

Putting the QA/QC into BIM

Brendan Dillon

Digital Facilities & infrastructure Program Manager

Denver International Airport



Chris Pittman

Project Architect/BIM Manager
Jacobs
Chris.Pittman@jacobs.com

Eddy Krygiel

Major Projects Development Executive
Autodesk
Eddy.Krygiel@Autodesk.com

Brendan Dillon

Digital Facilities & Infrastructure
Program Manager
Denver International Airport
Brendan.Dillon@flydenver.com

Mark Hughes

Sr. BIM Program Manager, Global
Aviation Business Line
AECOM
Mark.Hughes3@aecom.com

Class Summary

Putting the QA/QC Into BIM

BIM (Building Information Modeling) is becoming more prevalent as a deliverable required by large owners. Owners are asking for more robust models and the inclusion of data capture for operations and maintenance. At the same time, the number of models it takes to create a project continues to grow. This puts BIM managers in the precarious situation of needing to support existing projects while trying to create workflows to manage a growing list of digital deliverables. In this session, we will explore industry trends and project examples that include BIM deliverables mandated by owners. We will hear from owners about what they are looking for in BIM deliverables, and why. Finally, we'll explore ways to use Dynamo and Revit software's free model-checking tools to create automated workflows for model checking for the best BIM deliverables.

LEARNING OBJECTIVES

LEARNING OBJECTIVE 1

Discover BIM deliverables and deliverable trends on large projects

LEARNING OBJECTIVE 2

Learn multiple ways to create a QA/QC plan for BIM models

LEARNING OBJECTIVE 3

Get acquainted with multiple tools to help automate review of BIM deliverables

LEARNING OBJECTIVE 4

Learn how to develop your own BIM QA/QC plan for your organization, from designers to owners

Emerging Deliverable Requirements & Standards



VALUE OF STANDARDS

LIVE LIFE. TRAVEL WELL.
Design Standards Manual

BIM

Denver International Airport
Airport Infrastructure Management

2017



2018

BIMFORUM

LEVEL OF DEVELOPMENT(LOD)
SPECIFICATION PART I & COMMENTARY
For Building Information Models and Data

September 2018

Milestones/Deliverables

| Model Elements | SD | DD | CD | Constr. Coord. | Fabrication |
|----------------|--------|--------|--------|----------------|-------------|
| 1 | High | Medium | Low | Medium | High |
| 2 | Medium | Medium | Medium | Medium | Medium |
| 3 | Low | Low | Low | Low | Low |
| 4 | Medium | Medium | Medium | Medium | Medium |
| 5 | High | High | High | High | High |

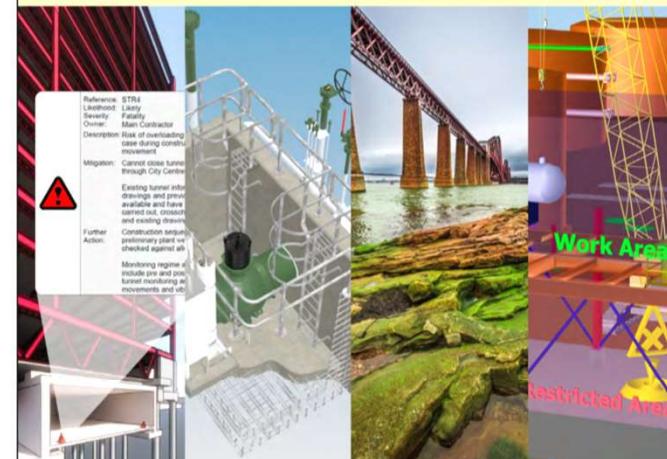
Building Systems

PARTICIPATING ORGANIZATIONS

Copyright © 2017 BIM Forum

PAS 1192-6:2018

Specification for collaborative sharing
and use of structured Health and Safety
information using BIM



COSTAIN

bsi.

| Attachment 2 - BIM Matrix: (Model Progression Specification) | | | | | | | | | |
|---|---------------------------|-----------------------------|--|---|-----------|--------------------------------------|-----------|------------|---------------------|
| Name: | xxxxx | | | | LOD | Level of Development | | | |
| Date: | xxxxxx | | | | MEA | Model Element Author | | | |
| ASTM UNIFORMAT II Classification of Building Elements (E1557-97) | | | | | | DESIGN MODEL LEVEL OF DEVELOPMENT | | | |
| Level 1 Group Elements | Level 2 Group Elements | Level 3 Individual Elements | | Level 4 Sub-Elements | 30% - 59% | 60% - 89% | 90% - 99% | 100% - IFC | Record Design Model |
| Structure | A10 Foundations | A1010 Standard Foundations | | A1011 Wall Foundations | 100 | 200 | 200 | 300 | 300 |
| | | | | A1012 Column Foundations & Pile Caps | 100 | 200 | 200 | 300 | 300 |
| | | | | A1013 Perimeter Drainage & Insulation | 100 | 200 | 200 | 300 | 300 |
| | A1020 Special Fou | | | A1024 Underprinting | 100 | 200 | 200 | 300 | 300 |
| | | | | A1025 Dewatering | 100 | 200 | 200 | 300 | 300 |
| | | | | A1026 Raft Foundations | 100 | 200 | 200 | 300 | 300 |
| | | | | A1027 Pressure Injected Grouting | 100 | 200 | 200 | 300 | 300 |
| | | | | A1029 Other Special Conditions | 100 | 200 | 200 | 300 | 300 |
| | A1030 Slab on Grade | | | A1031 Standard Slab on Grade | 100 | 200 | 200 | 300 | 300 |
| | | | | A1032 Structural Slab on Grade | 100 | 200 | 200 | 300 | 300 |
| | | | | A1033 Inclined Slab on Grade (Sloped Surface Grading) | 100 | 200 | 200 | 300 | 300 |
| | | | | A1034 Trenches, Pits & Bases | 100 | 200 | 200 | 300 | 300 |
| | | | | A1035 Under-Slab Drainage & Insulation | 100 | 200 | 200 | 300 | 300 |
| | A2010 Basement Excavation | | | A2011 Excavation for Basements | 100 | 200 | 200 | 300 | 300 |
| | | | | A2012 Structure Back Fill & Compaction | 100 | 200 | 200 | 300 | 300 |

Standard Lod Matrix

Image caption goes here

Attachment 2 - BIM Matrix: (Model Progression Specification)

| Project Name: | | xxxxx | | | LOD MEA | Level of Development | | Model Element Author | | | | |
|---|---------------------------|--------------------------------|---|-------------------------------|----------------|--------------------------------------|--|----------------------|-----------|-----------|------------|---------------------------|
| Date: | | xxxxxx | | | | Design Model Level of Development | | | | | | |
| ASTM UNIFORMAT II Classification of Building Elements (E1557-97) | | | | Asset Management Requirements | | | Construction Model Level of Development | | | | | |
| Level 1 Major Group Elements | Level 2 Group Elements | Level 3 Individual Elements | Level 4 Sub-Elements | In Project? | Asset (Y/N) | Cx | MEA | 30% - 59% | 60% - 89% | 90% - 99% | 100% - IFC | Record Design Model |
| | | B2030 | Exterior Doors | | | | | | | | | |
| | | | B2031 Glazed Doors & Entrances | Yes | Yes | No | | 100 | 200 | 200 | 300 | 300 |
| | | | B2032 Solid Exterior Doors | Yes | Yes | No | | 100 | 200 | 200 | 300 | 300 |
| | | | B2033 Revolving Doors | Yes | Yes | Yes | | 100 | 200 | 200 | 300 | 300 |
| | | | B2034 Overhead Doors | Yes | Yes | Yes | | 100 | 200 | 200 | 300 | 300 |
| | | | B2039 Other Doors & Entrances | Yes | Yes | Maybe | | 100 | 200 | 200 | 300 | 300 |
| | B30 Roofing | B3010 | Roof Coverings | | | | | | | | | |
| | | | B3011 Roof Finishes | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | B3012 Traffic Toppings & Paving Membranes | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | B3013 Roof Insulation & Fill | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | B3020 | Roof Openings | | | | | | | | | |
| | | | B3022 Roof Hatches | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | B3023 Gravity Roof Ventilators | Yes | Yes | No | | 100 | 200 | 200 | 300 | 300 |
| C | Interiors | C10 Interior Construction | C1010 Partitions | | | | | | | | | |
| | | | C1011 Fixed Partitions | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1012 Demountable Partitions | Yes | Yes | Yes | | 100 | 200 | 200 | 300 | 300 |
| | | | C1013 Retractable Partitions | Yes | Yes | Yes | | 100 | 200 | 200 | 300 | 300 |
| | | | C1014 Site Built Toilet Partitions | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1015 Site Built Compartments Cubicles | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1016 Interior Balustrades and Screens | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1017 Interior Windows & Storefronts | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | C1020 | Interior Doors | | | | | | | | | |
| | | | C1021 Interior Doors | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1022 Interior Door Frames | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1023 Interior Door Hardware | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1024 Interior Door Wall Opening Elements | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1025 Interior Door Sidelights & Transoms | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |
| | | | C1026 Interior Hatches & Access Doors | Yes | No | No | | 100 | 200 | 200 | 300 | 300 |

DEN Lod Matrix

Image caption goes here

Attachment 2 - BIM Matrix: (Model Progression Specification)

| | | | | | | | | LOD | | | | Level of Development | | | |
|------------------------------|------------------------|-----------------------------|--|---|--|-------------------|---------------|--------------------|-------------|-------------|-----|-------------------------------|-----------|-----------|------------|
| | | | | | | | | MEA | | | | Model Element Author | | | |
| | | | | ASTM UNIFORMAT II Classification of Building Elements (E1557-97) | | | | MODEL REQUIREMENTS | | | | ASSET MANAGEMENT REQUIREMENTS | | | |
| Level 1 Major Group Elements | Level 2 Group Elements | Level 3 Individual Elements | Level 4 Sub-Elements | Facilities Object Type | Civil Layer Name | Civil Object Type | FAA OD Tables | In Project? | Asset (Y/N) | Asset Types | Cx | 30% - 59% | 60% - 89% | 90% - 99% | 100% - IFC |
| | | | G2051 Fine Grading & Soil preparation | n/a | C-TOPO-MAJR-, C-TOPO-MINR- | AEC Surface (TIN) | N | Yes | No | | No | 100 | 200 | 200 | 300 |
| | | | G2052 Erosion Control Measures | n/a | C-STRM-EROS- | Block | Y | Yes | No | | No | 100 | 200 | 200 | 300 |
| | | | G2053 Top Soil and Planting Beds | n/a | L-PLNT-BEDS- | Polyline | Y | Yes | No | | No | 100 | 200 | 200 | 300 |
| | | | G2054 Seeding and Sodding | n/a | L-DETL-GRAS- | Polyline / Hatch | Y | Yes | No | | No | 100 | 200 | 200 | 300 |
| | | | G2055 Planting | n/a | L-PLNT-PLTS- | Block | Y | Yes | No | | No | 100 | 200 | 200 | 300 |
| | | | G2056 Planters | n/a | L-PLNT-CTNR- | Polyline | Y | Yes | No | | No | 100 | 200 | 200 | 300 |
| | | | G2057 Irrigation Systems | n/a | L-IRRIG-PIPE-, L-IRRIG-SPKL- | AEC Pipe | Y | Yes | Yes | | Yes | 100 | 200 | 200 | 300 |
| | | | G2059 Other Landscape Features | n/a | | Polyline | Y | Yes | No | | No | 100 | 200 | 200 | 300 |
| | | G3010 Water Supply | | | | | | | | | | | | | |
| | | | G3011 Potable Water Distribution and Storage | n/a | F-NATR-PIPE | AEC Pipe | Y | Yes | Yes | | Yes | 100 | 200 | 200 | 300 |
| | | | G3012 Non Potable Water Distrib. And Storage | n/a | F-NATR-PIPE | AEC Pipe | Y | Yes | Yes | | Yes | 100 | 200 | 200 | 300 |
| | | | G3013 Well Systems | n/a | C-DETL-TANK- | | Y | Yes | Yes | | Yes | 100 | 200 | 200 | 300 |
| | | | G3014 Fire Protection Distribution and Storage | n/a | F-WATR-CONN-, F-WATR-PUMP-, F-WATR-RYDR- | | Y | Yes | Yes | | Yes | 100 | 200 | 200 | 300 |
| | | G3020 | | | | | | | | | | | | | |

DEN LoD Matrix v.2019

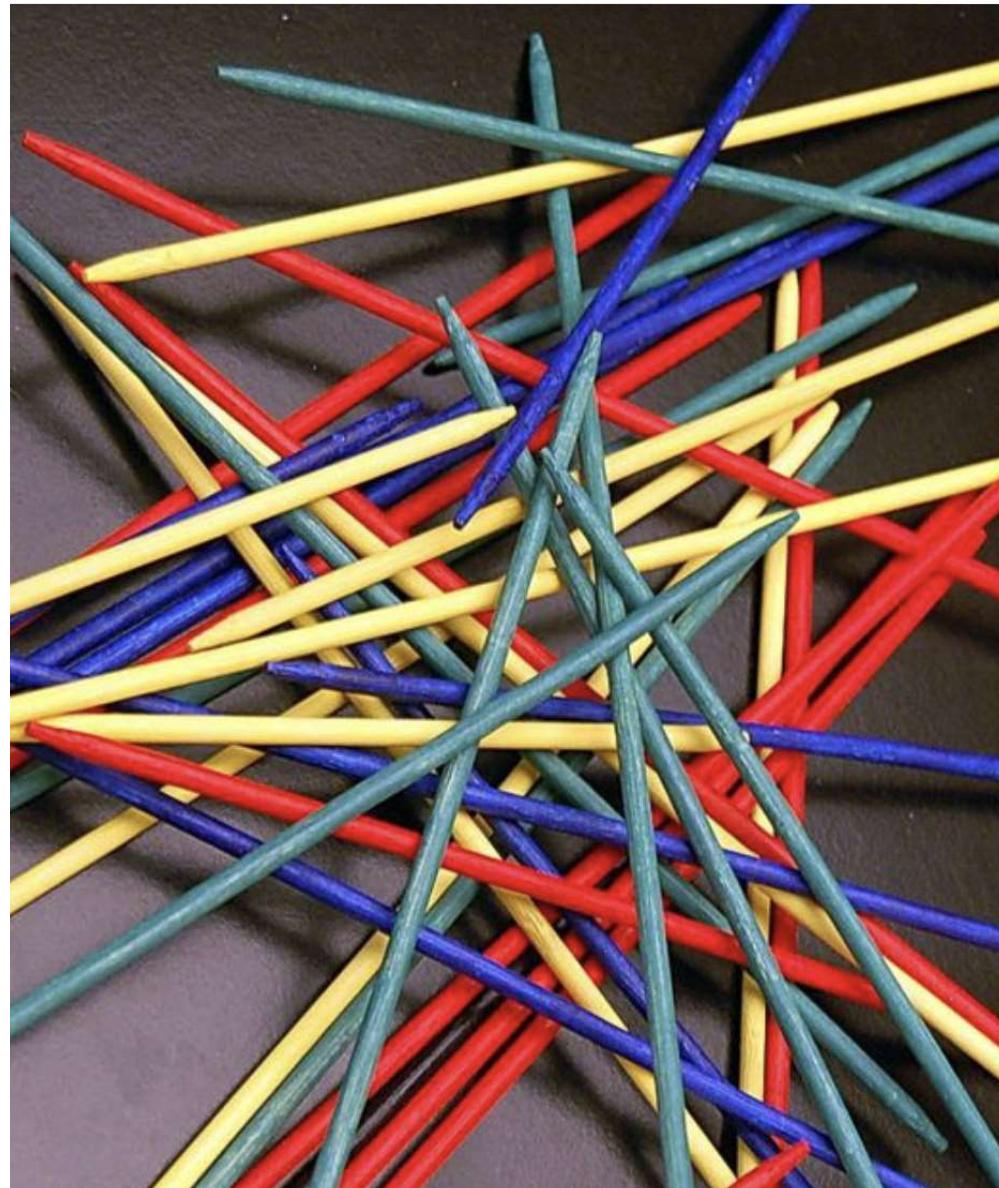
| | | | | MODEL REQUIREMENTS | | | | ASSET MANAGEMENT REQUIREMENTS | | | | | | | |
|-------|---------------------------------|--|------------------------------|------------------------|----------------------------|-------------------|---------------|-------------------------------|-------------|-------------|-----|-----|-----|-----|-----|
| | | | | Facilities Object Type | Civil Layer Name | Civil Object Type | FAA OD Tables | In Project? | Asset (Y/N) | Asset Types | Cx | | | | |
| G2051 | Fine Grading & Soil preparation | | | n/a | C-TOPO-MAJR-, C-TOPO-MINR- | AEC Surface (TIN) | N | Yes | No | | No | | | | |
| G2052 | Erosion Control Measures | | | n/a | C-STRM-EROS- | Block | Y | Yes | No | | No | | | | |
| G2053 | Top Soil and Planting Beds | | | n/a | L-PLNT-BEDS- | Polyline | Y | Yes | No | | No | | | | |
| G2054 | Seeding and Sodding | | | n/a | L-DETL-GRAS- | Polyline / Hatch | Y | Yes | No | | No | | | | |
| G2055 | Planting | | | n/a | L-PLNT-PLTS- | Block | Y | Yes | No | | No | | | | |
| G2056 | Planters | | | n/a | L-PLNT-CTNR- | Polyline | Y | Yes | No | | No | | | | |
| | | | G3054 Cooling Towers on Site | n/a | M-HTCW-CHLP- | | Y | Yes | Yes | | Yes | 100 | 200 | 200 | 300 |
| | | | G3060 Fuel Distribution | n/a | C-FUEL-MAIN-, C-FUEL-SERV- | AEC Pipe | Y | Yes | No | | No | 100 | 200 | 200 | 300 |
| | | | G3061 Fuel Piping | n/a | | | Y | Yes | Yes | | Yes | 100 | 200 | 200 | 300 |

Developing a QA/QC Plan



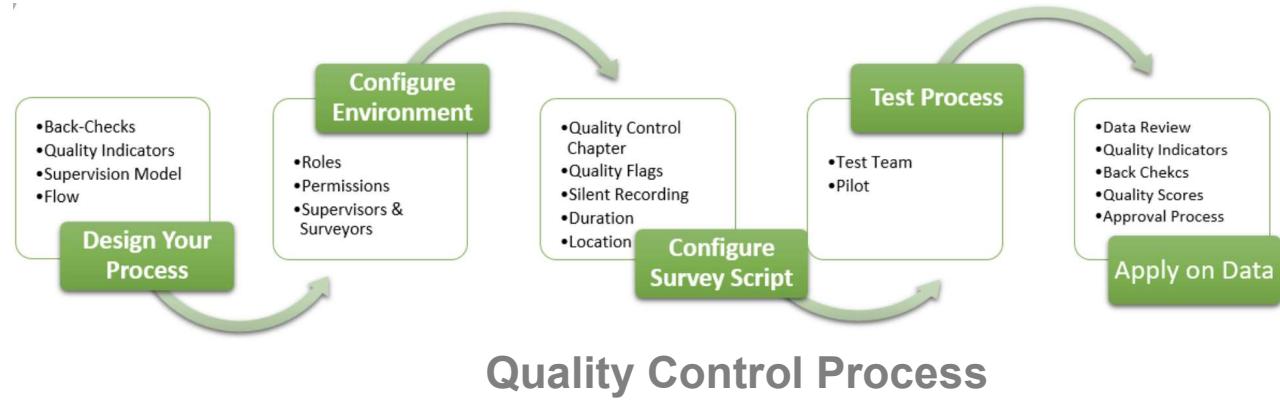
BIM and QA/QC

- Where are my plans?
- In the last two years alone 90 percent of the data in the world was generated.
- Research from IDC shows that **90%** of the data produced is unstructured



Objective Measures

- Creating the plan
- Know the difference between QC and QA.
 - If you don't have QC, you can't measure QA.
- BXP, BPXP, EIR, Design Standards, Specifications
- Recognize that quantity can be a measure of quality
- Time is also a measure of Quality
- Model Quality is not a measure of Design Intent



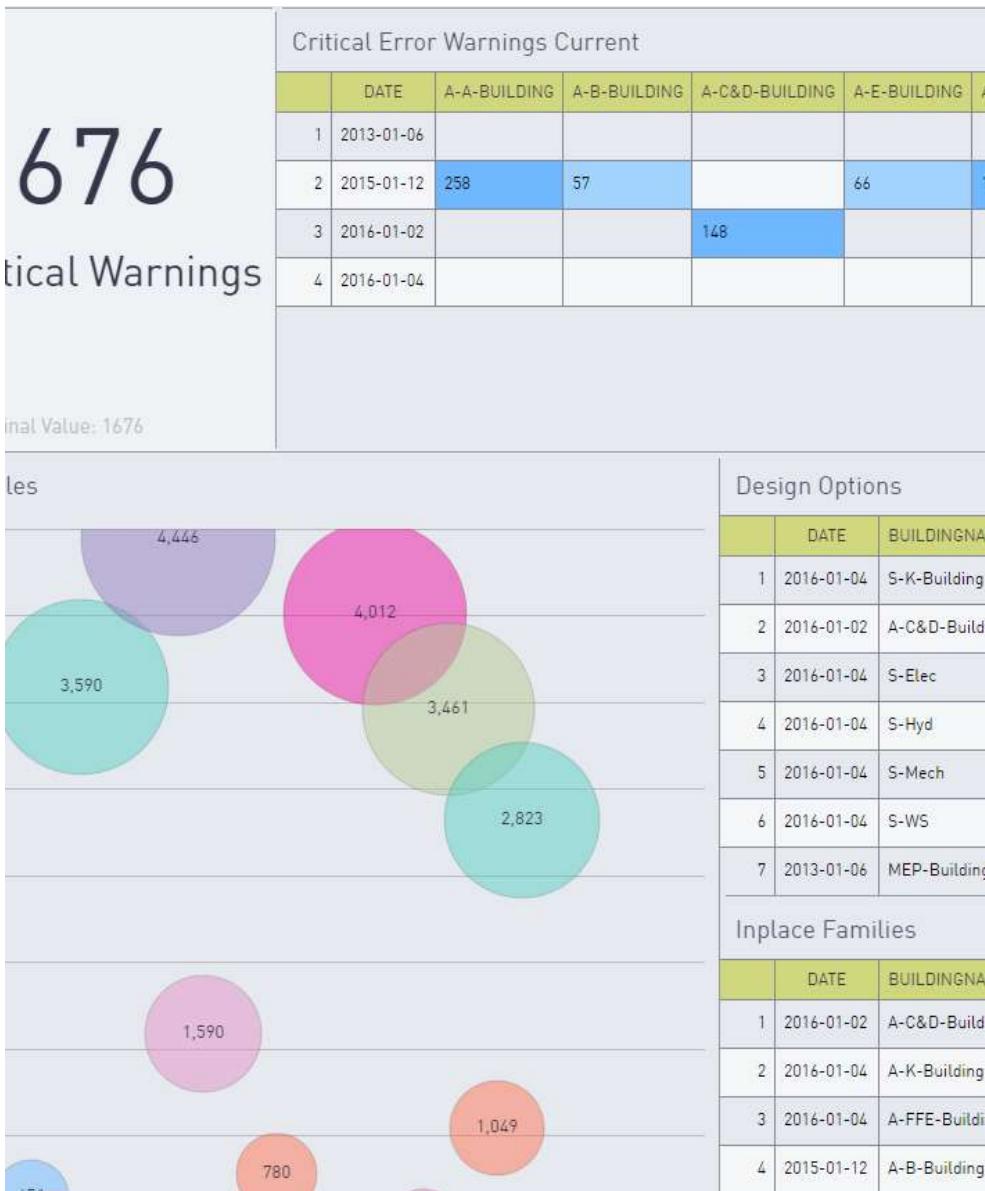
Quality Control Process



Objective Measures

- You want me to count what?

- How do I count the number of aspects of QA/QC?
- How do I measure the quality of a 3D object?
- How do I measure the quality of the hard copy deliverables vs. the model deliverables?
- .



QA/QC Tools

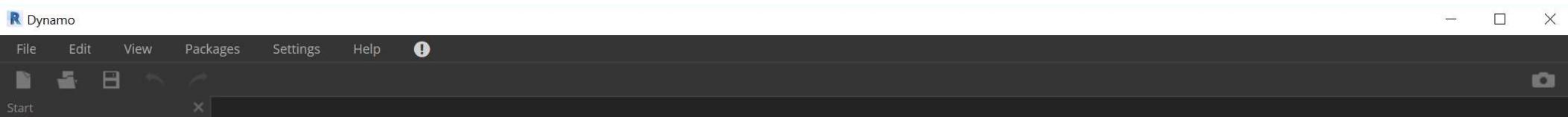


Dynamo!



“Dynamo Studio is a stand-alone programming environment that enables designers to create visual logic to explore parametric conceptual designs and automate tasks.”

Autodesk



 **Dynamo**

FILES

-  New
-  Custom Node
-  Open

ASK

-  Discussion forum
-  Dynamo website

DYNAMO!

REFERENCE

-  Getting Started
-  Dynamo Primer
-  Video Tutorials
-  Dynamo Dictionary

RECENT

- ModelChecker DYN
- ModelChecker DYN
- DEN Model Review DYN
- DEN Rooms Placed-NotEnclosed Query
- DEN Workset Check DYN

CODE

-  Github repository
-  Send issues

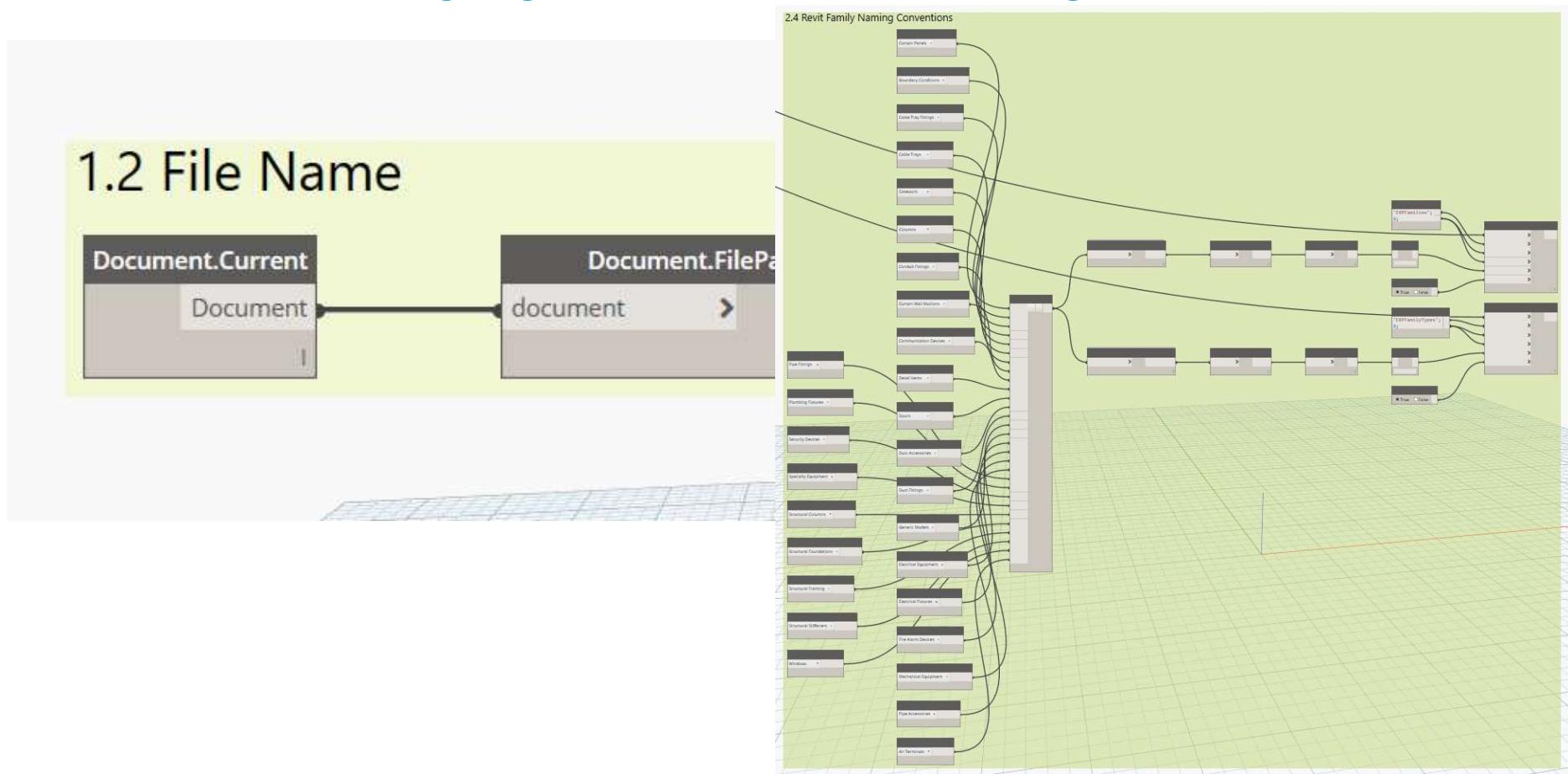
BACKUP

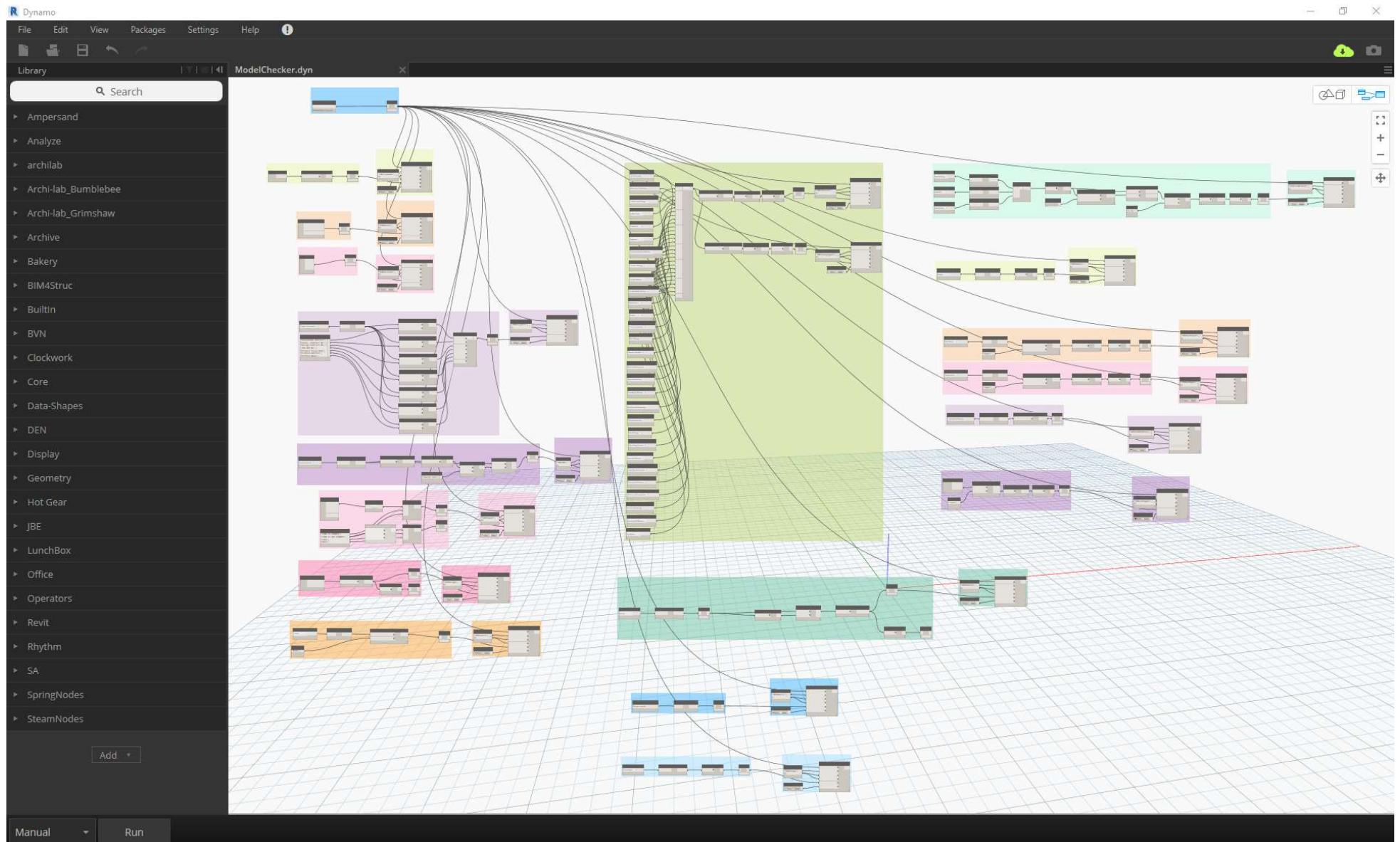
Backup location

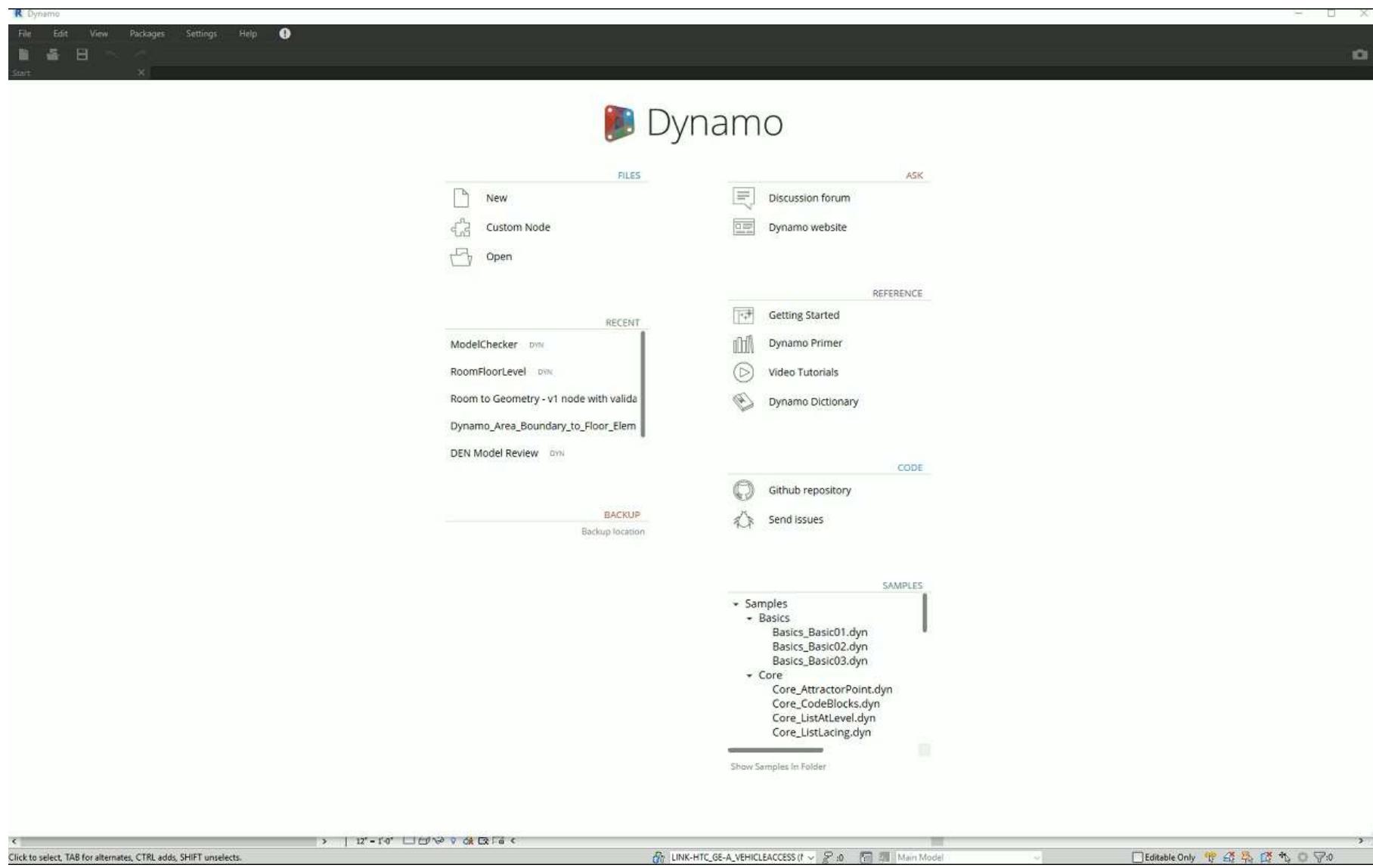
SAMPLES

Bringing Multiple Scripts Together

1.2 File Name







18
CHECKS

2
MINUTES TO
RUN

3
HOURS SAVED
PER REVIEW

300
MODEL REVIEWS
IN 2018

Family Library Analysis with BIMHelper Tools



File Architecture Structure Steel Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins **BIMHelperTools** Modify

Licenses Manual Youtube channel Batch print Library analysis Parameters Subcategories Dynamic legends Copy element types Upgrade projects Family hierarchy Export library Browse families Place family instance Element selections Configure sheet Multi sheets Assemblies Duplicate sheets Software configuration General tools Libraries Elements data Sheet manipulations Extra

| Thumb Nail | Family Name | Category | Filesize (KB) | Saved in version | Room calculation point | Unused materials? | Unused fill patterns? | Unused line patterns? | Nested families? | Imported geometry? | Has groups? | Has arrays? | Symbolic lines | Symbolic lines plan? | Grade | Notes |
|------------|--|---------------------|---------------|---------------------|------------------------|--|---|---|------------------|--------------------|-------------|-------------|----------------|-------------------------------|-------|-------|
| | \NA-000000-SYM-Break Line.rfa | Detail Items | 240 | Autodesk Revit 2018 | NULL | Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, Phase-Demo, Phase-Exist, Phase-Temp, Analytical Floor Surface, Analytical Slab Surface, Analytical Wall Surface | Diagonal up | Dash Dot C, Dash Dot Dot A, Aligning, Center A, Dash C, Dash Dot A, Dash Dot Dot C, Hidden C, Hidden D, Dash A, Dots A, Hidden B, Dash | False | False | False | False | P | this family is already in KOP | | |
| | \NA-050000-LADDER - Cage.rfa | Specialty Equipment | 732 | Autodesk Revit 2018 | False | Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, Phase-Demo, Phase-Exist, Phase-Temp, Analytical Floor Surface, Analytical Slab Surface, Analytical Wall Surface, Aluminum-O'Keeffe's-Standard Mill Finish | Diagonal up, Diagonal crosshatch, Lad533.dwg-1, Lad533.dwg-2, Lad533.dwg-3 | Dash Dot C, Dash Dot Dot A, Aligning, Center A, Dash C, Dash Dot A, Dash Dot Dot C, Hidden C, Hidden D, Dash A, Dots A, Hidden B, Dash, Grid Line | True | False | False | False | F | | | |
| | \NA-050500-FASTEN-Bolt.rfa | Detail Items | 276 | Autodesk Revit 2018 | NULL | Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, Phase-Demo, Phase-Exist, Phase-Temp, Analytical Floor Surface, Analytical Slab Surface, Analytical Wall Surface | Diagonal up, Diagonal crosshatch, Plastic, Steel, Concrete, Aluminum, Gypsum-Plaster, Insulation - Rigid, Masonry - Brick, Masonry - Concrete Block, Wood - Finish | Dash Dot C, Dash Dot Dot A, Aligning, Center A, Dash C, Dash Dot A, Dash Dot Dot C, Hidden C, Hidden D, Dash A, Dots A, Hidden B, Dash | False | False | False | True | P | | | |
| | \NA-054000-ANGLE-Lshape.rfa | Detail Items | 256 | Autodesk Revit 2018 | NULL | Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, Phase-Demo, Phase-Exist, Phase-Temp, Analytical Floor Surface, Analytical Slab Surface, Analytical Wall Surface | Diagonal up, Diagonal crosshatch, Plastic, Steel, Concrete, Aluminum, Gypsum-Plaster, Insulation - Rigid, Masonry - Brick, Masonry - Concrete Block, Wood - Finish | Dash Dot C, Dash Dot Dot A, Aligning, Center A, Dash C, Dash Dot A, Dash Dot Dot C, Hidden C, Hidden D, Dash A, Dots A, Hidden B, Dash | False | False | False | True | P | | | |
| | \NA-054000-HATS-Furring Hat Channels-Section.rfa | Detail Items | 244 | Autodesk Revit 2018 | NULL | Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, Phase-Demo, Phase-Exist, Phase-Temp, Analytical Floor Surface, Analytical Slab Surface, Analytical Wall Surface | Diagonal up, Crosshatch Diagonal 01, 0422-CMU, 0620-Wood 01, 0330-Concrete, 0660-Plastic, 0512-Steel, 0762-Aluminum, 0925-Gypsum Plaster, 0722-Insulation Rigid, 0421-Brick | Dash Dot C, Dash Dot Dot A, Aligning, Center A, Dash C, Dash Dot Dot C, Hidden C, Hidden D, Dash A, Dots A, Hidden B, Dash | False | False | False | True | P | | | |
| | \NA-054000-ZEES-Light Gauge Zees-Section.rfa | Detail Items | 244 | Autodesk Revit 2018 | NULL | Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, Phase-Demo, Phase-Exist, Phase-Temp, Analytical Floor Surface, Analytical Slab Surface, Analytical Wall Surface | Diagonal up, Crosshatch Diagonal 01, 0422-CMU, 0620-Wood 01, 0330-Concrete, 0660-Plastic, 0512-Steel, 0762-Aluminum, 0925-Gypsum Plaster, 0722-Insulation Rigid, 0421-Brick | Dash Dot C, Dash Dot Dot A, Aligning, Center A, Dash C, Dash Dot Dot C, Hidden C, Hidden D, Dash A, Dots A, Hidden B, Dash | False | False | False | True | P | | | |
| | \NA-054100-STUD-C Studs-Side.rfa | Detail Items | 244 | Autodesk Revit 2018 | NULL | Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, Phase-Demo, Phase-Exist, Phase-Temp, Analytical Floor Surface, Analytical Slab Surface, Analytical Wall Surface, Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, | Diagonal up, 0422-CMU, 0620-Wood 01, 0330-Concrete, 0660-Plastic, 0512-Steel, 0762-Aluminum, 0925-Gypsum Plaster, 0722-Insulation Rigid, 0421-Brick | Dash Dot C, Dash Dot Dot A, Aligning, Center A, Dash C, Dash Dot Dot C, Hidden C, Hidden D, Dash A, Dots A, Hidden B, Dash | False | False | False | True | P | | | |
| | \NA-054100-STUD-Channel Studs-.rfa | | 244 | Autodesk | NULL | Glass, Phase - Demo, Phase - Exist, Phase - Temporary, Phase - New, Poche, 088000-Glass, Phase-Demo, Phase-Exist, Phase-Temp, Analytical Floor Surface, Analytical Slab Surface, Analytical Wall | Diagonal up, Diagonal crosshatch, Plastic, Steel, Concrete, Aluminum, Gypsum-Plaster, Insulation - Rigid, Masonry - Brick, Masonry - Concrete Block, | Dash Dot C, Dash Dot Dot A, Aligning, Center A, Dash C, Dash Dot A, Dash Dot Dot C, Hidden C, | False | False | False | True | P | | | |

What's the Value?

36

MINUTES

300

MODEL REVIEWS

180

HOURS

2

WEEKS

Average time
saved per model
submittal

Total model
reviews in one
year

Total anticipated
time saved

Payback period
for the tool

Autodesk Model Development Specification & Checker



DEN Concourse Expansion Program Numbers

150+

USERS

20+

MODELS

1,000,000+

ELEMENTS

650,000+

SQUARE-FEET

6

PHASES

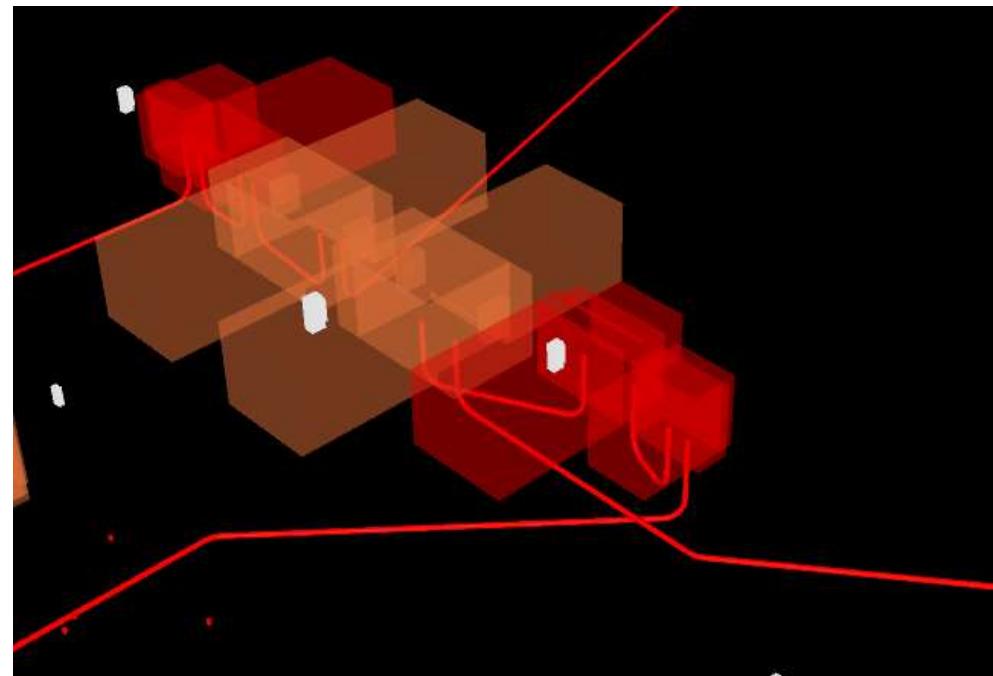
500+

ASSETS

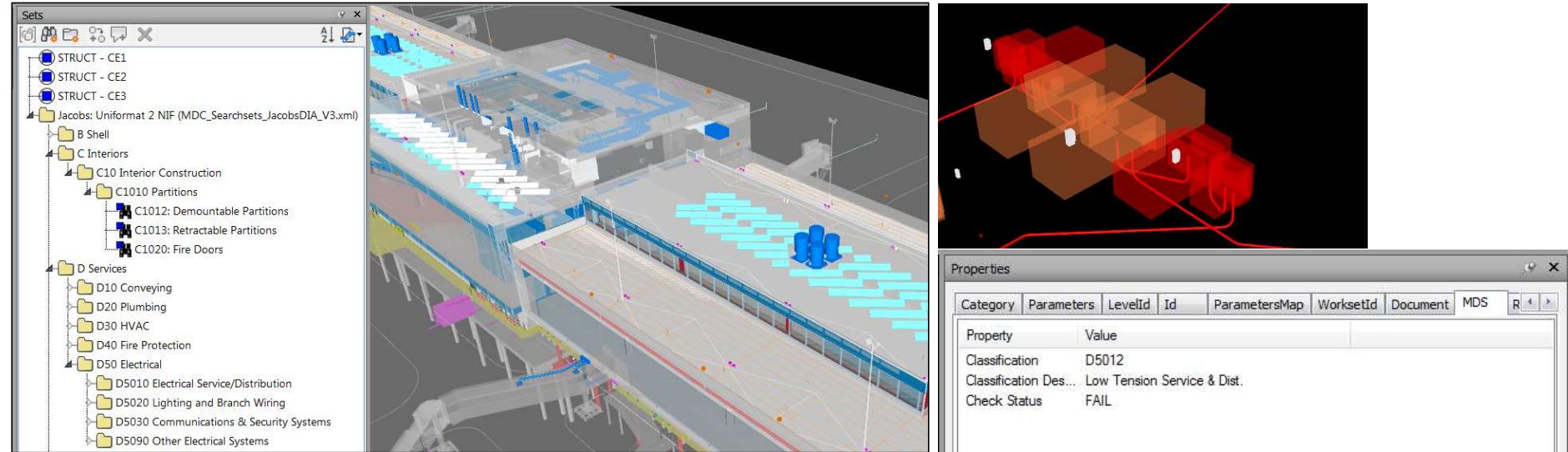
Autodesk – Model Checker

The Autodesk Model Development Specification (MDS) Checker Tool application and database provides the ability to produce a series of reports, defining the 'Who, What and When' of the attributed data and values to be provided.

- These reports may then be used as guidance for the design team, as to what is required, when and whether these data requirements have been successfully completed in alignment with DEN's asset database.
- The project BIM lead completes these reports on a periodic basis and allows the team to track data over time to insure full compliance at project completion



| Navisworks Sets | | | |
|-----------------------------------|--|------|--------|
| C1020: Fire Doors | | 84 | 0% |
| Z1011: Rooms | | 2262 | 96.95% |



| Log | |
|--|--|
| G3063: Fuel Storage Tanks Instances Count: 0 | |
| G3064: Fuel Dispensing Stations Instances Count: 0 | |
| G3091: Industrial Waste Systems Instances Count: 0 | |
| G3092: POL Distribution Systems Instances Count: 0 | |
| G4011: Substations Instances Count: 0 | |
| G4021: Site Fixtures & Transformers Instances Count: 0 | |
| G4022: Site Lighting Poles Instances Count: 0 | |
| G4024: Site Lighting Controls Instances Count: 0 | |
| G4031: Site Communications Systems Instances Count: 0 | |
| G4032: Site Security & Alarm Systems Instances Count: 0 | |
| G4091: Cathodic Protection Instances Count: 0 | |
| G4092: Site Emergency Power Generation Instances Count: 0 | |
| Z1011: Rooms Instances Count: 695 Passrate: 96.55% | |
| Z1012: Spaces Instances Count: 0 | |
| Z1021: No Classification Instances Count: 10544 Passrate: 0% | |
| Z1022: Imported Cad Instances Count: 0 | |
| Z1023: Misclassified Instances Count: 0 | |

Done

| D5012: Low Tension Service & Distribution | | | |
|---|-------------------------------------|--|---------------------------------|
| Classification | D5012 : Low Tension Service & Dist. | | |
| Family | 262213-LVTRAN | | |
| Type | 15kVA 480V | | |
| ElementId | 2002581 | | |
| ASSET | True | Keyword("0,1,Yes,No") | Not a keyword: 0,1,Yes,No |
| ASSET_FUNC_AREA | ELECTRIC | Keyword("adm,building,contract,electric,fleet,hi-tech,hvac,plumbing,radio") | OK |
| ASSET_LOCATION | | IsMatch("(^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_[0-9]{3}[A-Z]?\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_ST[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_MS[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_CR[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_EL[0-9]{2}\$)") | Not found |
| ASSET_STATUS | DESIGNED | Keyword("DESIGNED") | OK |
| ASSET_TYPE | | | Not found |
| Mark | 166 | IsMatch([A-Z]{1,3})-(0-9){1,3}) | Does not match RegEx expression |

The “New/Better” Way



Log

Project Stage: SD
 Selected Categories:
 Z1011: Rooms

Checking...

Z1011: Rooms Instances Count 2272 Passrate: 82.17%

Model Details

| | |
|--------------------------------------|-----------------|
| Filename | MDS Model Check |
| Report Date | 11/11/2018 |
| Report Time | 4:40 PM |
| Navisworks MDS Model Checker Version | 27/09/2017 v1.7 |

Navisworks Sets

| | | |
|--------------|------|--------|
| Z1011: Rooms | 2272 | 96.79% |
|--------------|------|--------|

Z1011: Rooms

| | | | |
|----------------|----------------|---|----|
| Classification | Z1011 : Rooms | | |
| ElementId | 2796425 | | |
| Number | CCC_02_3E_EL06 | IsMatch("^\CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_[0-9]{3}[A-Z]?\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_ST[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_MS[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_CR[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_EL[0-9]{2}\$ ") | OK |
| Pass Rate | 100% | | |

Z1011: Rooms

| | | | |
|----------------|----------------|---|---------------------------------|
| Classification | Z1011 : Rooms | | |
| ElementId | 2796427 | | |
| Number | CCC_02_6E_MS## | IsMatch("^\CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_[0-9]{3}[A-Z]?\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_ST[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_MS[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_CR[0-9]{2}\$ ^CC[BC]_[0-9]{2}_[1-9]?[0-9][A-Z]_EL[0-9]{2}\$ ") | Does not match RegEx expression |
| Pass Rate | 0% | | |

Bonus!



MDS Model Checker

BIM Interoperability Tools

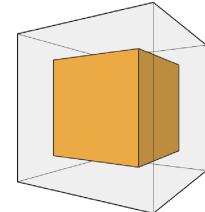
biminteroperabilitytools.com



For more information

Autodesk Model Checker for Revit

Overview



- 1 Automatically check your Revit models based on a set of BIM requirements and generate a compliance report
- 2 Reports can be run directly in a Revit model giving project teams the ability to check their compliance at any time
- 3 Several pre-built and pretested checksets are already included for you to use or customize (General, OSU, WMU, PSU, State of TN, USACE, COBie)
- 4 Create your own custom checksets with the Model Checker Configurator

Autodesk BIM Interoperability Tools | Model Checker

AUTODESK MODEL CHECKER FOR REVIT

Title: Element Checks Organized by Family Category
Date: Wednesday, July 11, 2018
Author:
Description:

USACE-Revit-Model-Checker-Sample-Project-2019.rvt

Check Summary: 301 Checks, 279 (93%) Pass, 22 Fail
Report Date: Monday, August 13, 2018 - 12:33:58 PM
Revit Filepath: C:\Users\tj.meehan\OneDrive\Documents\Revit Samples\USACE-Revit-Model-Checker-Sample-Project-2019.rvt
Checkset File: http://www.biminteroperabilitytools.com/modelchecker/hostedchecks/checks-family-cat.xml

93%

Element Checks Organized by Family Category

301 Checks, 279 (93%) Pass, 22 Fail

Checks individual elements based on family category. Check results are provided in a pass/fail format, in which a "fail" condition occurs from either a list of elements that meet the check criteria, or that no elements are found to meet the check criteria.

| Category | Pass | Fail |
|---------------------|---------------------------------|------|
| Air Terminals | 5 Checks, 5 (100%) Pass, 0 Fail | 0 |
| Cable Tray | 3 Checks, 2 (67%) Pass, 1 Fail | 1 |
| Cable Tray Fittings | 3 Checks, 3 (100%) Pass, 0 Fail | 0 |

Copy HTML Excel Close



Classify . . .



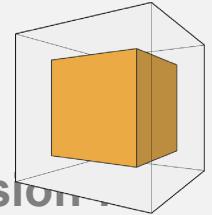
Validate . . .



Deliver

Autodesk Model Checker for Revit

If you already have experience with this tool, here are the New Features of Version 2018.

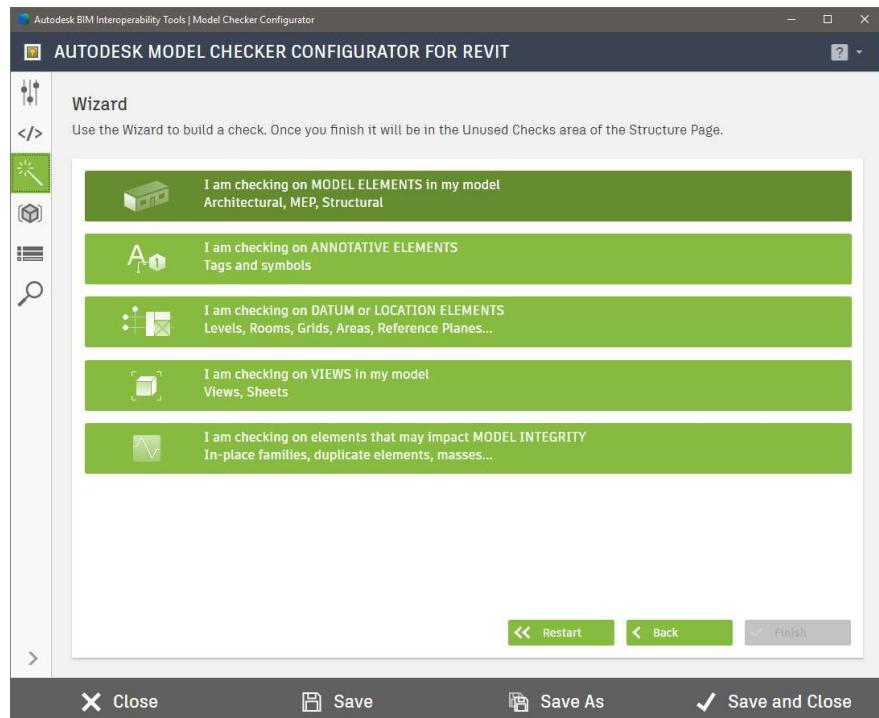
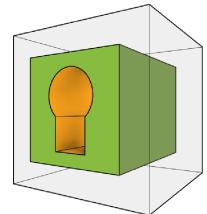


- All new User Interface
 - Modern design following Autodesk's latest UX format
 - Updated dialogs, new icons, and a dedicated ribbon
- Single, unified installation package
- Loading checksets now shows more information including date, author, and description
- New “recent files” list
- Expand / collapse / enable / disable all functionality added
- Revamped reports now show detailed summary for the entire checkset as well as each section
- New ability to export reports to Excel



Model Checker Configurator for Revit

Overview



- 1 Create your own configuration files for the Autodesk Model Checker for Revit
- 2 3 different methods to build your checks (Pre-Built, Wizard, Advanced)
- 3 Ships with 30+ sample checkset files to use as templates
- 4 Checkset files are open source XML format



Classify . . .



Validate . . .



Deliver

Revit Best Practices

04106_WyandotteLofts-A19-CENTRAL.rvt



BUILD: Autodesk Revit 2019 20180328_1600(x64)

PROJECT INFORMATION

| Name | Value |
|--------------------------|--|
| Author | |
| Building Name | |
| Category | |
| Client Name | 2120 Wyandotte Investors 5700 Golden Bear Overland Park, KS 66223 |
| Design Option | |
| Design Option | Main Model |
| Edited by | |
| Family Name | |
| Organization Description | |
| Organization Name | |
| Project Address | 2120 WYANDOTTE KANSAS CITY, MISSOURI 64108 |
| Project Issue Date | 19 December 2005 |
| Project Name | FREIGHTHOUSE FLATS |
| Project Number | 04106 |
| Project Status | CONSTRUCTION SET |
| SR Document GUID | ffcf1f65-8370-43a4-ae63-2077ab990b09 |
| Type Name | |
| Workset | 4 |

MODEL NAME

71.95 MB

FILE SIZE

55,872

ELEMENT COUNT

PERFORMANCE ANALYSIS

1,128!

Goal: 500 (-125.6%)

ERRORS & WARNINGS

6!

Goal: 0

IMPORTED CONTENT

28.2%

Goal: 20.0% (-40.85%)

VIEWS NOT ON SHEETS

473

Goal: 838 (+43.56%)

PURGE UNUSED

157!

Goal: 1

IN-PLACE FAMILIES

0

Goal: 0

FAMILIES >5000KB

MODEL LOCATION

| Name | Value |
|-------------------------------|-----------------|
| Project Base Point Coordinate | 0" E/W 0" N/S |
| Project Base Point Elevation | 0" |
| Project Base Point Rotation | 0.00° |
| Survey Point Coordinate | 0" E/W 0" N/S |
| Survey Point Elevation | 0" |

SHARED PARAMETERS FILE LOCATION

MODEL PERFORMANCE BASICS

MODEL PERFORMANCE IS PRIMARILY IMPACTED BY FOLLOWING INDUSTRY BEST PRACTICES FOR REVIT MODEL CREATION. A LARGE, WELL CONSTRUCTED MODEL CAN OUT PERFORM A SMALL MODEL THAT WASN'T WELL BUILT.

THE BEST PRACTICES THAT MOST IMPACT MODEL PERFORMANCE (OUTSIDE OF PHYSICAL HARDWARE) SHOWN TO THE LEFT. MINIMIZING THESE VALUES CAN DRAMATICALLY IMPACT PERFORMANCE.

SELECT THE INFORMATION ICON FOR ADDITIONAL INFORMATION.

Revit Best Practices

04106_WyandotteLofts-A19-CENTRAL.rvt



BUILD: Autodesk Revit 2019 20180328_1600(x64)

PROJECT INFORMATION

| Name | Value |
|--------------------------|--|
| Author | |
| Building Name | |
| Category | |
| Client Name | 2120 Wyandotte Investors 5700 Golden Bear Overland Park, KS 66223 |
| Design Option | |
| Design Option | Main Model |
| Edited by | |
| Family Name | |
| Organization Description | |
| Organization Name | |
| Project Address | 2120 WYANDOTTE KANSAS CITY, MISSOURI 64108 |
| Project Issue Date | 19 December 2005 |
| Project Name | FREIGHTHOUSE FLATS |
| Project Number | 04106 |
| Project Status | CONSTRUCTION SET |
| SR Document GUID | ffcf1f65-8370-43a4-ae63-2077ab990b09 |
| Type Name | |
| Workset | 4 |

MODEL NAME

71.95 MB

FILE SIZE

55,872

ELEMENT COUNT

PERFORMANCE ANALYSIS

1,128!

Goal: 500 (-125.6%)

ERRORS & WARNINGS

6!

Goal: 0

IMPORTED CONTENT

28.2%

Goal: 20.0% (-40.85%)

VIEWS NOT ON SHEETS

473

Goal: 838 (+43.56%)

PURGE UNUSED

157!

Goal: 1

IN-PLACE FAMILIES

0

Goal: 0

FAMILIES > 5000KB

MODEL LOCATION

| Name | Value |
|-------------------------------|-----------------|
| Project Base Point Coordinate | 0" E/W 0" N/S |
| Project Base Point Elevation | 0" |
| Project Base Point Rotation | 0.00° |
| Survey Point Coordinate | 0" E/W 0" N/S |
| Survey Point Elevation | 0" |

SHARED PARAMETERS FILE LOCATION

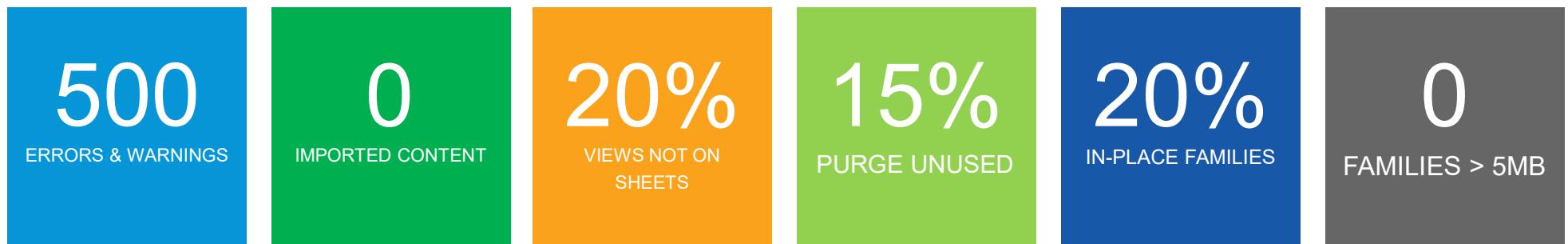
MODEL PERFORMANCE BASICS

VIEWS NOT ON SHEETS

AUTODESK RECOMMENDS TO NOT ALLOW THE NUMBER OF VIEWS NOT ON SHEETS TO BE NO MORE THAN 20% OF THE VIEWS PLACED ON SHEETS. THIS HELPS TO LIMIT THE NUMBER OF WORKING VIEWS IN THE MODEL FILE AND KEEP THE FILE RESPONSIVE.

MORE INFORMATION ABOUT IMPORTED CONTENT IS SHOWN ON THE [GOVERNANCE TAB](#).

6 SUGGESTED PRIMARY BEST PRACTICES



KEEP E&W
UNDER 500

DON'T IMPORT
DWG, SKP, ETC.

LINK!

KEEP VIEWS
NOT ON
SHEETS UNDER
20%

KEEP PURGE
UNUSED BELOW
15% OF
ELEMENT
COUNT

KEEP IN-PLACE
FAMILIES
BELOW 20% OF
FILE SIZE

FAMILIES OVER
5MB TEND TO
BE OVERLY
DETAILED

Revit Best Practices

04106_WyandotteLofts-A19-CENTRAL.rvt



MODEL NAME

IMPORTED CAD

| Name | Element ID |
|---|------------|
| northSTAIRf.dwg : northSTAIRf.dwg | 1964160 |
| northSTAIRf.dwg (2) : northSTAIRf.dwg (2) | 1994409 |
| DOORS.dwg : DOORS.dwg | 2192745 |
| DOORS.dwg (3) : DOORS.dwg (3) | 2192831 |
| DOORS.dwg (2) : DOORS.dwg (2) | 2192788 |
| 7-8 HAT.dwg : 7-8 HAT.dwg | 2349157 |

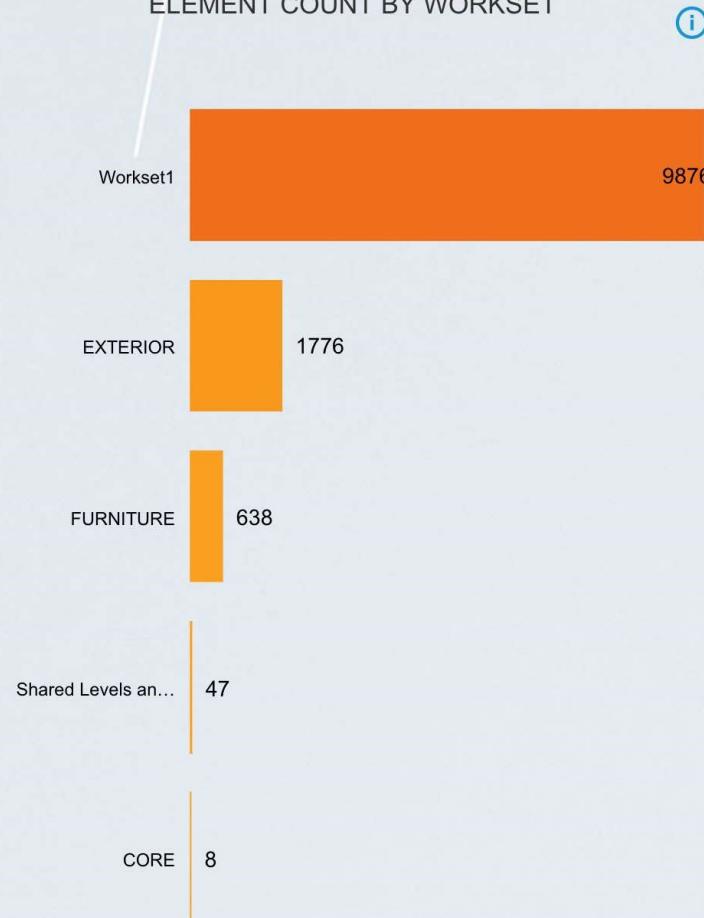
IMPORTED IMAGES

| Name | Element ID |
|---|------------|
| Raster Images : Codes Interpretation CI2003-060.jpg | 2347304 |
| Raster Images : ibc2003_TBL 720.1(2).jpg | 3236177 |
| Raster Images : UL U411.jpg | 3261160 |
| Raster Images : UL U412.jpg | 3261163 |
| Raster Images : UL U415.jpg | 3261156 |
| Raster Images : UL U465.jpg | 3261169 |

IMPORTED SKP

| Name | Element ID |
|------|------------|
| | |

ELEMENT COUNT BY WORKSET



DESIGN OPTIONS

| Name | Count |
|-------------------------|-------|
| PATIO OPTIONS (primary) | 24 |

GENERIC MODELS

| Name | Element ID |
|--|------------|
| Generic Models : 04106-awning : 04106-awning | 3270023 |
| Generic Models : 04106-East Door : EXISTING DOOR | 321486 |
| Generic Models : 04106-Galley Kitchen : 04106-Galley Kitchen | 1288727 |
| Generic Models : 04106-Galley Kitchen_UPGRADE : 04106-Galley Kitchen_UPGRADE | 1359253 |
| Generic Models : 04106-Galley Kitchen-unit20 : 04106-Galley Kitchen-unit20 | 1048765 |
| Generic Models : 04106-refrigerator cover non wall based : 04106-refrigerator cover non wall based | 1066537 |
| Generic Models : 04106-refrigerator cover non wall based : 04106-refrigerator cover non wall based | 1068242 |
| Generic Models : 04106-refrigerator cover non wall based : 04106-refrigerator cover non wall based | 1175609 |
| Generic Models : 04106-refrigerator cover non wall based : 04106-refrigerator cover non wall based | 1423411 |

Revit Best Practices

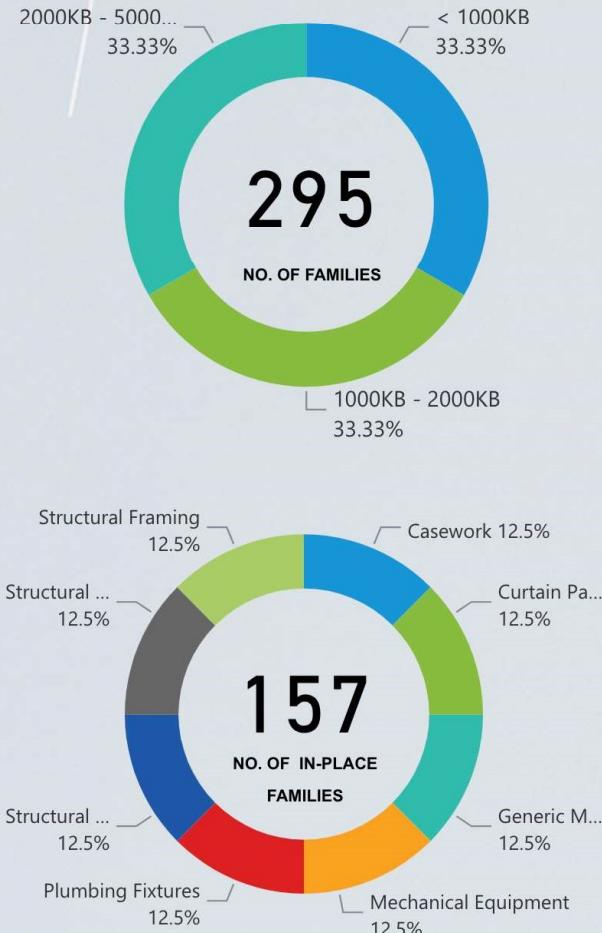
04106_WyandotteLofts-A19-CENTRAL.rvt



20 LARGEST FAMILIES

| Name | Value |
|--|----------|
| 04106-Galley Kitchen-unit20 | 3,484 KB |
| 04106-Galley Kitchen | 3,012 KB |
| 04106-Galley Kitchen_UPGRADE | 2,844 KB |
| Kitchen Typ 4 - L | 1,492 KB |
| Kitchen Typ 5 - L | 1,484 KB |
| Kitchen Typ 2 - L | 1,400 KB |
| Kitchen Typ 3 - L | 1,400 KB |
| Kitchen Typ 1 - L | 1,388 KB |
| 04106-Galley Kitchen-with 42 inch uppers | 1,284 KB |
| 2nd floor windowsB | 840 KB |
| Overhead-Sectional-tall | 816 KB |
| 2nd floor windows | 808 KB |
| 3rd floor windows | 736 KB |
| 3rd floor windowsB | 696 KB |
| 2nd floor windowsD | 684 KB |
| 3rd floor windowsC | 656 KB |
| 2nd floor windowsC | 528 KB |
| 04106-Counter Top w Sink_unit 20 | 496 KB |
| 3rd floor windowsD | 496 KB |
| 04106-Counter Top w Sink | 488 KB |
| 04106-Counter Top w Sink.0001 | 488 KB |
| double vanity | 464 KB |
| Sheets - CD - E1 30 x 42 | 448 KB |
| 4106-kitchen microwave cabinet | 436 KB |
| 4106-kitchen microwave cabinet_upgrade | 436 KB |
| single vanity | 412 KB |

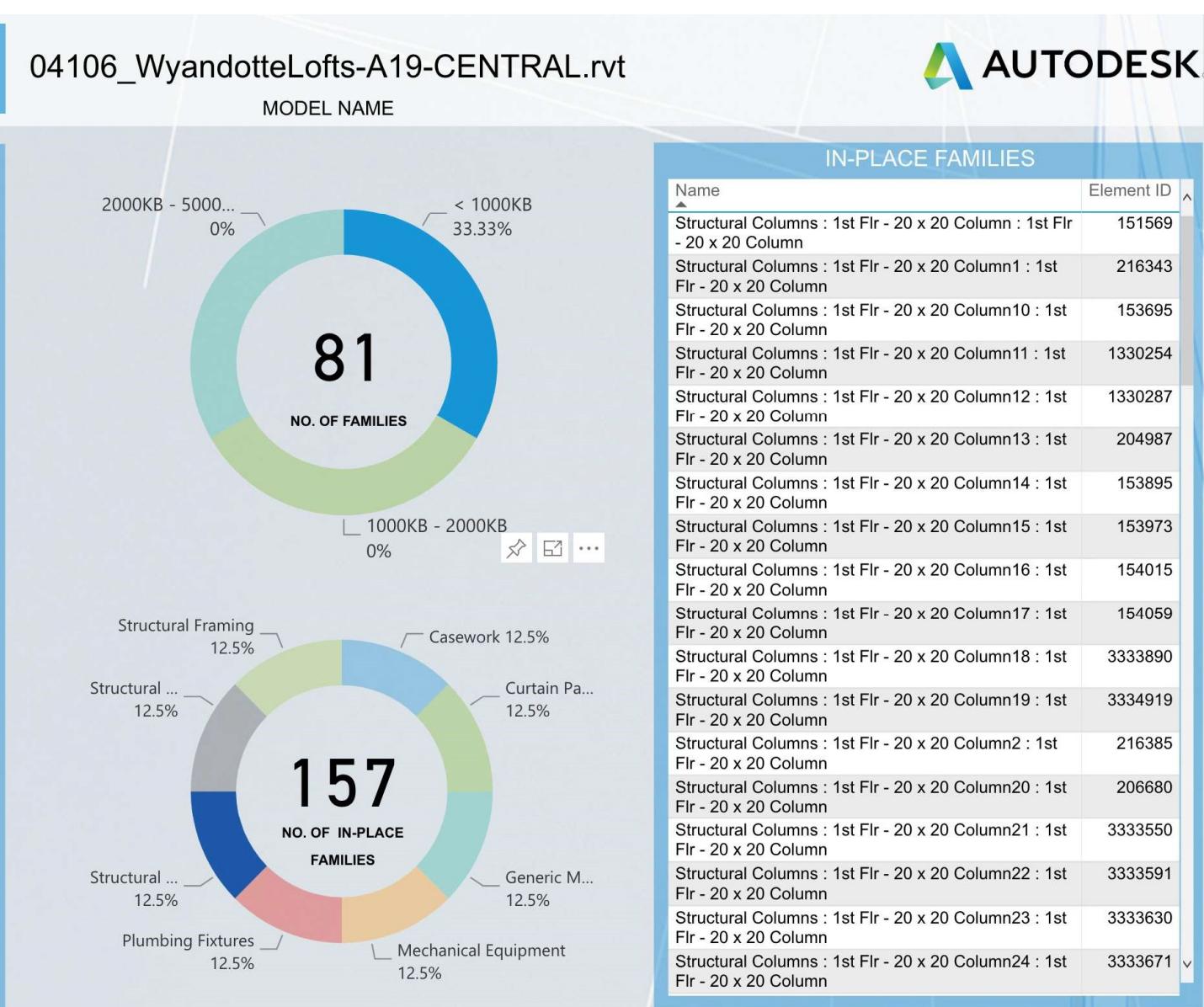
MODEL NAME



IN-PLACE FAMILIES

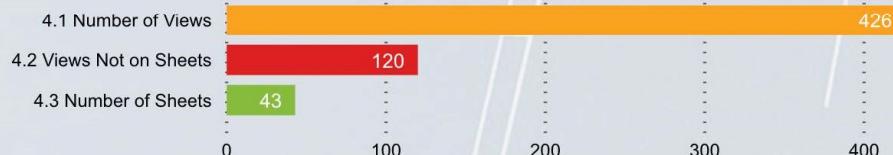
| Name | Element ID |
|--|------------|
| Casework : CALLBOX : CALLBOX | 3162905 |
| Curtain Panels : Curtain Panel : Curtain Panel | 1156846 |
| Curtain Panels : Curtain Panel1 : Curtain Panel | 353731 |
| Curtain Panels : Curtain Panel10 : Curtain Panel | 999622 |
| Curtain Panels : Curtain Panel11 : Curtain Panel | 1573023 |
| Curtain Panels : Curtain Panel12 : Curtain Panel | 639309 |
| Curtain Panels : Curtain Panel13 : Curtain Panel | 346784 |
| Curtain Panels : Curtain Panel14 : Curtain Panel | 639183 |
| Curtain Panels : Curtain Panel2 : Curtain Panel | 639544 |
| Curtain Panels : Curtain Panel3 : Curtain Panel | 3114292 |
| Curtain Panels : Curtain Panel4 : Curtain Panel | 639024 |
| Curtain Panels : Curtain Panel5 : Curtain Panel | 1211406 |
| Curtain Panels : Curtain Panel6 : Curtain Panel | 1211371 |
| Curtain Panels : Curtain Panel7 : Curtain Panel | 1211344 |
| Curtain Panels : Curtain Panel8 : Curtain Panel | 1211311 |
| Curtain Panels : Curtain Panel9 : Curtain Panel | 1573086 |
| Generic Models : balconies2 : balconies | 1224396 |
| Generic Models : balconies3 : balconies | 1224942 |
| Generic Models : balconies4 : balconies | 1232141 |
| Generic Models : balconies5 : balconies | 2649219 |
| Generic Models : balconies7 : balconies | 2651464 |
| Generic Models : Generic Models 1 : Generic Models 1 | 2237289 |
| Generic Models : Generic Models 2 : Generic Models 1 | 1457646 |
| Generic Models : Generic Models 3 : Generic Models 1 | 2237364 |
| Generic Models : Generic Models 4 : Generic Models 1 | 2237439 |
| Generic Models : Generic Models 5 : Generic Models 1 | 2237514 |
| Generic Models : tile shower : tile shower | 957080 |
| Generic Models : tile shower1 : tile shower | 957112 |
| Mechanical Equipment : hvac 22 x 1 : hvac 22 x 28 | 3670567 |

| 20 LARGEST FAMILIES | |
|--|---------|
| Name | Value |
| Structural Columns : 1st Flr - 20 x 20 Column : 1st Flr - 20 x 20 Column | 151569 |
| Structural Columns : 1st Flr - 20 x 20 Column1 : 1st Flr - 20 x 20 Column | 216343 |
| Structural Columns : 1st Flr - 20 x 20 Column10 : 1st Flr - 20 x 20 Column | 153695 |
| Structural Columns : 1st Flr - 20 x 20 Column11 : 1st Flr - 20 x 20 Column | 1330254 |
| Structural Columns : 1st Flr - 20 x 20 Column12 : 1st Flr - 20 x 20 Column | 1330287 |
| Structural Columns : 1st Flr - 20 x 20 Column13 : 1st Flr - 20 x 20 Column | 204987 |
| Structural Columns : 1st Flr - 20 x 20 Column14 : 1st Flr - 20 x 20 Column | 153895 |
| Structural Columns : 1st Flr - 20 x 20 Column15 : 1st Flr - 20 x 20 Column | 153973 |
| Structural Columns : 1st Flr - 20 x 20 Column16 : 1st Flr - 20 x 20 Column | 154015 |
| Structural Columns : 1st Flr - 20 x 20 Column17 : 1st Flr - 20 x 20 Column | 154059 |
| Structural Columns : 1st Flr - 20 x 20 Column18 : 1st Flr - 20 x 20 Column | 3333890 |
| Structural Columns : 1st Flr - 20 x 20 Column19 : 1st Flr - 20 x 20 Column | 3334919 |
| Structural Columns : 1st Flr - 20 x 20 Column2 : 1st Flr - 20 x 20 Column | 216385 |
| Structural Columns : 1st Flr - 20 x 20 Column20 : 1st Flr - 20 x 20 Column | 206680 |
| Structural Columns : 1st Flr - 20 x 20 Column21 : 1st Flr - 20 x 20 Column | 3333550 |
| Structural Columns : 1st Flr - 20 x 20 Column22 : 1st Flr - 20 x 20 Column | 3333591 |
| Structural Columns : 1st Flr - 20 x 20 Column23 : 1st Flr - 20 x 20 Column | 3333630 |
| Structural Columns : 1st Flr - 20 x 20 Column24 : 1st Flr - 20 x 20 Column | 3333671 |



MODEL NAME

VIEWS, SHEETS, VIEWS NOT ON SHEETS



OBJECT STYLES AND LINE STYLES



MODEL AND DETAIL GROUPS



ERRORS & WARNINGS

COUNT ERROR / WARNING

| | |
|-----|---|
| 943 | Two elements were not automatically joined because one or both is not editable. |
| 62 | Room is not in a properly enclosed region |
| 23 | A wall and a room separation line overlap. One of them may be ignored when Revit finds room boundaries. Shorten or delete the room separation line to remove the overlap. |
| 21 | Elements have duplicate "Number" values. |
| 13 | Highlighted walls overlap. One of them may be ignored when Revit finds room boundaries. Use Cut Geometry to embed one wall within the other. |
| 11 | Highlighted lines overlap. Lines may not form closed loops. |
| 10 | Line in Sketch is slightly off axis and may cause inaccuracies. |
| 8 | Highlighted walls are attached to, but miss, the highlighted targets. |
| 7 | There are identical instances in the same place. This will result in double counting in schedules. |
| 5 | Insert conflicts with joined Wall. |
| 4 | Actual Number of Risers is different from Desired Number of Risers. Add/remove Risers or change Desired Number of Risers in Stairs Properties. |
| 4 | Area separation line is slightly off axis and may cause inaccuracies. |
| 4 | Highlighted elements are joined but do not intersect. |

TOTAL ERRORS

1,128

BIM 360 for Field QA

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QA in Process

AUTODESK® BIM 360® | Denver International Airport ▾ ? MH

Account Admin

PROJECTS MEMBERS COMPANIES ANALYTICS SETTINGS APPS

Account Admin Overview

The Account Admin Overview provides account details and member, project, and company usage metrics.

Account Start/Renewal Date

12 Months remaining

Start Date: Mar 6, 2015 Renewal Date: Oct 31, 2019

Activated Members

624

| Category | Count |
|----------------------------|-------|
| Internal Company Members | 153 |
| External Company Members | 102 |
| Unassigned Company Members | 369 |

Member Limits by Services

| Service | Used / Total |
|----------------------|--------------|
| Document Management | 622/1000 |
| Project Management | 5/1000 |
| Design Collaboration | 305/3 |
| Model Coordination | 8/100 |
| Field Management | 12/1000 |
| BIM 360 Glue | 84/100 |
| BIM 360 Field | 236/1000 |

Activated Projects

194

Partner Companies

549



BIM 360 Field Program:

Why should I care.

CCD Auditor requesting validated process

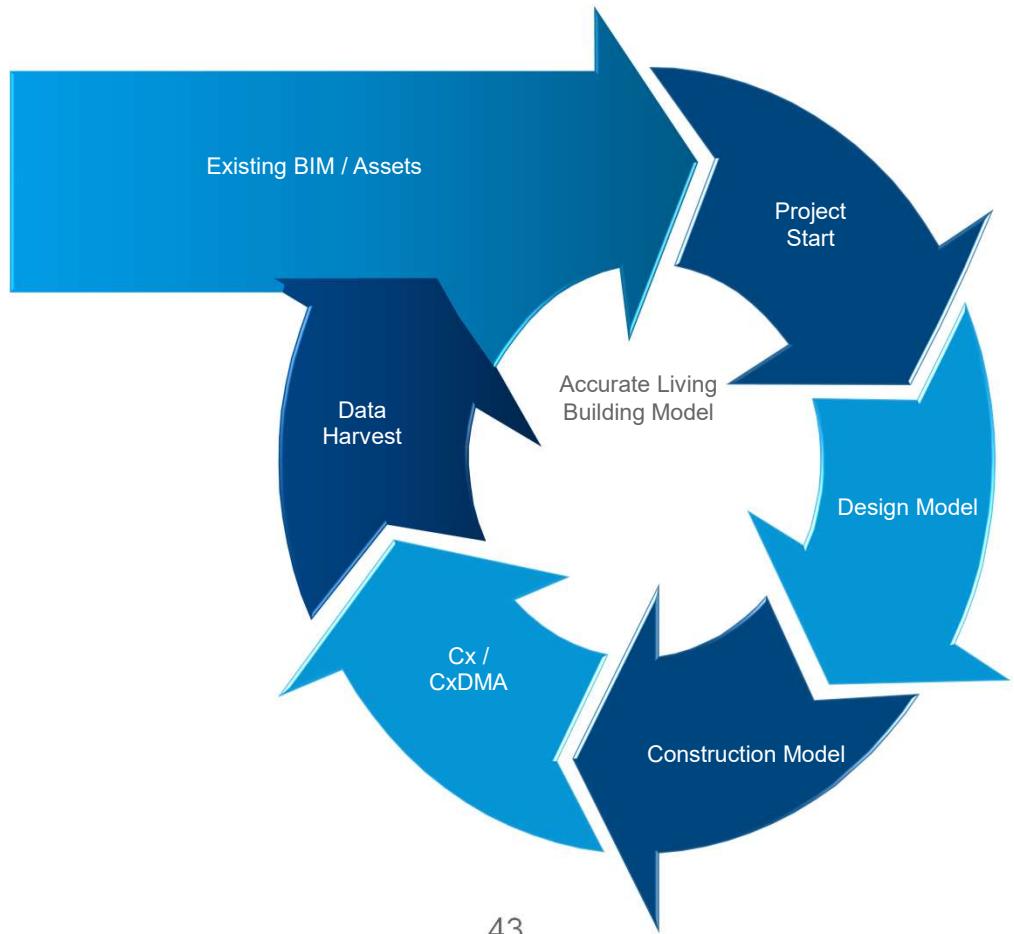
FAA funded projects required BIM

Claim Defense

Data for Data sake is not valuable

Structured Information from Data in a timely manner **is valuable.**

Better Project insight



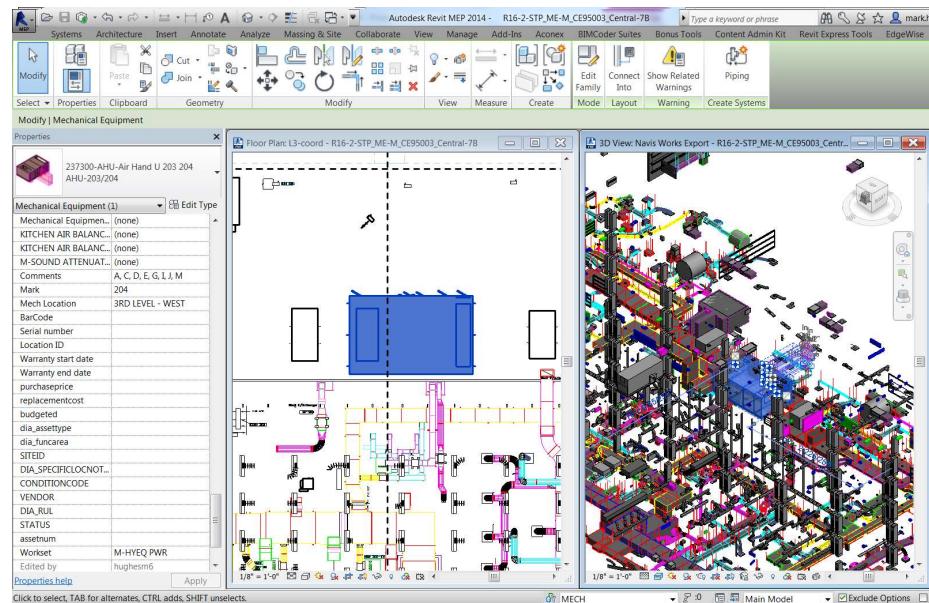
Commissioning & Asset Information Capture

Tools:

iPads for Data Collection

Data Migration

Linked to Model content



Equipment Data Capture

- Asset Equipment list
- Populated as Equipment is installed
- Verified by inspectors
- Additional DEN uses of Field



B | AUTODESK® BIM 360™ FIELD DEN-HTC-CE95003 > Equipment

| Name | Barcode | Serial number | Type | Description |
|-------------------|---------------------|--------------------|-----------------------------------|---------------------|
| 4-17BL4 | SSCP package equ | See attachments | Branch Panel | |
| 4-17BL1 | SSCP package equ | See attachments | Branch Panel | |
| 4-17AL5 | SSCP package equ | See attachments | Branch Panel | |
| 4-17BL6A | SSCP package equ | See attachments | Branch Panel | |
| 4-17BL5 | SSCP package equ | See attachments | Branch Panel | |
| 4-17AEH2A | SSCP package equ | See attachments | Branch Panel | |
| 4-17AT1 | SSCP package equ | See attachments | Transformer | |
| 4-17AL6 | SSCP package equ | See attachments | Branch Panel | |
| 4-17AT2 | SSCP package equ | See attachments | Transformer | |
| 4-17AL1 | SSCP package equ | See attachments | Branch Panel | |
| 4-17AE1 | SSCP package equ | See attachments | Branch Panel | |
| 4-17BT1 | SSCP package equ | See attachments | Transformer | |
| 4-17ADI | SSCP package equ | See attachments | Distribution Board | |
| FSD-10359 RM#1401 | See Penthouse FSI | See Penthouse FSI | FIRE DAMPER | |
| FSD-10398 RM#1488 | See Penthouse FSI | See Penthouse FSI | FIRE DAMPER | |
| FSD-10360 RM#1402 | See Penthouse FSI | See Penthouse FSI | FIRE DAMPER | |
| FSD-10397 RM#1487 | See Penthouse FSI | See Penthouse FSI | FIRE DAMPER | |
| EF-220 | Future | Future | ENVIRONMENTAL FAN | |
| EF-222 | Future | Future | ENVIRONMENTAL FAN | |
| SEF-200 | Future | Future | SUPPLY FAN | |
| FSD-10462 RM#302 | Couldn't access (B) | N/A | FIRE DAMPER | |
| FSD-10466 RM#302 | Couldn't access (B) | N/A | FIRE DAMPER | |
| FSD-10464 RM#302 | Couldn't access (B) | N/A | FIRE DAMPER | |
| FSD-10473 RM#312 | Access door in the | Access door in the | FIRE DAMPER | |
| SPF-205 | Access door broker | 13593972 | SMOKE CONTROL FAN | Access door bro... |
| PTAC-200 | 010646 | IK22407696 | PACKAGED TERMINAL AIR CONDITIONER | |
| 1-17AL1B | 010645 | See attachments | Branch Panel | |
| K5EC | 010644 | See attachments | Branch Panel | Inside the cabin... |
| 5-17BH2 (SMP-2) | 010643 | See attachments | Branch Panel | North wall of the |
| K5EB | 010642 | See attachments | Branch Panel | East wall of the |
| CUH-209 | 010641 | 03214613-5588 | CABINET UNIT HEATER | |
| CUH-214 | 010640 | 03214613-5593 | CABINET UNIT HEATER | |
| EWH-205 | 010639 | 1414R000062 | WATER HEATER (ELECTRIC) | |
| EWH-204 | 010638 | 1414R000060 | WATER HEATER (ELECTRIC) | |
| IRH-203 | 010637 | 1401-027-080-0078 | INFRARED RADIANT HEATER | |
| IRH-201 | 010636 | 1401-027-060-0066 | INFRARED RADIANT HEATER | |
| DWET-200 | 010635 | 286747 | EXPANSION TANK | |
| DWET-900 | 010634 | 286748 | EXPANSION TANK | |
| EWH-900 | 010633 | 1414R000039 | WATER HEATER (ELECTRIC) | |
| DWET-203 | 010632 | 286749 | EXPANSION TANK | |

Filters New Edit Remove 1000 items Filter: All Equipment

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Efficiency Gained

Information from Data:

- a) On a monthly basis each inspector performed inspections and Daily Reports for an average of **3.06 projects/day/mo.**
- b) The average daily time savings for the average **3.06** projects per day per month is **36.48 minutes per day total.**
- c) The Monthly Savings (21.65 work days) per inspector based on an average \$100/hr burdened rate (\$41.32/hr x 2.42 multiplier) is **\$1,316.43/mo.**
- d) Potential annual savings per Inspector = **\$15,797.14/year**
- e) Conclusion: Potential Efficiency Savings on 41 Inspectors per year = **\$647,682.80**

Weight and Cost of Paper

- Full set of plans weigh 1,185 lbs
- Full set of specifications weighs 68 lbs
- Reproduction cost per set \$7,296.00
- iPad weighs 2.2 lbs
- iPad cost \$1,200.00

| | |
|--|--|
| Project Data: | PTC = 443,555 SF. |
| | Hotel = 327,000 SF |
| Project Budget = 365 M | |
| 53 On site Management Staff + 5-10 Field Foreman over 2.5 years | |
| 51 iPads x \$100 applecare Plus = \$5,100 Dollars for 2 yr warrantee | |
| 2 Broken iPads = \$300 saved = Not worth it. | |
| | 04/17/2014 (6) 64 GB iPad Air Best Buy 4519.98 No Applecare+ |
| | 03/12/2014 (1) 64 GB iPad Air Best Buy 753.33 No Applecare+ |
| | 02/19/2014 (6) 32 GB iPad Air Best Buy 3958.08 Includes Applecare+ |
| | 02/01/2014 (1) 64 GB iPad Air Best Buy 753.33 No Applecare+ |
| 753.55 iPad | \$753.55 xx/xx/2013 (5) 64 GB iPad 3 WiFi 3258 |
| 107.64 Case | \$107.64 xx/xx/2013 (2) 64 GB iPad mini WiFi 1175 |
| 35 Apps | \$35.00 xx/xx/2012 (20) 64 GB iPad 2 Cellular 13857.2 |
| | xx/xx/2012 (5) 64 GB iPad 2 Cellular 3114.81 |
| | xx/xx/2012 (7) 64 GB iPad 2 Cellular 5150.99 |
| | xx/xx/2012 (6) 64 GB iPad 2 Cellular 4024 |
| | 40564.7 |
| | 6350.71 |
| Duplication Budget | 2065 |
| Actual Use \$12,217.00 | |
| Amount Sd ##### | 48980.4 |
| \$207,876.00 Saved | |
| | 3750 RFI 8 Min per RFI 500 Engineer Hrs. |
| Drawing Access | 10 Min Walk avert: 433 Foreman Hrs @ 10/ day 10 Min Walk avert: 346 Supt. Hrs @ 8/ day 10 Min Walk avert: 216 Eng. Hrs @ 5/ day 10 Min Walk avert: 87 PM Hrs @ 2/ day |
| | 1080 865 540 215 |
| | 4436 "e" sheets in IFC Drawings IFC Drawings = \$2,218.00/ set @ \$.50/ Sheet |
| | 5721 Bulletin Sheets added IFC + Bulleting Drawings = \$5,078.50/ set @ \$.50/ Sheet |
| Printing Budget | |
| Actual user \$31,902.00 | 10,157 sheets in IFC set including bulletin = 35,550' x 36" roll of paper |
| Amount Sd \$72,958.00 | IFC Drawings plus Bulletin would weigh 1,185 LBs. IFC Drawings would weigh 518 LBs. 15,526' long x 36" roll of paper |
| \$280,834 Saved - \$53,000 cost of ipad | |
| \$227,834 saved / 59 users | |
| \$3,861 saved per user! | |



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