CUSTOM ROOFTOP AHU	X	X	X	X	X

Lessons Learned – Test the Process with All Involved

SUBCONTRACTOR

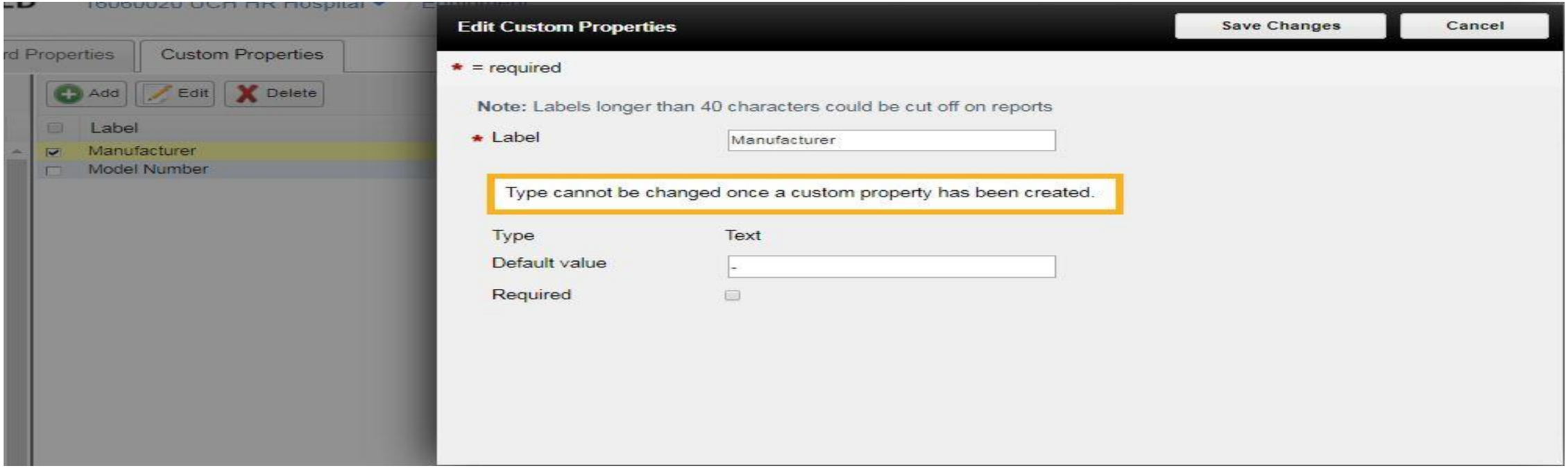
CONTRACTOR

OWNER



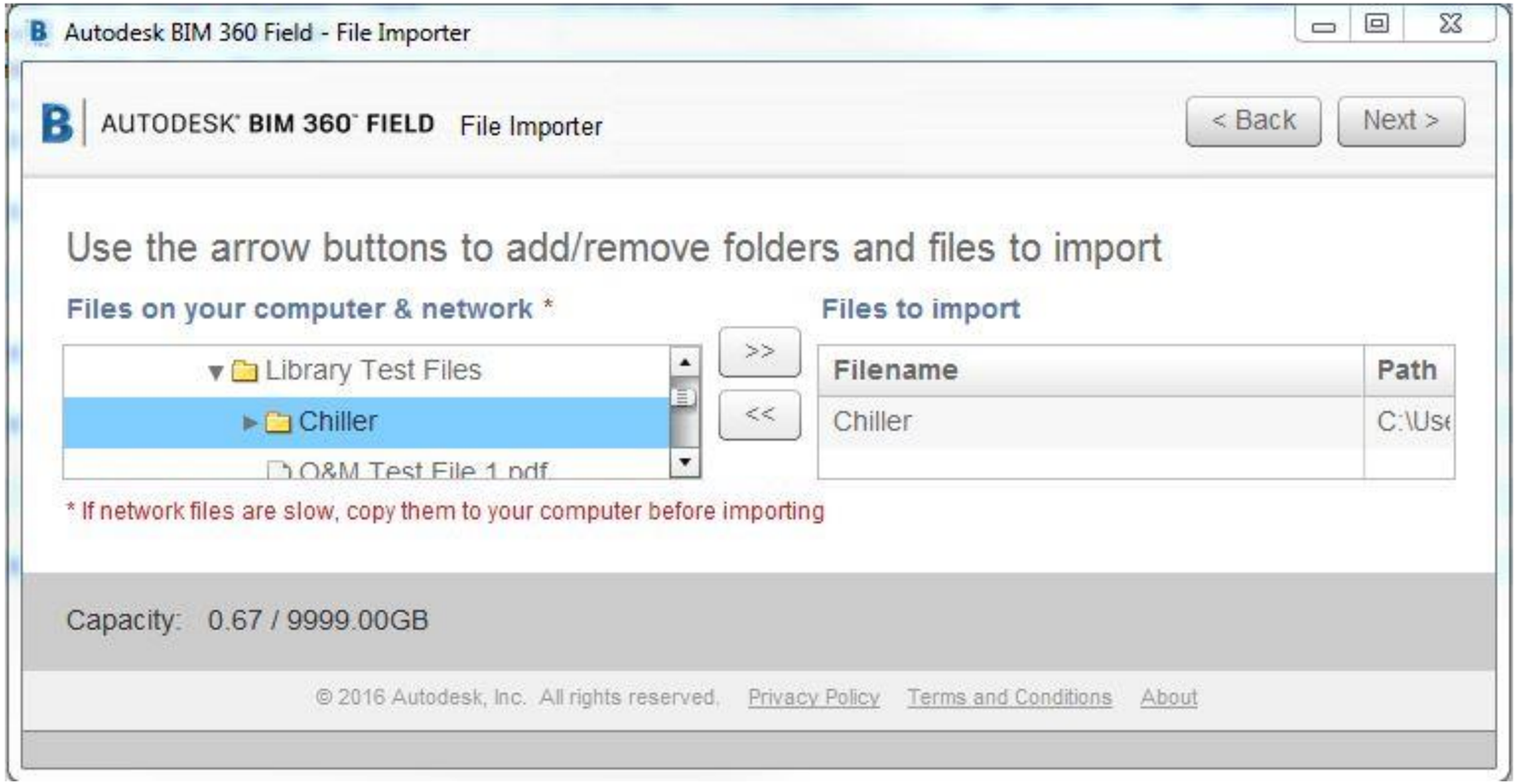
Lessons Learned – Add Placeholder Data

In BIM 360 Field enter a dash “-” in the “Default Value” field for Custom Properties since a blank field will not export to Ops.



Lessons Learned – Add Placeholder Data

In BIM 360 Field Make sure PDFs are clearly identified to the equipment they are associated.



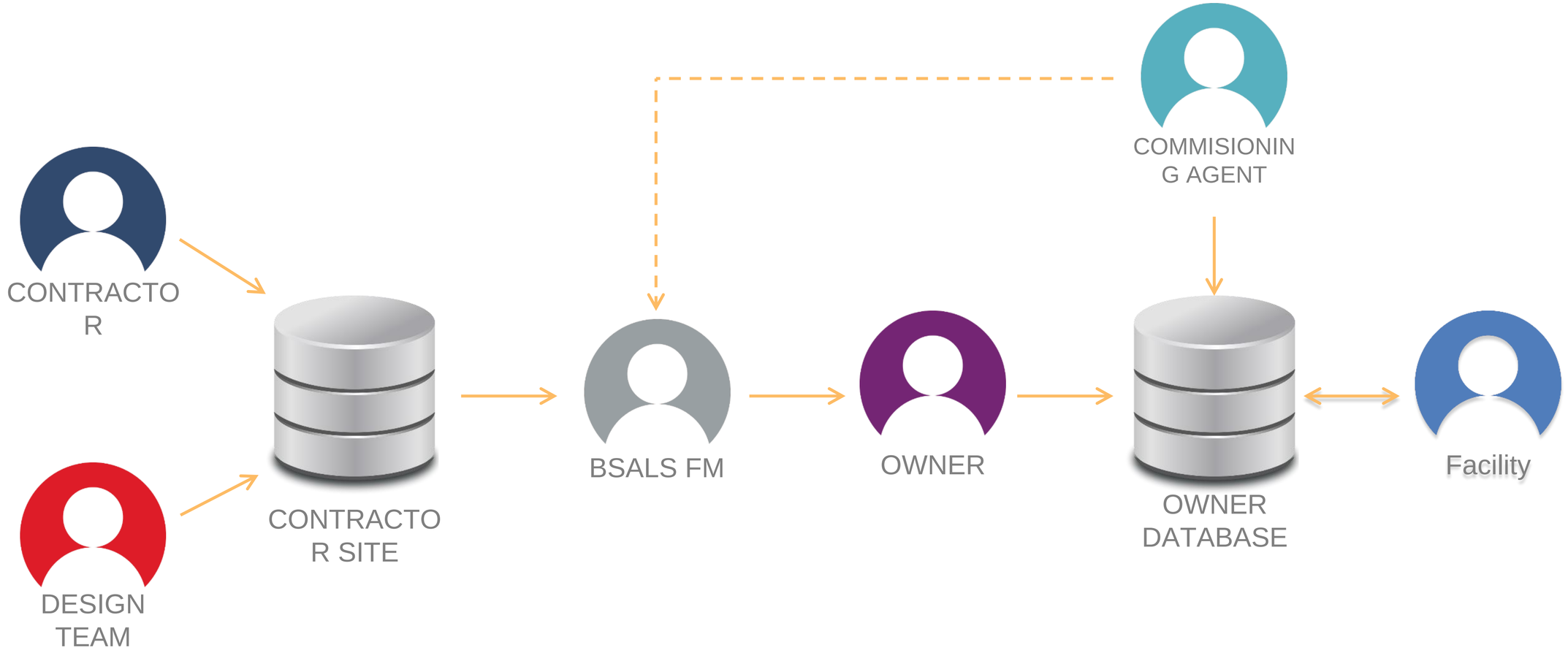
Greeley Medical Center

Greeley Hospital and Medical Center consists of the following:

- Hospital (196,110 SF)
- Medical Center (116,925 SF)
- CUP
- 58 Beds
- Construction Duration
  - Hospital 21 months
  - Medical Center 19 months

- Architect – BSA LifeStructures (FM BIM Author)
- CM/GC – JE Dunn Construction
- Commissioning Agent – eCube (BIM 360 Ops Field QR coder and data collector)
- Owner – UCHealth (Equipment naming and model uploader to BIM 360 Ops)

Data Flow

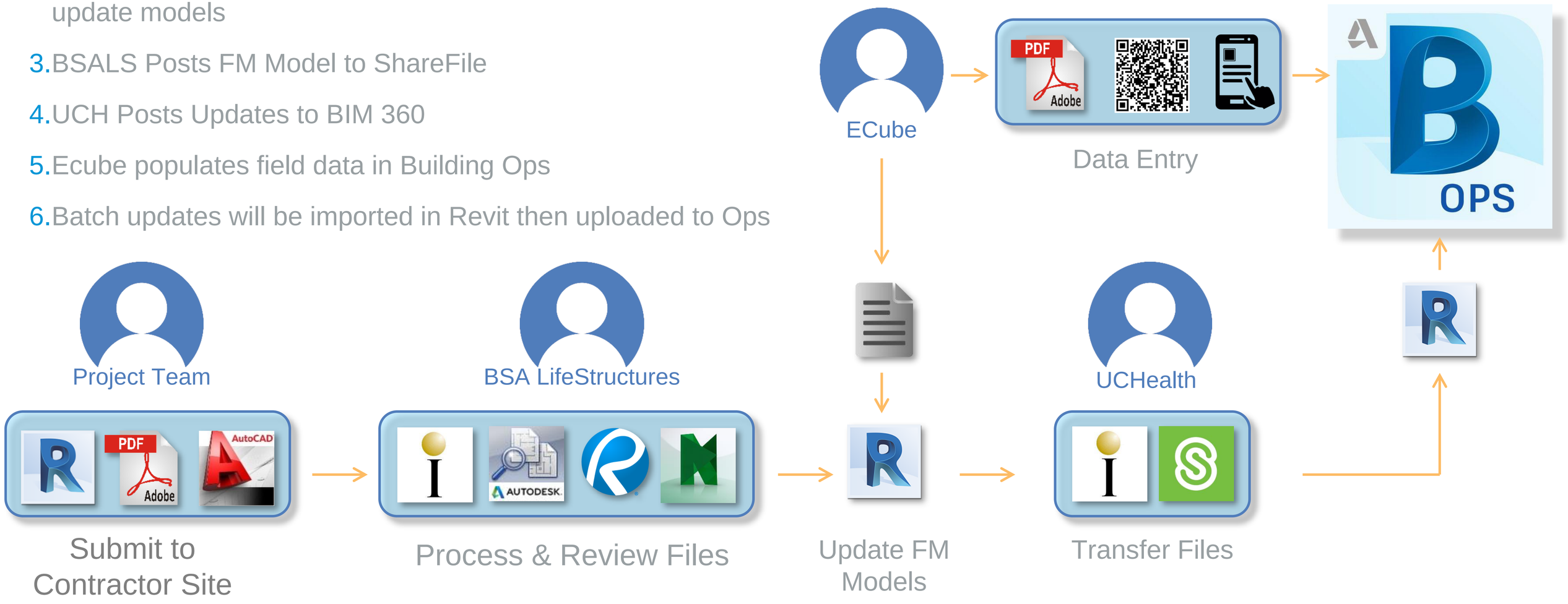

COMMISIONIN
G AGENT
CONTRACTO
R
BSALS FM
OWNER
Facility
CONTRACTO
R SITE
OWNER
DATABASE
DESIGN
TEAM

Revit to BIM 360 Ops Step-by-Step Process

1. Align Revit FM model assets (mechanical, electrical, fire protections, building automation, etc.) with coordination models
2. Rename assets’ Marks (if needed) in FM model files
3. Add custom parameters with placeholder data
4. Remove unnecessary data in background files (architectural, structural, etc.)
5. Merge FM model with the background files
6. Select assets to be exported (select assets by types – do not export all assets at once)
7. Obtain export code from BIM 360 Ops
8. Export assets to BIM 360 Ops
9. Repeat 6 through 8 for each the next set of assets to be exported

Software Diagram

1. Contractor post record drawings and working files of changes & Design Models to contractor site
2. BSALS Reviews Changes, distributes tasks within team to update models
3. BSALS Posts FM Model to ShareFile
4. UCH Posts Updates to BIM 360
5. Ecube populates field data in Building Ops
6. Batch updates will be imported in Revit then uploaded to Ops



Contractor Site

Project Documents

- Design Teams Upload Drawings and models to their construction management site.
- DCO’s CCD’s ASI’s
  - PDF
  - Navis
  - DWG
  - Revit

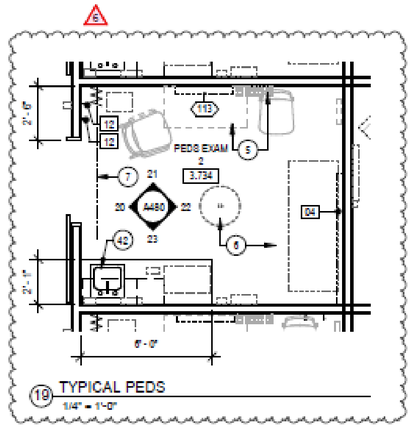
JE DUNN CONSTRUCTION Submittals

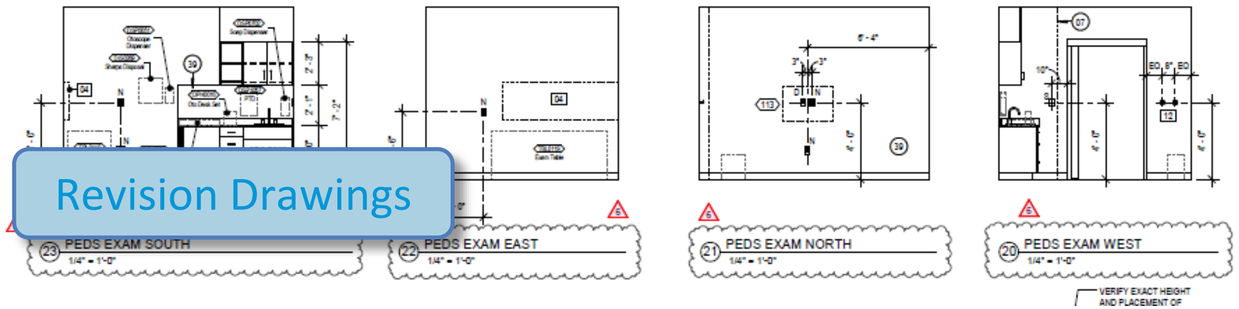
Projects Review the project list below for a summary of items

Show All Projects

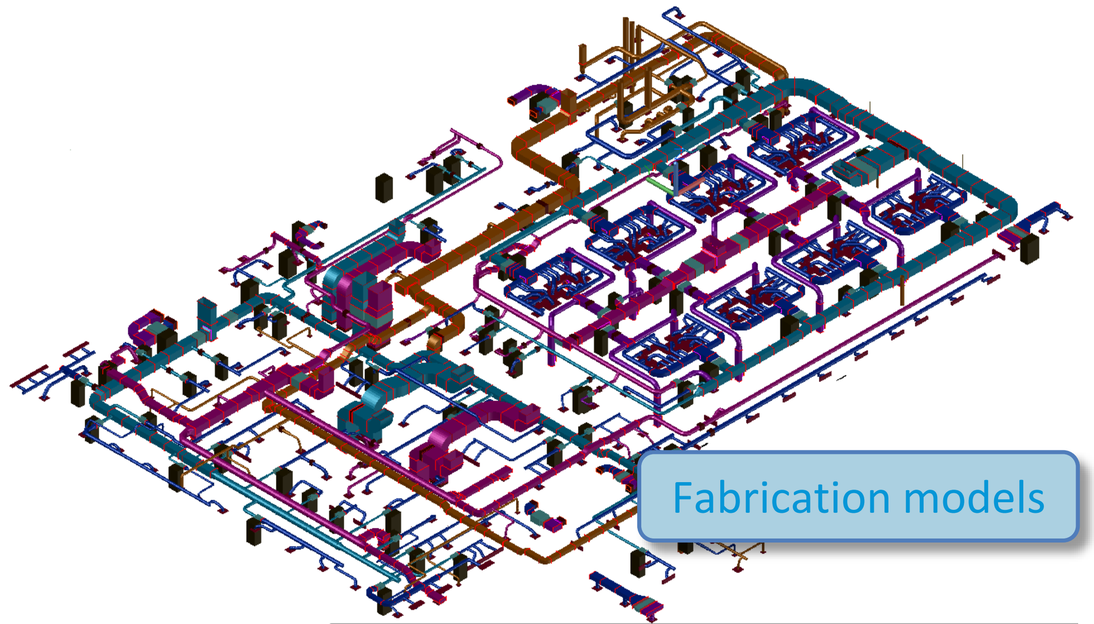
Project Number	Project Name	Pending	Delegated	Reviewed	Closed	Total
7007100	UCHealth - Greeley Hospital	3		8	532	543

ID	Name	Type ID	Spec Section	Due
033000-01	Cast-in-Place Concrete - Product Data (INCLUDED IN 033000-02)		033000-01	03/31/2017
033000-02	Cast-in-Place Concrete - Design Mixtures		033000-02	
033000-03	Cast-in-Place Concrete - Shop Drawings - Footing Reinforcement (Area F)		033000-03	
033000-06	Cast-in-Place Concrete - Qualification Data (INCLUDED IN 033000-02)		033000-06	03/31/2017
033000-07	Cast-in-Place Concrete - Material Test Reports (INCLUDED IN 033000-02)		033000-07	04/06/2017
033000-11	Cast-in Place Concrete - Steel Reinforcment (Area C)	Shop Drawings	033000	
033000-12	Cast-in Place Concrete - Steel Reinforcment (Area B)	Shop Drawings	033000	
033000-13	Cast-in Place Concrete - Steel Reinforcment (Area A)	Shop Drawings	033000	
033000-14	Cast-in Place Concrete - Steel Reinforcment (Area D)	Shop Drawings	033000	
033000-15	Cast-in Place Concrete - Steel Reinforcment (Area E)	Shop Drawings	033000	
033000-16	Cast-in Place Concrete - Steel Reinforcment (Area G)	Shop Drawings	033000	





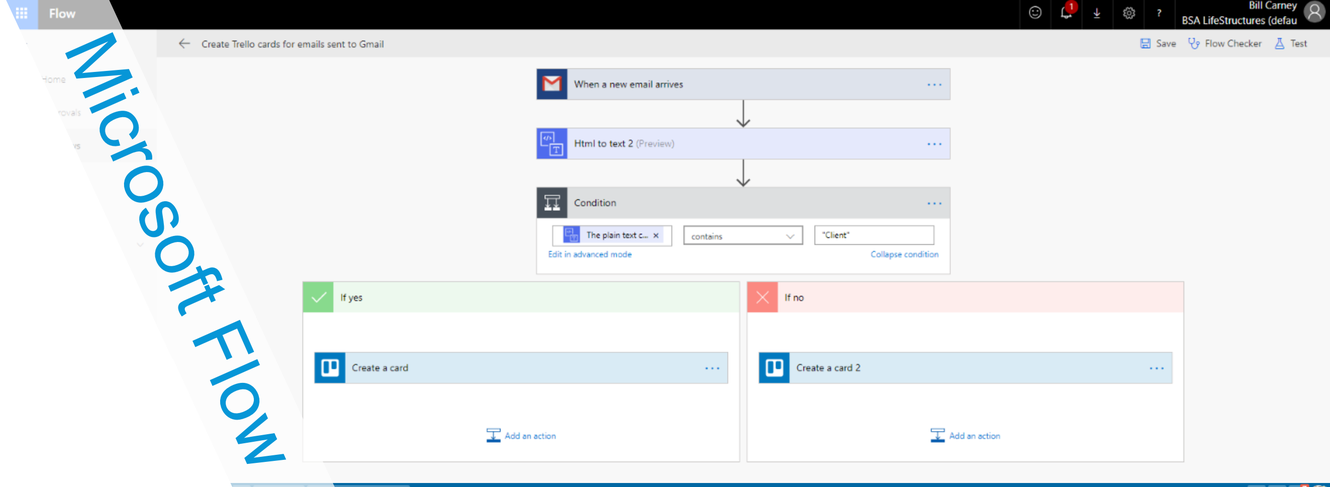
Revision Drawings



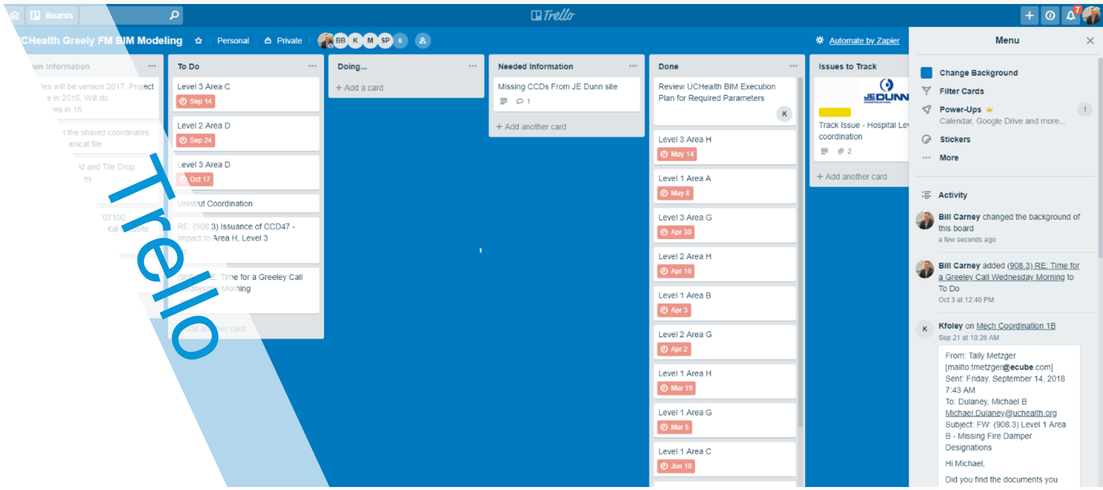
Fabrication models

Track Tasks

- Get notified of new post from JE Dunn site
- Microsoft Flow to setup task
- Email notification track task in Trello



Microsoft Flow

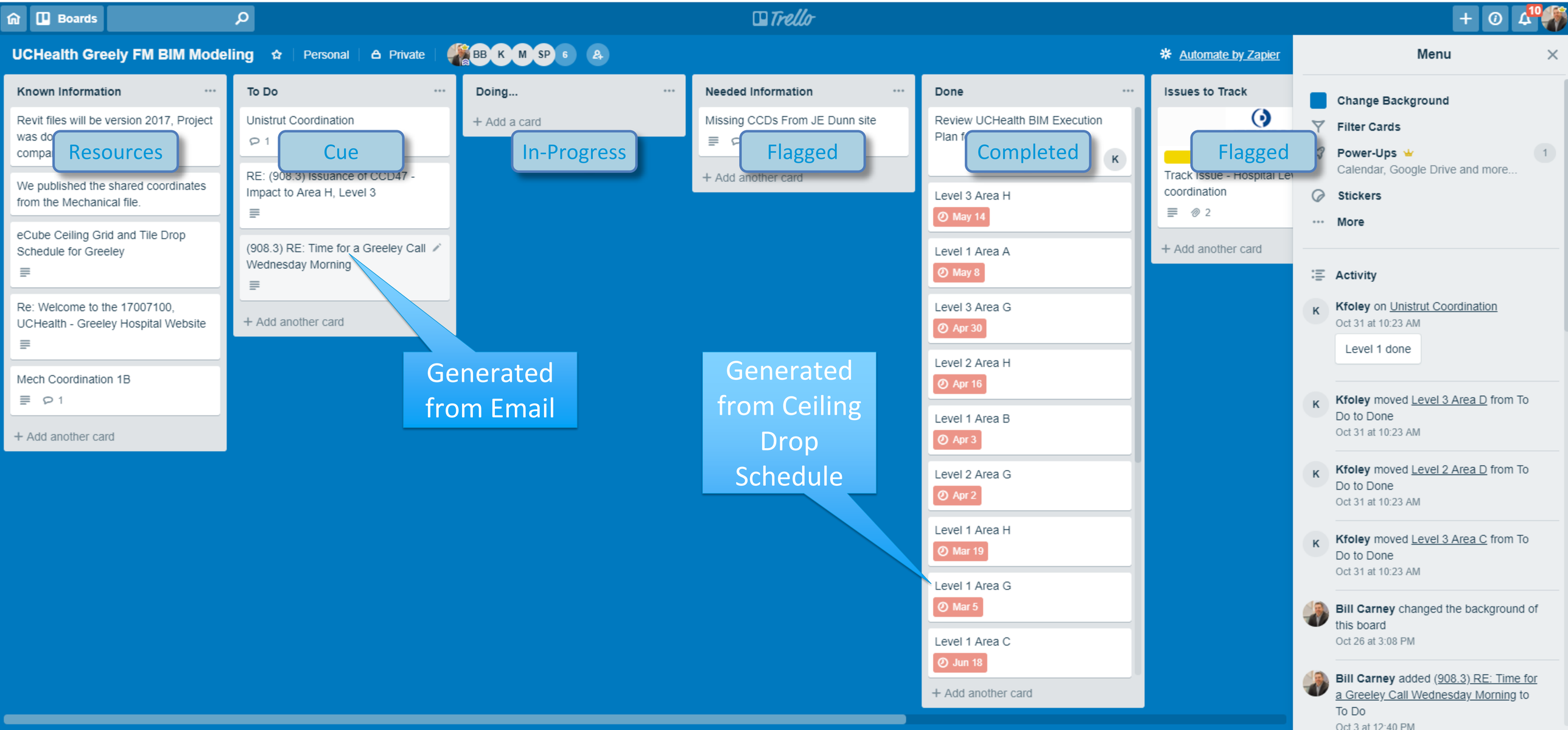


Trello

ACC				
Activity	Bldg	Space	Dates	BIM360 Model
	ACC	**Level 1 Area G**	**3/7/18 – 3/20/18**	
	ACC	Level 1 Area G	4/4/18 – 4/10/18	
	ACC	**Level 1 Area H**	**3/21/18 – 4/3/18**	
	ACC	Level 1 Area H	4/18/18 – 4/24/18	
	ACC	**Level 2 Area G**	**4/4/18 – 4/17/18**	
	ACC	Level 2 Area G	5/2/18 – 5/8/18	
	ACC	**Level 2 Area H**	**4/18/18 – 5/1/18**	
	ACC	Level 2 Area H	5/16/18 – 5/22/18	
	ACC	**Level 3 Area G**	**5/2/18 – 5/15/18**	
	ACC	Level 3 Area G	5/31/18 – 6/6/18	
	ACC	**Level 3 Area H**	**5/16/18 – 5/30/18**	
	ACC	Level 3 Area H	6/13/18 – 6/19	
		HOSPITAL		
	HOS	**Level 1 Area B**	**4/5/18 – 4/20/18**	

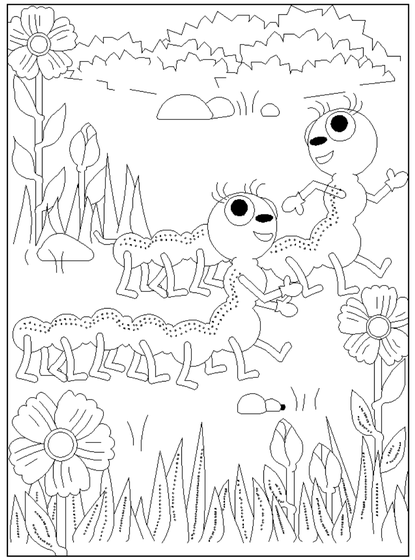
Ceiling Drop

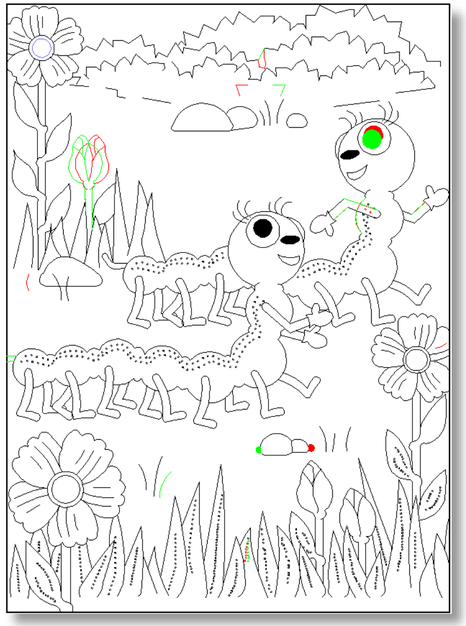
Trello

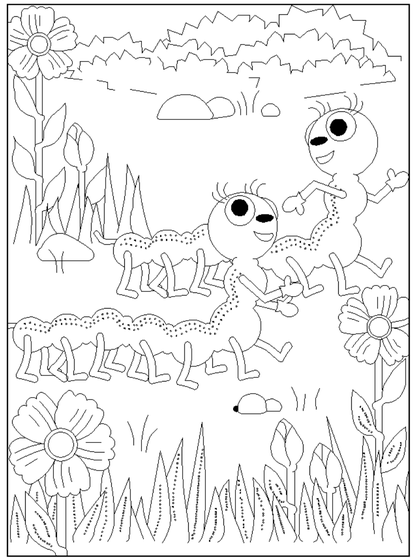

Boards
Trello
UCHealth Greely FM BIM Modeling
Personal
Private
Automate by Zapier
Known Information
Revit files will be version 2017, Project was do
compa
We published the shared coordinates from the Mechanical file.
eCube Ceiling Grid and Tile Drop Schedule for Greeley
Re: Welcome to the 17007100, UCHealth - Greeley Hospital Website
Mech Coordination 1B
Add another card
Resources
To Do
Unistrut Coordination
RE: (908.3) Issuance of CCD47 - Impact to Area H, Level 3
(908.3) RE: Time for a Greeley Call Wednesday Morning
Add another card
Cue
Generated from Email
Doing...
Add a card
In-Progress
Needed Information
Missing CCDs From JE Dunn site
Add another card
Flagged
Done
Review UCHealth BIM Execution Plan f
Level 3 Area H
May 14
Level 1 Area A
May 8
Level 3 Area G
Apr 30
Level 2 Area H
Apr 16
Level 1 Area B
Apr 3
Level 2 Area G
Apr 2
Level 1 Area H
Mar 19
Level 1 Area G
Mar 5
Level 1 Area C
Jun 18
Add another card
Completed
Generated from Ceiling Drop Schedule
Issues to Track
Track Issue - Hospital Le
coordination
Add another card
Flagged
Menu
Change Background
Filter Cards
Power-Ups
Calendar, Google Drive and more...
Stickers
More
Activity
Kfoley on Unistrut Coordination
Oct 31 at 10:23 AM
Level 1 done
Kfoley moved Level 3 Area D from To Do to Done
Oct 31 at 10:23 AM
Kfoley moved Level 2 Area D from To Do to Done
Oct 31 at 10:23 AM
Kfoley moved Level 3 Area C from To Do to Done
Oct 31 at 10:23 AM
Bill Carney changed the background of this board
Oct 26 at 3:08 PM
Bill Carney added (908.3) RE: Time for a Greeley Call Wednesday Morning to To Do
Oct 3 at 12:40 PM

Process & Review Models

- Separate model from design and construction
- Use review tools to identify the changes
- Create plan for updating FM Model



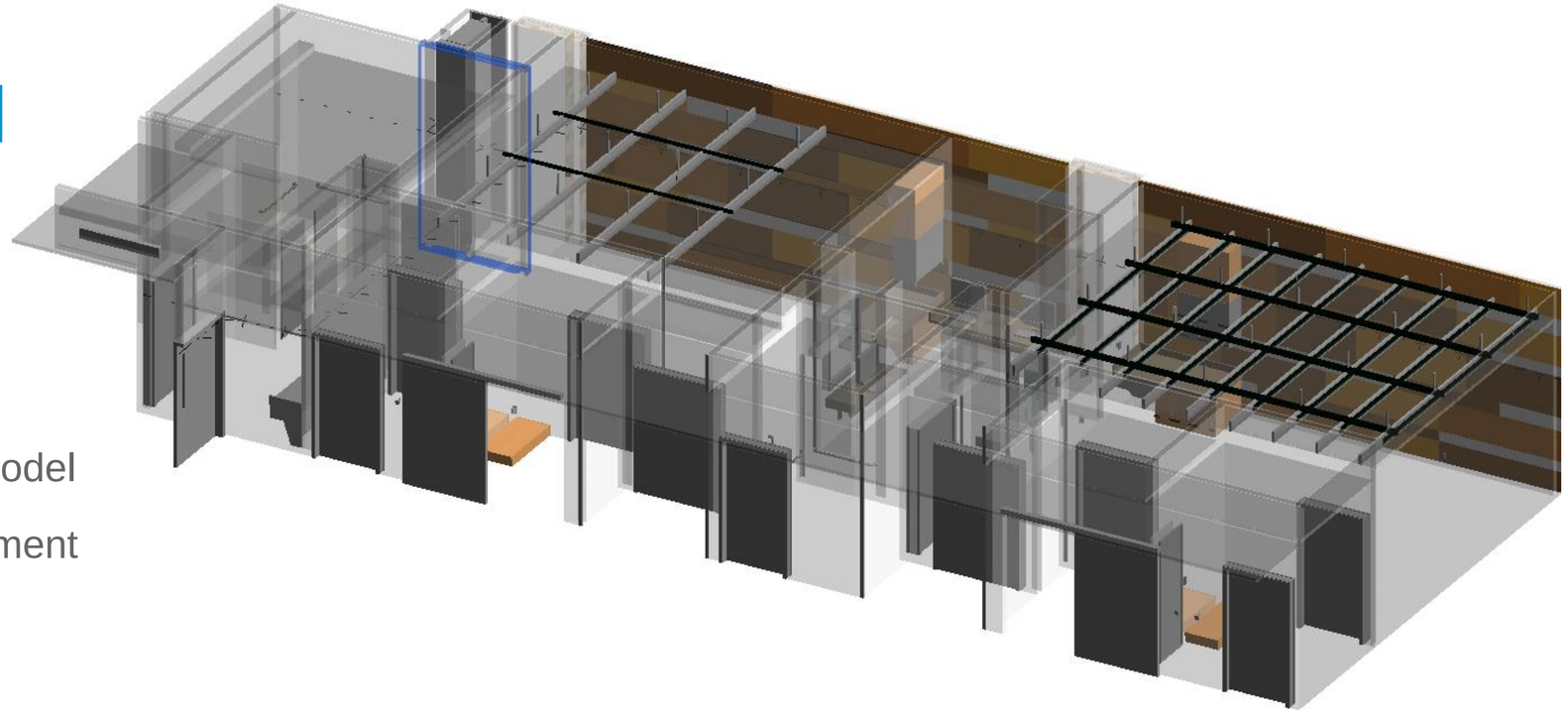




Update Scenarios

PDF	Drawing Overlay	http://www.hagenbusiness.com/bluebeam-tips-compare-documents-overlay-pages/
Revit	Model Compare	http://revitaddons.blogspot.com/2017/01/metamorphosis-free-and-open-source.html, https://youtu.be/uUcwH8GvlDY
3D Model	Reverse Clash Detection	Haven't had to do this one yet but the Geometry does not intersect node in Dynamo can show what does not intersect between differing geometry types.

Update Revit Model



- Take our review information
- Make a plan of attack and update model
- Update FM Model to provided document

Update Scenarios	
Fabrication Model	Align FM model content with fabrication model.
Small Design Change	Align FM model content with design changes provided
Large Design Change	Model Group and replace FM model content with New Model Content.
Non-Matching or Non- Modeled Content	Replace or remove content in FM model if needed. Model item to match provided content

BSA

UCHealth Greeley FM

Last Database Export: 27 Apr 2018 01:11 PM

File Transfer

- Building Home
- Activity Stream
- Tasks
- Reports
- Data Sheets
- Files
- Model Map
- Model Metrics

Tasks

Current Tasks | Completed Tasks | Setup Tasks | Task Servers | Timeline Overview | Timeline Detailed

PublishRevitModel

Name: PublishRevitModel

Scope: FILE

Building: UCHealth Greeley FM

Target: *

Priority: 5

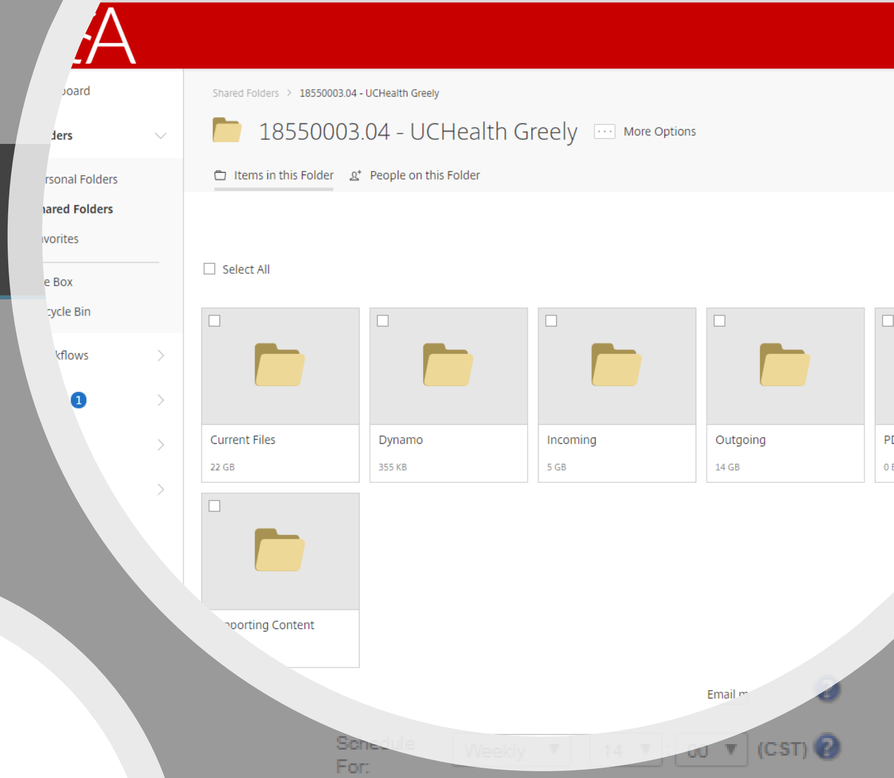
Post Action: Post to FTP

Publish Folder (Required)

\\bsalifestructures.com\indy1\BSA\1855\18550003\

Append Date To Filename

No



AUTODESK® BIM 360® OPS

My Buildings > All Assets

Name

ACC-AHU-3 EDITED BY MIKE

ACC-EV-1.909.1 ATU-Venturi Type-Single-8-14: SIZE 12 ACC-EV-1.909.1

Upload to Ops

mechanical equipment add category

barcode / QR code
00690
View others >

location
01- FIRST FLOOR >

3D model
View >

associated tickets
None

assigned
None

history
View >

Photos and Videos

Add Photo or Video

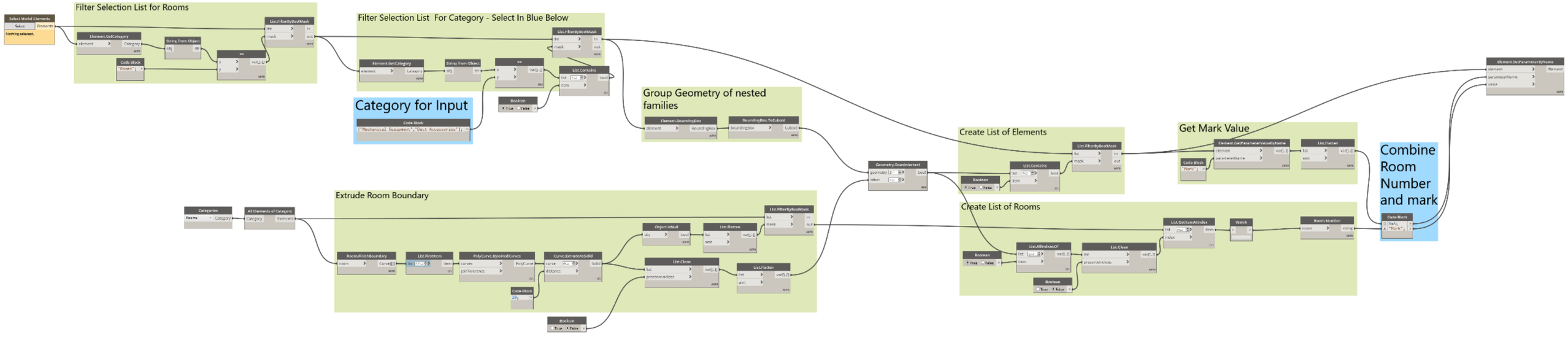
Documents and Manuals

Add PDF

QR Coding

Automation

- Room and level Based Numbering
- Connecting Data
- Synchronizing across files
- Adding Parameters and Setting Values



Lessons Learned – Parameter Groups

Parameters added to Revit will show as custom fields in the Asset view of Ops. These parameters must be assigned in the following Revit MEP groups:

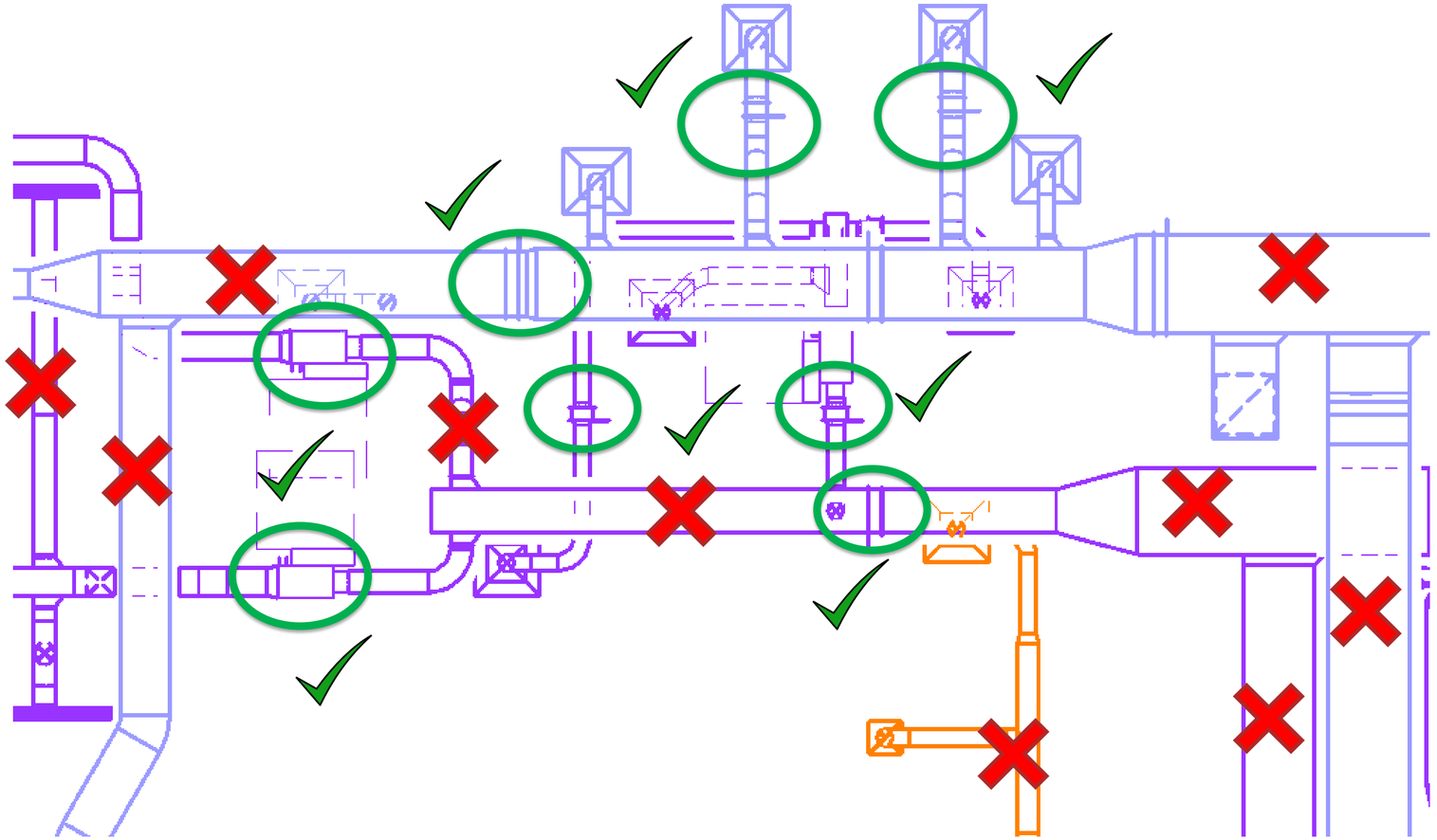
- Electrical
- Electrical – Circuiting
- Electrical – Lighting
- Electrical – Load
- Mechanical
- Mechanical – Flow
- Mechanical – Loads
- Plumbing

Only shared parameters of type MEP are exported.

Mechanical Equipment (1)	
Mechanical - Flow	
MAX AIR FLOW	215.00
MAX UNOCCUPIED AIR FLOW	0.00
MIN AIR FLOW	60.00
MIN UNOCCUPIED AIR FLOW	0.00
Reheat CFM	0.00
Minimum Function CFM	0.00
Maximum Function CFM	0.00
Air Flow	0.00
Flow Rate (GPM)	
Wtr Side Max Water Flow Rate (GPM)	
Fan RPM	
Wtr Side Min Water Flow Rate (GPM)	
Capacity (GPM)	
Airflow (CFM)	
Mechanical - Loads	
MBH	0.000000
Max RPM	
PD (Ft)	
Capacity (Tons)	
Amb. Air	

Lessons Learned – Exporting Assets

Select only the assets that should be exported from Revit *prior* to exporting them to BIM 360 Ops. Duct, pipe, cable tray, etc. should not be exported as they do not need regular maintenance.



Select only assets to be exported

Lessons Learned – Placeholder Data

Placeholder data must be added to the parameters in Revit or BIM 360 Ops won't import the parameters (hyphens as placeholders added below).

Revit Shared Parameters

Mechanical - Flow	
Flow Rate (GPM)	
Wtr Side Max Water Flo...	-
Fan RPM	-
Wtr Side Min Water Flow...	-
Capacity (GPM)	
Airflow (CFM)	
Mechanical - Loads	
Suction Velocity	0.00 FPS
Discharge Velocity	0.00 FPS
Max RPM	
PD (Ft)	-
Capacity (Tons)	-
Amb. Air	-
LWT (Deg. F)	-
EFT (Deg. F)	-
Max PD (Ft)	
LFT (Deg. F)	
EWT (Deg .F)	-

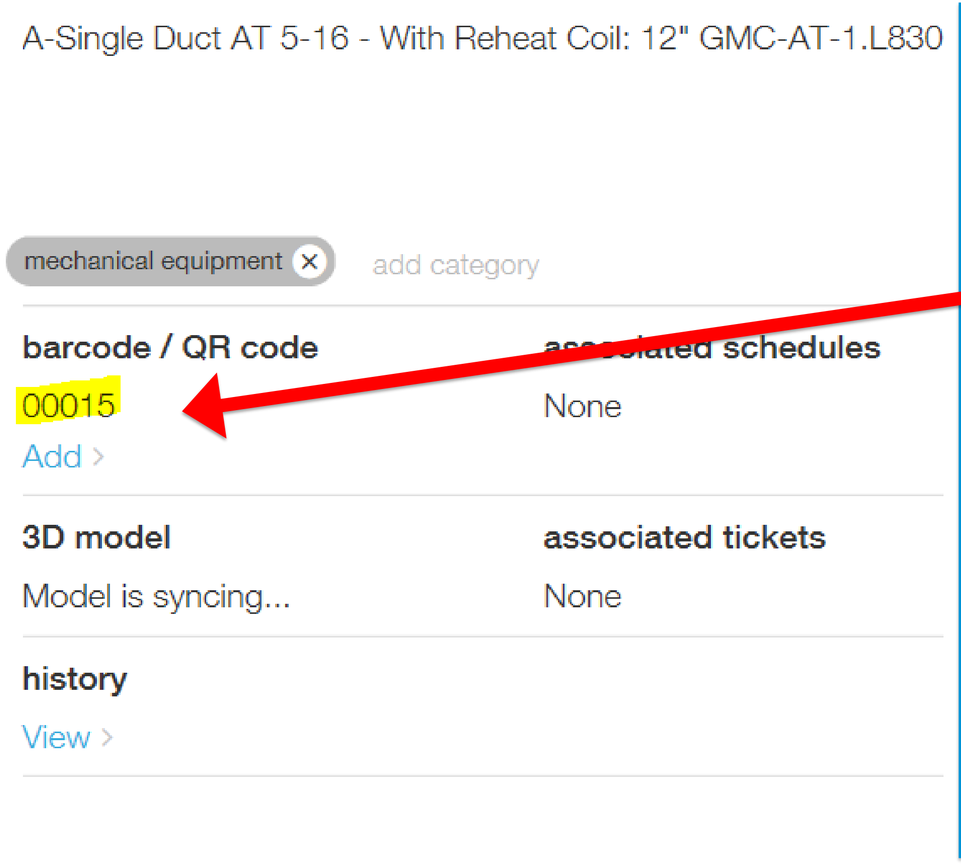
Shared Parameters as Fields in BIM 360 Ops

amb. air	**apparent power**	**capacity (tons)**
-	0 VA	-
design flow rate	**discharge velocity**	**eft (deg. f)**
0 GPM	0 FPS	-
ewt (deg .f)	**fan rpm**	**flow rate**
-	-	0 GPM
fluid type	**hp**	**impeller size**
-	-	0"
lwt (deg. f)	**max ref. side press.**	**max wtr side press.**
-	-	-

Lessons Learned – Do not start QR codes with “0”

Do not start QR codes with “0” such as 0001. If the file is exported to .csv the barcode field changes to number format and the leading zeroes disappear: 0001 becomes 1 in the .csv file.

BIM 360 Ops Barcode



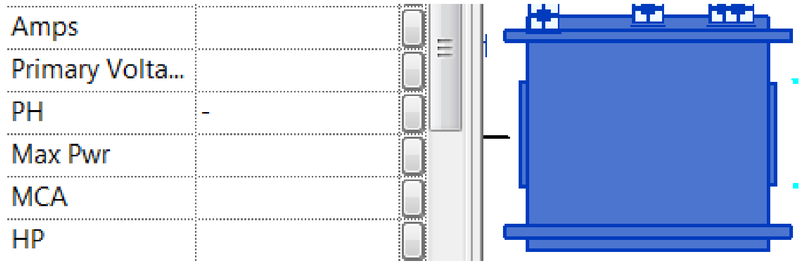
Barcode After Export to .CSV

Asset Description	Barcode
A-Single Duct AT 5-16 - With Reheat Coil: 12" GMC-AT-1.L830	15
A-Single Duct AT 5-16 - With Reheat Coil: [illegible] GMC-AT-1.972	7
A-Single Duct AT 5-16 - With Reheat Coil: 08" GMC-AT-1.909	22
A-Single Duct AT 5-16 - With Reheat Coil: 14" GMC-AT-1.L900	9
A-Single Duct AT 5-16 - With Reheat Coil: 08" GMC-AT-1.934	3
A-Single Duct AT 5-16 - With Reheat Coil: 10" GMC-AT-1.908	25
A-Single Duct AT 5-16 - With Reheat Coil: 08" GMC-AT-1.960	5
A-Single Duct AT 5-16 - With Reheat Coil: 14" GMC-AT-1.950-A	4
A-Single Duct AT 5-16 - With Reheat Coil: 08" GMC-AT-1.907	659

Lesson Learned - Additional Exports from Revit to BIM 360 Ops May Overwrite Data in BIM 360 Ops

If placeholder data such as dashes are added to Revit custom parameters *and* the asset was previously exported to BIM 360 Ops the placeholder data may overwrite data for the custom parameter already entered in BIM 360 Ops on subsequent exports.

REVIT asset exported to BIM 360 Ops



BIM 360 Ops

hp

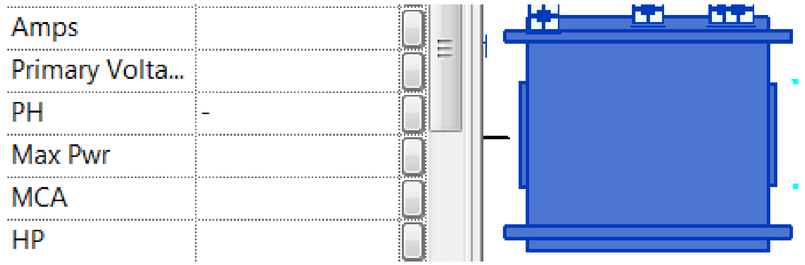
-

Technician adds “3” BIM 360 Ops

hp

3

Asset location is changed in REVIT and re-exported to BIM 360 Ops



“-” Overwrites “3” in BIM 360 Ops

hp

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Lesson Learned – General Considerations

As with any system there are many considerations to implementing the system

- Plan ahead!
- Meet with the BIM 360 Ops end users
  - Do they want the Marks revised to include rooms numbers?
  - What custom parameters do they require?
  - Will the data be shared with other systems?
    - Does the Mark need to be separated from the Family and Type?
  - Plan for changes (don’t re-export from Revit and overwrite BIM 360 Ops entered data)
- How and where will the data be entered (Revit, BIM 360 Ops, BIM 360 Field, CSV File)?
- Ops is formatted for iOS (iPhones only). The iPhone app can be downloaded from Apple for the iPad but it is formatted for the iPhone screen
- Ops can run in web mode using Safari on an iPad but the iOS must be 10 or higher

How To Decide Which Workflow to Use?

BIM 360 GLUE TO BIM 360 FIELD TO BIM 360 OPS WORKFLOW:

Advantages

1. Ideal method for using trade contractor coordination models which should reflect installation
2. Least expensive of the two methods

Disadvantages

1. Possibly multiple file types to maintain
2. If owner is maintaining the models Owner will need BIM 360 Glue and BIM 360 Field to export to BIM 360 Ops
3. Multiple parties (subcontractors) involved

REVIT TO BIM 360 OPS WORKFLOW:

Advantages

1. Easy to maintain the Revit models and export to BIM 360 Ops
2. Data can be exported (3rd party or via Dynamo) to the Revit model
3. Data can be manipulated easier in Revit using Dynamo
4. Some data may already exist in the Revit families

Disadvantages

1. The Revit MEP model must be updated (as-built) to reflect coordination and asset installation
2. Additional cost to update the Revit MEP models

Conclusions

Large facilities may undergo frequent renovations - consider using the Revit to BIM 360 Ops workflow.

- Directly export to BIM 360 Ops but consider carefully the use of custom parameters
- To avoid accidental overwriting BIM 360 Ops data export the data to spreadsheets or use Dynamo to copy date directly to the families in Revit

Facilities expected to have few renovations consider the BIM 360 Glue/BIM 360 Field/BIM 360 Ops workflow.

- The subcontractor models can be used
- However, if the owner is going to maintain the model the owner may need the various applications used by the subcontractors