

DIGITAL  
CONSTRUCTION  
SUMMER SCHOOL

# The BIM Interoperability Tools Opportunities in Education

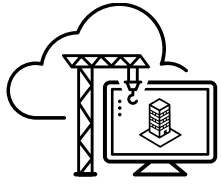




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**Charles E (Chuck) Mies,** LEED AP, Assoc AIA  
Senior Manager, Business Development  
Autodesk, Inc.



# Who is this Chuck person?

## A Little about me

- “Recovering Architect”
- 16 years at Autodesk in Technical, Sales and Business Development Roles
- 36 years in industry spread across Architecture, Construction, Facilities Management and Technology
- Involved in multiple interoperability initiatives inside and outside Autodesk
- Proud Father and Grandfather
- I Escape through Woodworking

And.....





# I am a (Amateur) Rocket Scientist





# Purpose

Over the next few minutes...

- **Interoperability Approach**

What is the value and how does Autodesk approach BIM Interoperability?

- **BIM Interoperability Tools Introduction**

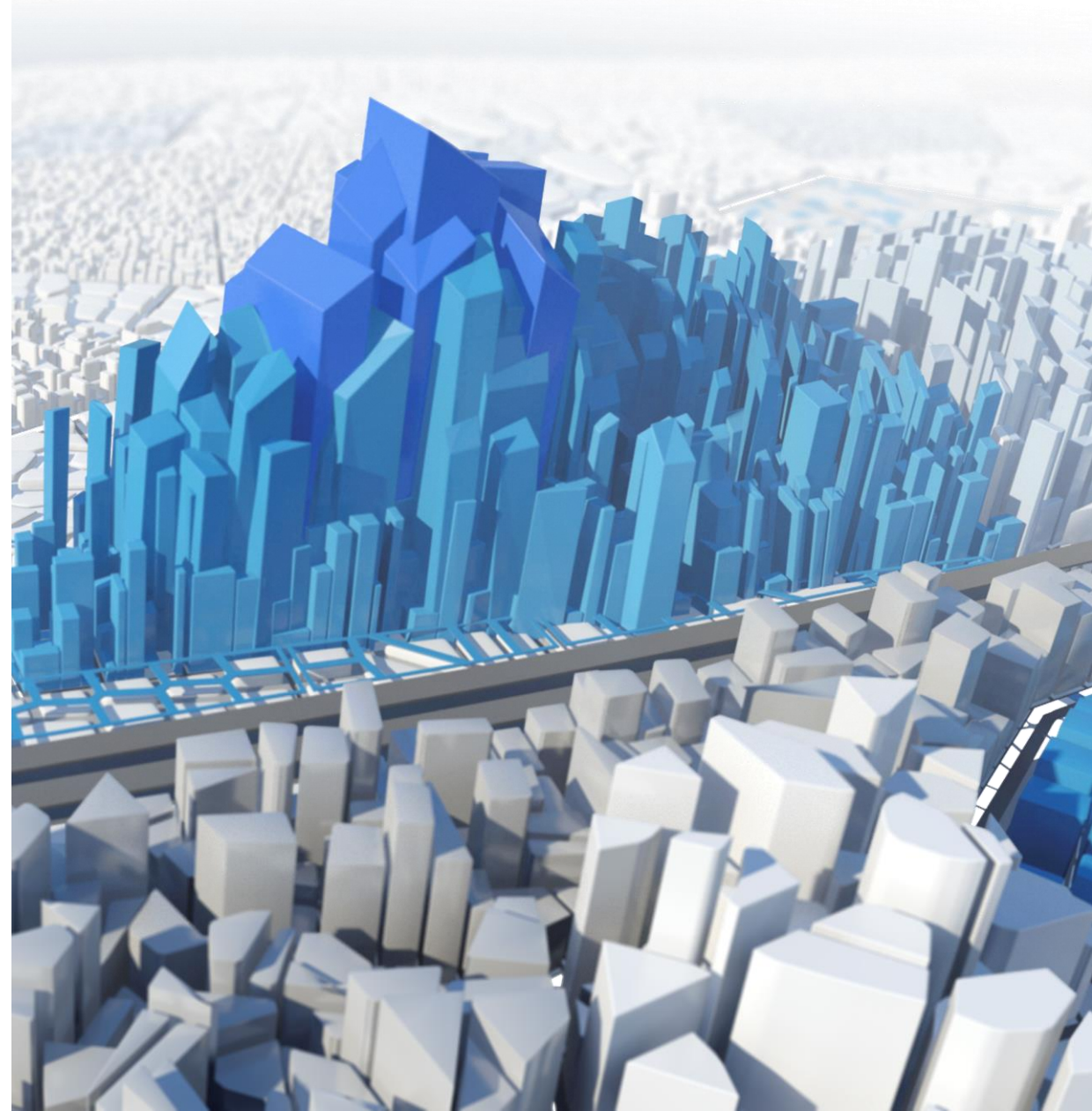
What is this set of tools, and what do they do?

- **Opportunity In Education**

How can you use these tools?

- **Questions and Answers**

Where to get the tools and where to get help?







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# Approach

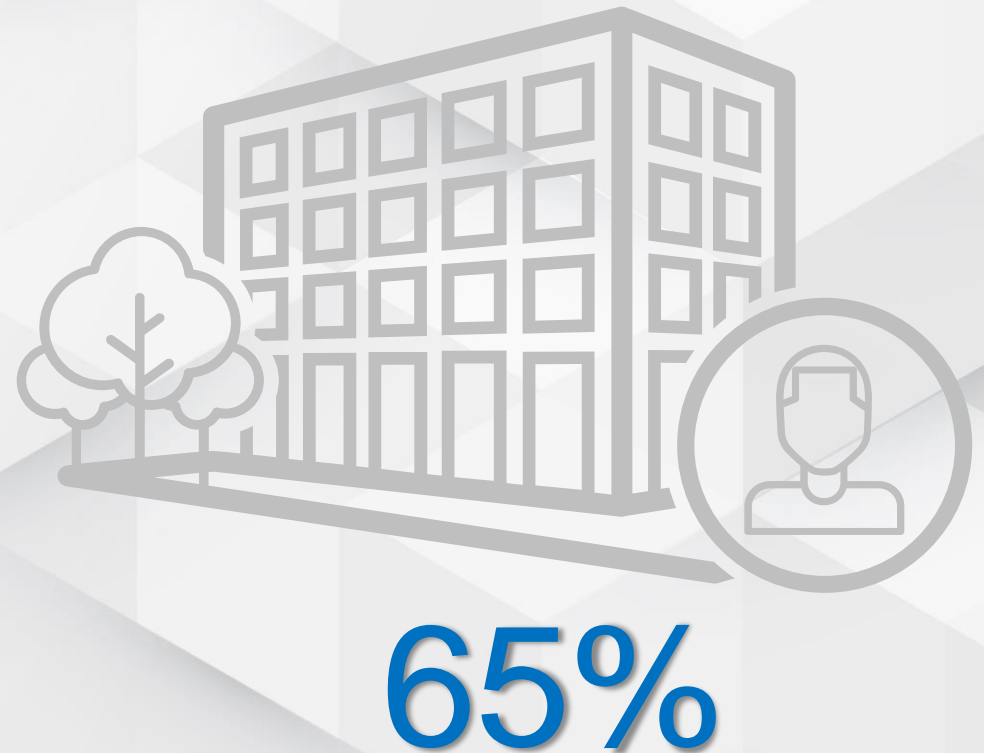




# What are the Challenges from Poor Interoperability

The cost to Owners and why Industry should be focused on solving this

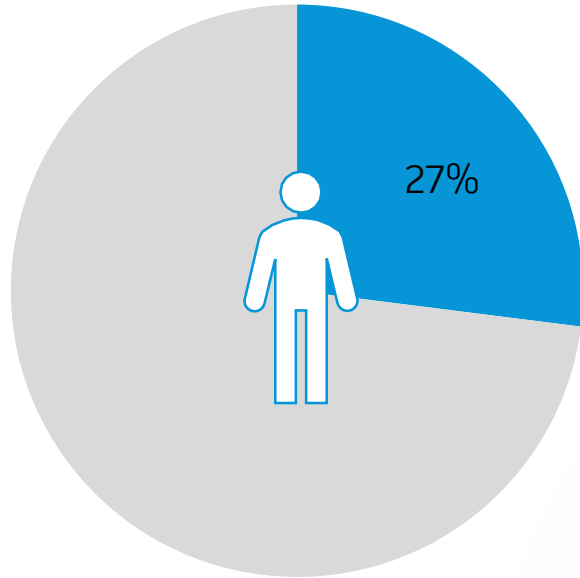
- Poor use of data, coupled with highly fragmented teams, costs the **US \$15.8B** annually on capital construction projects
- The owner's burden of that money wasted is about **65%** of those costs during ongoing operations





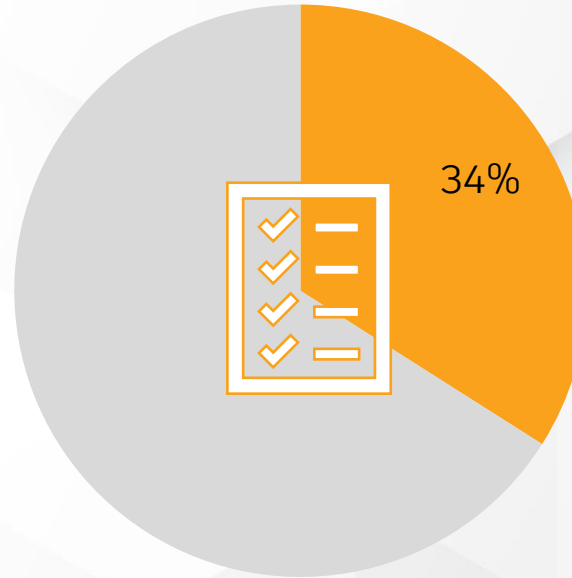
# What Value is Most Desired from Owners

Understanding the Owner's perception of value should influence education priorities



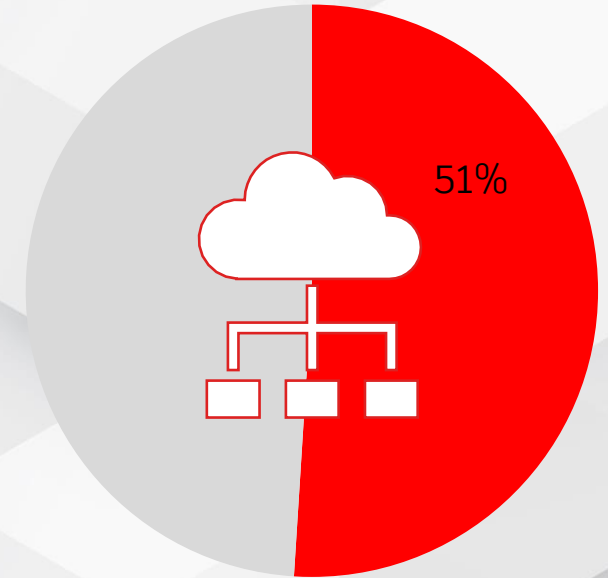
## Communication

Culture  
Knowledge Sharing  
Interoperability  
Less Silos



## Asset Mgmt

Asset Data Capture  
Accurate As-Built  
ROI / Capital Planning



## Data

Access to Data  
Better Data  
Data Ownership  
Data Integrity



# Delivering Value – The Autodesk Approach

How do we tackle BIM Interoperability to deliver this value?







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# TOOLS

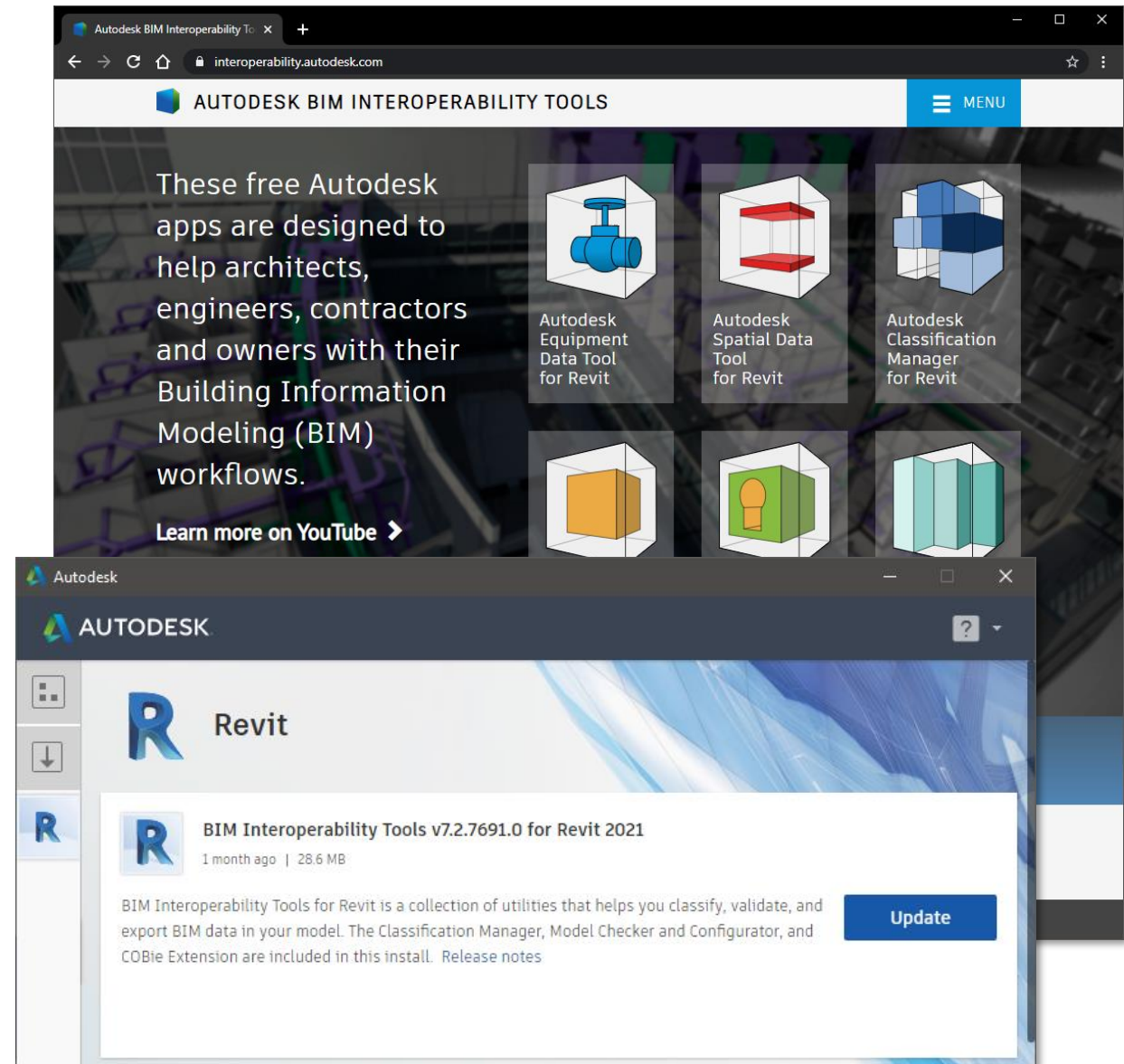




# BIM Interoperability Tools

<https://interoperability.autodesk.com>

- **Free** tools to help you with interoperability
- In development since 2011, **downloaded over 1.5 million times** worldwide
- They are included in the **Autodesk Desktop App** for all Revit installations
- You can also find them in your account on the **[manage.autodesk.com](https://manage.autodesk.com)** site
- If you have problems, let us know, we can get you the tools!



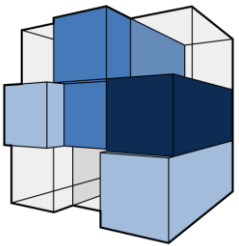


# BIM Interoperability Tools

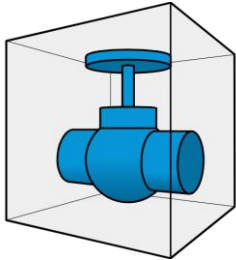
Align the Tools with Standardize, Validate, Deliver



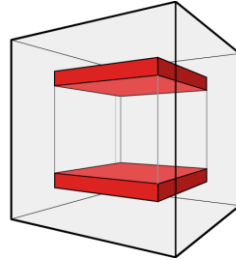
## Standardize



Autodesk  
**Classification  
Manager**  
for Revit



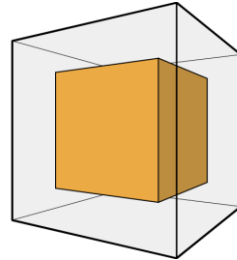
Autodesk  
**Equipment  
Data Tool**  
for Revit



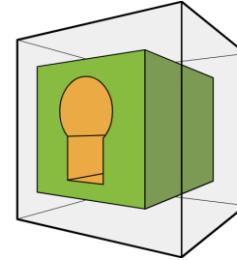
Autodesk  
**Spatial  
Data Tool**  
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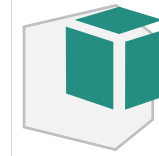
## Validate



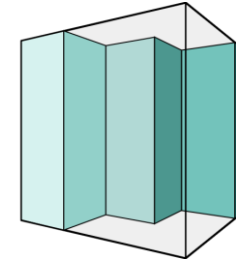
Autodesk  
**Model  
Checker**  
for Revit



Autodesk  
**Model  
Checker  
Configurator**  
for Revit



## Deliver



Autodesk  
**COBie  
Extension**  
for Revit

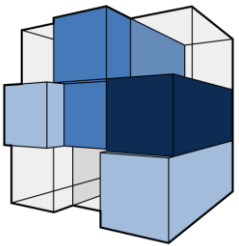


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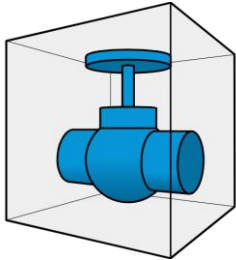
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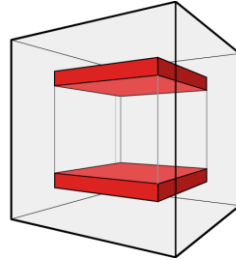
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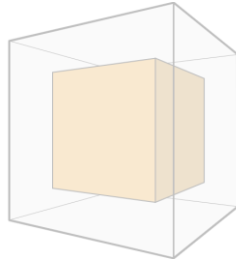
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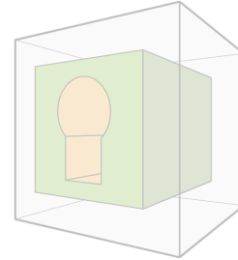
Autodesk  
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for Revit



## Validate



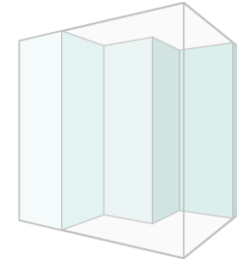
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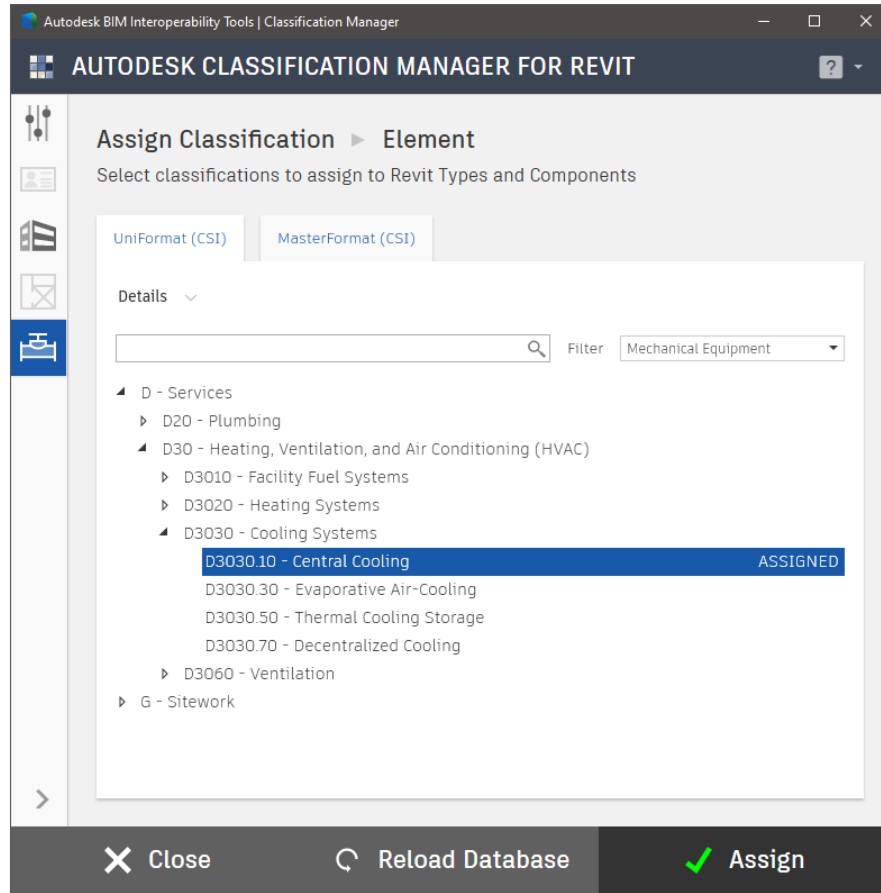
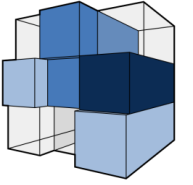
## Deliver



Autodesk  
**COBie  
Extension**  
for Revit



# Autodesk **Classification Manager** for Revit



- Build “**picklists**” of data to allow your teams to choose from a pre-built list of values when adding data to parameters on elements
- Includes **robust databases** for all the major classification systems  
UniFormat, MasterFormat, OmniClass, Uniclass, IFC, FICM
- Quickly apply data from **multiple classification systems** at once to all your elements



Standardize



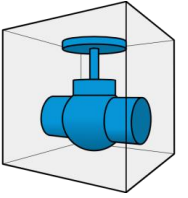
Validate



Deliver



# Autodesk **Equipment Data Tool** for Revit



- Easily assign **family subcategories** for your equipment
- Based on the subcategory, automatically **assign custom parameters** to your equipment families
- **Batch update** all your equipment families with your custom parameters and pre-populated values

Autodesk BIM Interoperability Tools | Equipment Data Tool

## AUTODESK EQUIPMENT DATA TOOL FOR REVIT

Configure. Step 3. Subcategory Parameter.  
Choose which parameter will be your subcategory parameter.

Choose a parameter:

- Equipment Data - Subcategory Parameter
  - GSA.AssetType.Abbreviation  
Asset Type designation used as equipment subcategory for General Services Administration (GSA)
  - GSA.AssetType.Description  
Assigns a GSA Asset Type FULL DESCRIPTION to an object that requires maintenance. Value must equal a selection provided in the custom GSA list "GSA.Type.Category". If a object is not specifically identified by the Custom GSA List, this value should use the "Unknown" designation.
- Equipment Data - Common Parameters
  - GSA.OmniClass.System.Category  
Attribute that categorizes a building system. All model objects that are physically connected to object types in "GSA.Type.Category Picklist" must be assigned to the respective System Category. Value must equal a selection from the most current OmniClass Table 21.
  - GSA.Manufacturer.e-mail  
The contact email for the manufacturer of the installed product.
  - GSA.Model.Number  
The manufacturer model number of the installed product.
  - GSA.Serial.Number  
The serial number of the installed object. Must match the value found on installed equipment nameplates. Must be in ISO Date format
  - GSA.Instance.Name  
The name of the object instance. This must be a unique value, only assigned to one object. Must match the name of the object found on design drawing schedules.
  - GSA.Labor.Warranty.Duration  
The length of the warranty period for labor repairs provided by the product manufacturer (not the contractor warranty). Left blank during planning and design. Value populated after construction

Choose how it is applied:

☒ Type  
☐ Instance

How to apply the value:

☒ Number  
☐ Description  
☐ Both

Concatenation Text:

:

Group Under:

Data

Close Back Next Finish and Close



Standardize



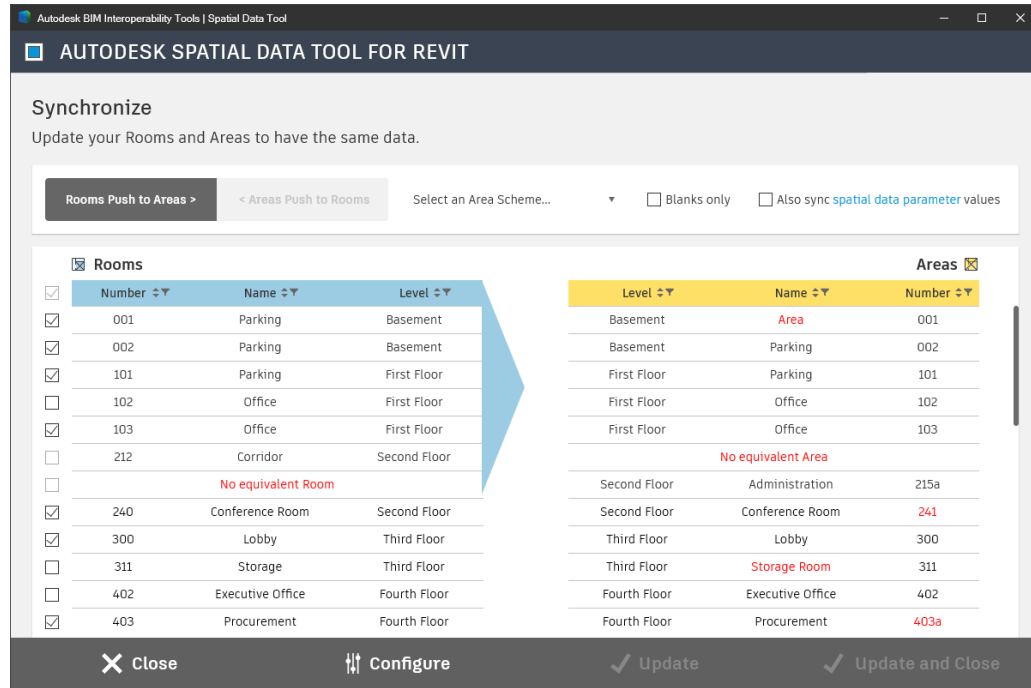
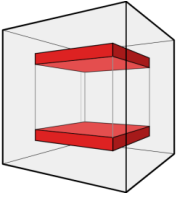
Validate



Deliver



# Autodesk **Spatial Data Tool** for Revit



- Easily attach your **custom parameters** to all Rooms and Areas in your model
- Quickly **synchronize** the Name and Number data between your Rooms and Areas
- Export your settings to import and **standardize** across all models in your projects



Standardize



Validate



Deliver

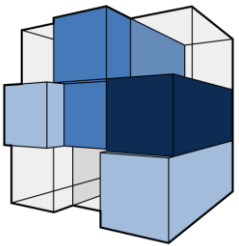


# BIM Interoperability Tools - Standardize

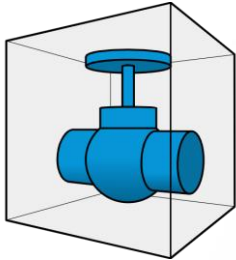
## Applications for Curriculum



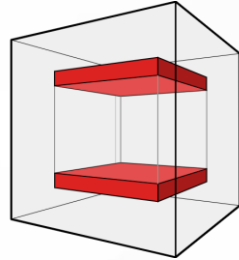
## Standardize



Autodesk  
**Classification  
Manager**  
for Revit



Autodesk  
**Equipment  
Data Tool**  
for Revit



Autodesk  
**Spatial  
Data Tool**  
for Revit

## Educational Concepts Supported

- Benefits from using classification systems in architecture, engineering and construction
- Importance in consistency of data input and how to accommodate
- Value of standardized sets of information for each object type and the role in operations

## Applicable Courses

- Fundamental Modeling Courses (All)
- Architectural Courses (Classification, Spatial)
- Engineering courses (Classification, Equipment)
- Construction Management Courses (Classification, Equipment)
- Construction Estimating Courses (Classification)
- Facilities Management Courses (All)

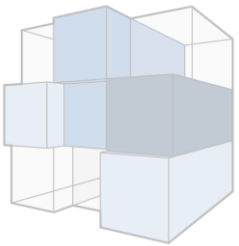


# BIM Interoperability Tools

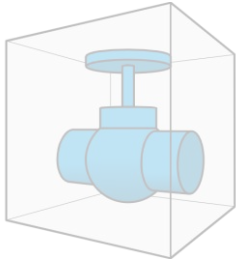
Align the Tools with Standardize, Validate, Deliver



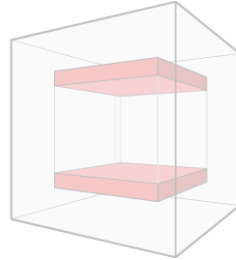
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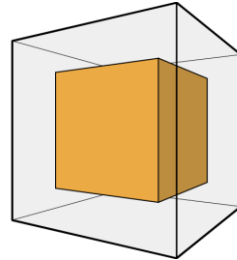
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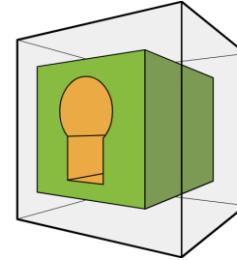
Autodesk  
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## Validate



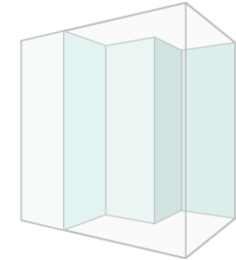
Autodesk  
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Autodesk  
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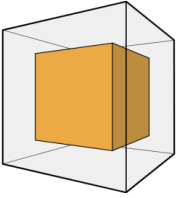
## Deliver



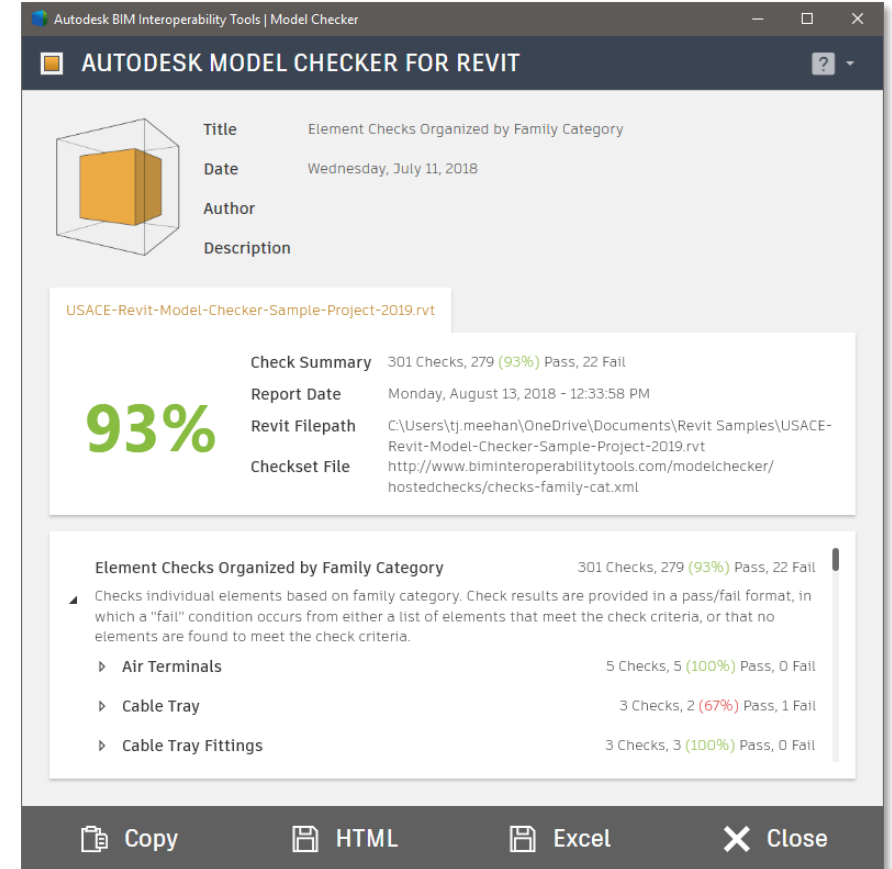
Autodesk  
**COBie  
Extension**  
for Revit



# Autodesk **Model Checker** for Revit



- Automatically **check your Revit models** against a set of pre-determined data standards
- Reports can be read directly or from a **Dashboard**
- Dozens of **pre-built** and tested checksets are already included for you to use or customize (Revit modeling best practices, general model health, standard and informational checks, COBie)
- Easily **create your own** custom checksets with the Configurator
- Includes **automation** and **scheduling**



Standardize . . .



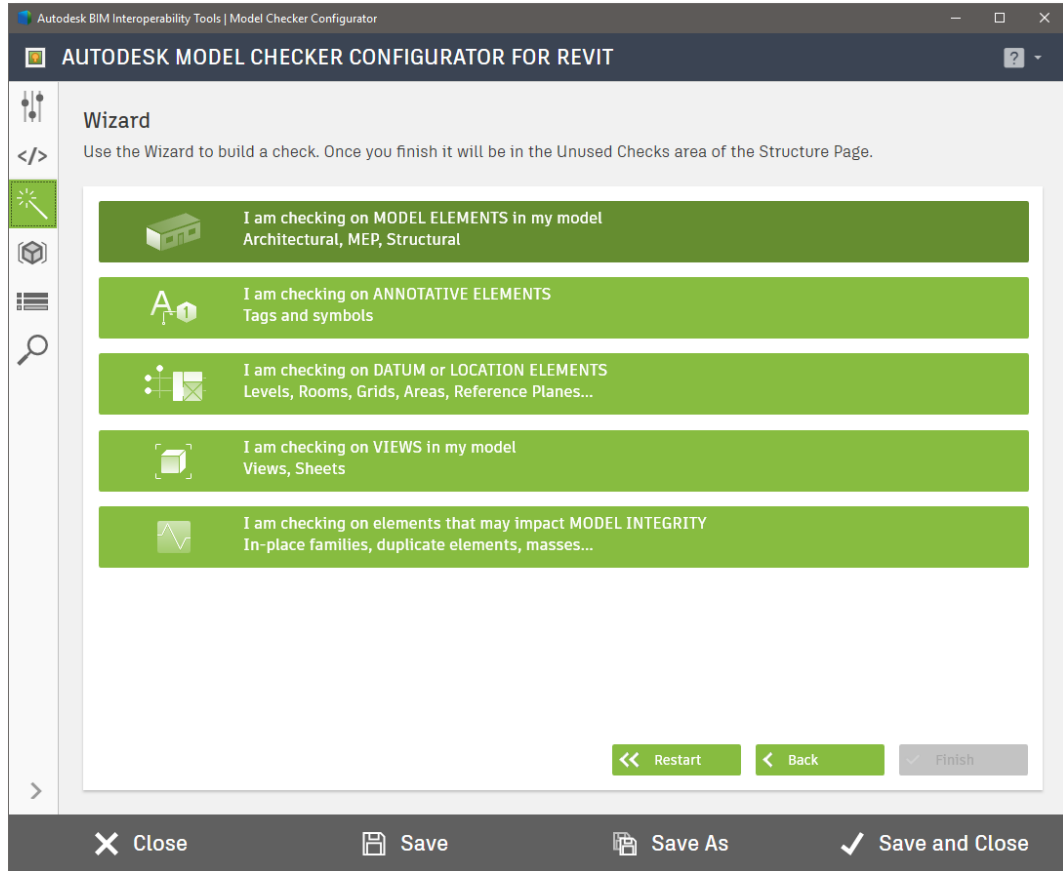
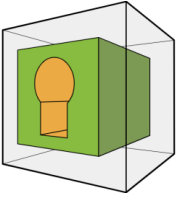
Validate . . .



Deliver



# Autodesk Model Checker Configurator



- **Create your own** checkset files for the Autodesk Model Checker for Revit
- 3 different **methods** to build your checks (Pre-built, Wizard, Advanced)
- Ships with dozens of **sample checkset** files to use as a starting point
- Checkset files are **open-source** XML format



Standardize . . .



Validate . . .



Deliver

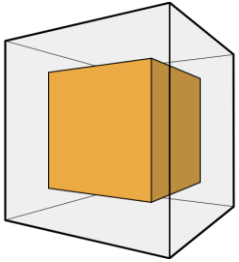


# BIM Interoperability Tools - Validate

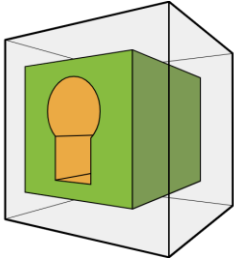
## Applications for Curriculum



## Validate



Autodesk  
**Model  
Checker**  
for Revit



Autodesk  
**Model  
Checker  
Configurator**  
for Revit

## Educational Concepts Supported

- The use of tools for model validation and correction
- Importance of modeling best practices
- How to measure and track model health to identify trends and correct
- How to easily identify and the correct model errors

## Applicable Courses

- Fundamental Modeling Courses (All)
- Architectural Courses (All)
- Engineering Courses (All)
- Construction Management Courses (All)
- Construction Estimating Courses (All)
- Facilities Management Courses (All)

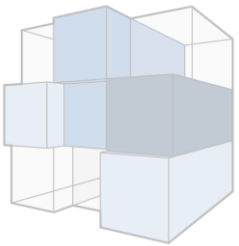


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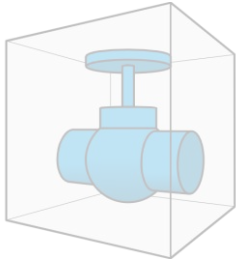
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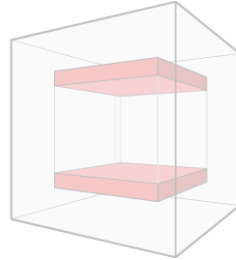
## Standardize



Autodesk  
**Classification  
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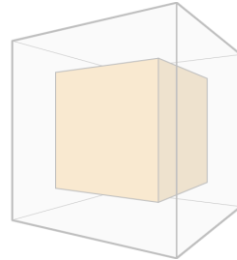
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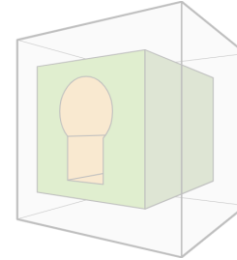
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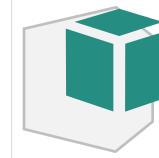
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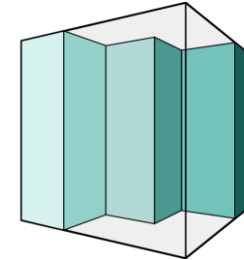
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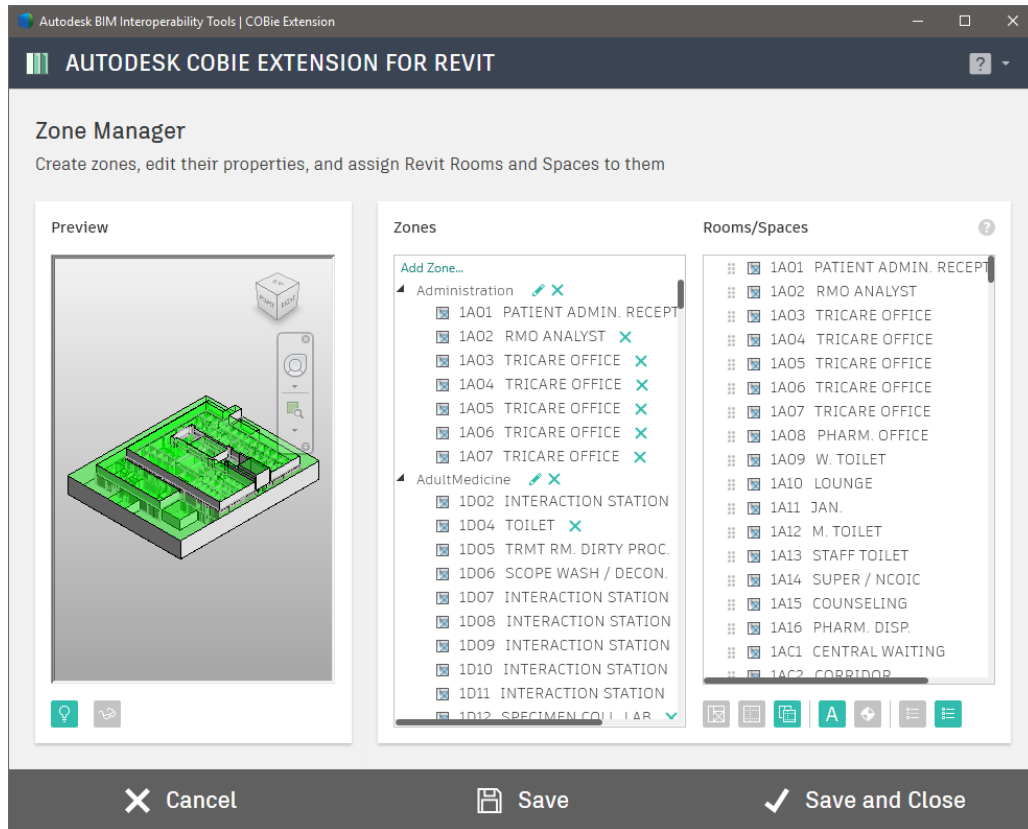
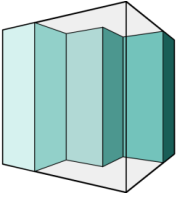
## Deliver



Autodesk  
**COBie  
Extension**  
for Revit



# Autodesk COBie Extension for Revit



- Setup your Revit models to **capture and manage** COBie data
- **Export** that data to a COBie compliant spreadsheet
- Includes features like a **Zone Manager** and customer **parameter mapping**
- **Integrated** with the Classification Manager



Standardize



Validate

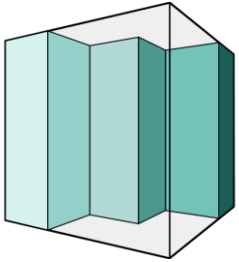


Deliver



# BIM Interoperability Tools - Deliver

## Applications for Curriculum



Autodesk  
**COBie**  
**Extension**  
for Revit

## Educational Concepts Supported

- The role of standards in data handover
- The importance of structured formats in managing and collecting attributes
- The opportunity for cost-savings in FM handover information

## Applicable Courses

- Construction Management Courses
- Courses / Workshops Specific To COBie





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# Example Opportunity Model Checker / Configurator





# Revit Best Practices

96 checks to review modeling best practices and integrity (for Revit 2019 - 2022)



## Model Performance

- How many warnings and purgeable elements?
- What are the largest families?
- How many links, raster images, and imported CAD files?



## Rooms, Spaces, Areas

- How many of each?
- Are any unplaced, unenclosed, or redundant?
- Do they all have unique numbers?



## Views

- How many Views, Schedules, Sheets, Scope Boxes?
- What Views don't have a template assigned?
- What Views have hidden elements?



## Elements

- Any on the wrong worksets?
- Any duplicates?
- What Generic Models and in-place families exist?
- How many of each category?
- How many total?

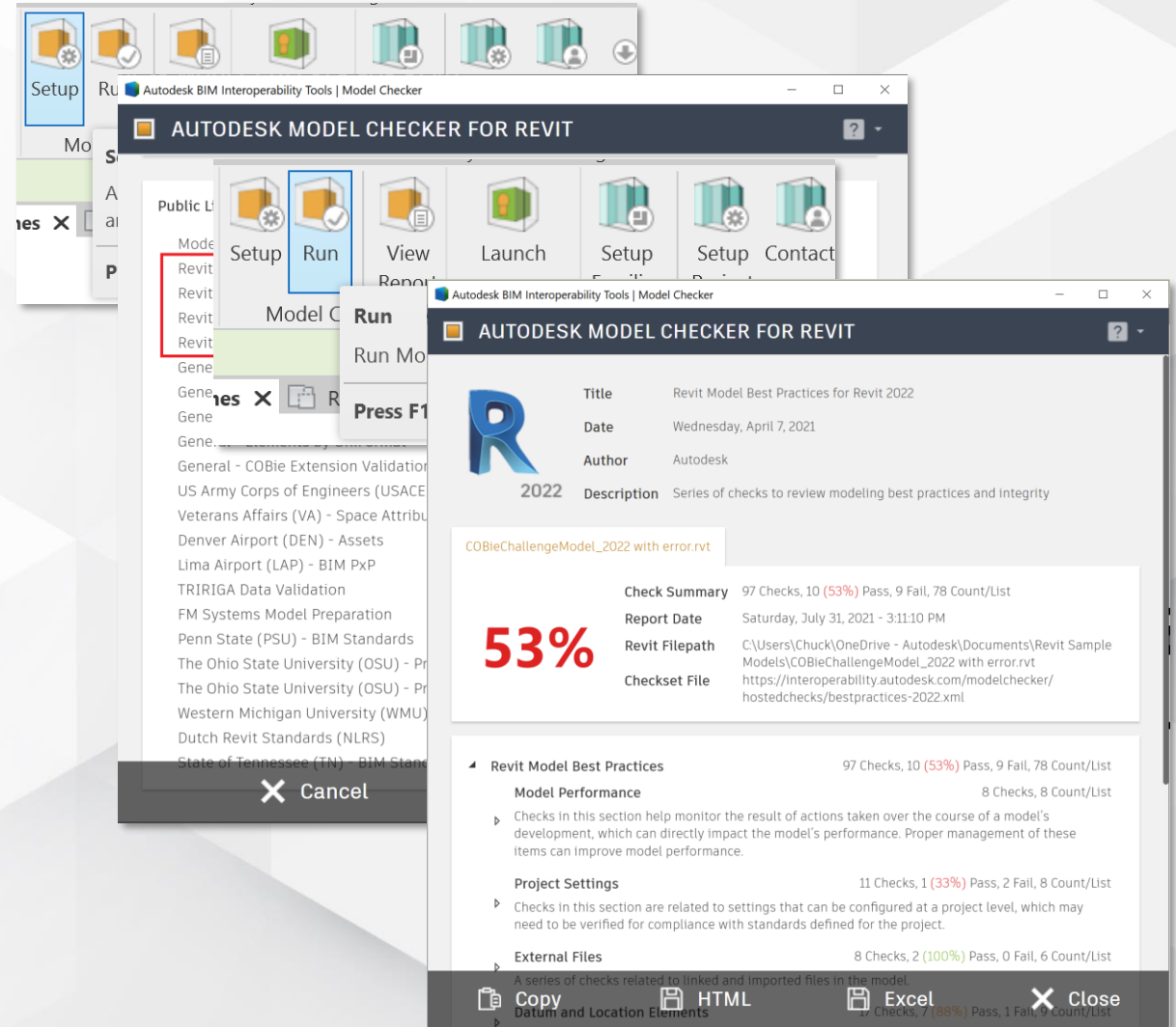


# Revit Best Practices

## Quickly Check a Model Against Accepted Practices

### Simple Process for Model Checking

- Install the BIM Interoperability Tools
- From the BIM Interoperability Tools ribbon menu, select “Setup” under the Model Checker
- From the publicly available checks, select “Revit Best Practices” for the version of Revit that you are using
- Select “Save and Close”
- Back to the Ribbon, Select “Run” and then “Run Report”
- When Completed, The Report will be Displayed





# Model Health Dashboard Sample



23 Trackable, quantifiable checks for model health review used in Power BI Dashboard



## Model Performance

- How many warnings?
- How many purgeable elements?
- How many duplicate elements?
- What is the file size?



## Links and Imports

- What are the linked Revit and CAD files?
- What are the imported CAD files?
- What other imports exist (SKP and raster images)?



## Views

- How many Views?
- How many Sheets?
- What Views are not on Sheets?
- What Views have hidden elements?



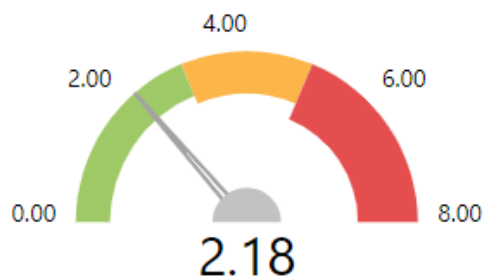
## Elements

- How many Model and Detail Groups?
- How many In-Place Families?
- What is the total number of elements?

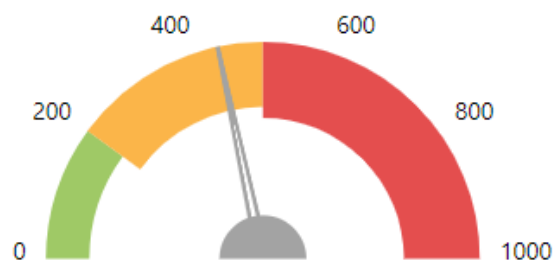


Project X  
Model Health Latest Dashboard

Warnings Per MB

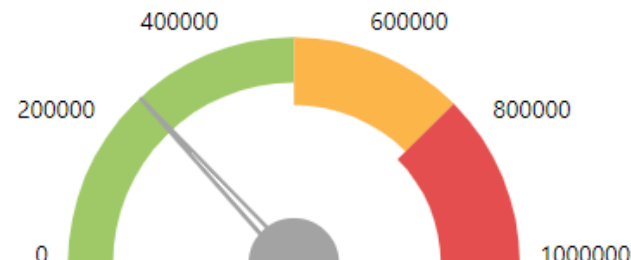


! **944**  
Total Warnings

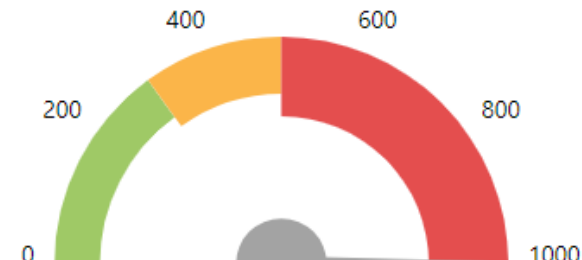


🗄️ **433**  
File Size in MB

Last run report  
Monday, June 24, 2019



🧩 **262K**  
Total Elements



🗑️ **1693**  
Purgable Elements

📈 Elements Performance

**511**

Model Groups

**12K**

Detail Groups

**555**

In-Place Families

**173**

Duplicates

🔄 Imports

**101**

CAD Imports

**0**

SKP Imports

**1482**

Custom Obj Styles

**95**

Raster Images

👁️ Views

**2493**

Total Views

**1871**

w/Hidden Elements

**722**

Not On Sheets

**318**

Sheets

🔗 Links

**15**

Revit Links

**19**

CAD Links

📋 Worksets and Options

**13**

Worksets

**10**

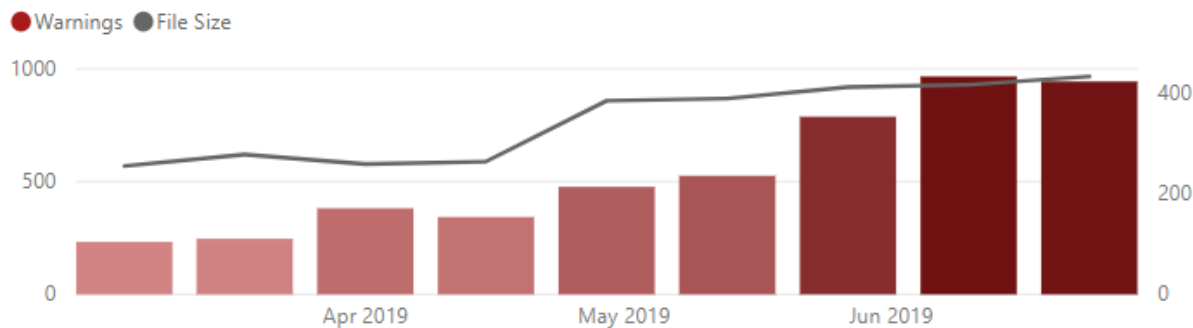
Options



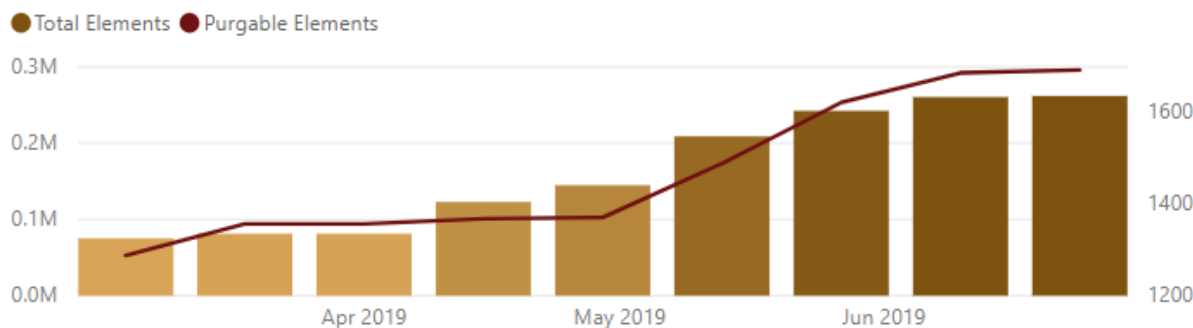
# Project X

## Model Health Trend Dashboard

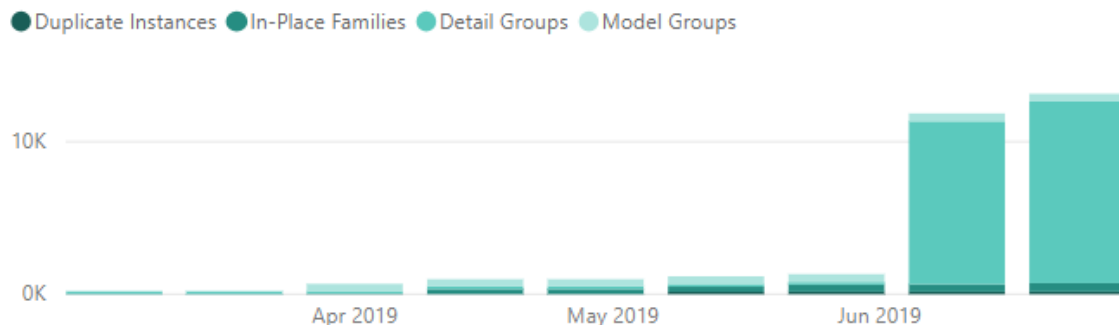
### Warnings and File Size by Report Date



### Total Elements and Purgable Elements by Report Date



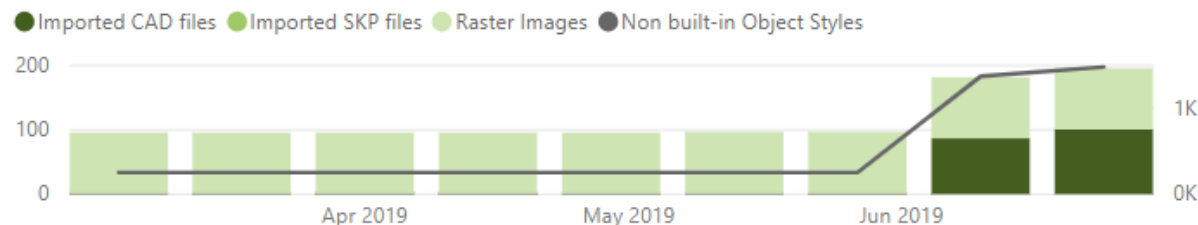
### Duplicate Instances, In-Place Families, Detail Groups and Model Groups by Report Date



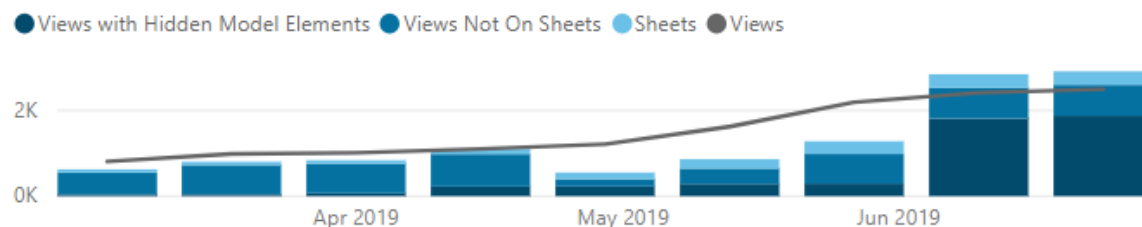
## Last run report

### Monday, June 24, 2019

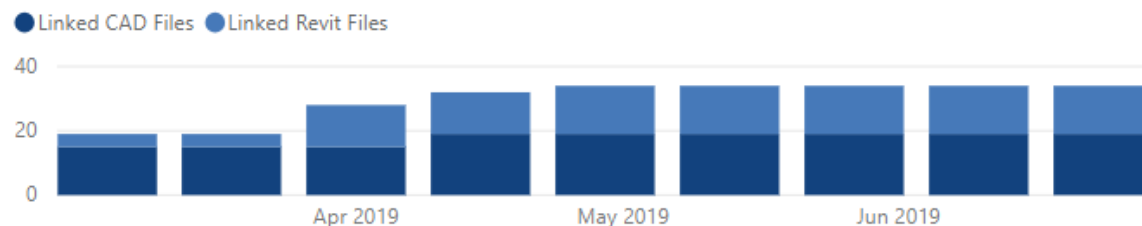
### Imported CAD files, Imported SKP files, Raster Images and Non built-in Object Styles by Report Date



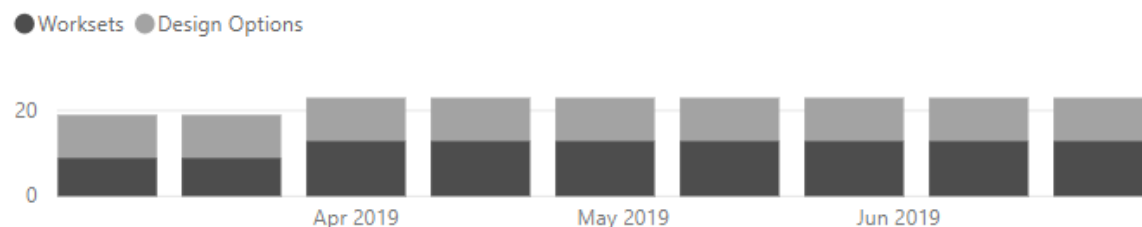
### Views with Hidden Model Elements, Views Not On Sheets, Sheets and Views by Report Date



### Linked CAD Files and Linked Revit Files by Report Date



### Worksets and Design Options by Report Date





# Model Health Dashboard

## Detailed Help Available for Setting Up the Tool

### Model Health Dashboard

Use the Model Checker to export consistent formatted data to track your model's health in a data visualization application.

#### Single Revit Project Tracking



Download a sample Health Dashboard Model Checker checkset XML, a Microsoft PowerBI template, and instructions. This sample will track a single Revit project over time



Watch a video with detailed instructions on implementing the sample dashboard. This sample will track a single Revit project over time

#### Multiple Revit Project Tracking



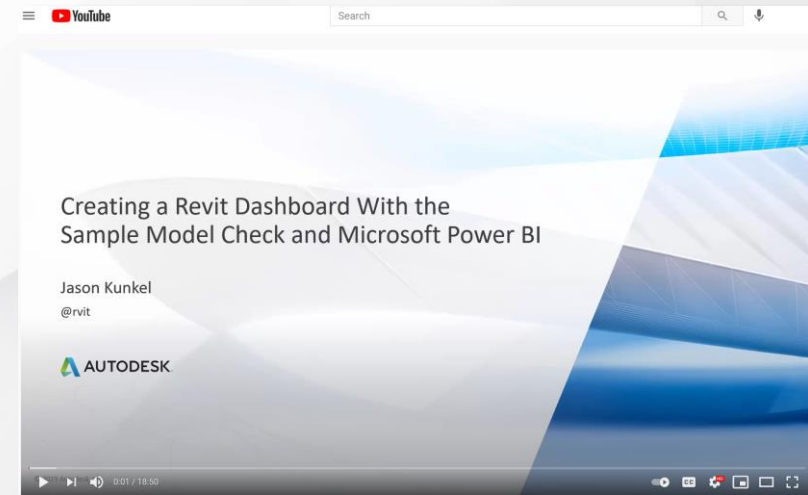
Download a sample Health Dashboard Model Checker checkset XML, a Microsoft PowerBI template, and instructions. This sample will track multiple Revit projects over time



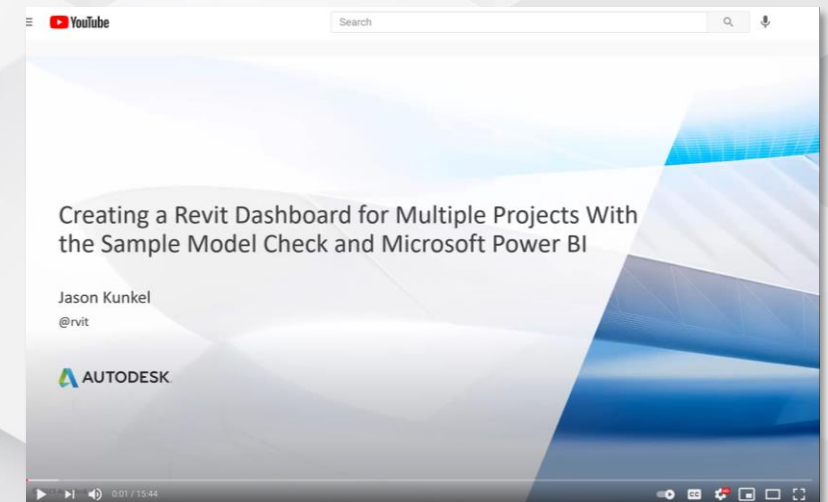
Watch a video with detailed instructions on implementing the sample dashboard. This sample will track multiple Revit projects over time



<https://interoperability.autodesk.com/modelchecker.php>



[https://youtu.be/\\_DBky01uRq4](https://youtu.be/_DBky01uRq4)



[https://youtu.be/nUS\\_hE0Dn5E](https://youtu.be/nUS_hE0Dn5E)





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# IN SUMMARY





# In Summary

Some thoughts on the tools in an educational context

- 1 Model Checker**
  - Use the Revit best practices checks to ensure that your students are modeling consistent with Autodesk guides
- 2 Model Checker**
  - Use the model health check and Power BI dashboard templates to understand your class' model development from a dashboard
- 3 Model Checker Configurator**
  - Develop checks that can help the students understand the importance of data and attribution
- 4 Classification Manager**
  - Teach the students to use the Classification Manager to generate picklists for all common labeling and classification tasks
- 5 Equipment Data Tool**
  - Learn the role of the Equipment Data Tool in some of the most requested industry trends such as Digital Twins
- 6 Take Advantage of In-Revit Workflows**
  - Because the tools run inside of Revit, they create an iterative process. Check It, Correct It!





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# LEARN MORE





# Start with the Tools Website

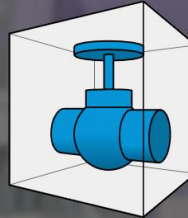
<https://interoperability.autodesk.com/>

 AUTODESK BIM INTEROPERABILITY TOOLS

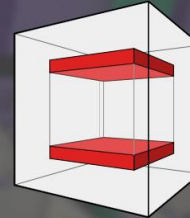
≡ MENU

These free Autodesk apps are designed to help architects, engineers, contractors and owners with their Building Information Modeling (BIM) workflows.

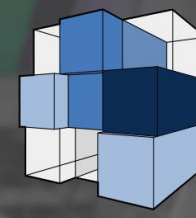
Learn more on YouTube ➤



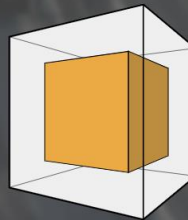
Autodesk  
Equipment Data  
Tool for Revit



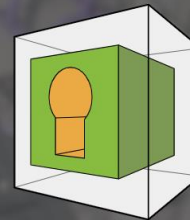
Autodesk  
Spatial Data Tool  
for Revit



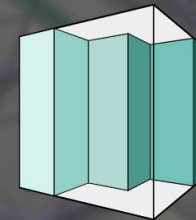
Autodesk  
Classification  
Manager for Revit



Autodesk  
Model Checker  
for Revit



Autodesk  
Model Checker  
Configurator



Autodesk  
COBie Extension  
for Revit

Autodesk is currently reevaluating our support of the Enhanced DWG Editor and the COBie Extension for NavisWorks plugins. During the evaluation period, we have removed the tools from the download site. Please contact [BIMInteroperability@autodesk.com](mailto:BIMInteroperability@autodesk.com) for questions or if you need access to either tool.



# Explore the YouTube Site

https://www.youtube.com/biminteroperabilitytools

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Autodesk COBie Extension for Revit

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VIEW FULL PLAYLIST





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# QUESTIONS







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