BUILDING INNOVATION
Emerging Technologies Series

The Importance of Standardized Data for Your Digital Twin

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Agenda

Why standardized data?

What is standardized data?

How do ensure standardized data?

About Your Speakers

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Vice President
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- Registered Architect
- Past president of AIA Northern Virginia
- Co-Chair of the COBie Workgroup at NIBS
- Recognized expert in Revit, AutoCAD, COBie, and BIM
- Speaker at AU, BILT, NFMT, CFTA, NIBS
- Almost 30 Years of Experience in the AEC Industry
- 20+ Years as a technology consultant

Justin Friedman
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- 17 years experience using FM technology
- 5 years as FM technology consultant
- Speaker at Building Insights, NIBS, and CFTA
- Public and Private sector experience

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Why Standardized Data?

The importance of having consistent, relevant data.

Why Standardized Data?

Accurate Reporting

Digital Twin Visualizations

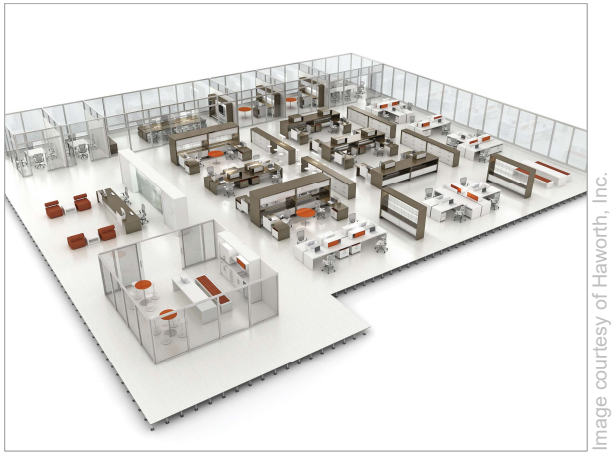

Image courtesy of Haworth, Inc.

Passing Data to Your FM Systems

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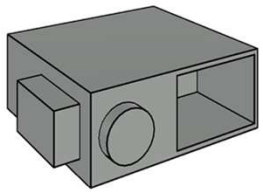
What is Standardized Data?

The different types of data.

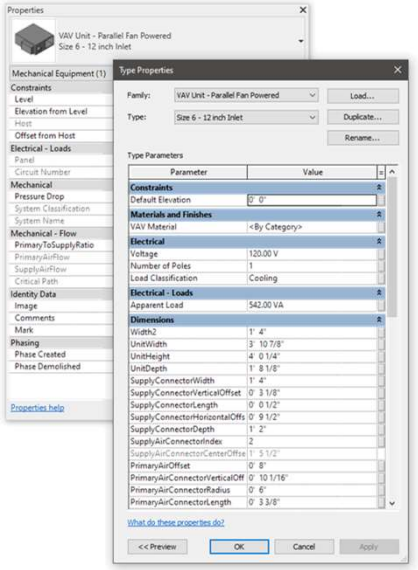
2 Types of Data

Graphical Data



- Structural elements
- Core & Shell elements
- Site elements
- Fixtures, furniture, and equipment (assets)
- Simplified for digital twin
- 2D for space planning
- **Asset ID**

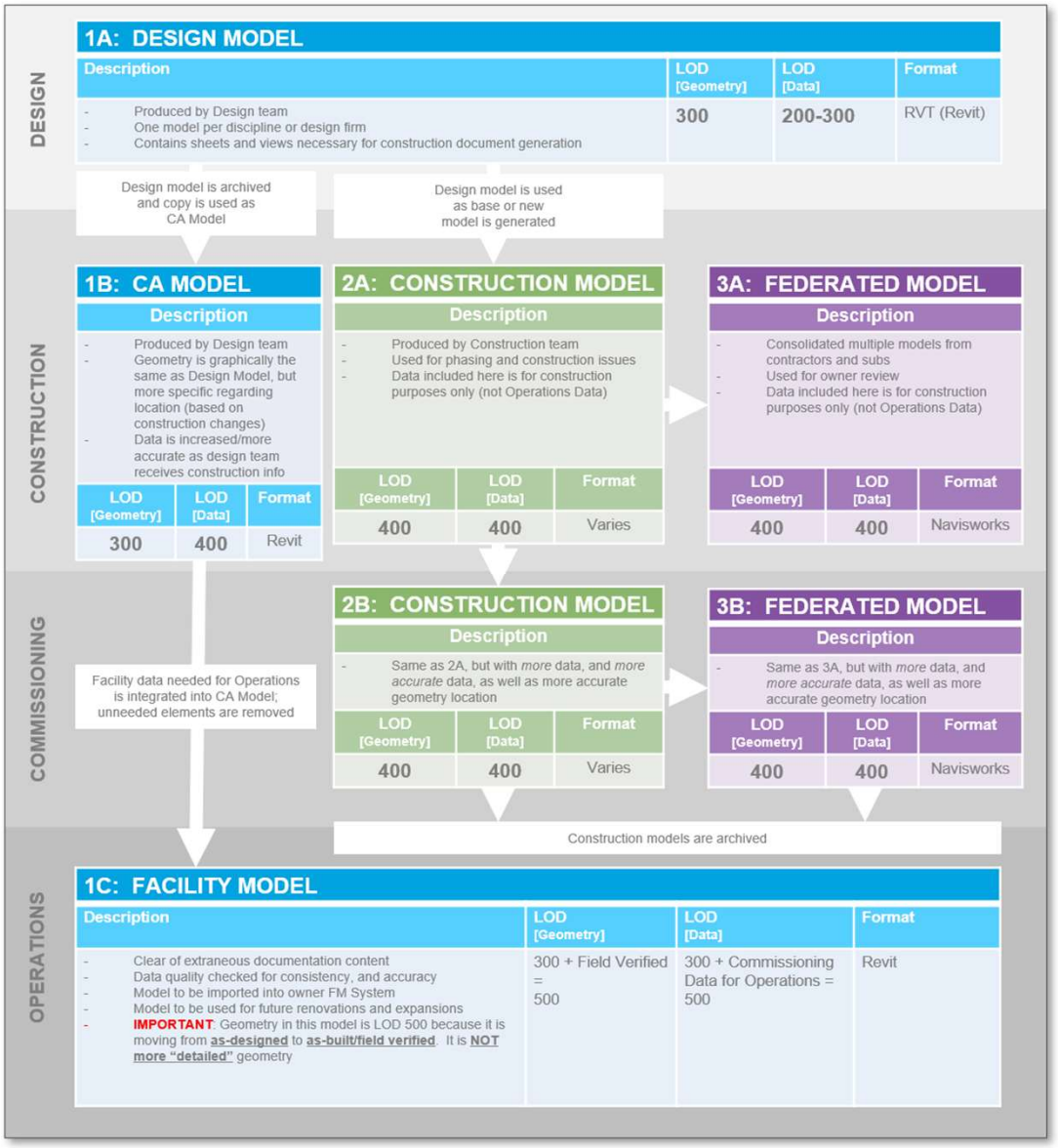
Informational Data



- Identification (manufacturer, make, model, etc.)
- Location (floor, room, etc.)
- Engineering/functionality (power, flow, etc.)
- Installation (serial number, warranty information, etc.)
- Manuals (operational, maintenance)
- **Asset ID**

Data Collection

WHO	WHEN	HOW	WHAT
Architects and Engineers	Design + CA	▪ Updating the Revit models	▪ Data in parameters (informational data) ▪ Updated geometry to match RFIs, Redlines (graphical data)
Contractors	Construction	▪ Generating redline drawings ▪ Gathering documents	▪ As-built conditions (graphical data) ▪ Documentation about equipment including their manuals, warranties, etc. (informational data)
Commissioning Agent	Commissioning	▪ Capturing data ▪ Gathering documents	▪ Installation and performance (informational data) ▪ Documentation about equipment including their manuals, warranties, etc. (informational data)



Model Lifecycle

- Construction models do not make good operations models
- They include too much detail and are modified to accommodate means and methods in construction
- Design models updated with redlines should be carried through to operations
- Ideally, LOD 300 models (geometry), as they will be your backgrounds for future work/renovations
- You want all the data and just enough geometry

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How do I ensure standardized data?

Tools, techniques, best practices, and recommendations.

LOD Designations

ISSUES

- No national standard for LOD
- Based on a linear relationship (e.g., 100, 200, 300, 350, 400, 450, 500)

200	Inclusions: • General shape	
300	Inclusions: • Specific section type and size	
350	Inclusions: • Member connections such as, base plates and gusset plates, anchor rods • Connection details with correct and reliable dimensions • Steel structure reinforcements and stiffeners (e.g. for penetrations) • Cap plates	
400	Inclusions: • Welds • Coping of members • Washers, nuts, etc.	

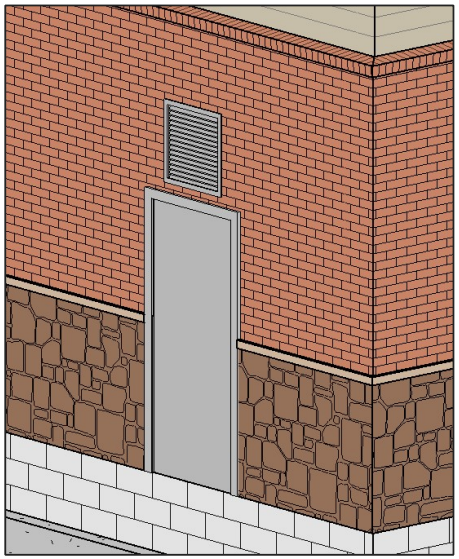
RECOMMENDATIONS

- Separate LOD for **Graphical Data** and **Informational Data**
- Use 100, 200, 300, 400 for graphics and A, B, C, D for data
- For example, instead of LOD 300, define it as LOD 300C

LOD Elements

ISSUES

- Typically organized by UniFormat or MasterFormat
- Not all classifications have equivalent elements in the model authoring software



RECOMMENDATIONS

- Base your LOD on Revit family categories

Level of Development (LOD) Tables
- Air Terminals
- Areas
- Cable Tray
- Cable Tray Fittings
- Casework
- Ceilings (Exterior)
- Ceilings (Interior)
- Columns (Non-Structural)
- Communication Devices
- Conduits
- Conduit Fittings
- Curtain Panels
- Curtain Wall Mullions
- Data Devices
- Detail Items
- Doors (Exterior)
- Doors (Interior)
- Ducts
- Duct Accessories
- Duct Fittings
- Duct Insulation
- Duct Linings
- Duct Placeholders
- Duct Systems
- Electrical Equipment
- Electrical Equipment (Fire Alarm)
- Electrical Fixtures
- Entourage

LOD Elements

Plumbing Fixtures

General Information

SUBSET	N/A
EQUIVALENT BUILDING ELEMENTS	Drains, drinking fountains, lavatories, mop sinks, showers, toilets, urinals
CLASSIFICATIONS	
Uniformat 2010	D2010.60: Plumbing Fixtures
OmniClass Table 21	21-04 20 10 60: Plumbing Fixtures
MasterFormat	22 40 00: Plumbing Fixtures
OmniClass Table 22	22-22 40 00: Plumbing Fixtures
OmniClass Table 23	23-31 00 00: Plumbing Specific Products and Equipment
NOTES	Plumbing fixtures can be modeled in both the architectural and MEP models. However, only one model will be designated the single source for all plumbing fixture locations

Graphics and Facility Data

	GRAPHICS	FACILITY DATA
LOW DETAIL	**100** INCLUDES: generic modeling with preliminary geometry and dimensions	**A** INCLUDES: phasing, length, width, height, subcategory (see Section S6.F)
MEDIUM DETAIL	**200** INCLUDES: "basis of design" modeling with general geometry and dimensions	**B** INCLUDES: same as A + mounting type, mounting height, location detectable by Room or Space
HIGH DETAIL	**300** INCLUDES: "basis of design" modeling with detailed geometry and dimensions, code clearances	**C** INCLUDES: same as B + "basis of design" specifications + UniFormat & MasterFormat classification
EXTRA DETAIL	**400** INCLUDES: manufacturer provided "as-built" modeling with accurate geometry and dimensions, code clearances	**D** INCLUDES: same as C + "as-built" manufacturer & model, cost

Non-Real World Elements

ISSUES

- Models include elements that are not equivalent to real-world elements
- For example: Views, Sheets, Details, Legends, Settings, Phases, Design Options, etc.
- Most you don’t need in a model at delivery

RECOMMENDATIONS

- Make them part of your modeling standards
- Most should stay during the project as interim deliverables (INT)
- Most should be removed for final deliverables (FIN)
- Include them in your BIM Execution Plan

Non-Real World Elements

Type >		100% DD	MODEL				PROJECT CLOSEOUT	MODEL			
Project Phase >			DESIGN					CONSTRUCTION			
Time of Exchange >			100% DESIGN DEVELOPMENT					PROJECT CLOSEOUT			
MODEL ELEMENT			LOD		RESP PARTY	NOTES		LOD		RESP PARTY	NOTES
REVIT CATEGORY	SUBSET		GRAPHICS	FACILITY DATA				GRAPHICS	FACILITY DATA		
MODEL STANDARDS			REQUIREMENT	RESP PARTY	NOTES			REQUIREMENT	RESP PARTY	NOTES	
Settings	Fill Patterns		INT	ALL				FIN	ALL		
	Line Styles		INT	ALL				FIN	ALL		
	Line Weights		INT	ALL				FIN	ALL		
	Naming Conventions		INT	ALL				FIN	ALL		
	Phases and Demolition		INT	ALL				FIN	ALL		
	Project North		INT	ALL				FIN	ALL		
	True North		INT	ALL				FIN	ALL		
	Project Base Point		INT	ALL				FIN	ALL		
	Survey Point		INT	ALL				FIN	ALL		
	Project Location		INT	ALL				FIN	ALL		
	Project Units and Precision		INT	ALL				FIN	ALL		
	Sheet Issues/Revision		INT	ALL				FIN	ALL		
Organization	Assemblies		INT	ALL				FIN	ALL		
	Browser Organization		INT	ALL				FIN	ALL		
	Design Options		INT	ALL				FIN	ALL		
	Detail Groups		INT	ALL				FIN	ALL		
	Model Groups		INT	ALL				FIN	ALL		
	Views		INT	ALL				FIN	ALL		
	Worksets		INT	ALL				FIN	ALL		
	Datums		INT	ALL				FIN	ALL		
	Grids		INT	ALL				FIN	ALL		
	Levels		INT	ALL				FIN	ALL		
	Reference Planes		INT	ALL				FIN	ALL		
	Scope Boxes		INT	ALL				FIN	ALL		
	Modeling		INT	ALL				FIN	ALL		
	Duct and Piping Systems		INT	ALL				FIN	ALL		
	In-Place Families		INT	ALL				FIN	ALL		
	Generic Models and Mass Families		INT	ALL				FIN	ALL		
	Materials		INT	ALL				FIN	ALL		
	Model Lines		INT	ALL				FIN	ALL		
	Walls		INT	ALL				FIN	ALL		
Annotations	Annotation Types		INT	ALL				FIN	ALL		
	Tags		INT	ALL				FIN	ALL		
Imports / Exports	CAD Export Settings		INT	ALL				FIN	ALL		
	DWG Files		INT	ALL				FIN	ALL		
	Images		INT	ALL				FIN	ALL		

Data Fields

ISSUES

- The data fields in models (parameters) get lost in a sea of other data fields
- Asking for too many pieces of data will cause your consultants to either not do it, not do it correctly, or charge you too much

RECOMMENDATIONS

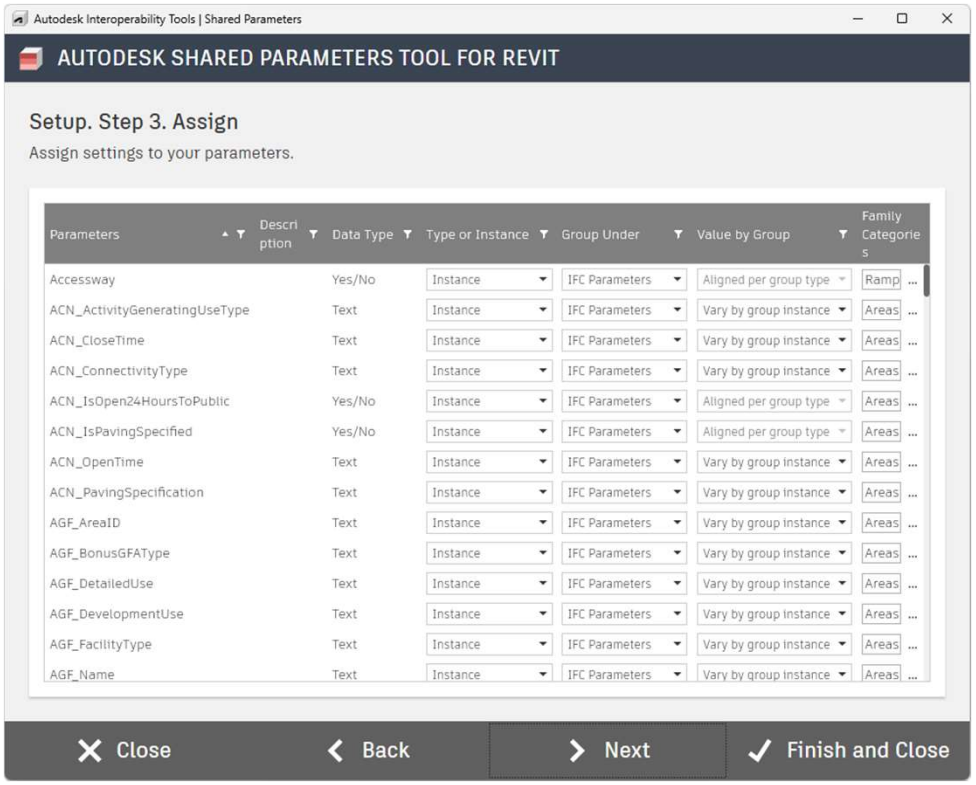
- Clear parameter naming standards that include:
  - Your organization's initials
  - The responsible party
  - Description
- Less is better…focus on the critical data needed to manage your facility
- The Autodesk Shared Parameter Tool will add the parameters you need to any model in 2 clicks

Data Fields

	A	B	C
1	PARAMETER GROUP	PARAMETER NAME	APPLICATION
2			
3	Architecture	DGS_ARCH_Building.Name	Instance
4	Architecture	DGS_ARCH_Building.Number	Instance
5	Architecture	DGS_ARCH_Door.Card.Reader	Instance
6	Architecture	DGS_ARCH_Door.Closer	Instance
7	Architecture	DGS_ARCH_Door.Frame.Fire.Rating	Type
8	Architecture	DGS_ARCH_Door.Frame.Material	Instance
9	Architecture	DGS_ARCH_Door.Hardware.Type	Instance
10	Architecture	DGS_ARCH_Door.Hinge.Size	Type
11	Architecture	DGS_ARCH_Door.Leaf.Dimensions	Type
12	Architecture	DGS_ARCH_Door.Leaf.Material	Instance
13	Architecture	DGS_ARCH_Door.Magnetic.Hold	Instance
14	Architecture	DGS_ARCH_Roof.Construction	Type
15	Architecture	DGS_ARCH_Room.Name	Instance
16	Architecture	DGS_ARCH_Room.Number	Instance
17	Architecture	DGS_ARCH_Room.Baseboard	Instance
18	Architecture	DGS_ARCH_Room.Ceiling	Instance
19	Architecture	DGS_ARCH_Room.Floor	Instance
20	Architecture	DGS_ARCH_Room.Wall.East	Instance
21	Architecture	DGS_ARCH_Room.Wall.North	Instance
22	Architecture	DGS_ARCH_Room.Wall.South	Instance
23	Architecture	DGS_ARCH_Room.Wall.West	Instance
24			
25			
26	Commissioning	DGS_CXA_Compressor.Serial.Number	Instance
27	Commissioning	DGS_CXA_Date.Commissioning	Instance
28	Commissioning	DGS_CXA_Date.Manufacture	Instance
29	Commissioning	DGS_CXA_Engine.Serial.Number	Instance
30	Commissioning	DGS_CXA_Expected.Life	Type
31	Commissioning	DGS_CXA_Fan.Serial.Number	Instance
32	Commissioning	DGS_CXA_Serial.Number	Instance
33	Commissioning	DGS_CXA_Tank.Manufacture.Date	Instance
34	Commissioning	DGS_CXA_Warranty.Company.Name	Instance
35	Commissioning	DGS_CXA_Warranty.Contact.Email	Instance
36	Commissioning	DGS_CXA_Warranty.Contact.Phone	Instance
37	Commissioning	DGS_CXA_Warranty.Date.End	Instance
38	Commissioning	DGS_CXA_Warranty.Date.Renewal	Instance
39	Commissioning	DGS_CXA_Warranty.Date.Start	Instance
40	Commissioning	DGS_CXA_Warranty.Description	Instance
41			
42			
43	Contractor	DGS_GC_Burner.Manufacturer	Type
44	Contractor	DGS_GC_Compressor.Manufacturer	Type
45	Contractor	DGS_GC_Compressor.Model	Type
46	Contractor	DGS_GC_Date.Install	Instance
47	Contractor	DGS_GC_Drive.Part.Number	Type
48	Contractor	DGS_GC_Fan.Manufacturer	Type
49	Contractor	DGS_GC_Fan.Model	Type
50	Contractor	DGS_GC_Input.Breaker.Manufacturer	Instance
51	Contractor	DGS_GC_Input.Breaker.Model	Instance
52	Contractor	DGS_GC_Manufacturer.Name	Type

Data Fields

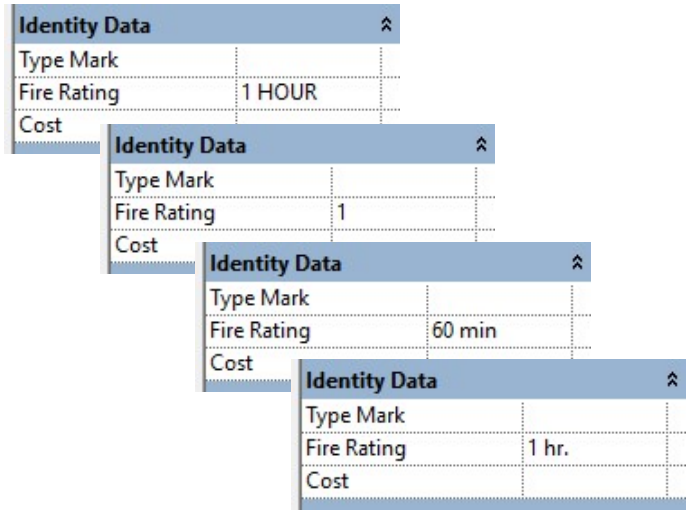
- Autodesk Shared Parameters Tool for Revit (SPT)
- Part of the Autodesk Interoperability Tools
- Free for all Revit users
- Allows you to map your shared parameters to the correct family categories at the correct level (type vs instance)



Data Values

ISSUES

- Your data fields have inconsistent values in them
- For example:



RECOMMENDATIONS

- Create “Picklists” for your teams to use when filling in your standard parameters
- The Autodesk Standardize Data Tool is free and lets you build Picklists in Excel

BEP Organization

ISSUES

- Your “element responsibility” matrix is too big to manage
- Consultants struggle to find what applies only to them

RECOMMENDATIONS

- Organize your rows by discipline (consultant), then by Revit family category
- Organize your columns by milestone
- Include data groups that allow for one-click expand/collapse

BEP Organization

BIM Execution Plan Element Responsibility
<<ENTER PROJECT NAME>>

Type >		PROGRAMMING	100% SD	MODEL DESIGN 50% DESIGN DEVELOPMENT				MODEL DESIGN 100% DESIGN DEVELOPMENT				MODEL DESIGN 50% CONSTRUCTION DOCUMENTS				MODEL DESIGN 75% CONSTRUCTION DOCUMENTS			
Project Phase >																			
Time of Exchange >																			
MODEL ELEMENT				LOD		RESP PARTY	NOTES	LOD		RESP PARTY	NOTES	LOD		RESP PARTY	NOTES	LOD		RESP PARTY	NOTES
REVIT CATEGORY	SUBSET			GRAPHICS	FACILITY DATA			GRAPHICS	FACILITY DATA			GRAPHICS	FACILITY DATA			GRAPHICS	FACILITY DATA		
STRUCTURE																			
Floors	Structural			200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Area Reinforcement				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Beam Systems				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Columns				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Connections				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Fabric Areas				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Fabric Reinforcement				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Foundations	Footings			200	A	STR		200	B	STR		200	B	STR		300	B	STR	
	Slabs			200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Framing				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Path Reinforcement				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Rebar				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Stiffeners				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Structural Trusses				200	A	STR		200	B	STR		200	B	STR		300	B	STR	
Walls	Subgrade			200	A	STR		200	B	STR		200	B	STR		300	B	STR	
ARCHITECTURE & INTERIOR DESIGN																			
Areas				200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Casework				200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Ceilings	Exterior			200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
	Interior			200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Columns				200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Curtain Panels				200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Curtain Systems				200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Curtain Wall Mullions				200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Detail Items				Elements in this Revit category will not be used				Elements in this Revit category will not be used				Elements in this Revit category will not be used				Elements in this Revit category will not be used			
Doors	Exterior			200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
	Interior			200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Entourage				Elements in this Revit category will not be used				Elements in this Revit category will not be used				Elements in this Revit category will not be used				Elements in this Revit category will not be used			
Floors	Non-Finish			200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
	Finish			200	A	ARCH		200	B	ARCH		200	B	ARCH		300	B	ARCH	
Furniture	Fixed			200	A	ID		200	B	ID		200	B	ID		300	B	ID	
	Movable			200	A	ID		200	B	ID		200	B	ID		300	B	ID	
Furniture Systems				200	A	ID		200	B	ID		200	B	ID		300	B	ID	
Generic Models				Elements in this Revit category will not be used				Elements in this Revit category will not be used				Elements in this Revit category will not be used				Elements in this Revit category will not be used			
Mass				Elements in this Revit category will not be used				Elements in this Revit category will not be used				Elements in this Revit category will not be used				Elements in this Revit category will not be used			

Templates

ISSUES

- Creating templates ensures all your standard modeling content is in one place
- But, your consultants refuse to use your templates because they have their own

RECOMMENDATIONS

- Consider creating a “warehouse” or “showcase” model with all your standard content
- Your consultants can easily import that content into their templates

Model Checking / QC

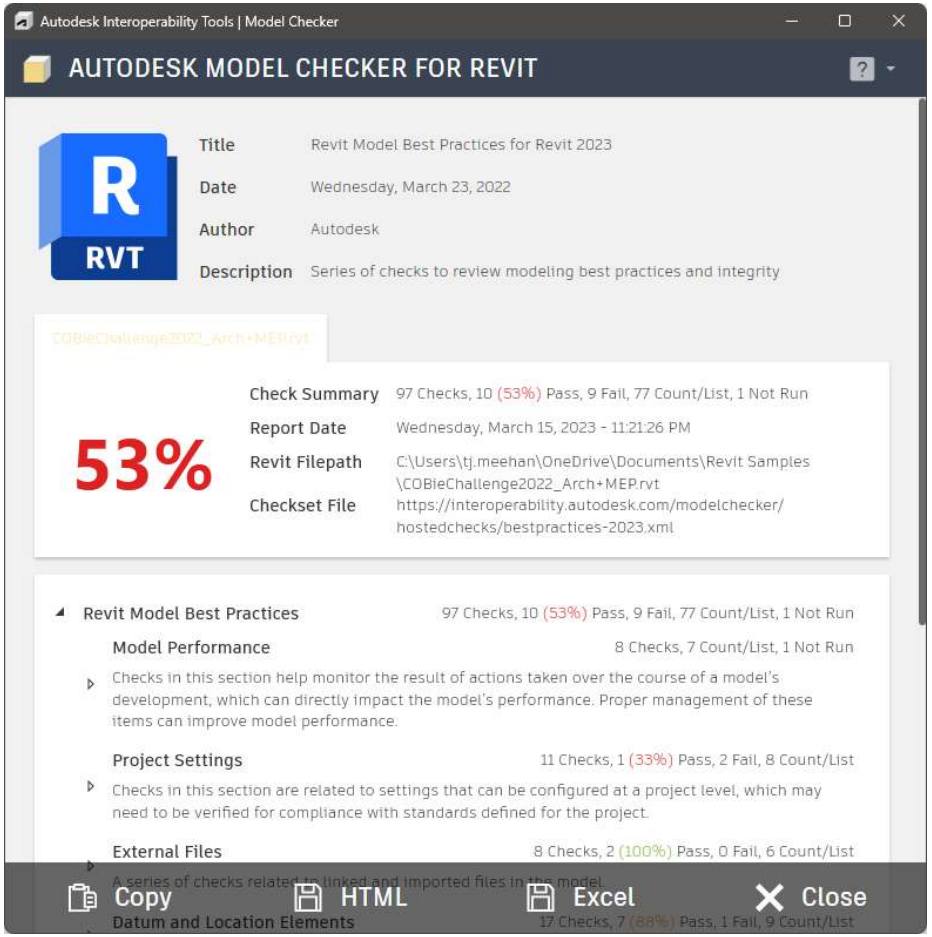
ISSUES

- It can be difficult and time-consuming to check that the model deliverables from your consultants are meeting your requirements

RECOMMENDATIONS

- Create a custom checkset for the Autodesk Model Checker for Revit
- Have your consultants run it and deliver the generated report with their models
- Your team can run it as a spot check
- The Model Checker has a cloud-based version called the Autodesk Validation Tool (AVT) that can run without Revit on any number of files

Model Checking / QC



Questions?