Identifying Data Patterns from Professional Practice

Van Woods

US Army Corps of Engineers

US Army Corps of Engineers®

"The views presented are those of the speaker and do not necessarily represent the views of the Department of Defense or the Army."

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE

BUILDING CONTENT SUMMIT

SPECIAL THANKS:

AVAIL™

- Randall Stevens
- Donovan Justice
- Max Sparkman
- Building Content Summit
- Revit Schedule CSV Parser
  - Free & Open Source Resource

ALLEGION
PIONEERING SAFETY™

- Shawn Foster
- Machine Learning, Data Analytics

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE

HDR

ssoe

W COLLEGE OF BUILT ENVIRONMENTS UNIVERSITY of WASHINGTON

US Army Corps of Engineers®

BIM GIS CIM

buildingSMARTalliance®
a council of the National Institute of Building Sciences

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE

Van Woods

- BIM Program Manager, US Army Corps of Engineers (USACE)
- Vice Chair, Board of Direction, buildingSMART alliance
- USACE Medical Center of Expertise, BIM Support, Tech Lead
- Former Research Architect, Construction Engineering Research Lab, USACE

Session Description

- Construction document drawings are rich in quality controlled tabular data and abundantly available. We will discuss how automated mass data extraction and analysis can be used to identify data patterns produced from products in professional practice.
- We will also demonstrate how others can contribute to assist with identifying industry-wide data trends. With a greater understanding of data practices we can make more rational and evidence-based decisions for standardization, quality control and other related uses.

Learning Objectives

At the end of this session, participants will be able to:

1. Describe areas of existing high quality and low quality BIM data
2. Explain methods for bulk data extraction and analysis
3. Summarize findings from data analysis
4. Demonstrate process to contribute to industry-wide data analysis

Introduction

- What?
  - Harvest existing AECO data with repeatable process using free and open source tools
    - Bulk extraction of existing quality controlled data
  - Crowd source data extraction and analyses

- Why?
  - Data-driven decision making
  - Standards prioritization and statistics
  - Datasets for data science and machine learning
  - Building Content Summit data analysis

- How?
  - We will demonstrate one approach
  - GOAL: Open source, industry-wide participation and analyses

Big Picture Goal

- BCS 2019 - Stage 1
  - Develop extraction method, format, submission process, proof of concept
  - Gauge interest, stimulate involvement**, collect feedback
- BCS 2020 - Stage 2
  - Incorporate feedback
  - Collect mountains of data**
  - Deep dive on data science analysis

**Randall Stevens BCS Quote: “Part of the goal with BCS has always been to have some actionable outcomes from our in-person annual gatherings to pursue during the year.”

Outline

- Rise of AI and Data Science
- BIM Data Complexity
- Legally Valid Data

- How To Extract
- Ways To Analyze
- How To Participate and Contribute

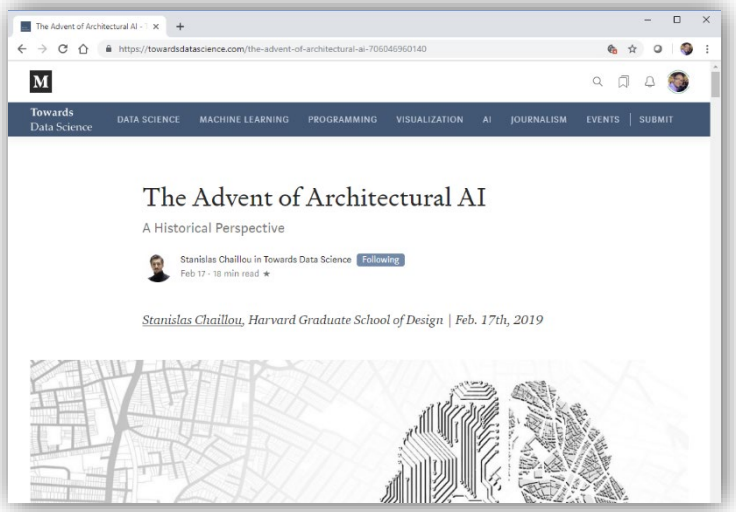
Outline

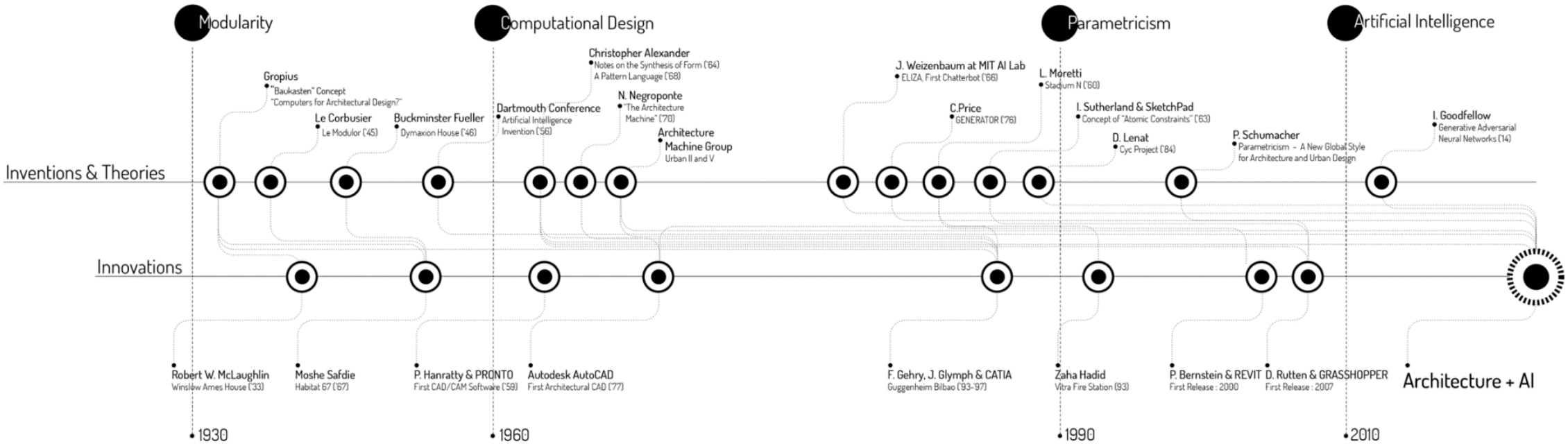
- Rise of AI and Data Science
- BIM Data Complexity
- Legally Valid Data

- How To Extract
- Ways To Analyze
- How To Participate and Contribute

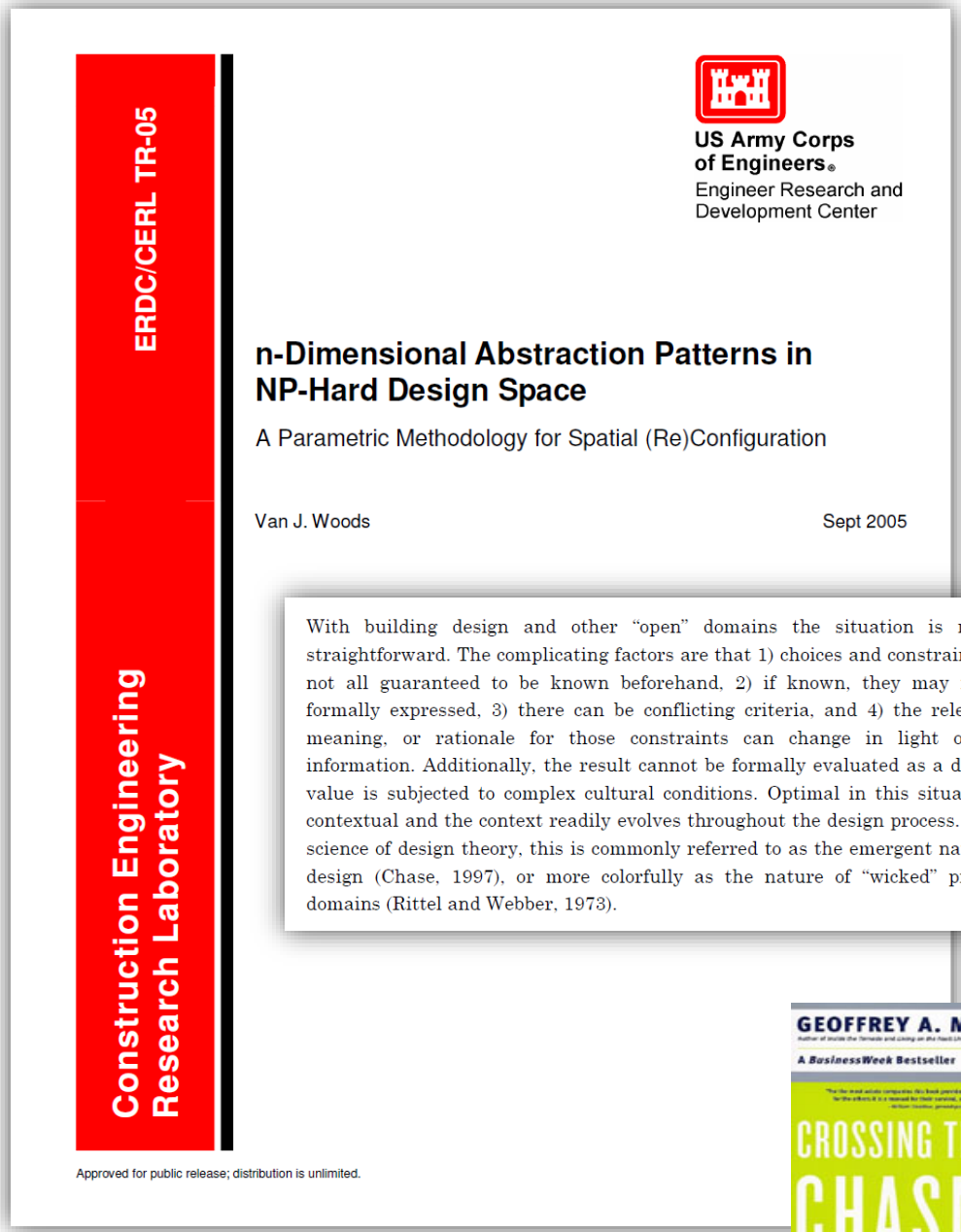
#1: The Advent of Architectural AI

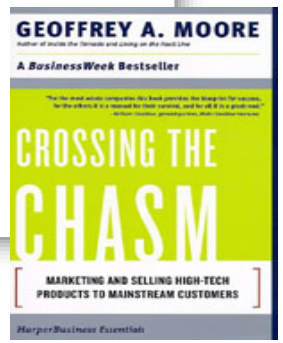
- Stanislas Chaillou
  - Harvard University Graduate School of Design
- History of inventions, theories, innovations





https://towardsdatascience.com/the-advent-of-architectural-ai-706046960140





- Generative Design
- "Design Space"
  - Search vs Exploration
- Emergent nature of design
- Interdependence between problem specification and problem solving
- Design theory research, AI in "Wicked" & "TAME" domains

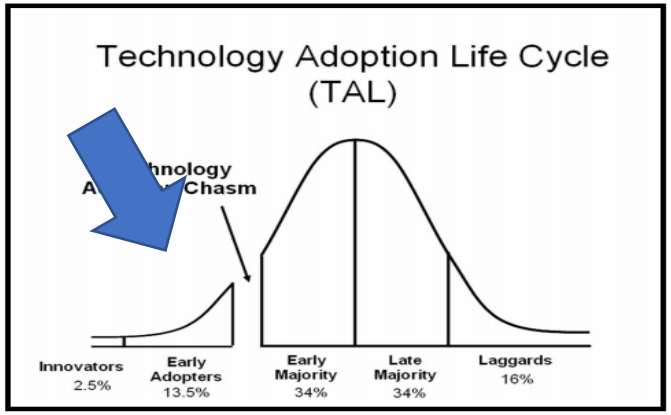
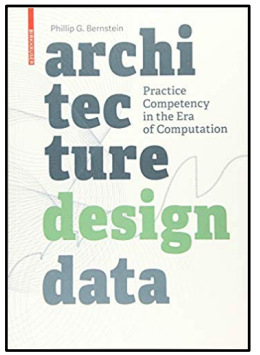


Figure 2. Technology Adoption Life Cycle: The Chasm



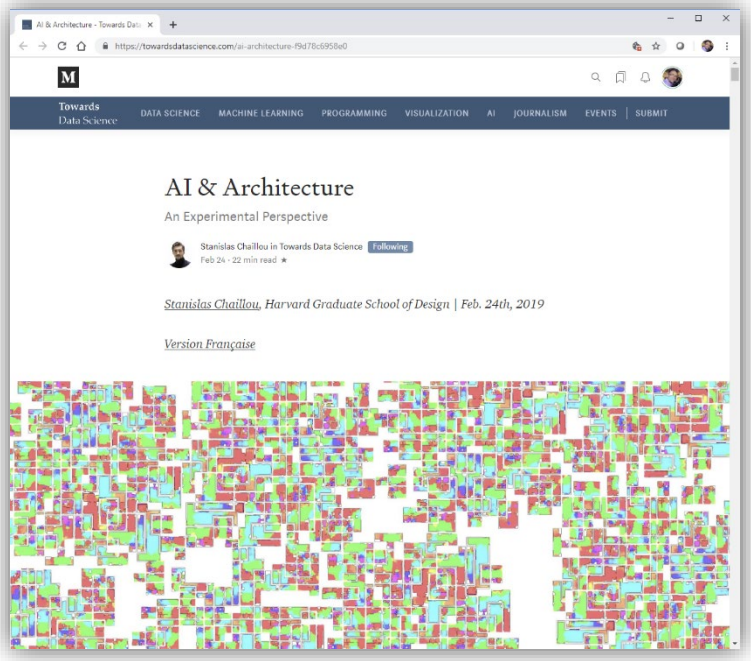
Source: https://apps.dtic.mil/dtic/tr/fulltext/u2/a473396.pdf

http://bit.ly/woodsreport

#2: AI & Architecture

- Stanislas Chaillou
  - Harvard University Graduate School of Design
- Examples of different possible applications of AI

GAN-enabled Space Layout under Morphing Footprint | Source: Stanislas Chaillou



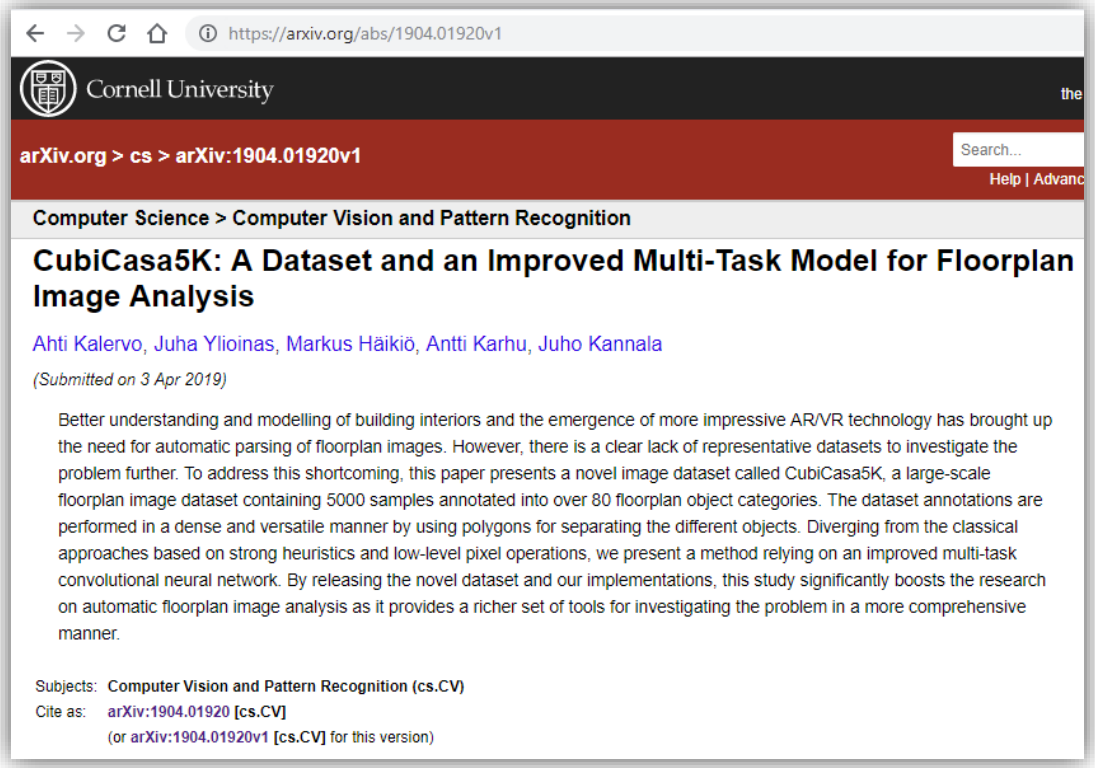
https://towardsdatascience.com/ai-architecture-f9d78c6958e0

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

CubiCasa5K

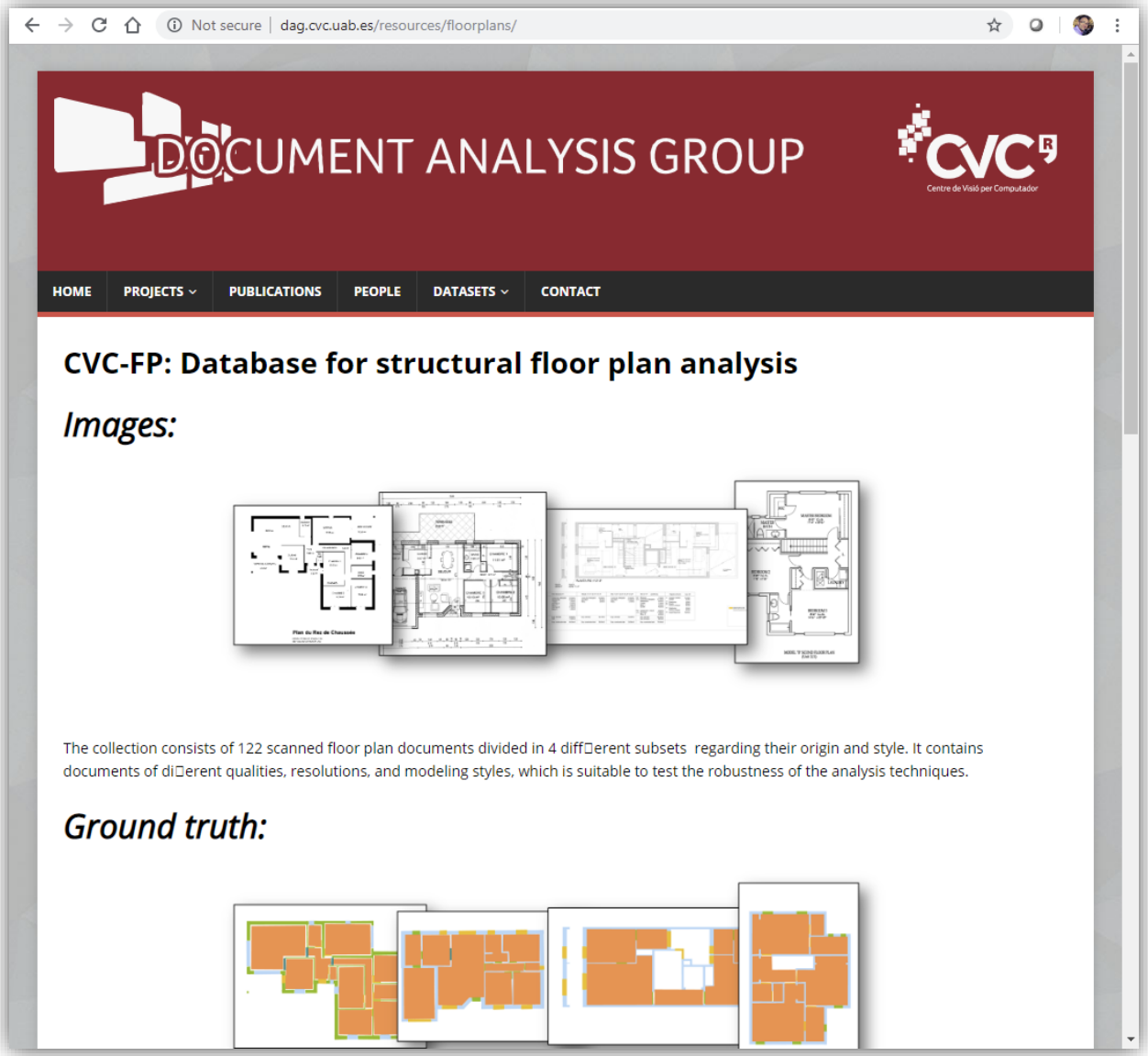
- 5,000 floorplan image samples
- 80 floorplan object categories annotated

- Research Paper
  - https://arxiv.org/abs/1904.01920
- Data and Code
  - https://github.com/CubiCasa/CubiCasa5k



CVC-FP

- 122 scanned floor plans
- Features identified for rooms, walls, doors, windows, parking doors, room separations, etc.



Contact and citation

Lluis-Pere de las Heras

```
@article{Heras15a,
author={de las Heras, Llu\'is-Pere and Terrades, OriolRamos and Robles, Sergi and S\'anchez, Gemma},
title={CVC-FP and SGT: a new database for structural floor plan analysis and its groundtruthing tool},
journal={International Journal on Document Analysis and Recognition},
year={2015}}
```

FloorNet

- Floorplan reconstruction from low density 3D scans
- 155 residential buildings (3D points, images)
- Ground-truthed annotated floorplans

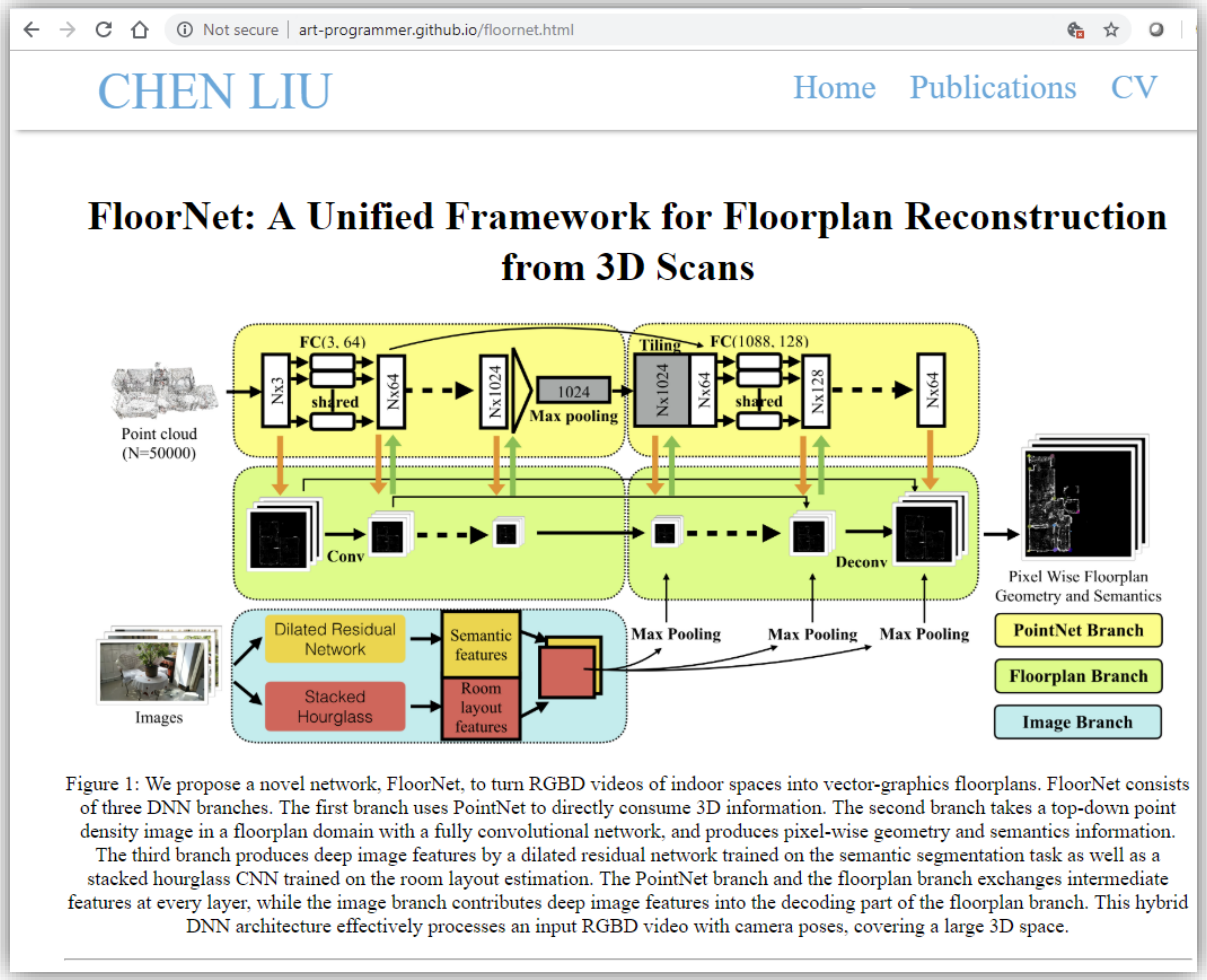


Figure 1: We propose a novel network, FloorNet, to turn RGBD videos of indoor spaces into vector-graphics floorplans. FloorNet consists of three DNN branches. The first branch uses PointNet to directly consume 3D information. The second branch takes a top-down point density image in a floorplan domain with a fully convolutional network, and produces pixel-wise geometry and semantics information. The third branch produces deep image features by a dilated residual network trained on the semantic segmentation task as well as a stacked hourglass CNN trained on the room layout estimation. The PointNet branch and the floorplan branch exchanges intermediate features at every layer, while the image branch contributes deep image features into the decoding part of the floorplan branch. This hybrid DNN architecture effectively processes an input RGBD video with camera poses, covering a large 3D space.

Paper

FloorNet: A Unified Framework for Floorplan Reconstruction from 3D Scans

Chen Liu*, Jiaye Wu*, Yasutaka Furukawa
(* indicates equal contribution.)

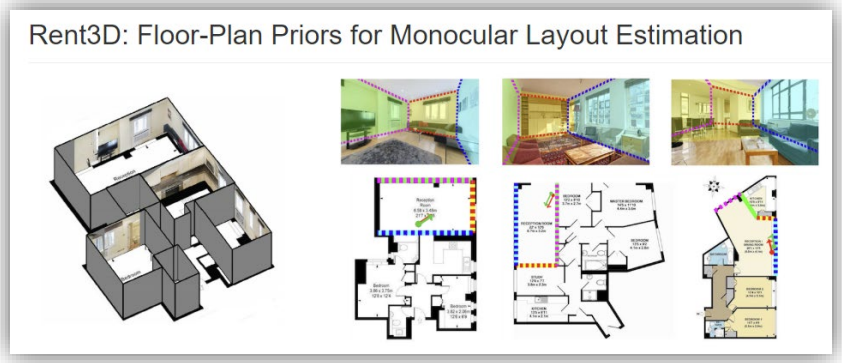
In *European Conference on Computer Vision (**ECCV**)*, 2018
[Arxiv] [Supp.] [Code and Data]

Rent3D dataset

- 215 annotated 2D floorplans
- 1,570 room photos with alignments

Rent3D: Floor-Plan Priors for Monocular Layout Estimation (***oral presentation***)
Chenxi Liu*, Alex Schwing*, Kaustav Kundu, Raquel Urtasun, Sanja Fidler
In *Computer Vision and Pattern Recognition* (**CVPR**), Boston, 2015
* Denotes equal contribution

Paper | Abstract | Suppl. Mat. | Bibtex



Not secure | www.cs.toronto.edu/~fidler/projects/rent3D.html

People

Chenxi Liu, Alexander Schwing, Kaustav Kundu, Raquel Urtasun, Sanja Fidler

Data

Rent3D dataset:

- **Rental ad data for 215 apartments**

Statistics for the Rent3D Dataset					
# apartments	**# of images**	**avg. # rooms per apt**	**avg. # walls per apt**	**avg. # windows per apt**	**avg. # doors per apt**
215	1570	6	31	6	9

- **Floor-plans have annotations for:**
  - Room types
  - Walls (represented with lines and dimension in real world)
  - Windows
  - Doors
- **Each photo of a room has the following ground-truth:**
  - Scene type (e.g., *kitchen*, *bedroom*, *outdoor*)
  - Room layout
  - Windows
  - Doors
- **Ground-truth alignment of each photo within floor-plan**

Contact

For questions regarding the data please contact Kaustav Kundu and Sanja Fidler.

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

Every other data specialist in the world is NOT a specialist with designing/constructing/operating.

WE have the most REAL WORLD data and expertise about the built environment.

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

Data, Data, Everywhere

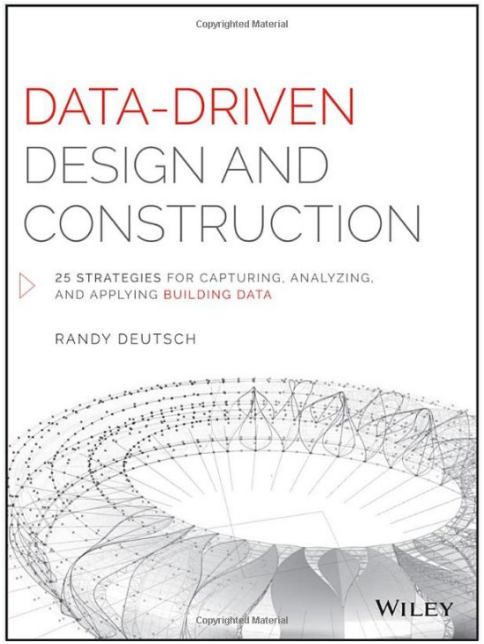
- Types of AECO data accessible to Corps by approximate descending quantity
  - PDF drawing sets
  - CAD drawing sets
  - Construction Specs (PDFs and SpecsIntact XML)
  - Customer CMMS databases
  - Construction Submittals
  - Construction Administration
  - Cost Estimates
  - GIS of facility portfolio
  - BIM
  - COBie
- Stages/Disciplines
  - All stages, lifecycle
    - Planning
    - Design
    - Construction
    - O&M
    - Real Estate
    - Environmental
  - All disciplines

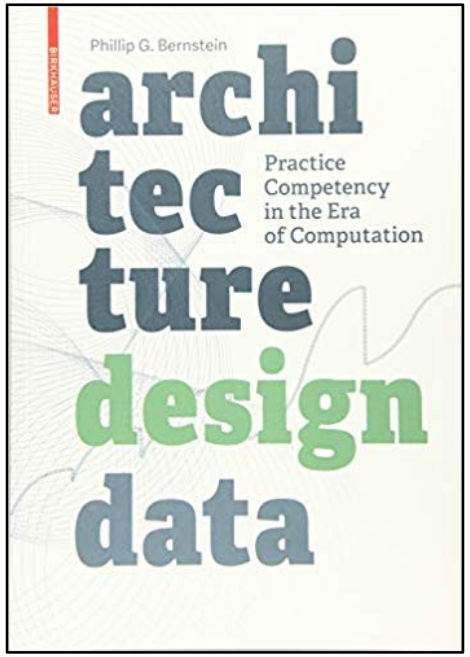
Summary

- Lots of datasets, but not a lot of **public** datasets with built environment data semantics
- Very little, if any, from BIM
- There are lots of uses of data beyond what we have traditionally spend a lot of time with in the BIM community
  - Standardization, Interoperability, Lifecycle Data Exchange
  - Artificial Intelligence, Machine Learning, Big Data, Data Mining, Generative Design, Data Analytics, Data Engineering, Data Science, Dashboarding, Data Visualization, Data Commissioning

For more info…

- Data-Driven Design and Construction
  - Randy Deutsch
- “Everything is data.”
  - David Fano, WeWork (formerly CASE)
- “Architecture - Design - Data: Practice Competency in the Era of Computation”
  - Phillip Bernstein
- LunchBox ML
  - Nathan Miller





Cognitive Bias in Data

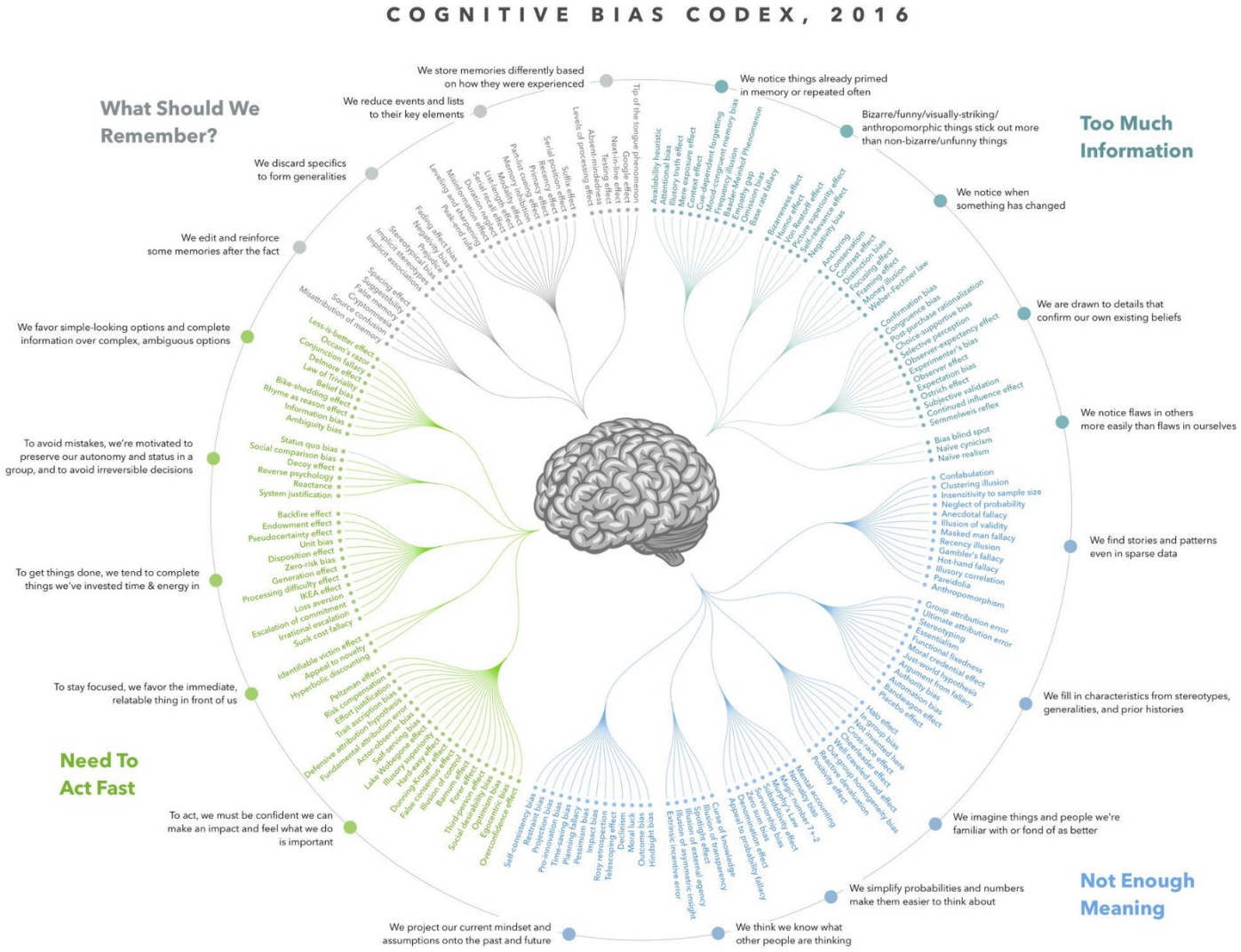
https://en.wikipedia.org/wiki/List_of_cognitive_biases

117 Decision-making, belief, and behavioral biases

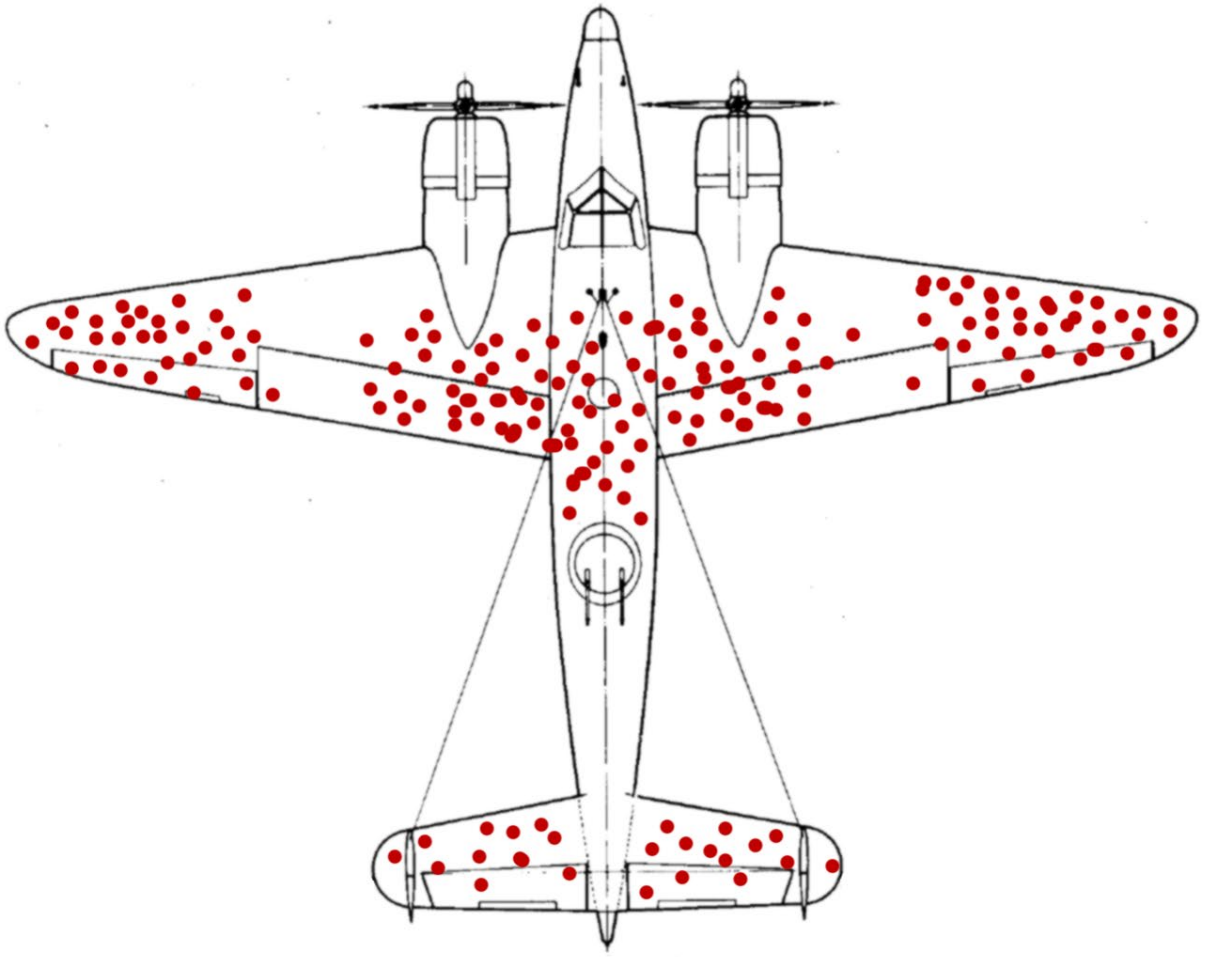
28 Social Biases

48 Memory Errors and Biases

TOTAL 193



Decision-making with data



- Importance of **data science** when transitioning to decision making with data
- Abraham Wald WWII classic data science **selection bias** example
- Technology is an amplifier
- What are the business processes to ensure smart decisions are made with large scale (life safety) impact?

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

BUILDING CONTENT SUMMIT by DBEI

Outline

- Rise of AI and Data Science
- BIM Data Complexity
- Legally Valid Data

- How To Extract
- Ways To Analyze
- How To Participate and Contribute

There are already MANY ways to get data in and out of BIM.

There are already ways to do ML in BIM.

What's the problem?

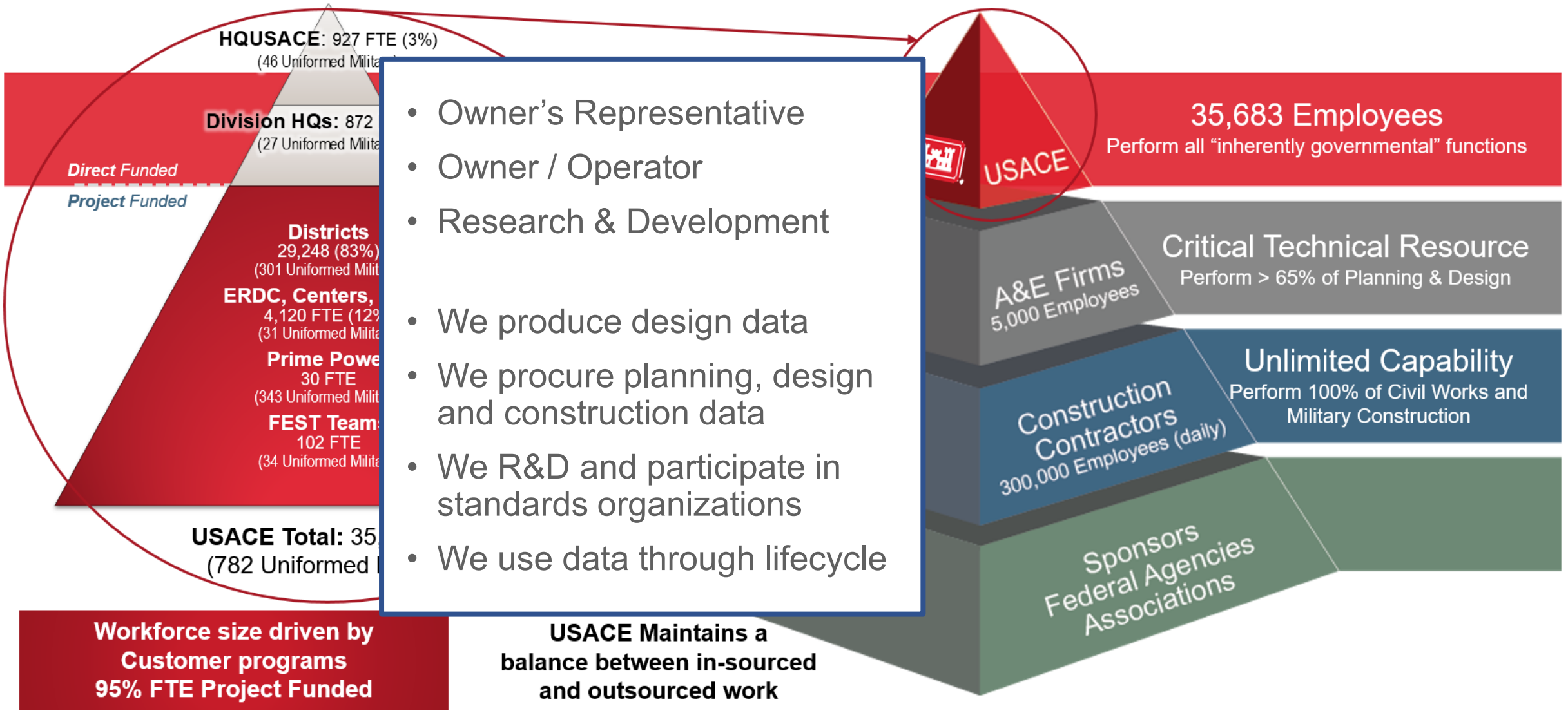
Data Quality Challenges

- Common Adage: **Garbage In, Garbage Out**
- Complexity
  - Breadth and depth
  - Processes
  - Procuring data
  - Systems
  - Change
- Legal context
- Impact on data mining scalability impact for low/medium quality data

No Such Thing As Data Composting

USACE ORGANIZATION AND MANPOWER

Civilian full time equivalents (FTE) and Uniformed End Strength (ES)



- Owner's Representative
- Owner / Operator
- Research & Development

- We produce design data
- We procure planning, design and construction data
- We R&D and participate in standards organizations
- We use data through lifecycle

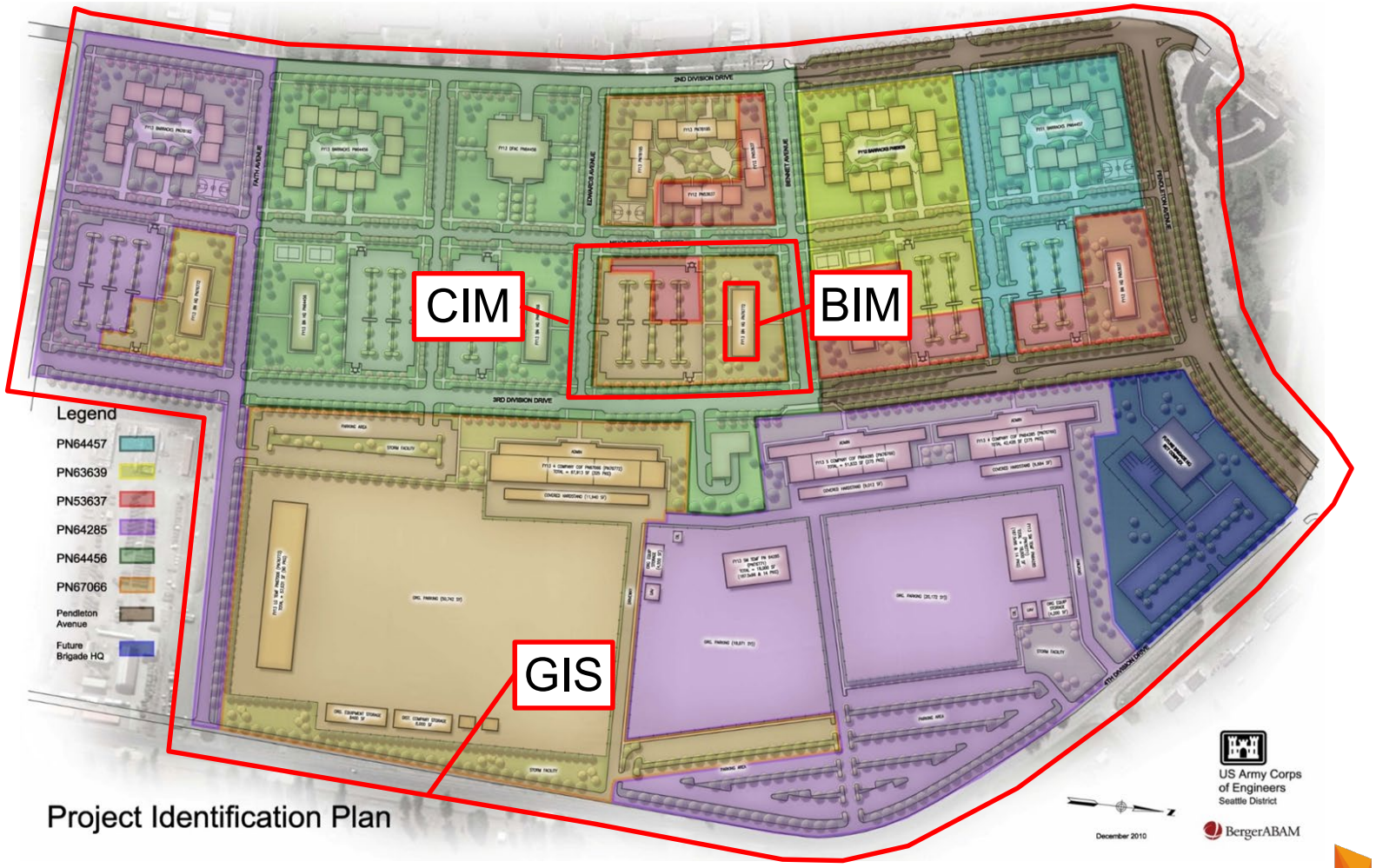
Workforce size driven by Customer programs
95% FTE Project Funded

USACE Maintains a balance between in-sourced and outsourced work

Table 2-1. Discipline Designators.

Discipline	Designator
General	G
Hazardous materials	H
Survey/Mapping	V
Geotechnical	B
Civil	C
Landscape	L
Structural	S
Architectural	A
Interiors	I
Fire protection	F
Plumbing	P
Mechanical	M
Electrical	E
Telecommunications	T
Resource	R
Other disciplines	X
Operations	O

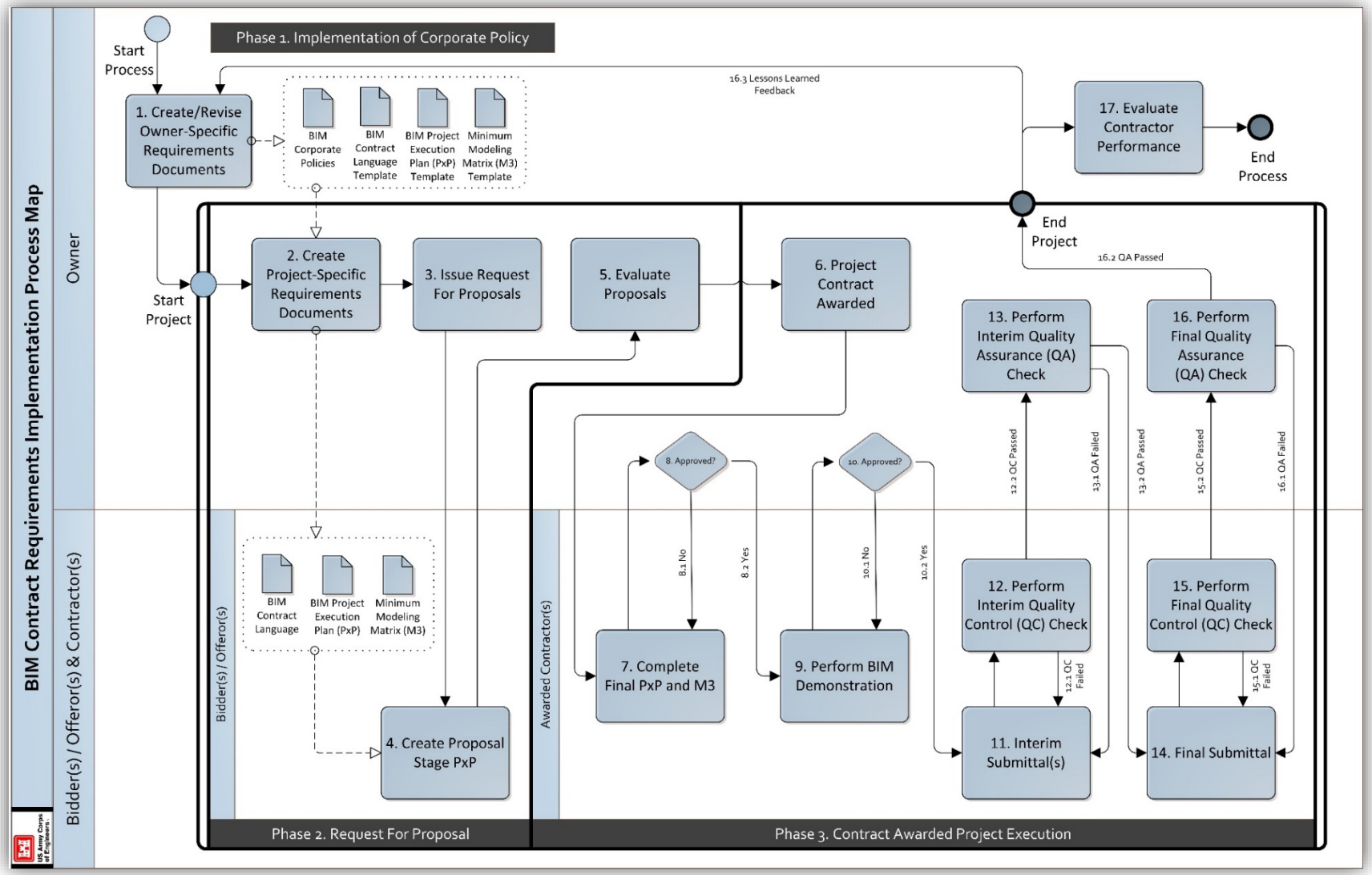
Multi-system, Multi-discipline



- Integration of BIM/CIM/GIS datasets and processes
- All disciplines

Digital Project Procurement

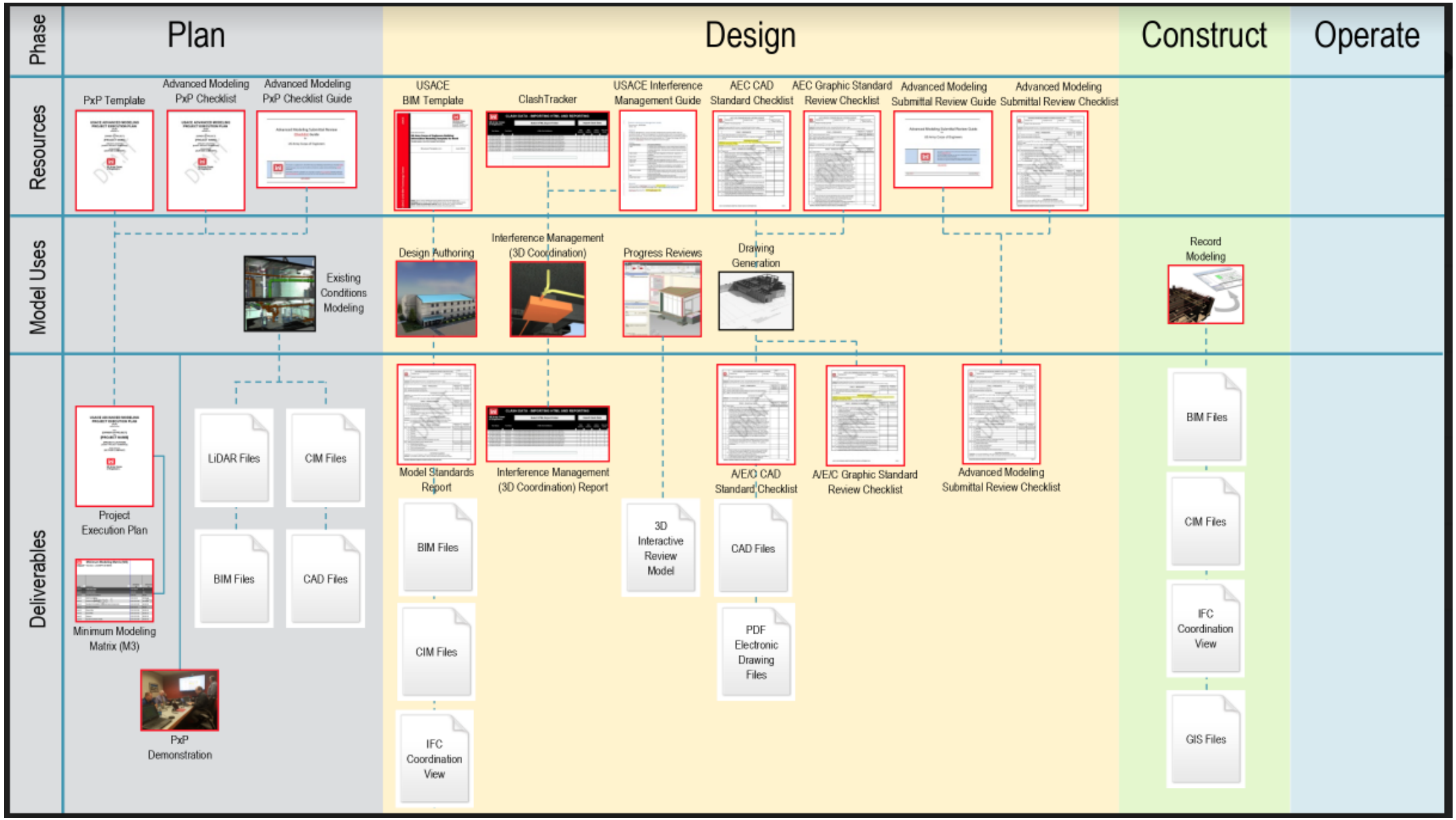
- NBIMS v3
- Section 5.8
- “Practical BIM Contract Requirements”
- AEC processes are complex



https://www.nationalbimstandard.org/files/NBIMS-US_V3_5.8_Practical_BIM_Contract_Requirements.pdf

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

The USACE Toolbox



DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

With all of these controls, the data must be perfect, right?

Complexity in the Process and Context

+

Complexity in the Technology

QTO Data Example

BIM

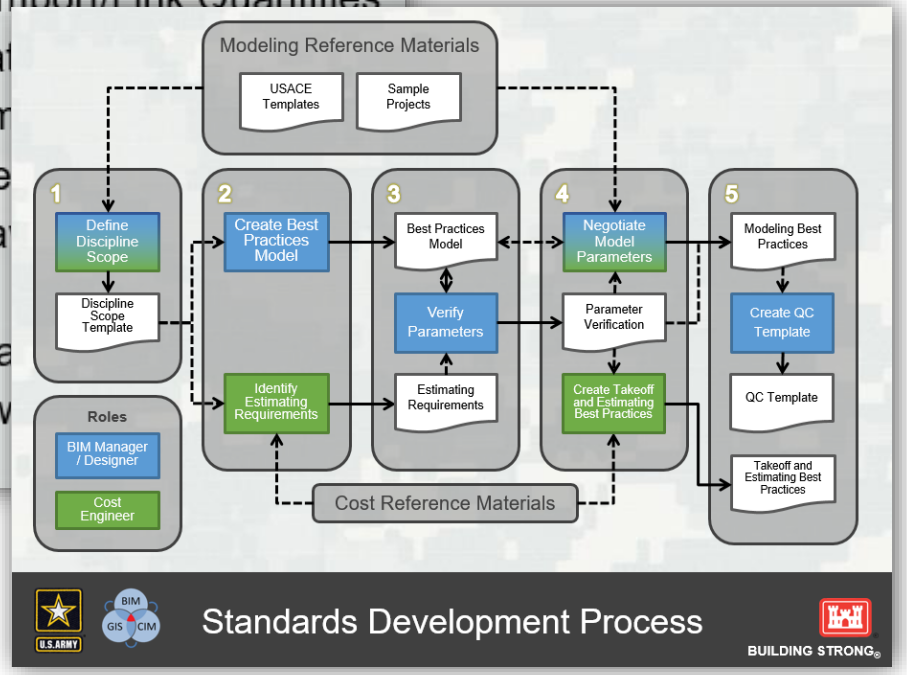
1. Manage Process
2. Create Content
3. Analyze Design
4. Document Design
5. Review Design
6. Check Content (QA/QC)
7. Publish Content

Quantity Take-Off

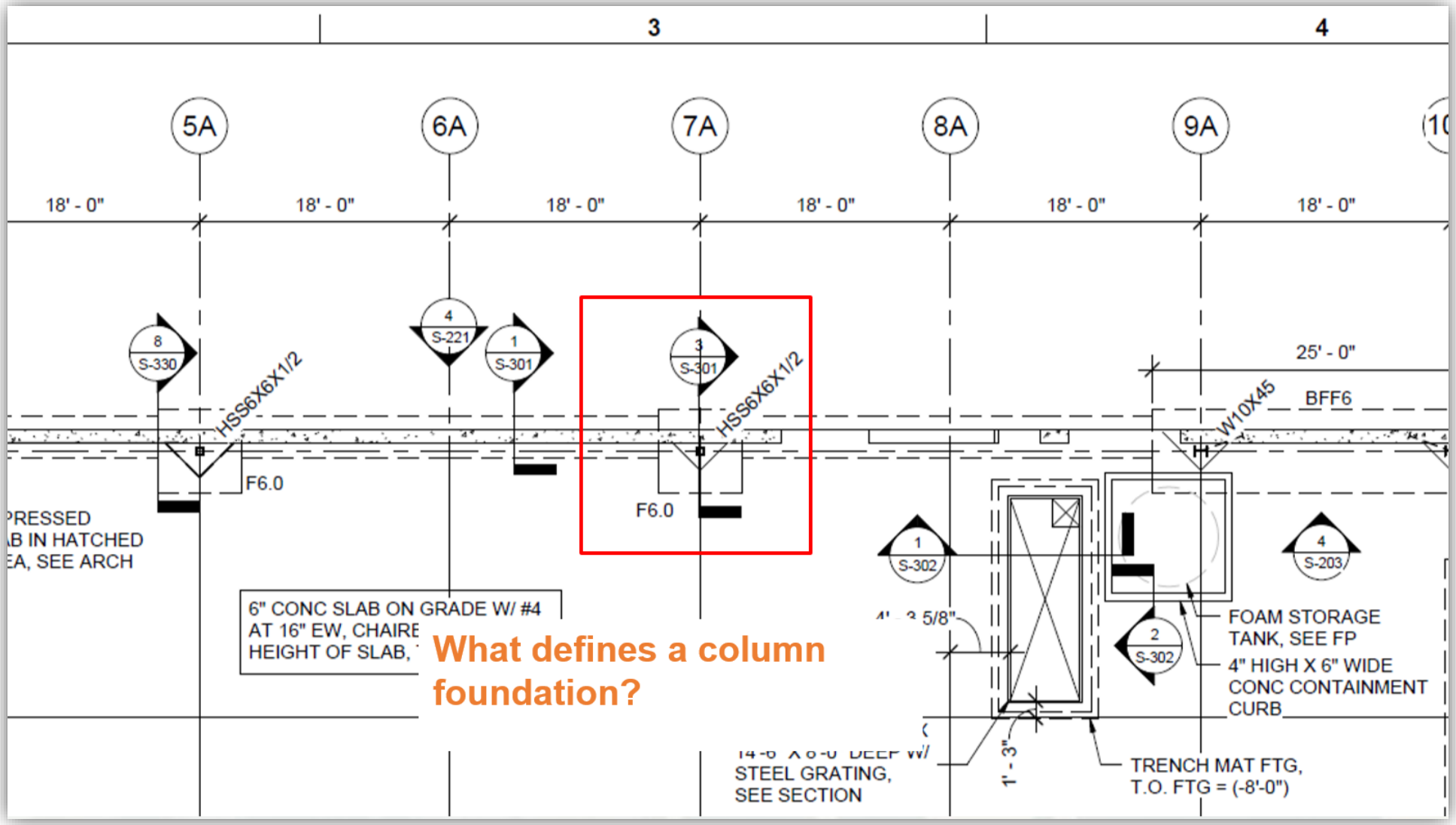
1. Identify & Interpret
2. Count & Measure
3. Visualize
4. Organize
5. Verify (QA/QC)
6. Manual Takeoff of Remaining Items
7. Iterate

Estimating (MII)

1. Import/Adapt/Export WBS
2. Input/Import/Link Quantities
3. Estimat
   Equipm
4. Update
   Per Da
5. Obtain
   Materia
6. Review



QTO “Data Spaghetti” Example

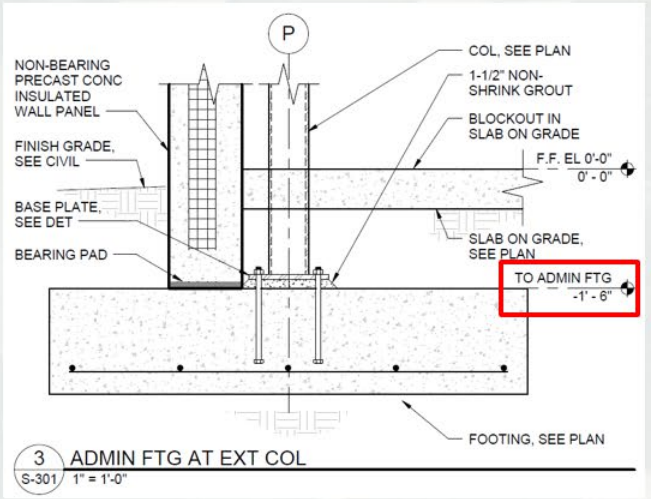


FOOTING SCHEDULE					
MARK	WIDTH	LENGTH	THICK	LONGIT REINF	TRANS REINF
F4.0	4'-0"	4'-0"	14"	(5)#5 BOT	(5) #5 BOT
F5.0	5'-0"	5'-0"	14"	(7)#5 BOT	(7) #5 BOT
F6.0	6'-0"	6'-0"	16"	(5)#7 BOT	(5) #7 BOT
F7.0	7'-0"	7'-0"	18"	(7)#7 BOT	(7) #7 BOT
F8.0	8'-0"	8'-0"	20"	(9)#7 BOT	(9) #7 BOT
F9.0	9'-0"	9'-0"	24"	(9)#8 BOT	(9) #8 BOT
F9.5	9'-6"	9'-6"	24"	(10)#8 BOT	(10) #8 BOT
F10.0	10'-0"	10'-0"	26"	(11)#8 BOT	(11) #8 BOT
WF3.0	3'-0"	-	14"	(4)#5 BOT	#5@12" BOT
BFF4	4'-0"	PLAN	24"	(5)#6 T&B	#6@10" T&B
BFF5	5'-0"	PLAN	30"	(6)#7 T&B	#7@12" T&B
BFF6	6'-0"	PLAN	30"	(7)#7 T&B	#7@12" T&B
BFF7	7'-0"	PLAN	30"	(8)#7 T&B	#7@12" T&B
BFF8	8'-0"	PLAN	36"	(9)#8 T&B	#8@12" T&B

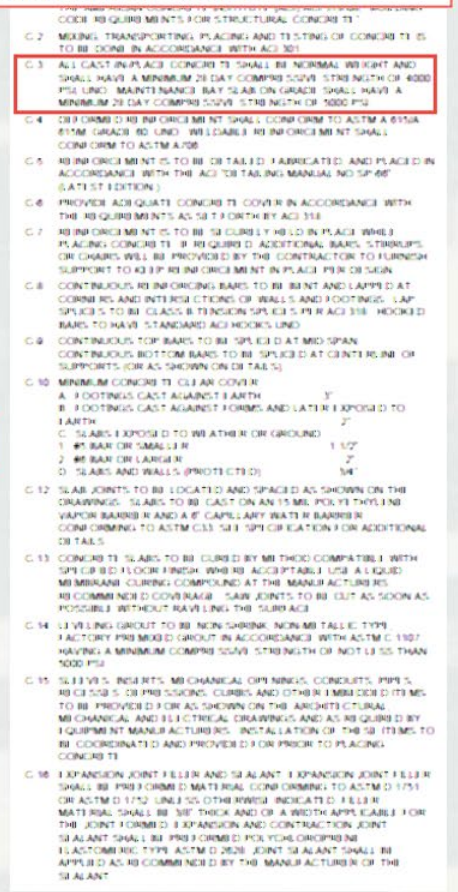
Schedule

C-3 ALL CAST-IN-PLACE CONCRETE SHALL BE NORMAL WEIGHT AND SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI, UNO. MAINTENANCE BAY SLAB ON GRADE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 5000 PSI.

Construction Note



Detail



1.4.10 Strength Requirements

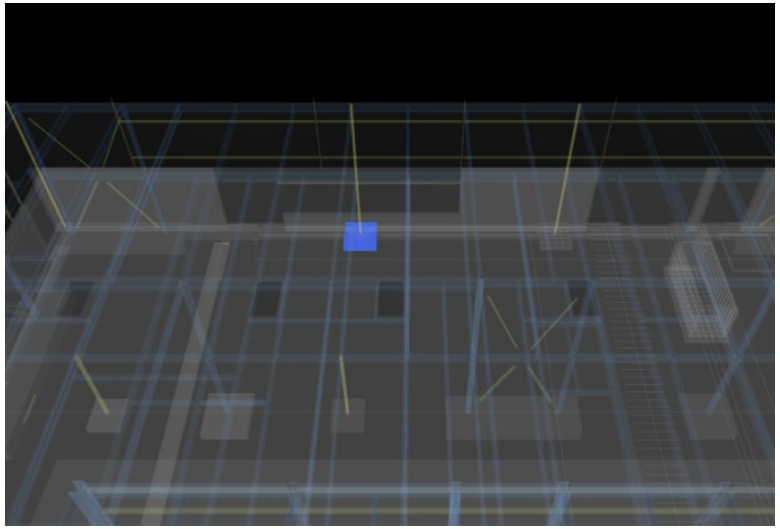
Specified compressive strength (f'c) shall be as follows:

COMPRESSIVE STRENGTH	STRUCTURE OR PORTION OF STRUCTURE
5000 psi at 28 days	Maintenance Bay slab on grade
4000 psi at 28 days	All areas UNO

Specification

1. IDENTIFY & INTERPRET

BUILDING STRONG®



Properties

Item | Element ID | Element | Rebar Cover - Other Faces | Phase Created

Property	Value
Name	F6.0
Type	F6.0
Family	Footing-Rectangular-(2000 PSF)_USACE
Category	Structural Foundations
Id	1026576
Rebar Cover - Other Faces	RebarCoverType "Cast against and perm...
Phase Created	Phase "New Construction", #0
Offset	0ft 0in
Estimated Reinforcement Volume	0.11
Rebar Cover - Bottom Face	RebarCoverType "Cast against and perm...
Workset	0
Moves With Grids	1
Level	Level "TO ADMIN FTG", #1171210
Rebar Cover - Top Face	RebarCoverType "Cast against and perm...
Enable Analytical Model	1
Host	Level : TO ADMIN FTG
Elevation at Bottom	-2ft 12in

Properties

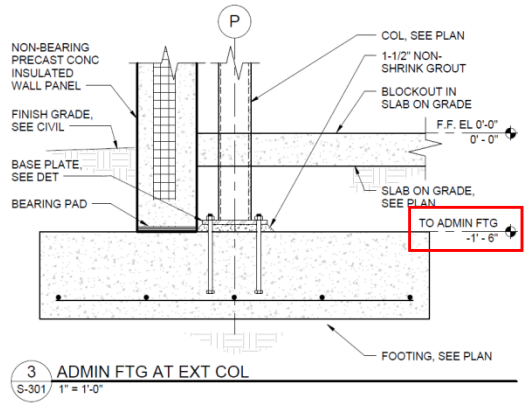
Level | Rebar Cover - Top Face | Revit Type | TimeLiner

Property	Value
Name	F6.0
Id	943981
Cost	0.00
Reinforcing A Bar Quantity	4
Reinforcing Longitudinal Size	0
Reinforcing B Bar Quantity	4
Reinforcing Transverse Spacing	0ft 0in
Width	6ft 0in
Reinforcing A Bar Size	5
Assembly Description	Spread Footings
Length	6ft 0in
Reinforcing Longitudinal Quantity	0
Footing Material	MaterialConcrete "Concrete - Cast-in-Place Concre
Assembly Code	A1010120
Workset	269
Reinforcing Quantity	45.93
Thickness	1ft 6in
Reinforcing B Bar Size	5
Reinforcing Transverse Size	0

COST ENGINEER:
"So here we run into our first problem…
You can see that the information contained in the model does NOT match the plans and specs.

- Reinforcing steel is incorrect
- Compressive strength is incorrect
- The Thickness is incorrect
- The depth below grade is incorrect

FOOTING SCHEDULE					
MARK	WIDTH	LENGTH	THICK	LONGIT REINF	TRANS REINF
F4.0	4'-0"	4'-0"	14"	(5)#5 BOT	(5) #5 BOT
F5.0	5'-0"	5'-0"	14"	(7)#5 BOT	(7) #5 BOT
F6.0	6'-0"	6'-0"	16"	(5)#7 BOT	(5) #7 BOT
F7.0	7'-0"	7'-0"	18"	(7)#7 BOT	(7) #7 BOT
F8.0	8'-0"	8'-0"	20"	(9)#7 BOT	(9) #7 BOT
F9.0	9'-0"	9'-0"	24"	(9)#8 BOT	(9) #8 BOT
F9.5	9'-6"	9'-6"	24"	(10)#8 BOT	(10) #8 BOT
F10.0	10'-0"	10'-0"	26"	(11)#8 BOT	(11) #8 BOT
WF3.0	3'-0"	-	14"	(4)#5 BOT	#5@12" BOT
BFF4	4'-0"	PLAN	24"	(5)#6 T&B	#6@10" T&B
BFF5	5'-0"	PLAN	30"	(6)#7 T&B	#7@12" T&B
BFF6	6'-0"	PLAN	30"	(7)#7 T&B	#7@12" T&B
BFF7	7'-0"	PLAN	30"	(8)#7 T&B	#7@12" T&B
BFF8	8'-0"	PLAN	36"	(9)#8 T&B	#8@12" T&B



Properties

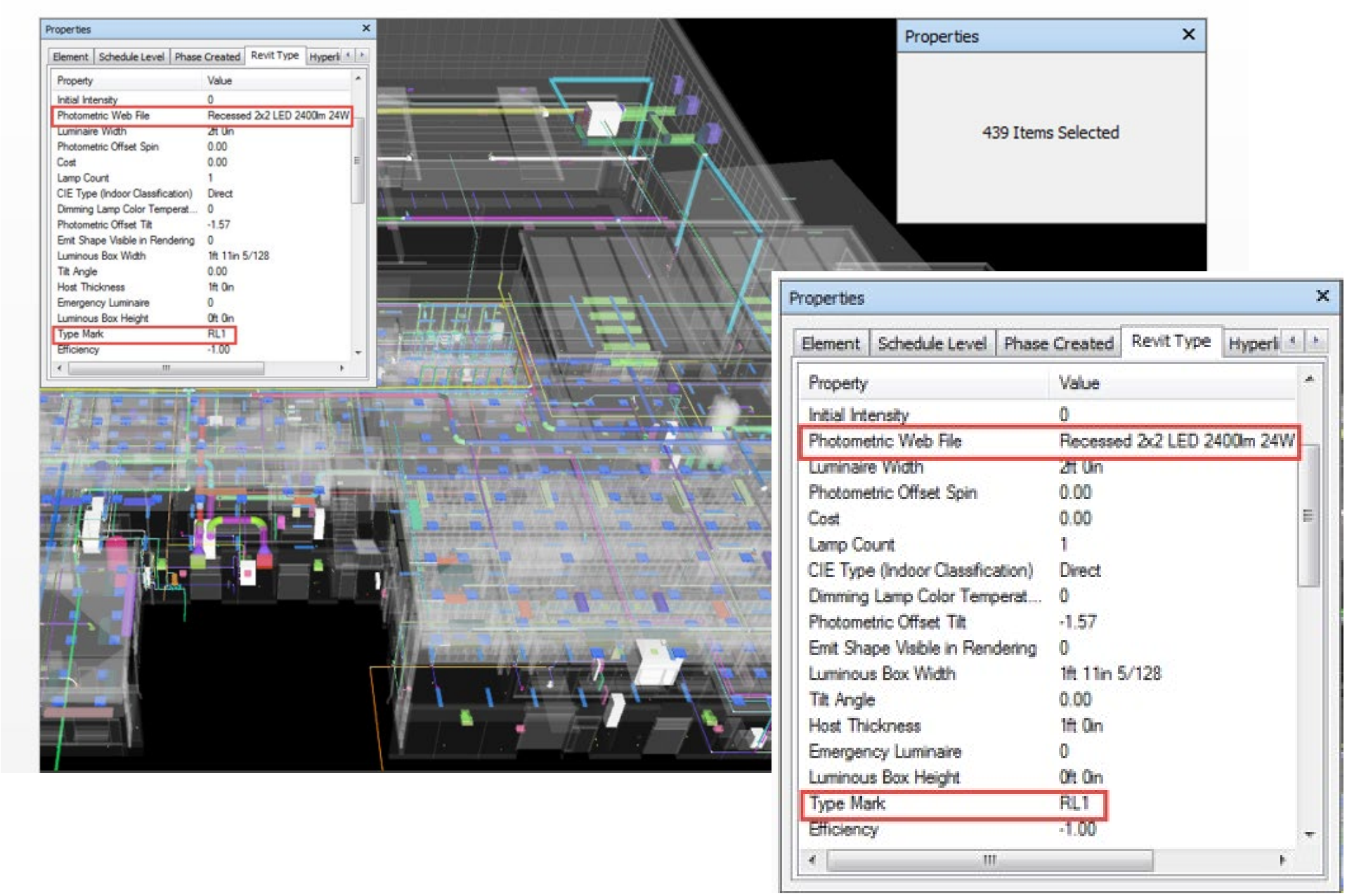
Item | Element ID | Element | Rebar Cover - Other Faces | Phase Created

Property	Value
Name	F6.0
Type	F6.0
Family	Footing-Rectangular-(2000 PSF)_USACE
Category	Structural Foundations
Id	1026576
Rebar Cover - Other Faces	RebarCoverType "Cast against and perm...
Phase Created	Phase "New Construction", #0
Offset	0ft 0in
Estimated Reinforcement Volume	0.11
Rebar Cover - Bottom Face	RebarCoverType "Cast against and perm...
Workset	0
Moves With Grids	1
Level	Level "TO ADMIN FTG", #1171210
Rebar Cover - Top Face	RebarCoverType "Cast against and perm...
Enable Analytical Model	1
Host	Level : TO ADMIN FTG
Elevation at Bottom	-2ft 12in

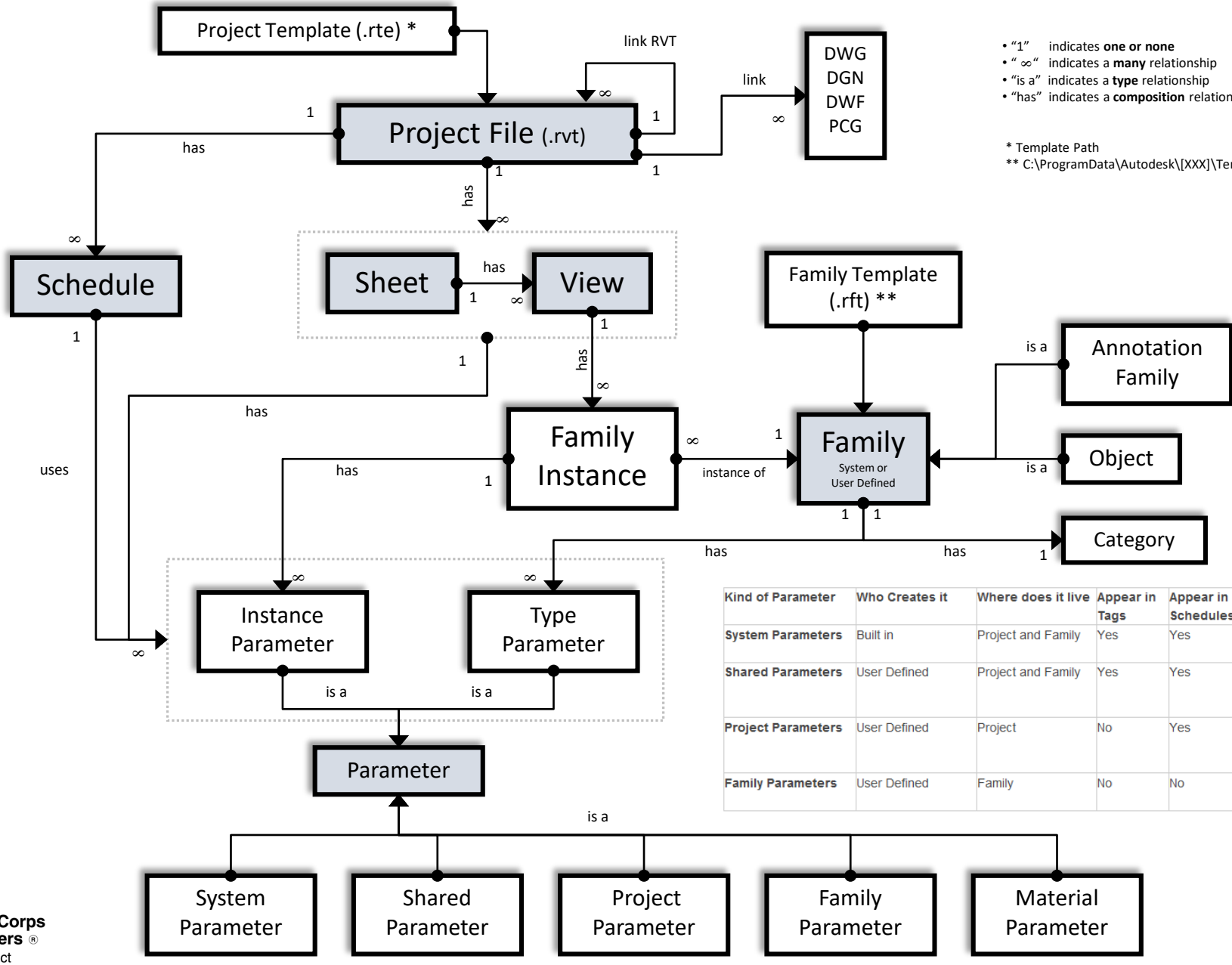
Properties

Level | Rebar Cover - Top Face | Revit Type | TimeLiner

Property	Value
Name	F6.0
Id	943981
Cost	0.00
Reinforcing A Bar Quantity	4
Reinforcing Longitudinal Size	0
Reinforcing B Bar Quantity	4
Reinforcing Transverse Spacing	0ft 0in
Width	6ft 0in
Reinforcing A Bar Size	5
Assembly Description	Spread Footings
Length	6ft 0in
Reinforcing Longitudinal Quantity	0
Footing Material	MaterialConcrete "Concrete - Cast-in-Place Concre
Assembly Code	A1010120
Workset	269
Reinforcing Quantity	45.93
Thickness	1ft 6in
Reinforcing B Bar Size	5
Reinforcing Transverse Size	0


Properties
Element
Schedule Level
Phase Created
Revit Type
Hyperl
Property
Value
Initial Intensity
0
Photometric Web File
Recessed 2x2 LED 2400lm 24W
Luminaire Width
2ft 0in
Photometric Offset Spin
0.00
Cost
0.00
Lamp Count
1
CIE Type (Indoor Classification)
Direct
Dimming Lamp Color Temperat...
0
Photometric Offset Tilt
-1.57
Emit Shape Visible in Rendering
0
Luminous Box Width
1ft 11in 5/128
Tilt Angle
0.00
Host Thickness
1ft 0in
Emergency Luminaire
0
Luminous Box Height
0ft 0in
Type Mark
RL1
Efficiency
-1.00
Properties
439 Items Selected
Properties
Element
Schedule Level
Phase Created
Revit Type
Hyperl
Property
Value
Initial Intensity
0
Photometric Web File
Recessed 2x2 LED 2400lm 24W
Luminaire Width
2ft 0in
Photometric Offset Spin
0.00
Cost
0.00
Lamp Count
1
CIE Type (Indoor Classification)
Direct
Dimming Lamp Color Temperat...
0
Photometric Offset Tilt
-1.57
Emit Shape Visible in Rendering
0
Luminous Box Width
1ft 11in 5/128
Tilt Angle
0.00
Host Thickness
1ft 0in
Emergency Luminaire
0
Luminous Box Height
0ft 0in
Type Mark
RL1
Efficiency
-1.00

Revit Data Conceptual Map



- "1" indicates **one or none**
- "∞" indicates a **many** relationship
- "is a" indicates a **type** relationship
- "has" indicates a **composition** relationship

* Template Path
** C:\ProgramData\Autodesk\[XXX]\Templates\US Imperial\

Kind of Parameter	Who Creates it	Where does it live	Appear in Tags	Appear in Schedules	Description
System Parameters	Built in	Project and Family	Yes	Yes	Built-in to Revit, You cannot change it
Shared Parameters	User Defined	Project and Family	Yes	Yes	Custom Parameter created for the highest portability and flexibility
Project Parameters	User Defined	Project	No	Yes	Custom Parameter accessible to all objects in a Project
Family Parameters	User Defined	Family	No	No	Custom Parameter accessible only to the Family

Source: Paul Aubin website

US Army Corps of Engineers ®
Seattle District
Van Woods, van.woods@usace.army.mil

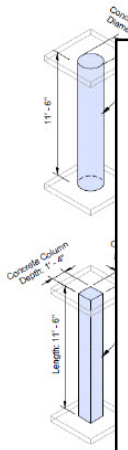
DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

BUILDING CONTENT SUMMIT by DBEI

USACE QUANTITY TAKEOFF STANDARDS: STRUCTURAL | AUTODESK NAVISWORKS

Concrete Columns

UniFormat 2010	
B1010.10.CF	Columns Supporting Floors
B1010.30	Balcony Floor Construction
B1010.40	Mezzanine Floor Construction
B1020.10.CR	Columns Supporting Roofs
B1020.30	Canopy Construction
MasterFormat 2010	
03 30 00	Cast-in-Place Concrete
03 40 00	Precast Concrete



ESTIMATING REQUIREMENTS

Required Estimating Information	In
Identification	N
Length	N
Width	N
Surface Area	N
Volume	N
Depth	N
Diameter	N
Concrete Compressive Strength	B

U.S. Army Corps of Engineers

QTO MODELING BEST PRACTICES: STRUCTURAL | AUTODESK REVIT

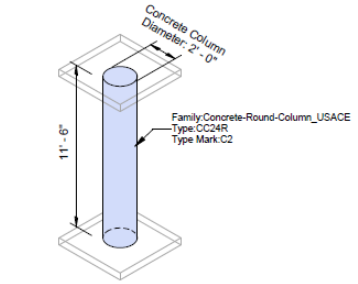
Structural Columns

Concrete Columns

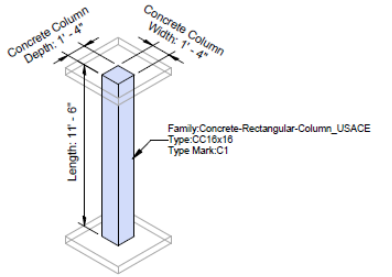
UniFormat 2010
B1010.10.CF - Columns Supporting Floors
B1010.30 - Balcony Floor Construction
B1010.40 - Mezzanine Floor Construction
B1020.10.CR - Columns Supporting Roofs
B1020.30 - Canopy Construction

MasterFormat 2010
03 30 00 - Cast-in-Place Concrete
03 40 00 - Precast Concrete

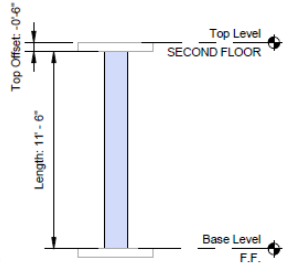
Revit Category
Structural Columns
Revit Families
- Concrete-Rectangular-Column_USACE
- Concrete-Round-Column_USACE



Concrete Column - Round



Concrete Column - Rectangular



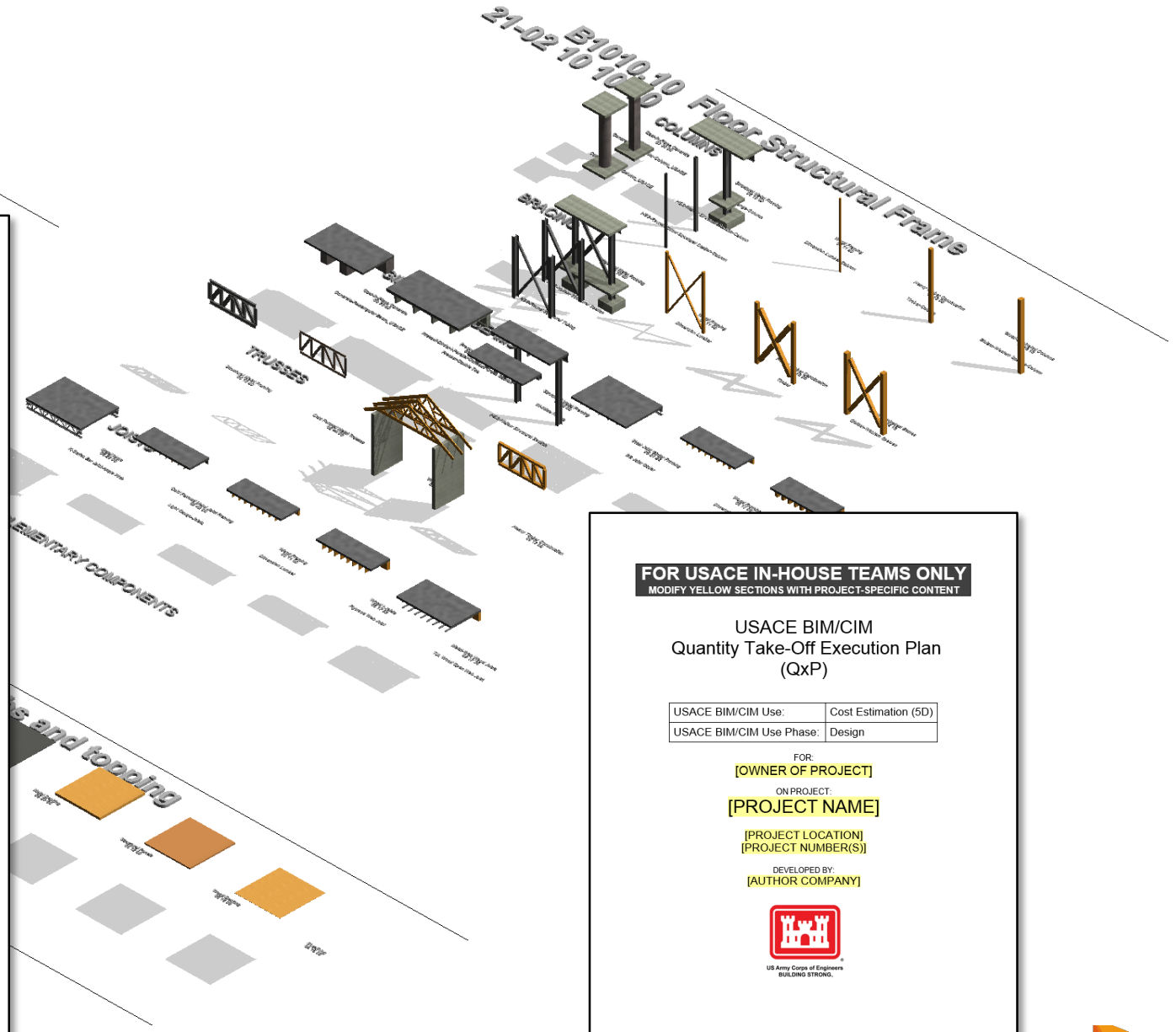
Concrete Column Elevation

QUANTIFICATION PARAMETERS

#	NAME	TYPE	INPUT	DATA TYPE	COMMENT
1	Family	System	User	Family	Name of model Family
2	Type	System	User	Type	Name of model Type
3	Length	System	Calculated	Length	Length of column model
4	Concrete Column Depth*	Shared	User	Length	Depth of column model (*Rectangular column only)
5	Concrete Column Width*	Shared	User	Length	Width of column model (*Rectangular column only)
6	Concrete Column Diameter*	Shared	User	Length	Diameter of column model (*Round column only)
7	Volume	System	Calculated	Volume	Volume of column model
8	Concrete Compressive Strength	-	User	-	Strength of concrete (write in general construction notes)
9	Reinforcement	-	User	-	Quantity, size, and spacing of reinforcing (detail on sheets)
10					

US Army Corps of Engineers | DISCIPLINE LEAD: Alan Heninger | BIM LEAD:Tyler Bush & Van Woods | TEMPLATE LEAD: Kevin Russ
USACE BIM/CIM Use - Design Phase Cost Estimation (5D) | 14 November 2014 | Template Version 2.0

S-04



FOR USACE IN-HOUSE TEAMS ONLY
MODIFY YELLOW SECTIONS WITH PROJECT-SPECIFIC CONTENT

USACE BIM/CIM Quantity Take-Off Execution Plan (QxP)

USACE BIM/CIM Use:	Cost Estimation (5D)
USACE BIM/CIM Use Phase:	Design

FOR:
[OWNER OF PROJECT]

ON PROJECT:
[PROJECT NAME]

[PROJECT LOCATION]
[PROJECT NUMBER(S)]

DEVELOPED BY:
[AUTHOR COMPANY]

US Army Corps of Engineers
BUILDING STRONG.

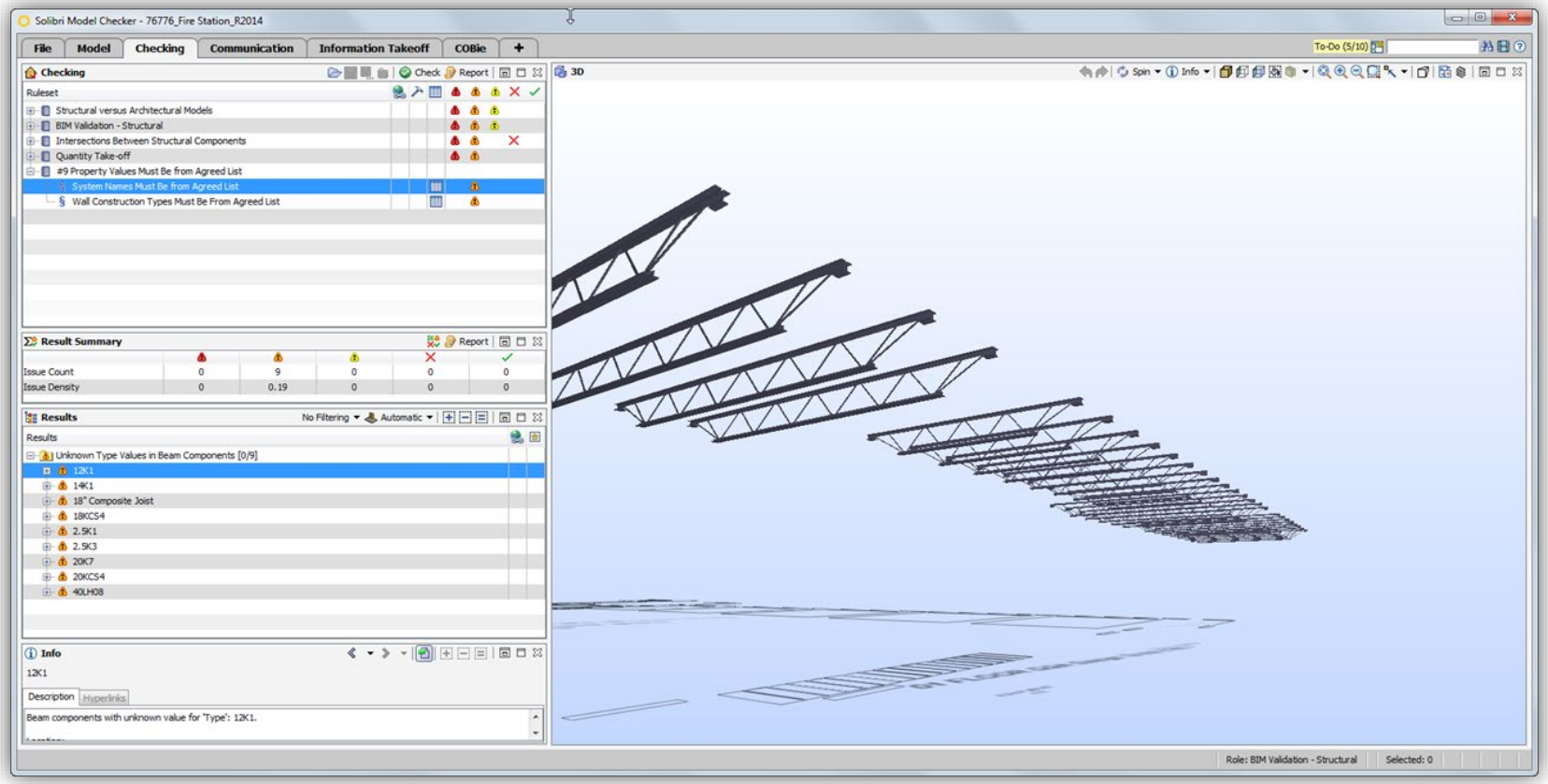
USACE IN-HOUSE QXP TEMPLATE FOR REVIT/INROADS (v0.2-20141114)

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

BUILDING CONTENT SUMMIT by DBEI

Trust But Verify

- Some OOTB content doesn't match industry standards
- Some system reported calculations are inaccurate

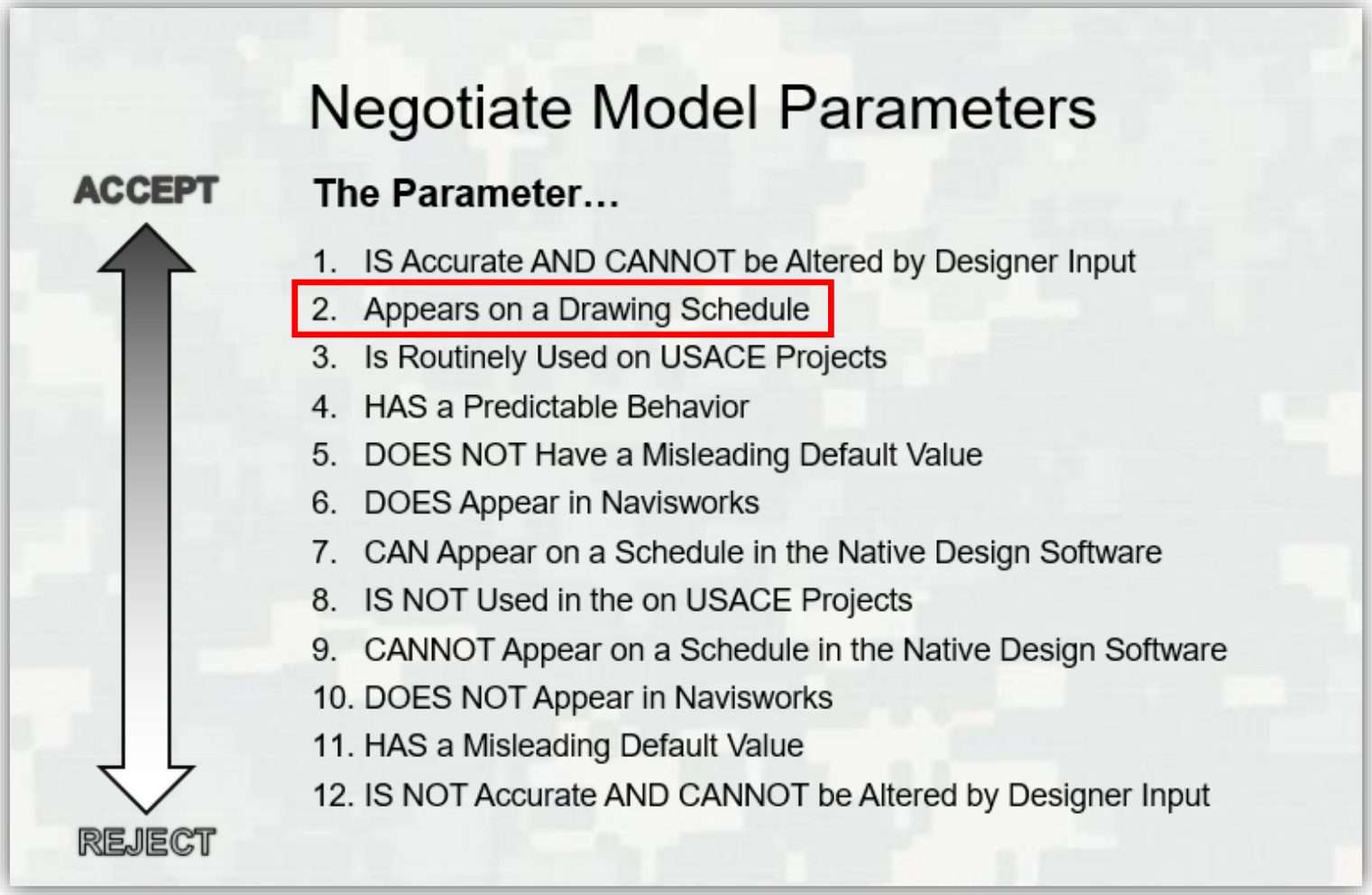


DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

BUILDING CONTENT SUMMIT by DBEI

Importance of Data Quality

- Near-term delivery of high-value, relevant, and accurate data executed consistently with iterative improvements was more important than large quantities of unverifiable data now or later
- Minimum Viable Product



The problem is not
how much data can you extract,
it's how much data can you **trust.**

Is **ALL** data supposed to be trustworthy?

Outline

- Rise of AI and Data Science
- BIM Data Complexity
- Legally Valid Data

- How To Extract
- Ways To Analyze
- How To Participate and Contribute

The answer to most AEC questions of any complexity come down to, ‘it depends on what is in the contract.’

Models/Databases vs Drawing Schedules

Models and Databases

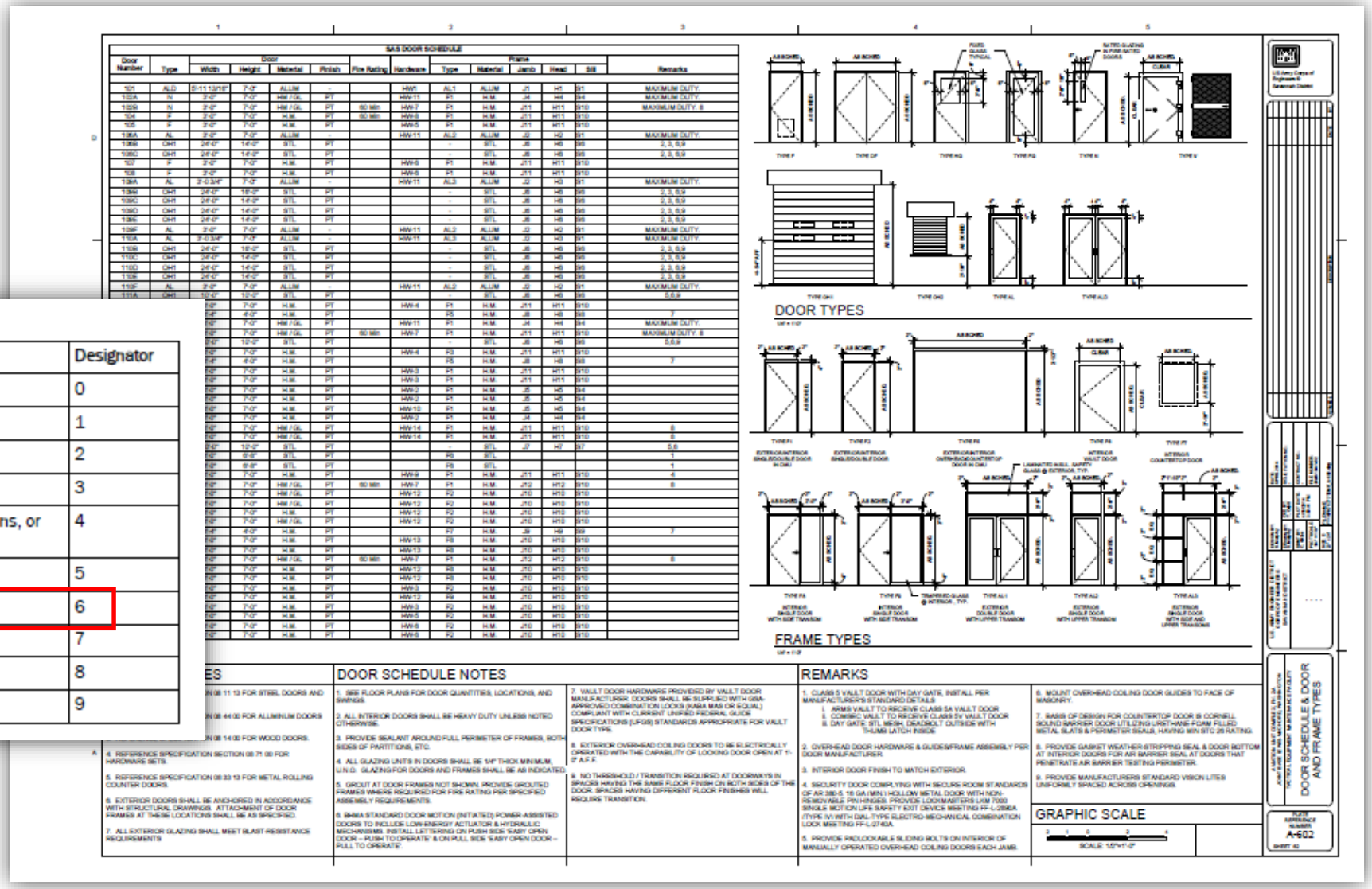
1. No shortage of ways to extract data
2. Difficult to determine intentionality, accuracy, and source
3. No “Right of Reliance” (typically)

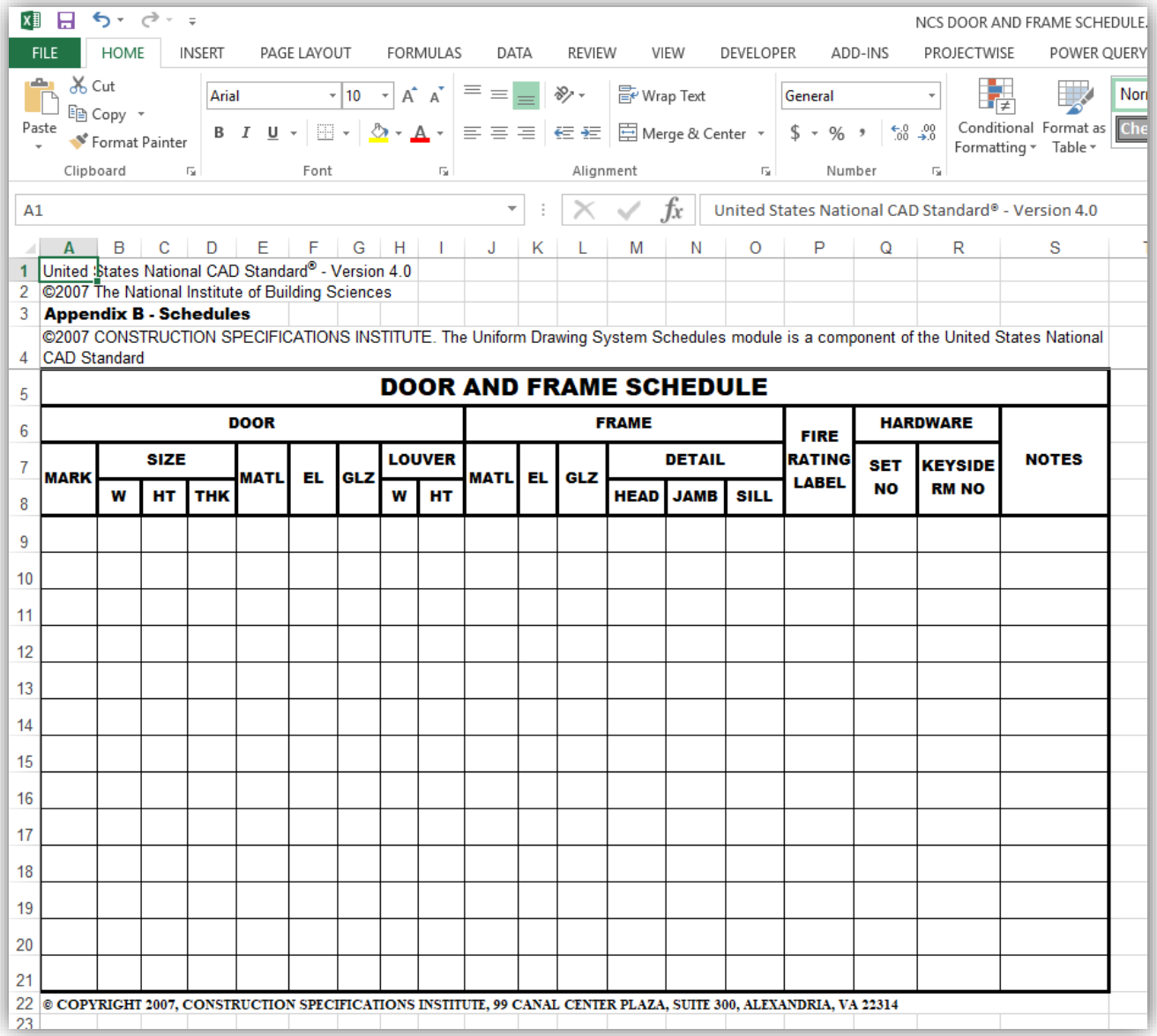
Drawing Schedules

1. Legal requirements
2. Not all project data is in drawing schedules, but tabular data is plentiful

Table 2-4. Sheet Type Designators.

Sheet Type	Designator
General (symbols legend, notes, etc.)	0
Plans (horizontal views and combination plan and profile)	1
Elevations and profiles (vertical views)	2
Sections (sectional views, cross sections, etc.)	3
Large scale views (Scaled up reproductions of plans, elevations, or sections that are not details)	4
Details	5
Schedules and diagrams	6
User defined	7
User defined	8
3D Representations (isometrics, perspectives, photographs)	9





NCS DOOR AND FRAME SCHEDULE.

FILE | HOME | INSERT | PAGE LAYOUT | FORMULAS | DATA | REVIEW | VIEW | DEVELOPER | ADD-INS | PROJECTWISE | POWER QUERY

Cut | Copy | Format Painter | Paste | Clipboard

Arial | 10 | Font

Wrap Text | Merge & Center | Alignment

General | Number

Conditional Formatting | Format as Table

A1 | United States National CAD Standard® - Version 4.0

United States National CAD Standard® - Version 4.0
©2007 The National Institute of Building Sciences
Appendix B - Schedules
©2007 CONSTRUCTION SPECIFICATIONS INSTITUTE. The Uniform Drawing System Schedules module is a component of the United States National CAD Standard

DOOR AND FRAME SCHEDULE

DOOR									FRAME						FIRE RATING LABEL	HARDWARE		NOTES
MARK	SIZE			MATL	EL	GLZ	LOUVER		MATL	EL	GLZ	DETAIL				SET NO	KEYSIDE RM NO	
	W	HT	THK				W	HT				HEAD	JAMB	SILL				

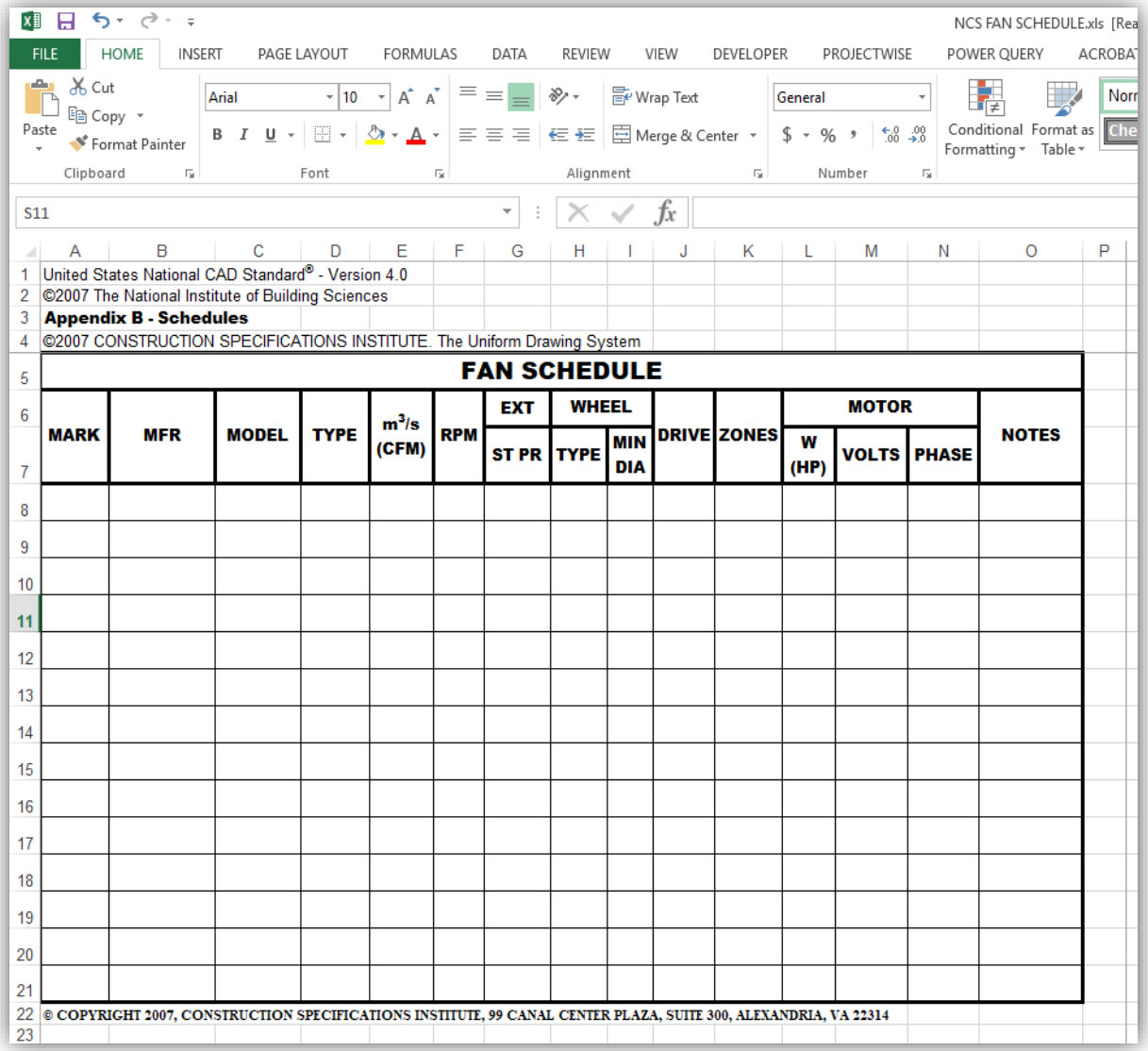
© COPYRIGHT 2007, CONSTRUCTION SPECIFICATIONS INSTITUTE, 99 CANAL CENTER PLAZA, SUITE 300, ALEXANDRIA, VA 22314

Name

- NCS CONCRETE BEAM REINFORCING SCHEDULE.xls
- NCS CONCRETE SLAB REINFORCING SCHEDULE.xls
- NCS DIFFUSER, REGISTER, AND GRILLE SCHEDULE (Expanded).xls
- NCS DIFFUSER, REGISTER, AND GRILLE SCHEDULE (Simple).xls
- NCS DISTRIBUTION PANELBOARD SCHEDULE.xls
- NCS DOOR AND FRAME SCHEDULE.xls
- NCS ELECTRICAL CIRCUIT SCHEDULE.xls
- NCS ELECTRICAL PANEL SCHEDULE (Expanded).xls
- NCS ELECTRICAL PANEL SCHEDULE (Simple).xls
- NCS EXTERIOR SIGNAGE SCHEDULE.xls
- NCS FAN SCHEDULE.xls
- NCS HVAC (Exhaust) FAN SCHEDULE.xls
- NCS HVAC AIR CLEANING DEVICE SCHEDULE.xls
- NCS INTERIOR SIGNAGE SCHEDULE.xls
- NCS LIGHTING FIXTURE SCHEDULE Expanded.xls
- NCS LIGHTING FIXTURE SCHEDULE Simple.xls
- NCS PLUMBING FIXTURE SCHEDULE Expanded.xls
- NCS PLUMBING FIXTURE SCHEDULE Simple.xls
- NCS PLUMBING PUMP SCHEDULE.xls
- NCS ROOM FINISH SCHEDULE.xls
- NCS VARIABLE CONSTANT VOLUME AIR TERMINAL UNIT.xls
- NCS WATER COOLED RECIPROCATING CHILLER SCHEDULE.xls
- NCS WATER HEATER SCHEDULE.xls
- NCS WINDOW SCHEDULE.xls

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

BUILDING CONTENT SUMMIT by DBEI

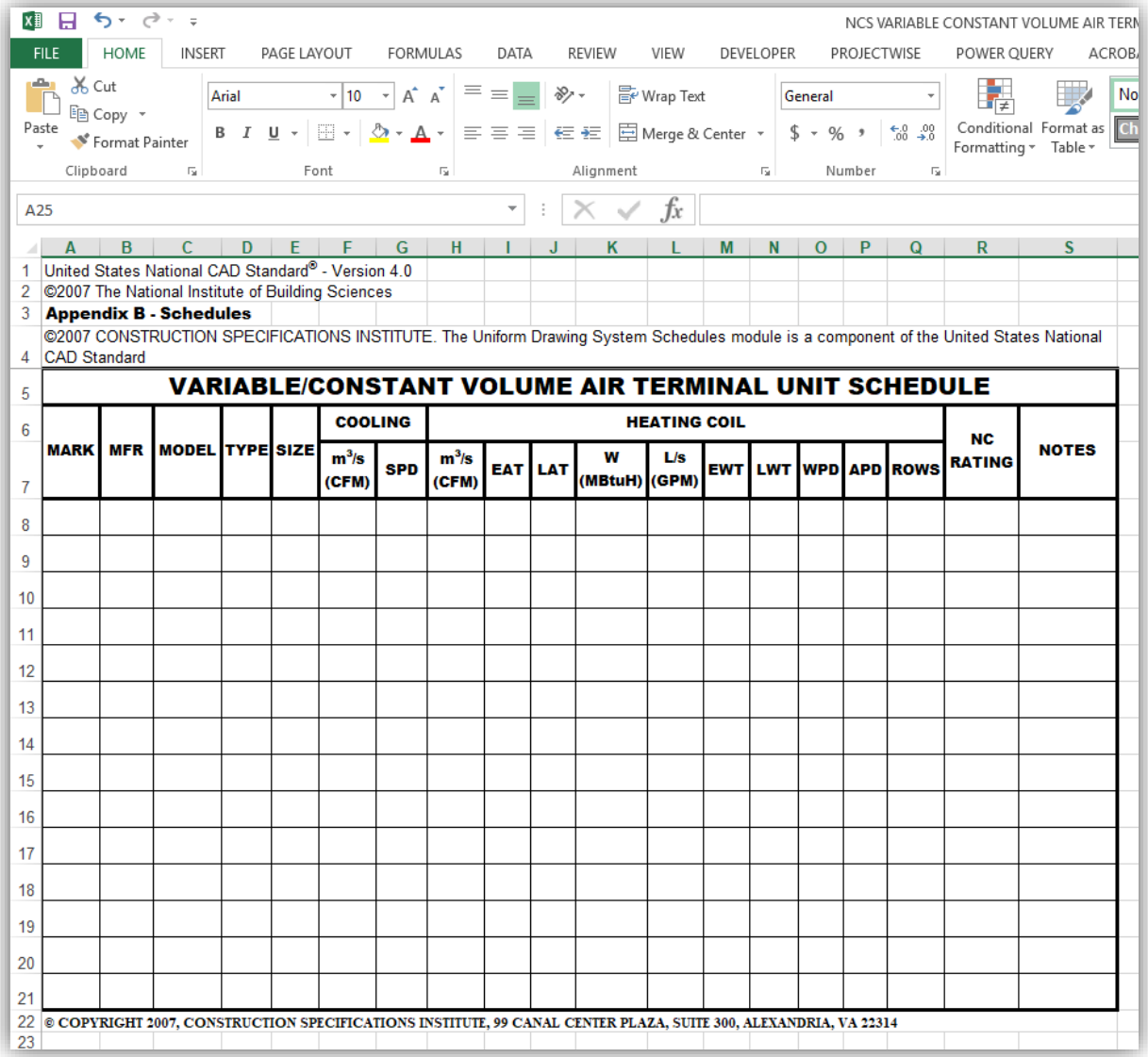


United States National CAD Standard® - Version 4.0
©2007 The National Institute of Building Sciences
Appendix B - Schedules
©2007 CONSTRUCTION SPECIFICATIONS INSTITUTE. The Uniform Drawing System

FAN SCHEDULE

MARK	MFR	MODEL	TYPE	m³/s (CFM)	RPM	EXT	WHEEL		DRIVE	ZONES	MOTOR			NOTES
						ST PR	TYPE	MIN DIA			W (HP)	VOLTS	PHASE	

© COPYRIGHT 2007, CONSTRUCTION SPECIFICATIONS INSTITUTE, 99 CANAL CENTER PLAZA, SUITE 300, ALEXANDRIA, VA 22314

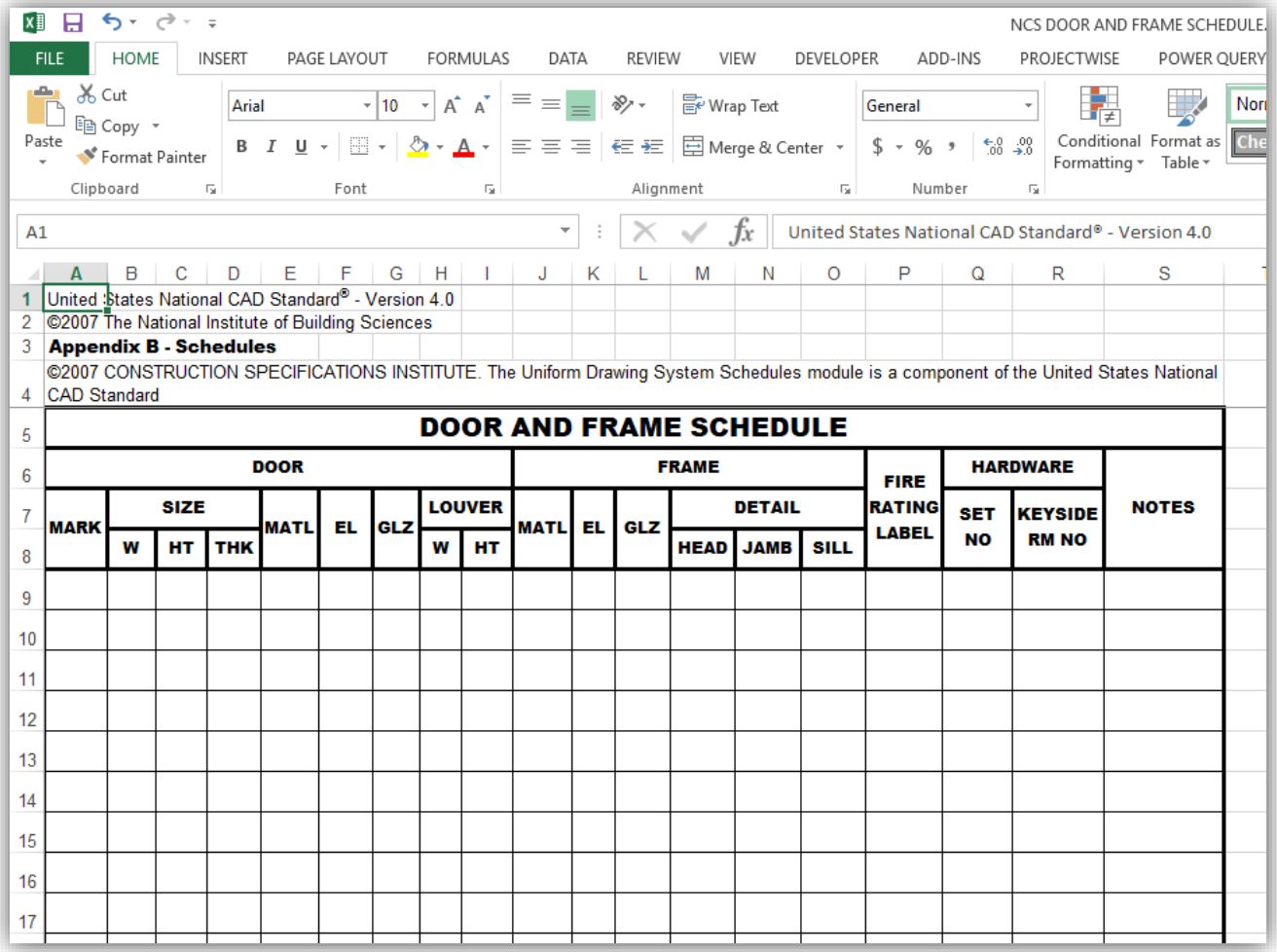


United States National CAD Standard® - Version 4.0
©2007 The National Institute of Building Sciences
Appendix B - Schedules
©2007 CONSTRUCTION SPECIFICATIONS INSTITUTE. The Uniform Drawing System Schedules module is a component of the United States National CAD Standard

VARIABLE/CONSTANT VOLUME AIR TERMINAL UNIT SCHEDULE

MARK	MFR	MODEL	TYPE	SIZE	COOLING		HEATING COIL									NC RATING	NOTES
					m³/s (CFM)	SPD	m³/s (CFM)	EAT	LAT	W (MBtuH)	L/s (GPM)	EWT	LWT	WPD	APD	ROWS	

© COPYRIGHT 2007, CONSTRUCTION SPECIFICATIONS INSTITUTE, 99 CANAL CENTER PLAZA, SUITE 300, ALEXANDRIA, VA 22314



NCS DOOR AND FRAME SCHEDULE.

FILE | HOME | INSERT | PAGE LAYOUT | FORMULAS | DATA | REVIEW | VIEW | DEVELOPER | ADD-INS | PROJECTWISE | POWER QUERY

Cut | Copy | Format Painter | Paste | Clipboard | Arial | 10 | Font | Wrap Text | Merge & Center | Alignment | General | Number | Conditional Formatting | Format as Table

A1 | United States National CAD Standard® - Version 4.0

1	United States National CAD Standard® - Version 4.0
2	©2007 The National Institute of Building Sciences
3	**Appendix B - Schedules**
4	©2007 CONSTRUCTION SPECIFICATIONS INSTITUTE. The Uniform Drawing System Schedules module is a component of the United States National CAD Standard

DOOR AND FRAME SCHEDULE

DOOR									FRAME						FIRE RATING LABEL	HARDWARE		NOTES
MARK	SIZE			MATL	EL	GLZ	LOUVER		MATL	EL	GLZ	DETAIL				SET NO	KEYSIDE RM NO	
	W	HT	THK				W	HT				HEAD	JAMB	SILL				

8 Required Architectural Assets

8.1 Doors

The following minimum set of information shall be provided in Construction Documents stage design deliverable schedule and reflected in the CD Stage COBie Deliverable. COBie data mapping is based on COBie format and current SPie template Window Door_DOOR_SecurityDoorsandFrames_US[46]

Table 78 Mapping for Minimum Door Type Schedule Headings

Design Schedule		COBie Mapping				
Heading	Unit	Sheet	Column	Attribute Name	Data Type	Attribute Reference
Name	Door-TypeXX-Space#-01	Component	Name		IfcLabel	
Type	Door-TypeXX	Component	TypeName		IfcText	
SpecificationSection	-	Attribute	TypeName		ifcText	Type
Location	(Space Name)	Component	SpaceName		IfcIdentifier	
Door Width	mm	Type	NominalLength		IfcPositiveLengthMeasure	
Door Height	mm	Type	NominalHeight		IfcPositiveLengthMeasure	
Door Thickness	mm	Type	NominalThickness		IfcPositiveLengthMeasure	
Door Type	-	Type	Name		IfcLabel	
Door Material	-	Type	Material		IfcLabel	
Door Finish	-	Type	Finish		IfcText	
Glazing Type	-	Attribute	-	Glazing	IfcText	Type
Security Code	-	Attribute	-	SecurityCode	IfcText	Type
Frame Type	-	Attribute	-	FrameType	IfcText	Type/Component
Frame Material	-	Attribute	-	FrameMaterial	IfcText	Type/Component
Frame Finish	-	Attribute	-	FrameFinish	IfcText	Type/Component
Frame Head	-	Attribute	-	Head	IfcText	Type/Component
Frame Jam	-	Attribute	-	Jam	IfcText	Type/Component
Frame Sill	-	Attribute	-	Sill	IfcText	Type/Component
Fire Label Class	-	Attribute	-	Class	IfcLabel	Type

[46] http://www.wbdg.org/references/spie/110901/Door_DOOR_SecurityDoorsandFrames_US/Door_DOOR_SecurityDoorsandFrames_USTypeProduct.html

8 Required Architectural Assets

8.1 Doors

The following minimum set of information shall be provided in Construction Documents stage design deliverable schedule and reflected in the CD Stage COBie Deliverable. COBie data mapping is based on COBie format and current SPie template Window Door_DOOR_SecurityDoorsandFrames_US[46]

Table 78 Mapping for Minimum Door Type Schedule Headings

Design Schedule		COBie Mapping				
Heading	Unit	Sheet	Column	Attribute Name	Data Type	Attribute Reference
Name	Door-TypeXX-Space#-01	Component	Name		IfcLabel	
Type	Door-TypeXX	Component	TypeName		IfcText	
SpecificationSection	-	Attribute	TypeName		ifcText	Type
Location	(Space Name)	Component	SpaceName		IfcIdentifier	
Door Width	mm	Type	NominalLength		IfcPositiveLengthMeasure	
Door Height	mm	Type	NominalHeight		IfcPositiveLengthMeasure	
Door Thickness	mm	Type	NominalThickness		IfcPositiveLengthMeasure	
Door Type	-	Type	Name		IfcLabel	
Door Material	-	Type	Material		IfcLabel	
Door Finish	-	Type	Finish		IfcText	
Glazing Type	-	Attribute	-	Glazing	IfcText	Type
Security Code	-	Attribute	-	SecurityCode	IfcText	Type
Frame Type	-	Attribute	-	FrameType	IfcText	Type/Component
Frame Material	-	Attribute	-	FrameMaterial	IfcText	Type/Component
Frame Finish	-	Attribute	-	FrameFinish	IfcText	Type/Component
Frame Head	-	Attribute	-	Head	IfcText	Type/Component
Frame Jam	-	Attribute	-	Jam	IfcText	Type/Component
Frame Sill	-	Attribute	-	Sill	IfcText	Type/Component
Fire Label Class	-	Attribute	-	Class	IfcLabel	Type
Fire Label Rating	-	Attribute	-	FireRating	IfcLabel	Type
Hardware Set	-	Attribute	-	HardwareSet	IfcText	Type/Component
Pressurization	-	Attribute	-	Pressurization	IfcBoolean	Type/Component
Egress Door	-	Attribute	-	Egress	IfcBoolean	Type/Component
SpatialPlacement	(From List)	Attribute	-	`	IfcText	Component
BasisOfDesign-Manufacturer	(Basis of Design)	Attribute	-	BODManufacturer	IfcLabel	Type
BasisOfDesign-ModelNumber	(Basis of Design)	Attribute	-	BODModel	IfcLabel	Type
BasisOfDesign-Notes	(If Required)	Attribute	-	BODNotes	IfcText	Type

[46] http://www.wbdg.org/references/spie/110901/Door_DOOR_SecurityDoorsandFrames_US/Door_DOOR_SecurityDoorsandFrames_USTypeProduct.html

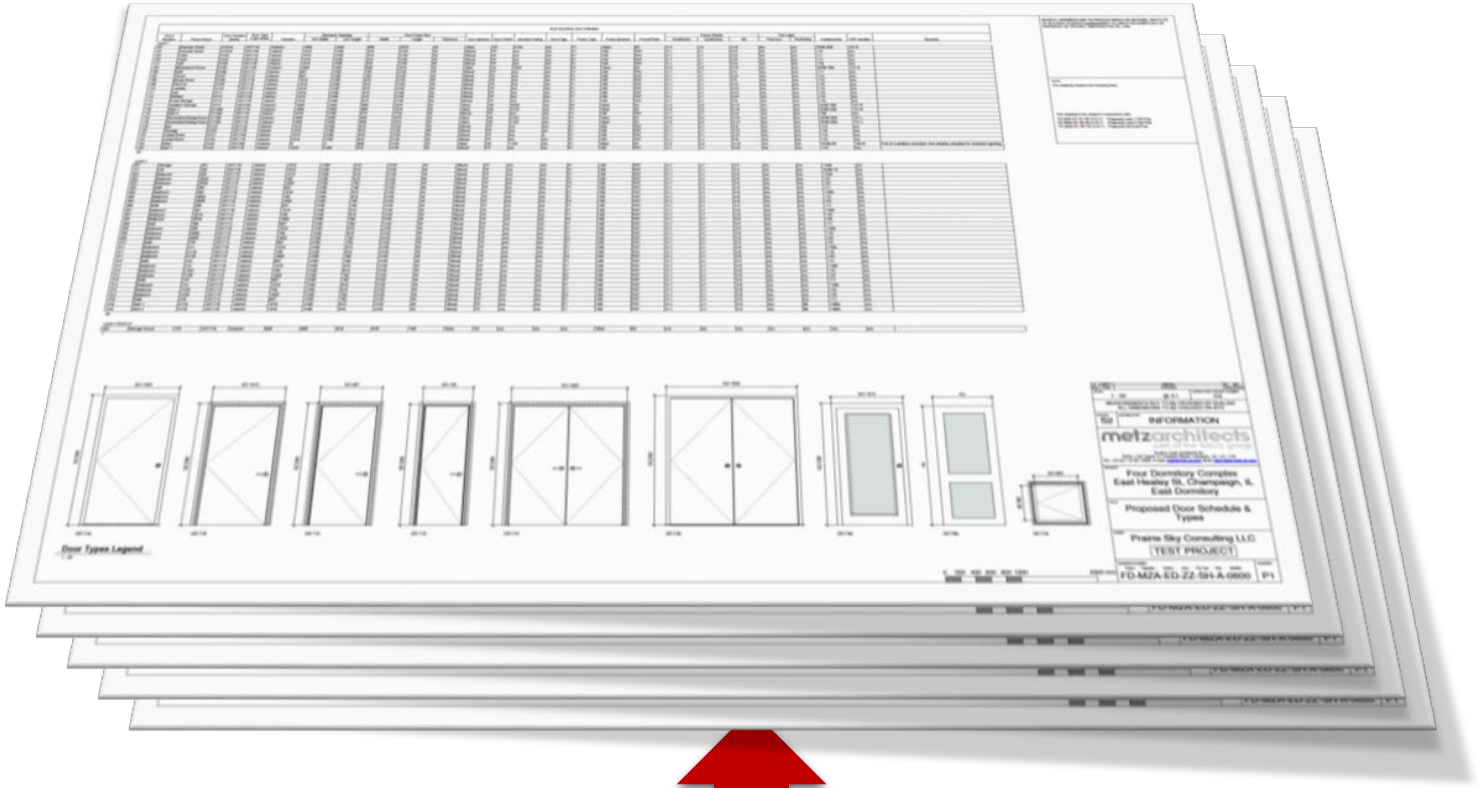
8.2 Windows

The following minimum set of information shall be provided in Construction Documents stage design deliverable schedule and reflected in the CD Stage COBie Deliverable. COBie data mapping is based on COBie format and current SPie template Window_WINDOW_SecurityWindows_US[47]

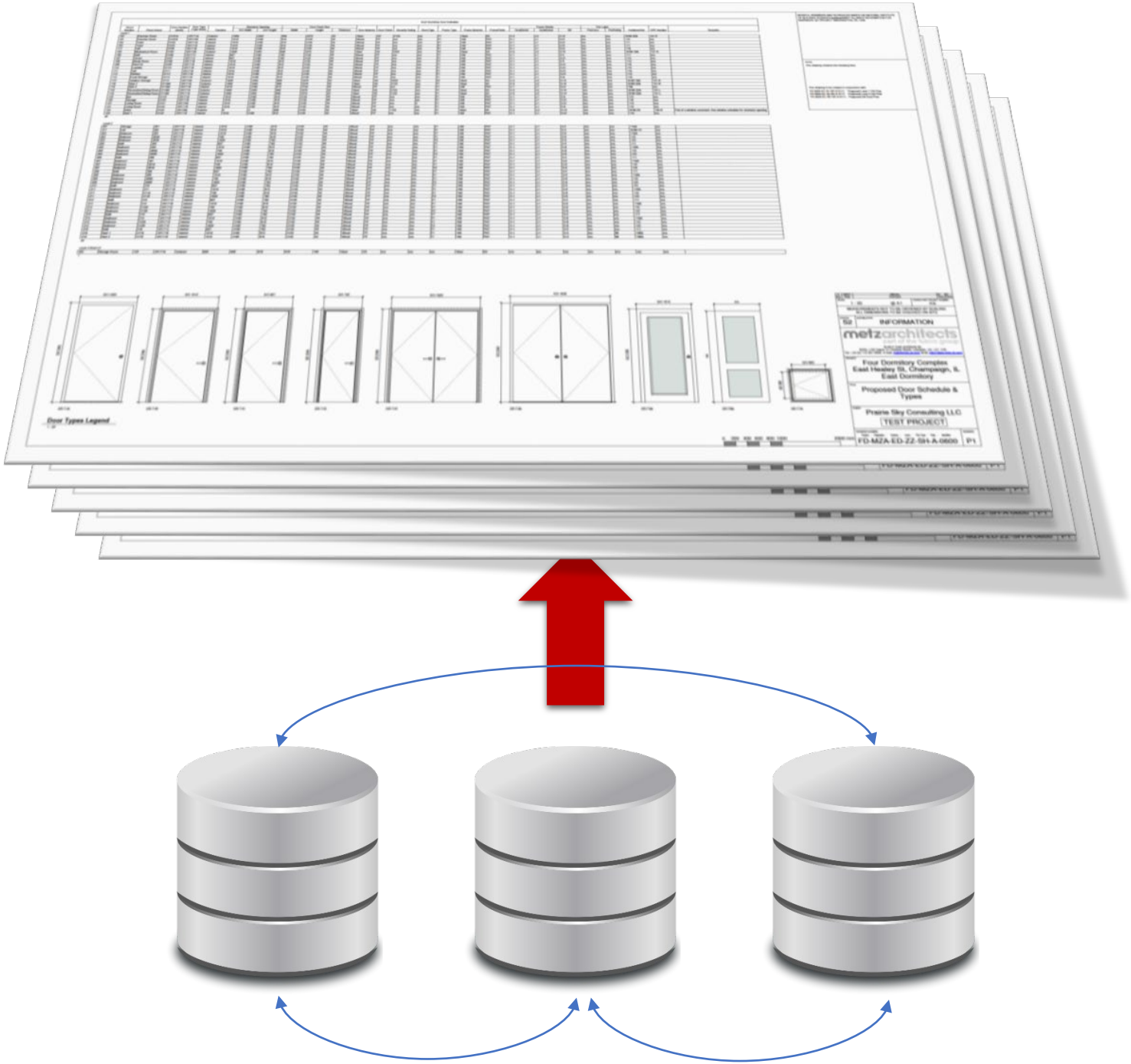
Table 79 Mapping for Minimum Window Type Schedule Headings

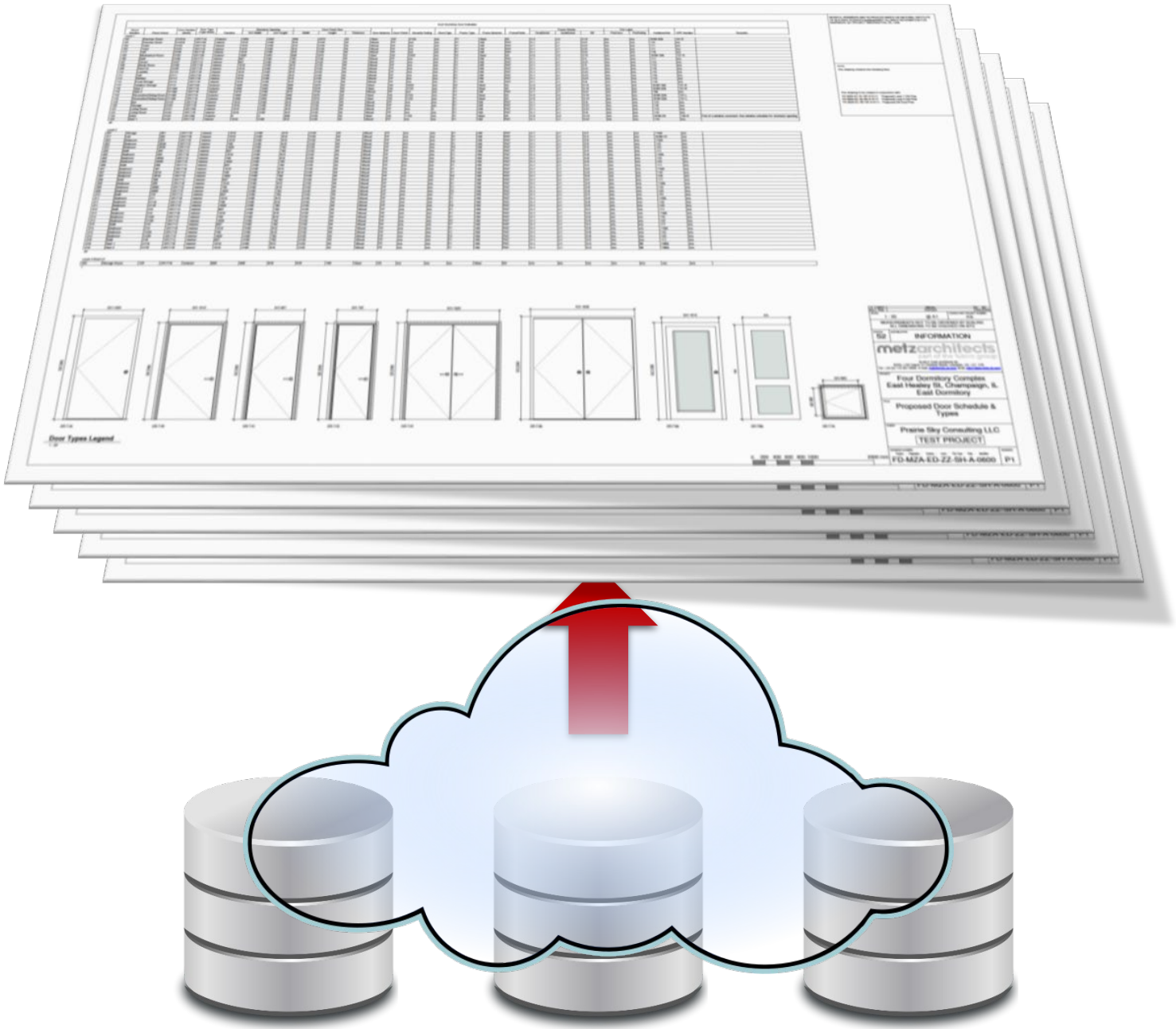
Design Schedule		COBie Mapping				
Heading	Unit	Sheet	Column	Attribute Name	Data Type	Attribute Reference
Name	Window-TypeXX-Space#-01	Component	Name		IfcLabel	
Type	Window-TypeXX	Component	TypeName		IfcText	
SpecificationSection	-	Attribute	TypeName		ifcText	Type
Location	(Space Name)	Component	SpaceName		IfcIdentifier	
Window Number	-	Attribute	-	Name	IfcIdentifier	Type
Security Code	-	Attribute	-	SecurityCode	IfcText	Type
Window Rating	-	Attribute	-	Rating	IfcText	Type
Glazing Type	-	Attribute	-	Glazing	IfcText	Type
Window Size	-	Type	NominalLength	NominalLength	IfcPositiveLength Measure	Type
Window Size	-	Type	NominalHeight	NominalHeight	IfcPositiveLength Measure	Type
Window Size	-	Type	NominalWidth	NominalThickness	IfcPositiveLength Measure	Type

[47] http://www.wbdg.org/references/spie/110901/Window_WINDOW_SecurityWindows_US/Window_WINDOW_SecurityWindows_USTypeProduct.html



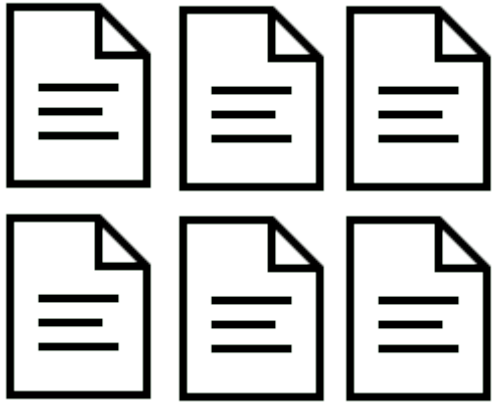
- < 15% are not derived from the database


INFORMATION
metzarchitects
Four Dormitory Complex
East Healey St, Champaign, IL
East Dormitory
Proposed Door Schedule & Types
Prairie Sky Consulting LLC
TEST PROJECT
FD-MZA-ED-Z2-SH-A-0600
P1
Door Types Legend

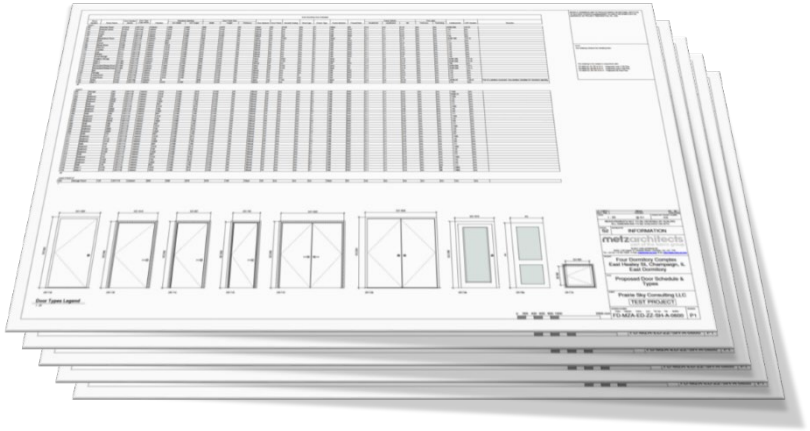

Door Types Legend
INFORMATION
metzarchitects
Four Dormitory Complex
East Healey St. Champaign, IL
East Dormitory
Proposed Door Schedule & Types
Prairie Sky Consulting LLC
TEST PROJECT
FD-MZA-ED-Z2-SH-A-0600
P1


Door Types Legend
INFORMATION
metzarchitects
Four Dormitory Complex
East Healey St, Champaign, IL
East Dormitory
Proposed Door Schedule & Types
Prairie Sky Consulting LLC
TEST PROJECT
FD-MZA-ED-Z2-SH-A-0600
P1

Contract



Construction Specifications

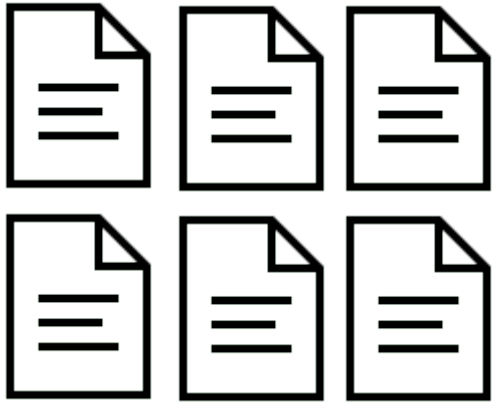


Construction Documents

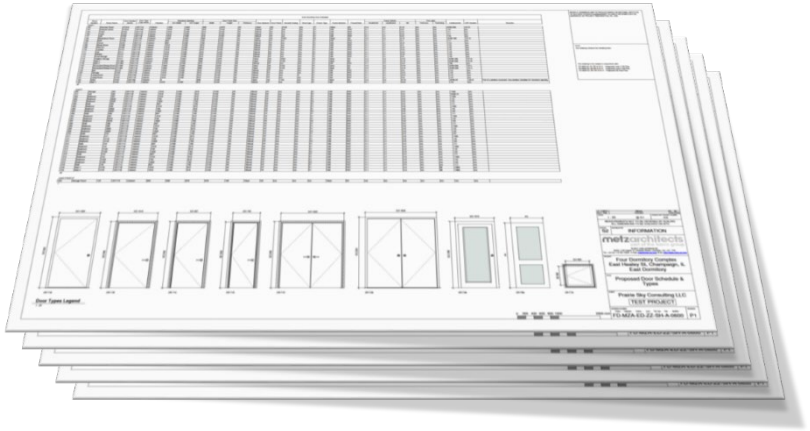
- Legally Binding
- Contract Deliverables
- Order of Precedence
- Right of Reliance
- Reference
- Chain of Custody

- Instrument of the Contract
- Standard of Care
- Case Law
- Data Supply Chain
- Provenance

Contract



Construction Specifications



Construction Documents

- Lega… the Contract
- Cont… are
- Orde…
- Righ… Chain
- Refe…
- Chain of Custody

Wait, that's not right…

Who the heck did that?!?

Who's going to clean up that mess?

Accountability

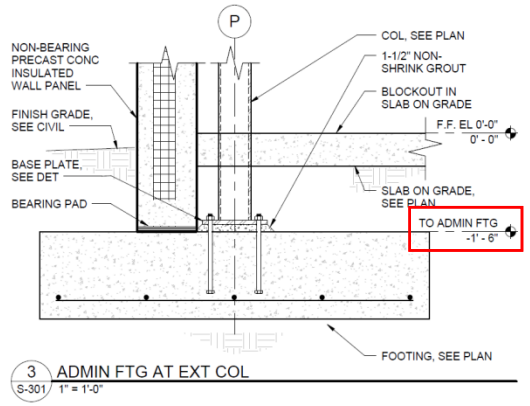
DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

BUILDING CONTENT SUMMIT by DBEI

"So here we run into our first problem…
You can see that the information contained in the model does NOT match the plans and specs."

- Reinforcing steel is incorrect
- Compressive strength is incorrect
- The Thickness is incorrect
- The depth below grade is incorrect

FOOTING SCHEDULE					
MARK	WIDTH	LENGTH	THICK	LONGIT REINF	TRANS REINF
F4.0	4'-0"	4'-0"	14"	(5)#5 BOT	(5) #5 BOT
F5.0	5'-0"	5'-0"	14"	(7)#5 BOT	(7) #5 BOT
F6.0	6'-0"	6'-0"	16"	(5)#7 BOT	(5) #7 BOT
F7.0	7'-0"	7'-0"	18"	(7)#7 BOT	(7) #7 BOT
F8.0	8'-0"	8'-0"	20"	(9)#7 BOT	(9) #7 BOT
F9.0	9'-0"	9'-0"	24"	(9)#8 BOT	(9) #8 BOT
F9.5	9'-6"	9'-6"	24"	(10)#8 BOT	(10) #8 BOT
F10.0	10'-0"	10'-0"	26"	(11)#8 BOT	(11) #8 BOT
WF3.0	3'-0"	-	14"	(4)#5 BOT	#5@12" BOT
BFF4	4'-0"	PLAN	24"	(5)#6 T&B	#6@10" T&B
BFF5	5'-0"	PLAN	30"	(6)#7 T&B	#7@12" T&B
BFF6	6'-0"	PLAN	30"	(7)#7 T&B	#7@12" T&B
BFF7	7'-0"	PLAN	30"	(8)#7 T&B	#7@12" T&B
BFF8	8'-0"	PLAN	36"	(9)#8 T&B	#8@12" T&B



Properties

Item | Element ID | Element | Rebar Cover - Other Faces | Phase Created

Property	Value
Name	F6.0
Type	F6.0
Family	Footing-Rectangular-(2000 PSF)_USACE
Category	Structural Foundations
Id	1026576
Rebar Cover - Other Faces	RebarCoverType "Cast against and perm...
Phase Created	Phase "New Construction", #0
Offset	0ft 0in
Estimated Reinforcement Volume	0.11
Rebar Cover - Bottom Face	RebarCoverType "Cast against and perm...
Workset	0
Moves With Grids	1
Level	Level "TO ADMIN FTG", #1171210
Rebar Cover - Top Face	RebarCoverType "Cast against and perm...
Enable Analytical Model	1
Host	Level : TO ADMIN FTG
Elevation at Bottom	-2ft 12in

Properties

Level | Rebar Cover - Top Face | Revit Type | TimeLiner

Property	Value
Name	F6.0
Id	943981
Cost	0.00
Reinforcing A Bar Quantity	4
Reinforcing Longitudinal Size	0
Reinforcing B Bar Quantity	4
Reinforcing Transverse Spacing	0ft 0in
Width	6ft 0in
Reinforcing A Bar Size	5
Assembly Description	Spread Footings
Length	6ft 0in
Reinforcing Longitudinal Quantity	0
Footing Material	MaterialConcrete "Concrete - Cast-in-Place Concre
Assembly Code	A1010120
Workset	269
Reinforcing Quantity	45.93
Thickness	1ft 6in
Reinforcing B Bar Size	5
Reinforcing Transverse Size	0

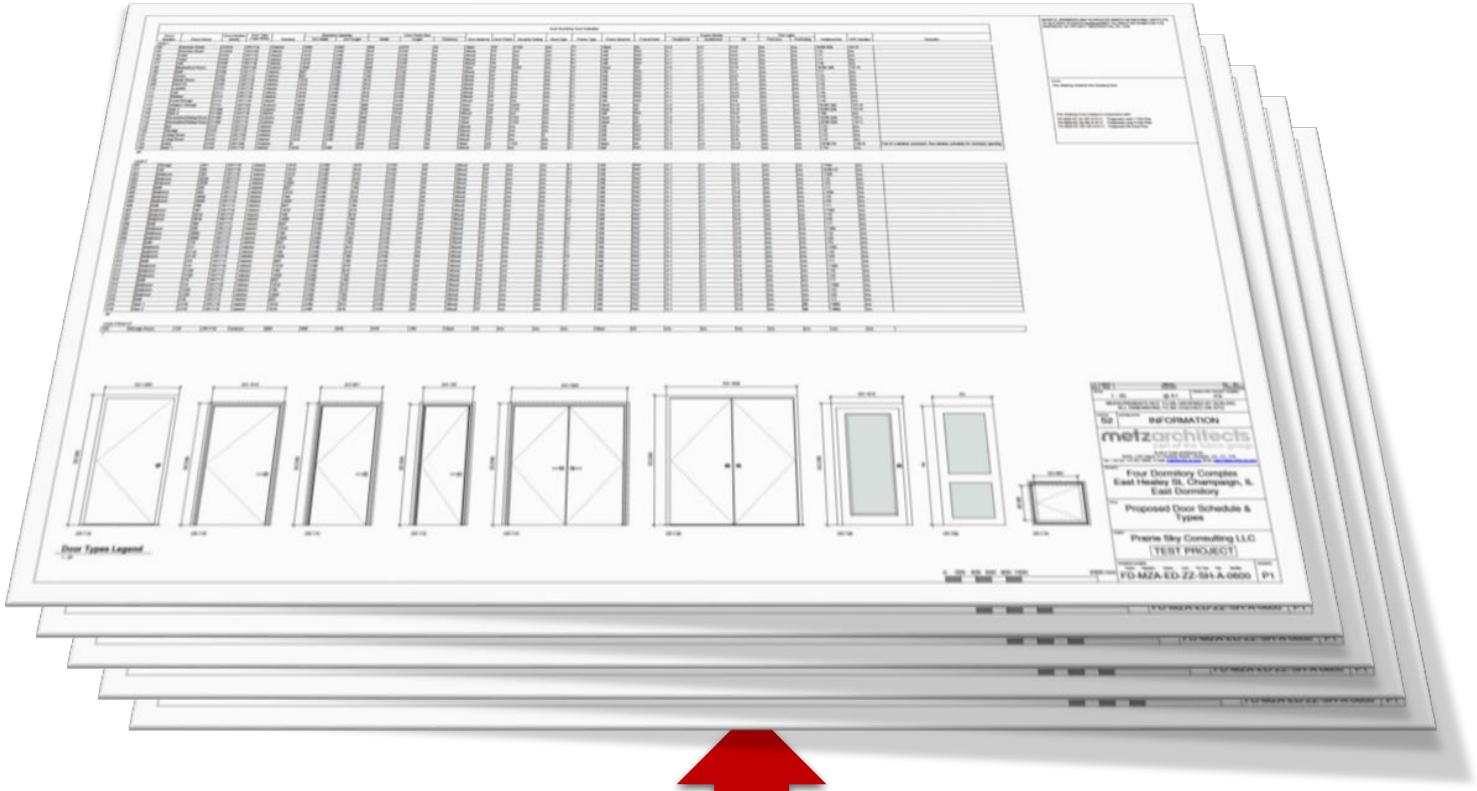
DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

Contract

Q: So, what data is trustworthy?

A: Whatever the contract states.

- Right of Reliance



- Reference

1.2.2. Contract Documents

The Design-Intent Model is the AE's primary design deliverable to VA. The 2D drawings are derived from the Design-Intent Model, but only reflect specific extracted views, and do not contain as much information as is in the Model, itself. The General Contractor is required to construct in accordance with the Model, as amended through contract approved processes. The Contract Documents may specifically state for construction costs less than $10 million that 2D drawings or other information takes precedence over the Design-Intent Model, but in all other cases, the Design-Intent Model takes precedence over the 2D drawings, and the non-editable federated Design-Intent Model will be the Instrument of the Contract used for construction award (NWD or equal). Regardless, all revisions to the Contract Documents after construction award must be made in the Design-Intent Model and the subsequent updated 2D Drawings must be derived from the updated Model. All models must be shared with project stakeholders as needed.

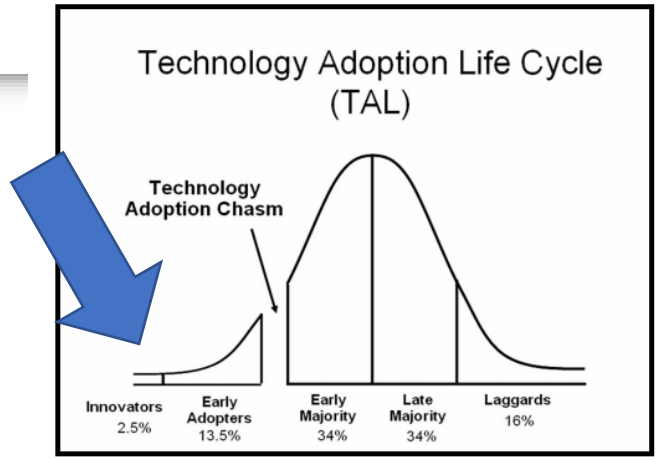
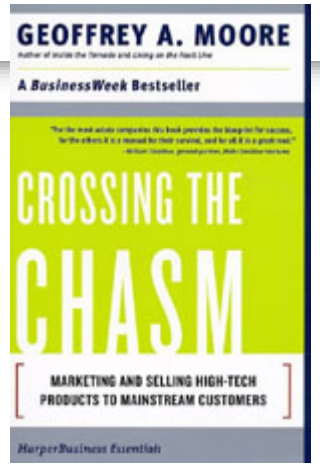


Figure 2. Technology Adoption Life Cycle: The Chasm

Source: https://apps.dtic.mil/dtic/tr/fulltext/u2/a473396.pdf



Drawings are a good filter to identify data that is currently quality controlled and legally required to be accurate.

Drawing Schedules provide one place to find a lot of data on a sheet.

Can we extract and publish drawing schedule data from 100 files? 500? 1,000? 5,000? 10,000? 50,000?

- Don’t we want to have the Right of Reliance on the model/database?
  - OF COURSE !

- Don’t we want to abandon drawings and build from the model?
  - MAYBE ?! “Abandon Drawings” vs “Evolve Drawings” debate

    Further reading: Tangerine (Rob Snyder) http://tangerinefocus.com

- Do we have to wait for that to harvest LARGE volumes of accurate data TODAY?
  - NO !

- Are there significant opportunities missed from not analyzing current and historical data?

Outline

- BIM Data Complexity
- Rise of AI and Data Science
- Legally Valid Data

- How To Extract
- Ways To Analyze
- How To Participate and Contribute

Let's get down into the technical weeds!

1. Inventory of all files on a network w/UID
2. Extract schedule data from BIM**
3. Specifications data

**Requirements: Crowdsourcing Friendly

Free, Open Source

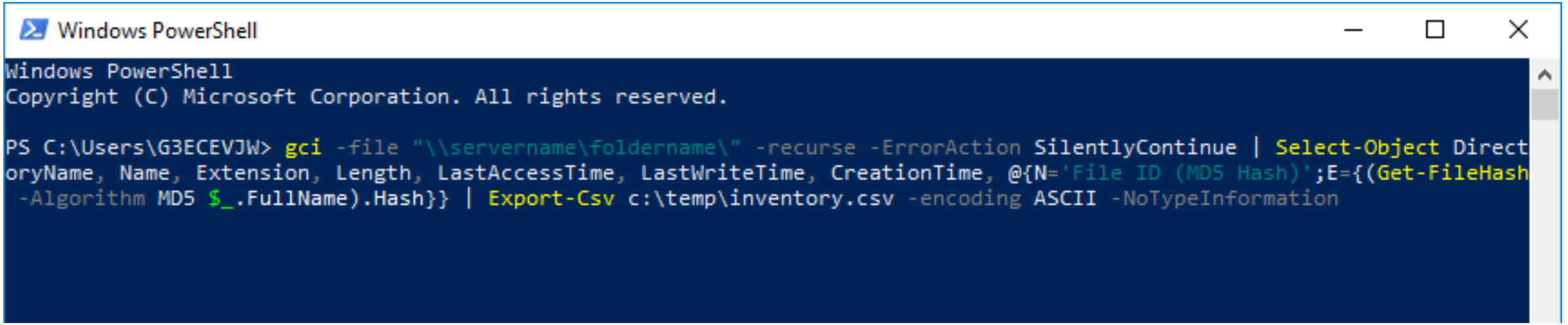
Bulk process thousands of files

Processed locally, no cloud, no data leakage

Export format with no external dependencies

No training required

Inventory & Collect Files

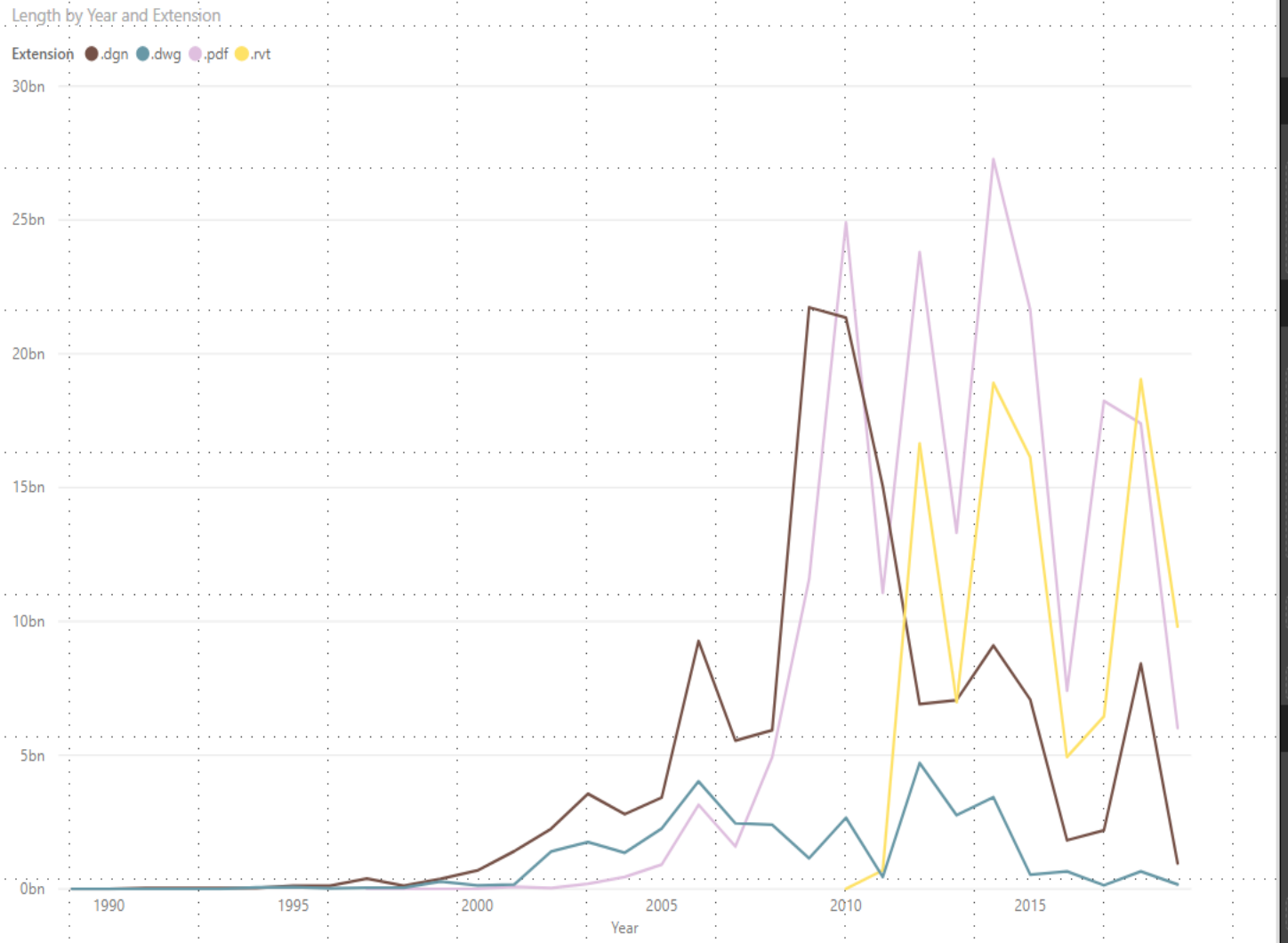


- PowerShell script for network-wide bulk file inventory
- Export CSV for loading into BI/dashboarding tools and/or database
  - LastAccessTime, LastWriteTime, CreationTime
  - File “fingerprint” MD5 hash
- 1 million files, ~400MB csv, 9 hrs

Paste Cut Copy Format Painter — Clipboard
Get Data Recent Sources Enter Data Edit Queries Refresh — External data
New Page New Visual Ask A Question Buttons Text box Image Shapes — Insert
From Marketplace From File — Custom visuals
Switch Theme — Themes
Manage Relationships — Relationships
New Measure New Column New Quick Measure — Calculations
Publish — Share

PROJECT DIRECTORIES

Extension	Count of Extension	Length
.pdf	67058	194035751374
.dgn	130471	137858992612
.rvt	2449	99639702266
.zip	1904	64189421462
.jpg	42765	52593465827
.tif	8020	42476849626
.dwg	39926	33856002550
.cel	5790	12664549312
.mdb	1476	7052836864
.psd	184	6434518742
.cal	26935	6344793736
.rfa	10661	4480863305
.dwfx	487	2265673270
.xls	16171	2227363633
.doc	5409	2107168563
.docx	1454	1102801758
.txt	10558	911278351
.bmp	124079	841821670
.png	1091	761076699
.xlsx	1955	488717098
.dgnlib	1624	116597458
.pset	581	52901295
Total	501048	672503147471



Power BI
Microsoft

VISUALIZATIONS
Values
Extension
Count of Extension
Length

FILTERS
Visual level filters
Count of Extension is (All)
Extension is .bmp, .cal, .cel, .dgn, .dgnlib, .d...
Length is (All)
Page level filters
Add data fields here
Report level filters
Add data fields here

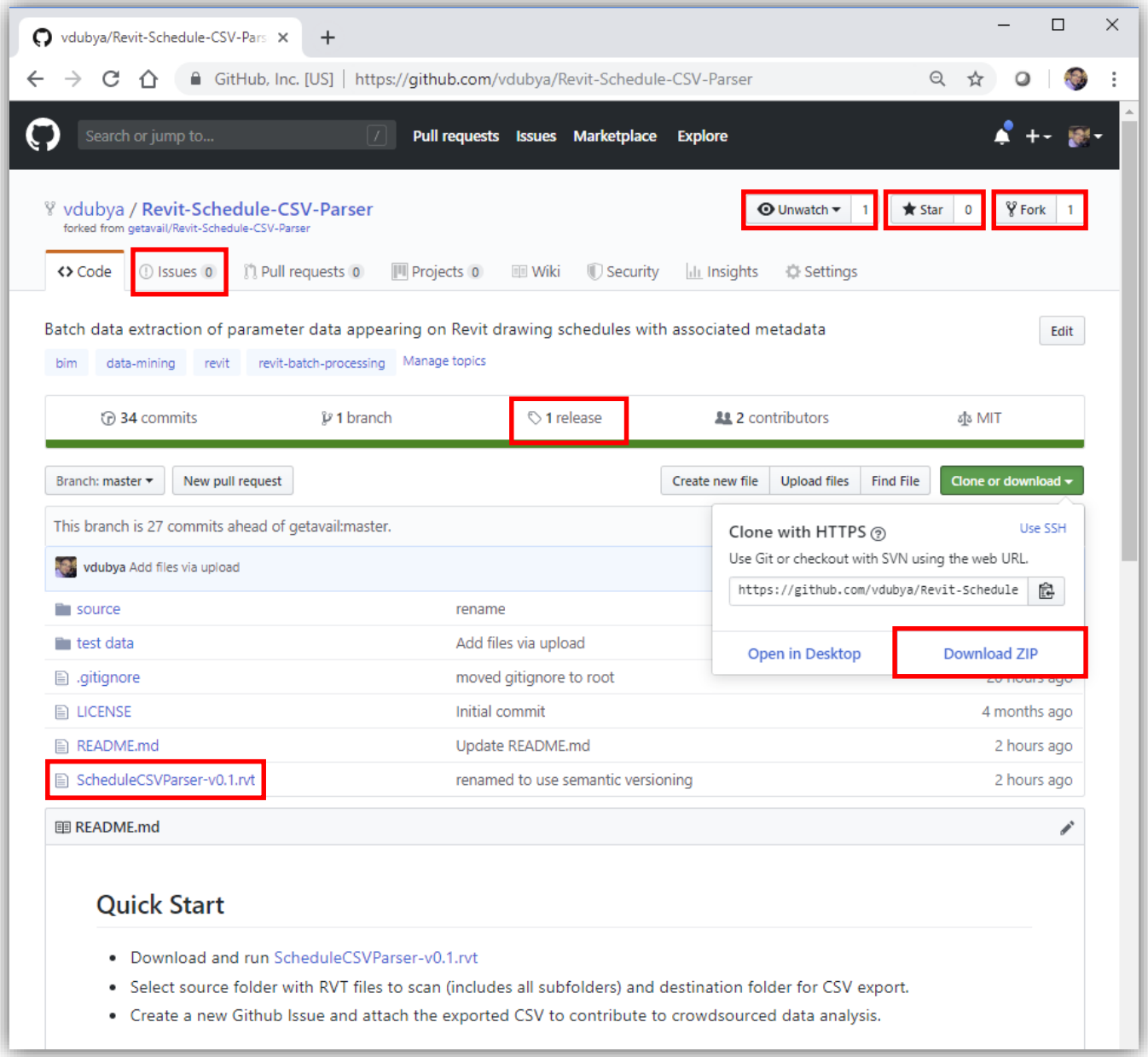
DRILLTHROUGH
Cross-report
Off
Keep all filters
On
Add drillthrough fields here

FIELDS
Search
i-drive-noID
i-drive-noID (2)
CreationTime
DirectoryName
Extension
LastAccessTime
LastWriteTime
Length
Name
Table1

PROJECT DIRECTORIES

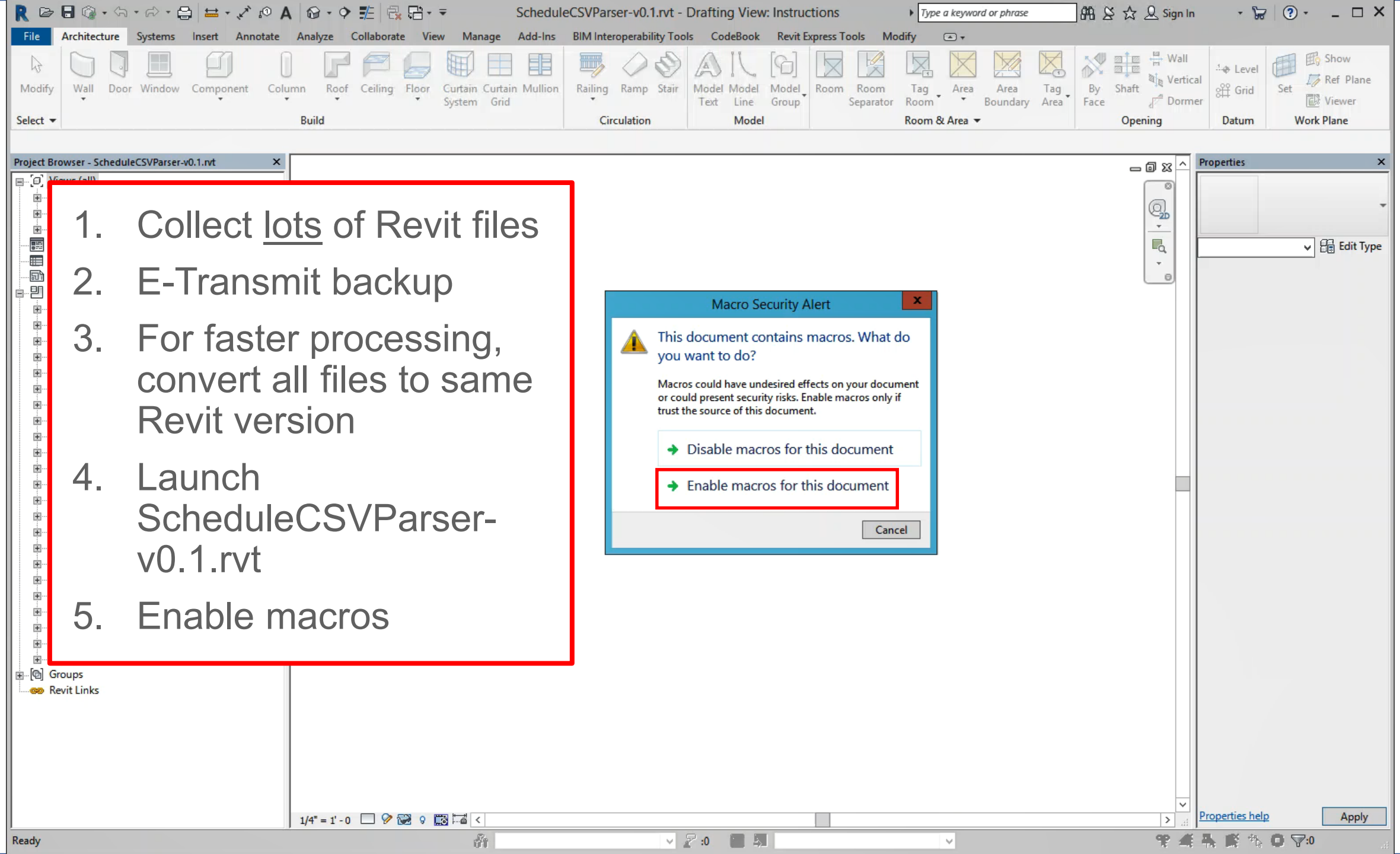
Extension	Count of Extension	Length
.dgn	130471	137858992612
.bmp	124079	841821670
.pdf	67058	194035751374
.jpg	42765	52593465827
.dwg	39926	33856002550
.cal	26935	6344793736
.xls	16171	2227363633
.rfa	10661	4480863305
.txt	10558	911278351
.tif	8020	42476849626
.cel	5790	12664549312
.doc	5409	2107168563
.rvt	2449	99639702266
.xlsx	1955	488717098
.zip	1904	64189421462
.dgnlib	1624	116597458
.mdb	1476	7052836864
.docx	1454	1102801758
.png	1091	761076699
.pset	581	52901295
.dwfx	487	2265673270
.psd	184	6434518742
Total	**501048**	**672503147471**

Extension	Count of Extension	Length
.pdf	67058	194035751374
.dgn	130471	137858992612
.rvt	2449	99639702266
.zip	1904	64189421462
.jpg	42765	52593465827
.tif	8020	42476849626
.dwg	39926	33856002550
.cel	5790	12664549312
.mdb	1476	7052836864
.psd	184	6434518742
.cal	26935	6344793736
.rfa	10661	4480863305
.dwfx	487	2265673270
.xls	16171	2227363633
.doc	5409	2107168563
.docx	1454	1102801758
.txt	10558	911278351
.bmp	124079	841821670
.png	1091	761076699
.xlsx	1955	488717098
.dgnlib	1624	116597458
.pset	581	52901295
Total	**501048**	**672503147471**

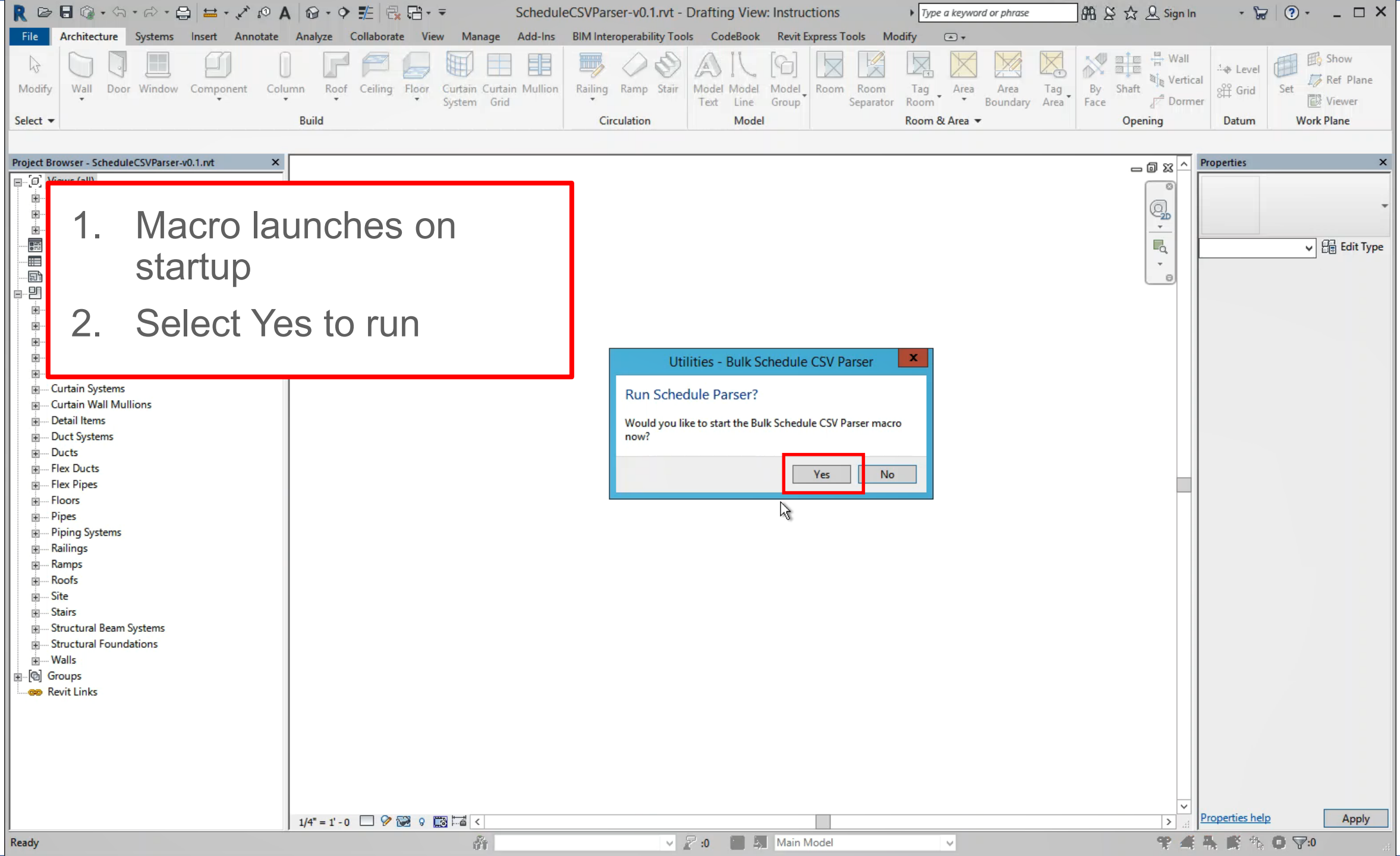


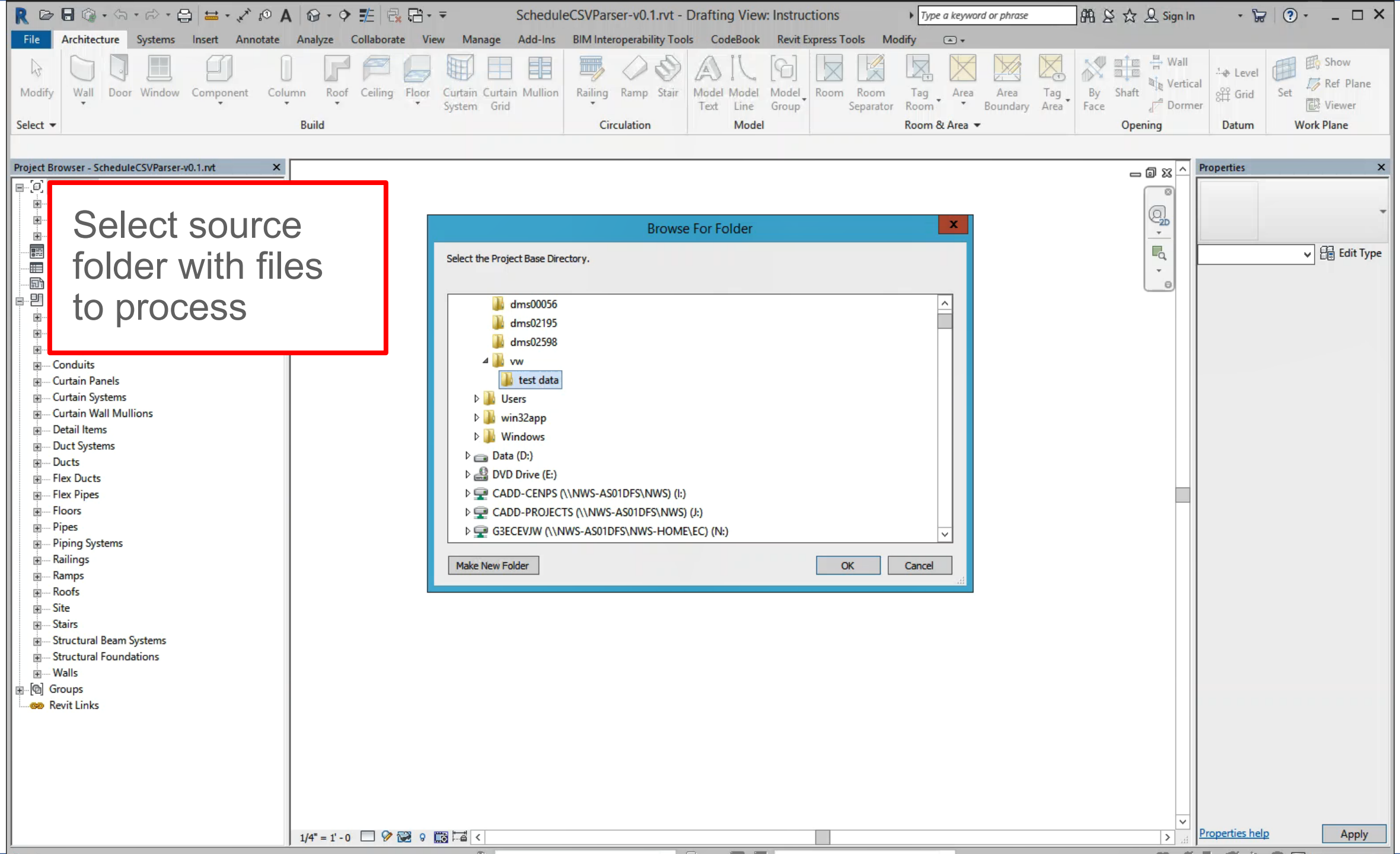
- Free, Open Source
- Batch extract schedule data from all files in folder and subfolders
- Identify whether schedule appears on sheet
- Column Header (with hierarchy) and Column Values ("|" delimited)
- Parameter Name
- Parameter GUID
- Export to CSV
- Processed locally, no data sent to cloud

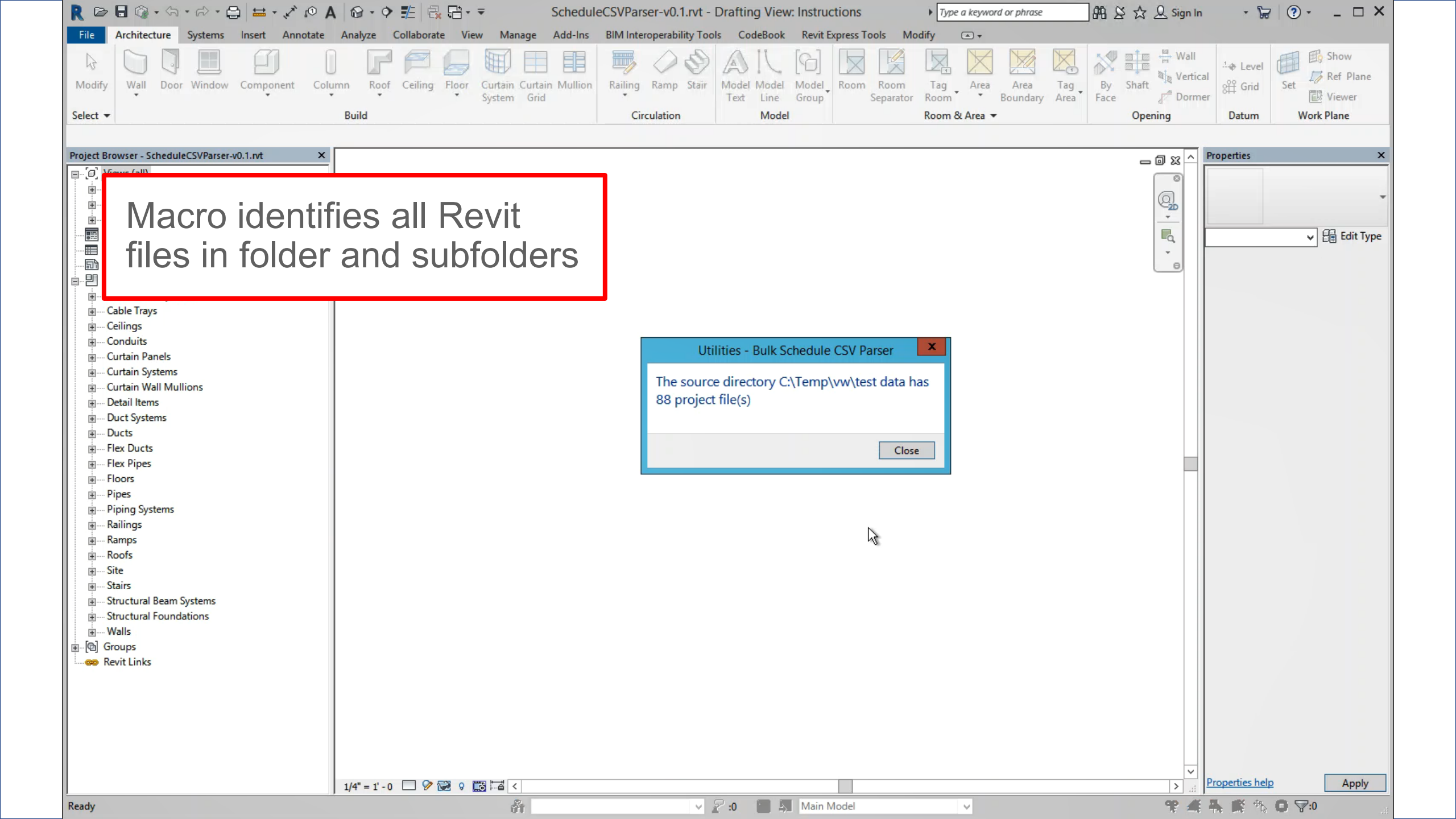
https://github.com/vdubya/Revit-Schedule-CSV-Parser

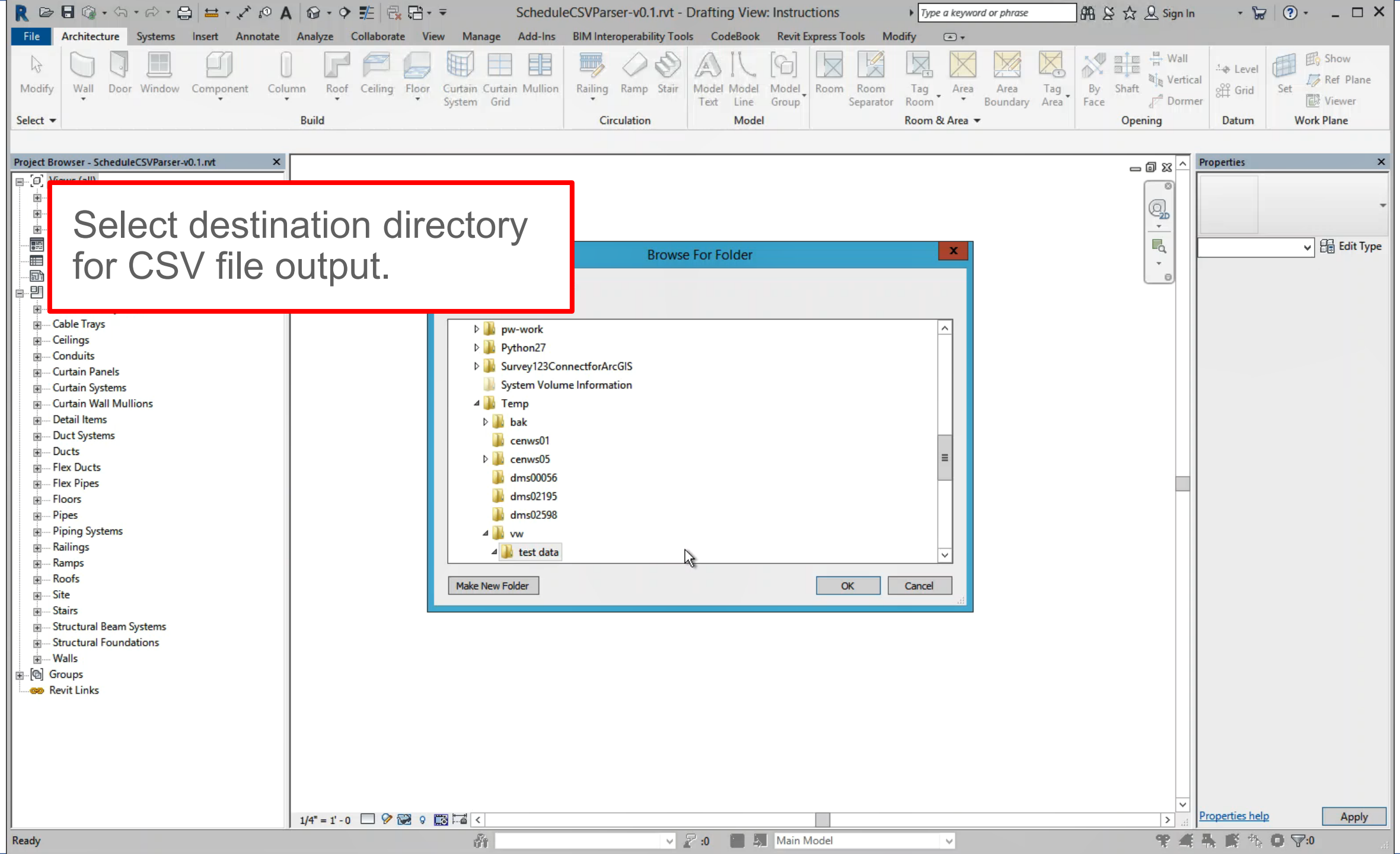


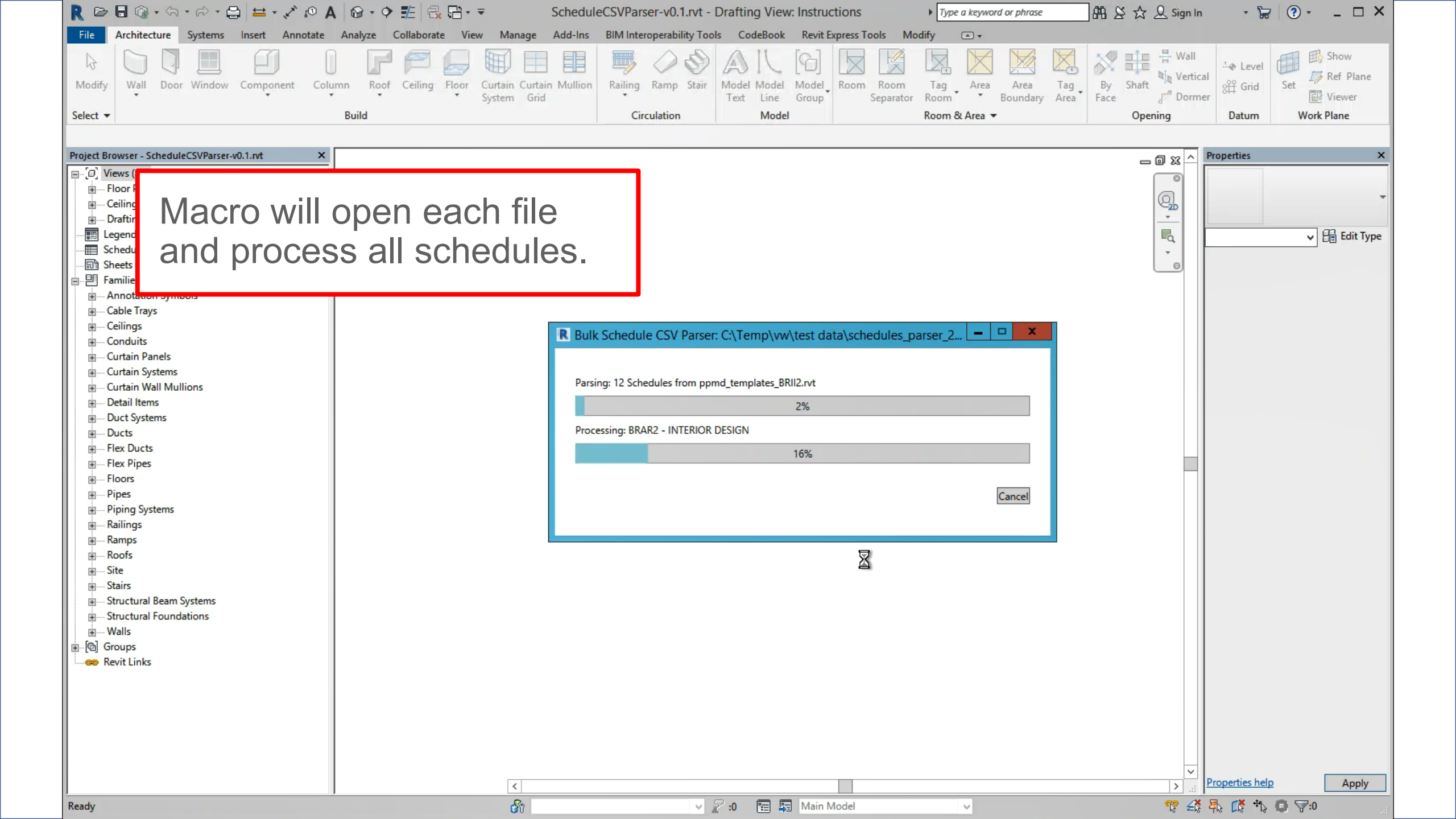
1. Collect lots of Revit files
2. E-Transmit backup
3. For faster processing, convert all files to same Revit version
4. Launch ScheduleCSVParser-v0.1.rvt
5. Enable macros

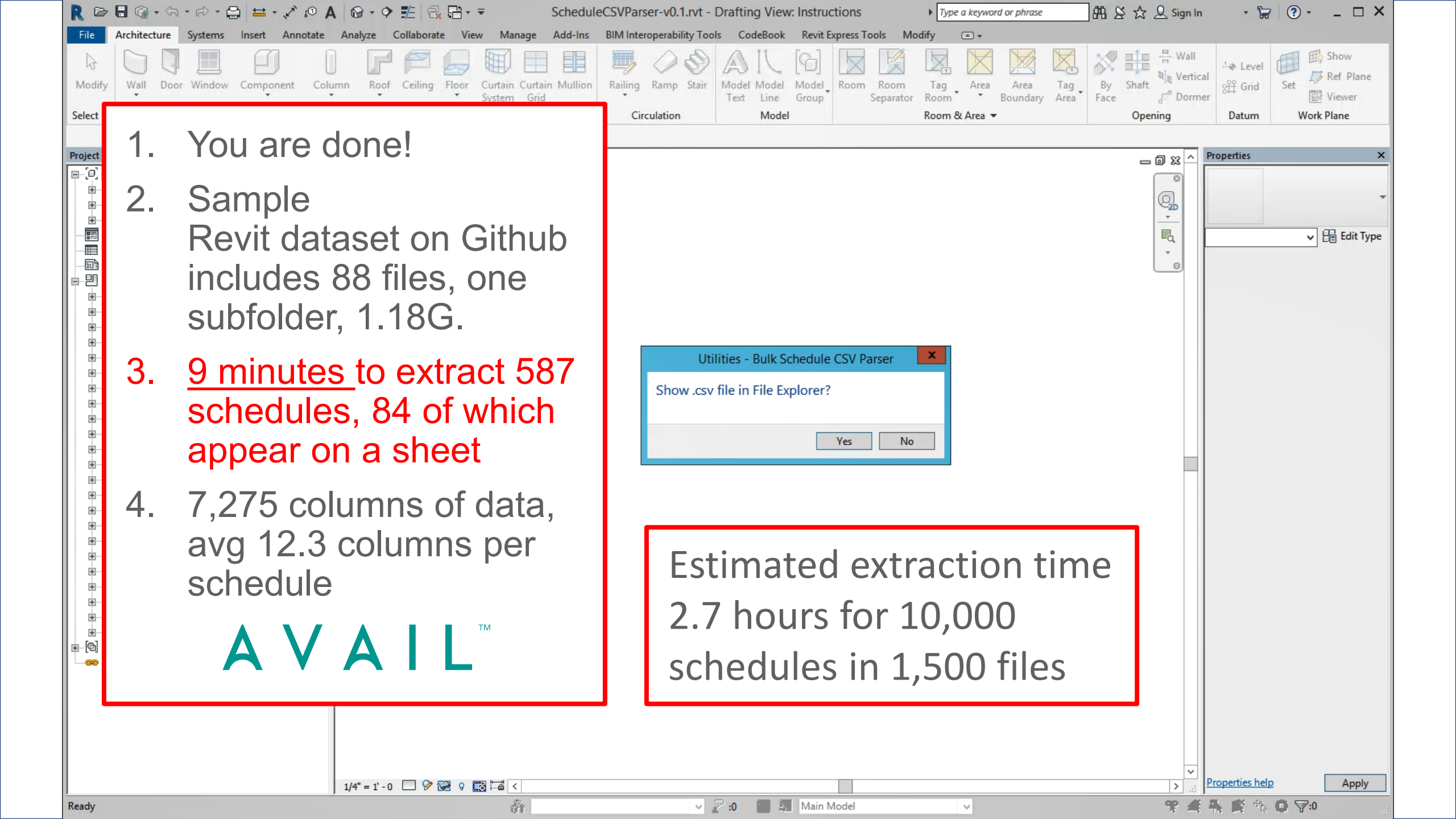

ScheduleCSVParser-v0.1.rvt - Drafting View: Instructions
Type a keyword or phrase
Sign In
File
Architecture
Systems
Insert
Annotate
Analyze
Collaborate
View
Manage
Add-Ins
BIM Interoperability Tools
CodeBook
Revit Express Tools
Modify
Modify
Wall
Door
Window
Component
Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
Mullion
Railing
Ramp
Stair
Model Text
Model Line
Model Group
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
By Face
Shaft
Wall
Vertical
Dormer
Level
Grid
Set
Show
Ref Plane
Viewer
Select
Build
Circulation
Model
Room & Area
Opening
Datum
Work Plane
Project Browser - ScheduleCSVParser-v0.1.rvt
Curtain Systems
Curtain Wall Mullions
Detail Items
Duct Systems
Ducts
Flex Ducts
Flex Pipes
Floors
Pipes
Piping Systems
Railings
Ramps
Roofs
Site
Stairs
Structural Beam Systems
Structural Foundations
Walls
Groups
Revit Links
1. Macro launches on startup
2. Select Yes to run
Utilities - Bulk Schedule CSV Parser
Run Schedule Parser?
Would you like to start the Bulk Schedule CSV Parser macro now?
Yes
No
Properties
Edit Type
Properties help
Apply
1/4" = 1' - 0
Ready
Main Model


ScheduleCSVParser-v0.1.rvt - Drafting View: Instructions
Type a keyword or phrase
Sign In
File
Architecture
Systems
Insert
Annotate
Analyze
Collaborate
View
Manage
Add-Ins
BIM Interoperability Tools
CodeBook
Revit Express Tools
Modify
Modify
Wall
Door
Window
Component
Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
Mullion
Railing
Ramp
Stair
Model Text
Model Line
Model Group
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
By Face
Shaft
Wall
Vertical
Dormer
Level
Grid
Set
Show
Ref Plane
Viewer
Select
Build
Circulation
Model
Room & Area
Opening
Datum
Work Plane
Project Browser - ScheduleCSVParser-v0.1.rvt
Conduits
Curtain Panels
Curtain Systems
Curtain Wall Mullions
Detail Items
Duct Systems
Ducts
Flex Ducts
Flex Pipes
Floors
Pipes
Piping Systems
Railings
Ramps
Roofs
Site
Stairs
Structural Beam Systems
Structural Foundations
Walls
Groups
Revit Links
Select source folder with files to process
Browse For Folder
Select the Project Base Directory.
dms00056
dms02195
dms02598
vw
test data
Users
win32app
Windows
Data (D:)
DVD Drive (E:)
CADD-CENPS (\\NWS-AS01DFS\NWS) (I:)
CADD-PROJECTS (\\NWS-AS01DFS\NWS) (J:)
G3ECEVJW (\\NWS-AS01DFS\NWS-HOME\EC) (N:)
Make New Folder
OK
Cancel
Properties
Edit Type
Properties help
Apply
1/4" = 1' - 0


ScheduleCSVParser-v0.1.rvt - Drafting View: Instructions
Type a keyword or phrase
Sign In
File
Architecture
Systems
Insert
Annotate
Analyze
Collaborate
View
Manage
Add-Ins
BIM Interoperability Tools
CodeBook
Revit Express Tools
Modify
Modify
Wall
Door
Window
Component
Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
Mullion
Railing
Ramp
Stair
Model Text
Model Line
Model Group
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
By Face
Shaft
Wall
Vertical
Dormer
Level
Grid
Set
Show
Ref Plane
Viewer
Select
Build
Circulation
Model
Room & Area
Opening
Datum
Work Plane
Project Browser - ScheduleCSVParser-v0.1.rvt
Cable Trays
Ceilings
Conduits
Curtain Panels
Curtain Systems
Curtain Wall Mullions
Detail Items
Duct Systems
Ducts
Flex Ducts
Flex Pipes
Floors
Pipes
Piping Systems
Railings
Ramps
Roofs
Site
Stairs
Structural Beam Systems
Structural Foundations
Walls
Groups
Revit Links
Macro identifies all Revit files in folder and subfolders
Utilities - Bulk Schedule CSV Parser
The source directory C:\Temp\vw\test data has 88 project file(s)
Close
Properties
Edit Type
Properties help
Apply
1/4" = 1' - 0
Ready
Main Model


ScheduleCSVParser-v0.1.rvt - Drafting View: Instructions
Type a keyword or phrase
Sign In
File
Architecture
Systems
Insert
Annotate
Analyze
Collaborate
View
Manage
Add-Ins
BIM Interoperability Tools
CodeBook
Revit Express Tools
Modify
Modify
Wall
Door
Window
Component
Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
Mullion
Railing
Ramp
Stair
Model Text
Model Line
Model Group
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
By Face
Shaft
Wall
Vertical
Dormer
Level
Grid
Set
Show
Ref Plane
Viewer
Select
Build
Circulation
Model
Room & Area
Opening
Datum
Work Plane
Project Browser - ScheduleCSVParser-v0.1.rvt
Cable Trays
Ceilings
Conduits
Curtain Panels
Curtain Systems
Curtain Wall Mullions
Detail Items
Duct Systems
Ducts
Flex Ducts
Flex Pipes
Floors
Pipes
Piping Systems
Railings
Ramps
Roofs
Site
Stairs
Structural Beam Systems
Structural Foundations
Walls
Groups
Revit Links
Select destination directory for CSV file output.
Browse For Folder
pw-work
Python27
Survey123ConnectforArcGIS
System Volume Information
Temp
bak
cenws01
cenws05
dms00056
dms02195
dms02598
vw
test data
Make New Folder
OK
Cancel
Properties
Edit Type
Properties help
Apply
1/4" = 1' - 0
Ready
Main Model


ScheduleCSVParser-v0.1.rvt - Drafting View: Instructions
Type a keyword or phrase
Sign In
File
Architecture
Systems
Insert
Annotate
Analyze
Collaborate
View
Manage
Add-Ins
BIM Interoperability Tools
CodeBook
Revit Express Tools
Modify
Modify
Wall
Door
Window
Component
Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
Mullion
Railing
Ramp
Stair
Model Text
Model Line
Model Group
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
By Face
Shaft
Wall
Vertical
Dormer
Level
Grid
Set
Show
Ref Plane
Viewer
Select
Build
Circulation
Model
Room & Area
Opening
Datum
Work Plane
Project Browser - ScheduleCSVParser-v0.1.rvt
Views (
Floor P
Ceiling
Draftin
Legend
Schedu
Sheets
Familie
Annotation Symbols
Cable Trays
Ceilings
Conduits
Curtain Panels
Curtain Systems
Curtain Wall Mullions
Detail Items
Duct Systems
Ducts
Flex Ducts
Flex Pipes
Floors
Pipes
Piping Systems
Railings
Ramps
Roofs
Site
Stairs
Structural Beam Systems
Structural Foundations
Walls
Groups
Revit Links
Macro will open each file
and process all schedules.
Bulk Schedule CSV Parser: C:\Temp\vw\test data\schedules_parser_2...
Parsing: 12 Schedules from ppmd_templates_BRII2.rvt
2%
Processing: BRAR2 - INTERIOR DESIGN
16%
Cancel
Properties
Edit Type
Properties help
Apply
Ready
:0
Main Model
:0


ScheduleCSVParser-v0.1.rvt - Drafting View: Instructions
Type a keyword or phrase
Sign In
File
Architecture
Systems
Insert
Annotate
Analyze
Collaborate
View
Manage
Add-Ins
BIM Interoperability Tools
CodeBook
Revit Express Tools
Modify
Modify
Wall
Door
Window
Component
Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
Mullion
Railing
Ramp
Stair
Model Text
Model Line
Model Group
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
By Face
Shaft
Wall
Vertical
Dormer
Level
Grid
Set
Show
Ref Plane
Viewer
Select
Circulation
Model
Room & Area
Opening
Datum
Work Plane
Project
Properties
Edit Type
Properties help
Apply
1/4" = 1' - 0
Ready
Main Model
1. You are done!
2. Sample
Revit dataset on Github includes 88 files, one subfolder, 1.18G.
3. 9 minutes to extract 587 schedules, 84 of which appear on a sheet
4. 7,275 columns of data, avg 12.3 columns per schedule
AVAIL™
Utilities - Bulk Schedule CSV Parser
Show .csv file in File Explorer?
Yes
No
Estimated extraction time
2.7 hours for 10,000 schedules in 1,500 files

TextPad - Y:\VW\schedules\test data\schedules_parser_2019-13-07_17-27-18.csv

File Edit Search View Tools Macros Configure Window Help

Find incrementally Match case

Document Selector

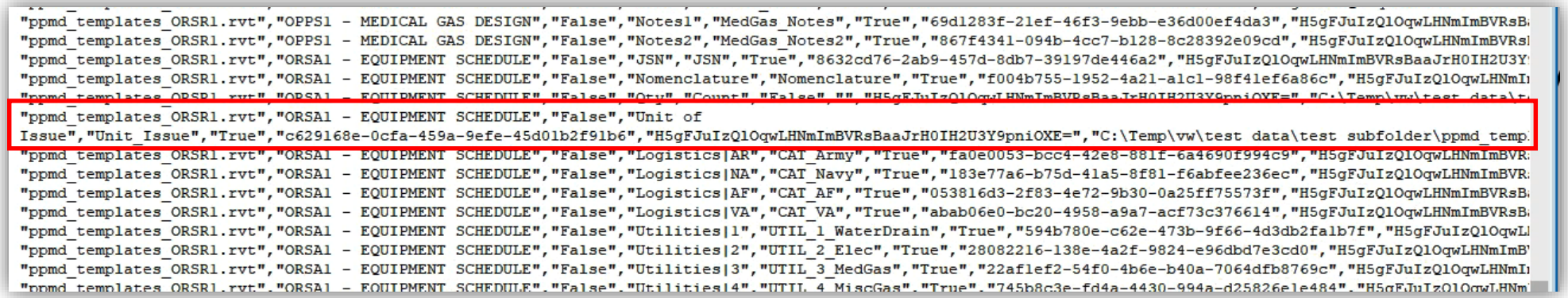
schedules_parser_2019-13-07_17-27-18.csv

schedules_parser_2019-13-07_17-2...

```
"Filename","Schedule Title","IsOnSheet","Column Headers","Parameter Name","Is Shared","Shared Parameter Guid","File Hash","Filepath","Column Values"
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Nomenclature","Nomenclature","True","f004b755-1952-4a21-a1c1-98f41ef6a86c","srJ0IoBhfmbM+DJ/eHY
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Qty","Count","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\test data\ppm
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","LF","CustomLength","True","f338df87-67c7-40c3-b0e8-6ebb5a3fe5b8","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuq
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|AR","CAT_Army","True","fa0e0053-bcc4-42e8-881f-6a4690f994c9","srJ0IoBhfmbM+DJ/eHYlqe7
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|NA","CAT_Navy","True","183e77a6-b75d-41a5-8f81-f6abfee236ec","srJ0IoBhfmbM+DJ/eHYlqe7
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|AF","CAT_AF","True","053816d3-2f83-4e72-9b30-0a25ff75573f","srJ0IoBhfmbM+DJ/eHYlqe7BQ
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|VA","CAT_VA","True","abab06e0-bc20-4958-a9a7-acf73c376614","srJ0IoBhfmbM+DJ/eHYlqe7BQ
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|1","UTIL_1_WaterDrain","True","594b780e-c62e-473b-9f66-4d3db2falb7f","srJ0IoBhfmbM+DJ
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|2","UTIL_2_Elec","True","28082216-138e-4a2f-9824-e96dbd7e3cd0","srJ0IoBhfmbM+DJ/eHYlq
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|3","UTIL_3_MedGas","True","22aflef2-54f0-4b6e-b40a-7064dfb8769c","srJ0IoBhfmbM+DJ/eHY
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|4","UTIL_4_MiscGas","True","745b8c3e-fd4a-4430-994a-d25826ele484","srJ0IoBhfmbM+DJ/eH
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|5","UTIL_5_NonMedGas","True","323edf97-d058-44ef-a0fb-1836c80554d8","srJ0IoBhfmbM+DJ/
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|6","UTIL_6_Misc","True","38083e2d-8ba3-4868-9752-742b7a4a9586","srJ0IoBhfmbM+DJ/eHYlq
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Floor Finish|Preferred","Floor Finish","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=",
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Floor Finish|Alternate","Floor Finish2","True","4030719d-a272-44la-8bfa-d5eb510a1687","srJ0IoBhfm
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Wall Finish|Preferred","Wall Finish","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Wall Finish|Alternate","Wall Finish2","True","5a49d499-57b3-4elf-afc0-4c041c862be1","srJ0IoBhfmbM
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Ceiling Finish|Preferred","Ceiling Finish","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcy
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Ceiling Finish|Alternate","Ceiling Finish2","True","acb31fdl-378b-4329-97b0-400ae39b5bc4","srJ0Io
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Room Height|ft - in","Ceiling_Hgt_IP","True","9fl4ca4f-2465-4385-a17c-7aa549f64c09","srJ0IoBhfmbM
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Room Noise|Min NC","Noise_NC_MIN","True","8c49df6c-7d6b-49fd-9459-f57d0921d704","srJ0IoBhfmbM+DJ/
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Room Noise|Max NC","Noise_NC_MAX","True","629b571a-1c14-443c-b8e8-1130b5edb513","srJ0IoBhfmbM+DJ/
"ppmd_templates_BRII2.rvt","BRAR2 - INTERIOR DESIGN","False","Room Noise|SC","Noise_SC","True","44bf9cdl-070a-432c-87d9-26a321lcfe07","srJ0IoBhfmbM+DJ/eHYlqe7B
"ppmd_templates_BRII2.rvt","BRII2 - DATA/TELEPHONE EQUIPMENT","False","JSN","JSN","True","8632cd76-2ab9-457d-8db7-39197de446a2","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqb
"ppmd_templates_BRII2.rvt","BRII2 - DATA/TELEPHONE EQUIPMENT","False","Nomenclature","Nomenclature","True","f004b755-1952-4a21-a1c1-98f41ef6a86c","srJ0IoBhfmbM
"ppmd_templates_BRII2.rvt","BRII2 - DATA/TELEPHONE EQUIPMENT","False","Qty","Count","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\test
"ppmd_templates_BRII2.rvt","BRII2 - DATA/TELEPHONE EQUIPMENT","False","Logistics|AR","CAT_Army","True","fa0e0053-bcc4-42e8-881f-6a4690f994c9","srJ0IoBhfmbM+DJ/
"ppmd_templates_BRII2.rvt","BRII2 - DATA/TELEPHONE EQUIPMENT","False","Logistics|NA","CAT_Navy","True","183e77a6-b75d-41a5-8f81-f6abfee236ec","srJ0IoBhfmbM+DJ/
"ppmd_templates_BRII2.rvt","BRII2 - DATA/TELEPHONE EQUIPMENT","False","Logistics|AF","CAT_AF","True","053816d3-2f83-4e72-9b30-0a25ff75573f","srJ0IoBhfmbM+DJ/eH
"ppmd_templates_BRII2.rvt","BRII2 - DATA/TELEPHONE EQUIPMENT","False","Logistics|VA","CAT_VA","True","abab06e0-bc20-4958-a9a7-acf73c376614","srJ0IoBhfmbM+DJ/eH
"ppmd_templates_BRII2.rvt","BRII2 - DOOR SCHEDULE","False","Mark","Construction Type","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\tes
"ppmd_templates_BRII2.rvt","BRII2 - DOOR SCHEDULE","False","Type","Family","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\test data\ppmd
"ppmd_templates_BRII2.rvt","BRII2 - DOOR SCHEDULE","False","Count","Count","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\test data\ppmd
"ppmd_templates_BRII2.rvt","BRII2 - DOOR SCHEDULE","False","Height|ft - in","Height","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\test
"ppmd_templates_BRII2.rvt","BRII2 - DOOR SCHEDULE","False","Width|ft - in","Width","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\test d
"ppmd_templates_BRII2.rvt","BRII2 - DOOR SCHEDULE","False","Notes","Type Comments","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\test d
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Lighting|LUX1","Light_Level_LUX","True","fc853981-f613-4f05-81bd-e48fb947424b","srJ0IoBhfmbM+DJ
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Lighting|Footcandles1","Light_Level_FC","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Lighting|LUX2","Light_Level_LUX2","True","172flcff-58cc-41cd-b888-0e7a81d2bf40","srJ0IoBhfmbM+D
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Lighting|Footcandles2","Light_Level_FC2","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcy
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Lighting|Notes","Light_Notes","True","a36245ac-ea57-45c2-bac5-bed4d04a4f78","srJ0IoBhfmbM+DJ/eH
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Lighting|Notes2","Light_Notes2","True","6d0b4891-ce4c-45f8-9560-387866098a10","srJ0IoBhfmbM+DJ/
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Essential Power|% Power","ES_Power%","True","7cbfe71a-865f-4cf4-b400-c67e3939439b","srJ0IoBhfmbM
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Essential Power|% Light","ES_Light%","True","af00a8bb-40cb-434a-a7e5-b4140f3c844f","srJ0IoBhfmbM
"ppmd_templates_BRII2.rvt","BRII2 - ELECTRICAL DESIGN","False","Essential Power|Notes","ES Notes","True","0c3ae867-1060-40b5-bb68-261d16a167a0","srJ0IoBhfmbM+D
```

Explorer Docume... Clip Libr...

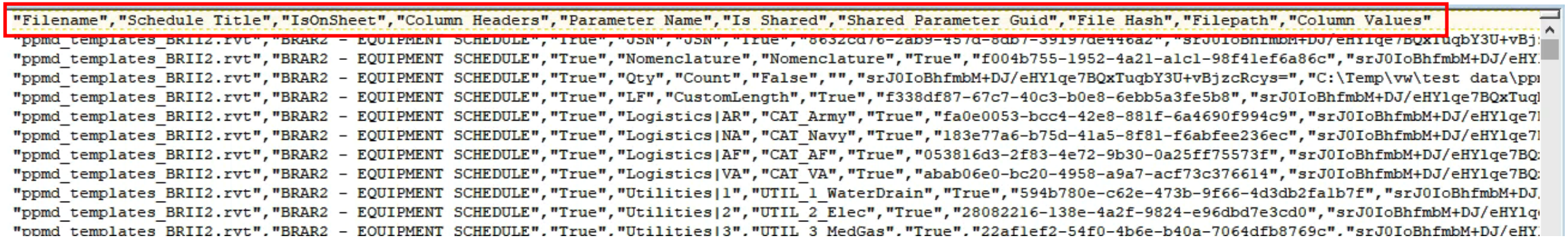
Search Results



```
"ppmd_templates_ORSR1.rvt","OPPS1 - MEDICAL GAS DESIGN","False","Notes1","MedGas_Notes","True","69d1283f-21ef-46f3-9ebb-e36d00ef4da3","H5gFJuIzQlOqwLHNmImBVRsB
"ppmd_templates_ORSR1.rvt","OPPS1 - MEDICAL GAS DESIGN","False","Notes2","MedGas_Notes2","True","867f4341-094b-4cc7-b128-8c28392e09cd","H5gFJuIzQlOqwLHNmImBVRs
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","JSN","JSN","True","8632cd76-2ab9-457d-8db7-39197de446a2","H5gFJuIzQlOqwLHNmImBVRsBaaJrH0IH2U3Y
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Nomenclature","Nomenclature","True","f004b755-1952-4a21-a1c1-98f41ef6a86c","H5gFJuIzQlOqwLHNmI
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Qty","Count","False","","H5gFJuIzQlOqwLHNmImBVRsBaaJrH0IH2U3Y9pniOXE=","C:\Temp\vw\test data\t
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Unit of
Issue","Unit_Issue","True","c629168e-0cfa-459a-9efe-45d01b2f91b6","H5gFJuIzQlOqwLHNmImBVRsBaaJrH0IH2U3Y9pniOXE=","C:\Temp\vw\test data\test subfolder\ppmd_temp
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Logistics|AR","CAT_Army","True","fa0e0053-bcc4-42e8-881f-6a4690f994c9","H5gFJuIzQlOqwLHNmImBVR
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Logistics|NA","CAT_Navy","True","183e77a6-b75d-41a5-8f81-f6abfee236ec","H5gFJuIzQlOqwLHNmImBVR
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Logistics|AF","CAT_AF","True","053816d3-2f83-4e72-9b30-0a25ff75573f","H5gFJuIzQlOqwLHNmImBVRsB
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Logistics|VA","CAT_VA","True","abab06e0-bc20-4958-a9a7-acf73c376614","H5gFJuIzQlOqwLHNmImBVRsB
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Utilities|1","UTIL_1_WaterDrain","True","594b780e-c62e-473b-9f66-4d3db2fa1b7f","H5gFJuIzQlOqwL
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Utilities|2","UTIL_2_Elec","True","28082216-138e-4a2f-9824-e96dbd7e3cd0","H5gFJuIzQlOqwLHNmImB
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Utilities|3","UTIL_3_MedGas","True","22aflef2-54f0-4b6e-b40a-7064dfb8769c","H5gFJuIzQlOqwLHNmI
"ppmd_templates_ORSR1.rvt","ORSA1 - EQUIPMENT SCHEDULE","False","Utilities|4","UTIL_4_MiscGas","True","745b8c3e-fd4a-4430-994a-d25826e1e484","H5gFJuIzQlOqwLHNm
```

Handles carriage returns and special characters correctly.

Sample Data Export Example



```
"Filename","Schedule Title","IsOnSheet","Column Headers","Parameter Name","Is Shared","Shared Parameter Guid","File Hash","Filepath","Column Values"
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","JSN","JSN","True","8632cd76-2ab9-457d-8db7-39197de446a2","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBj
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Nomenclature","Nomenclature","True","f004b755-1952-4a21-a1c1-98f41ef6a86c","srJ0IoBhfmbM+DJ/eHY
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Qty","Count","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U+vBjzcRcys=","C:\Temp\vw\test data\pp
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","LF","CustomLength","True","f338df87-67c7-40c3-b0e8-6ebb5a3fe5b8","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuq
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|AR","CAT_Army","True","fa0e0053-bcc4-42e8-881f-6a4690f994c9","srJ0IoBhfmbM+DJ/eHYlqe7
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|NA","CAT_Navy","True","183e77a6-b75d-41a5-8f81-f6abfee236ec","srJ0IoBhfmbM+DJ/eHYlqe7
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|AF","CAT_AF","True","053816d3-2f83-4e72-9b30-0a25ff75573f","srJ0IoBhfmbM+DJ/eHYlqe7BQ
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|VA","CAT_VA","True","abab06e0-bc20-4958-a9a7-acf73c376614","srJ0IoBhfmbM+DJ/eHYlqe7BQ
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|1","UTIL_1_WaterDrain","True","594b780e-c62e-473b-9f66-4d3db2falb7f","srJ0IoBhfmbM+DJ
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|2","UTIL_2_Elec","True","28082216-138e-4a2f-9824-e96dbd7e3cd0","srJ0IoBhfmbM+DJ/eHYlq
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|3","UTIL_3_MedGas","True","22aflef2-54f0-4b6e-b40a-7064dfb8769c","srJ0IoBhfmbM+DJ/eHY
```

Drawing Schedule Data Extraction Schema

The following data is extracted in the following comma delimited format with quote wrapped strings, with one CSV row for each drawing schedule column:

```
"Filename","Schedule Title","IsOnSheet","Column Headers","Parameter Name","Is Shared","Shared Parameter Guid","Fil
```

1. **Filename**: File name with file extension.
2. **Schedule Title**: Title of drawing schedule if displayed graphically on the sheet. This can be different than the name of the
3. **IsOnSheet**: `True` if the drawing schedule appears on a sheet, otherwise `False`.
4. **Column Headers**: Drawing schedule column headers. Headers with groupings are formatted with a "|" delimiter like: "Group Text|Column Header Text". Column headers and groupings are what are displayed graphically, and are not required to match the `ParameterName` containing the data.
5. **Parameter Name**: Name of the parameter that stores the data. The parameter name can be different than what `ColumnHeaders` displays on the sheet.
6. **Is Shared**: `True` if the `Parameter Name` is stored with a parameter with a GUID (in Revit, a "Shared Parameter"), and `False` if not.
7. **Shared Parameter Guid**: GUID of the parameter (in Revit, the `Shared Parameter` GUID).
8. **File Hash**: SHA256 hash of file, used to uniquely ID each file independent of filename, timestamp, and path.
9. **Filepath**: File name with path.
10. **Column Values**: All values in the column separated by the delimiter "|". Delimiter only between values, not at beginning and end. An empty column results in "" not "||".

https://github.com/vdubya/Revit-Schedule-CSV-Parser/blob/master/README.md

"Schedule Title"

"DOOR AND FRAME SCHEDULE"

"Column Headers","Column Values"

"DOOR|MARK","1|2|3"

"DOOR|SIZE|W",""

"DOOR|SIZE|HT",""

"DOOR|SIZE|THK",""

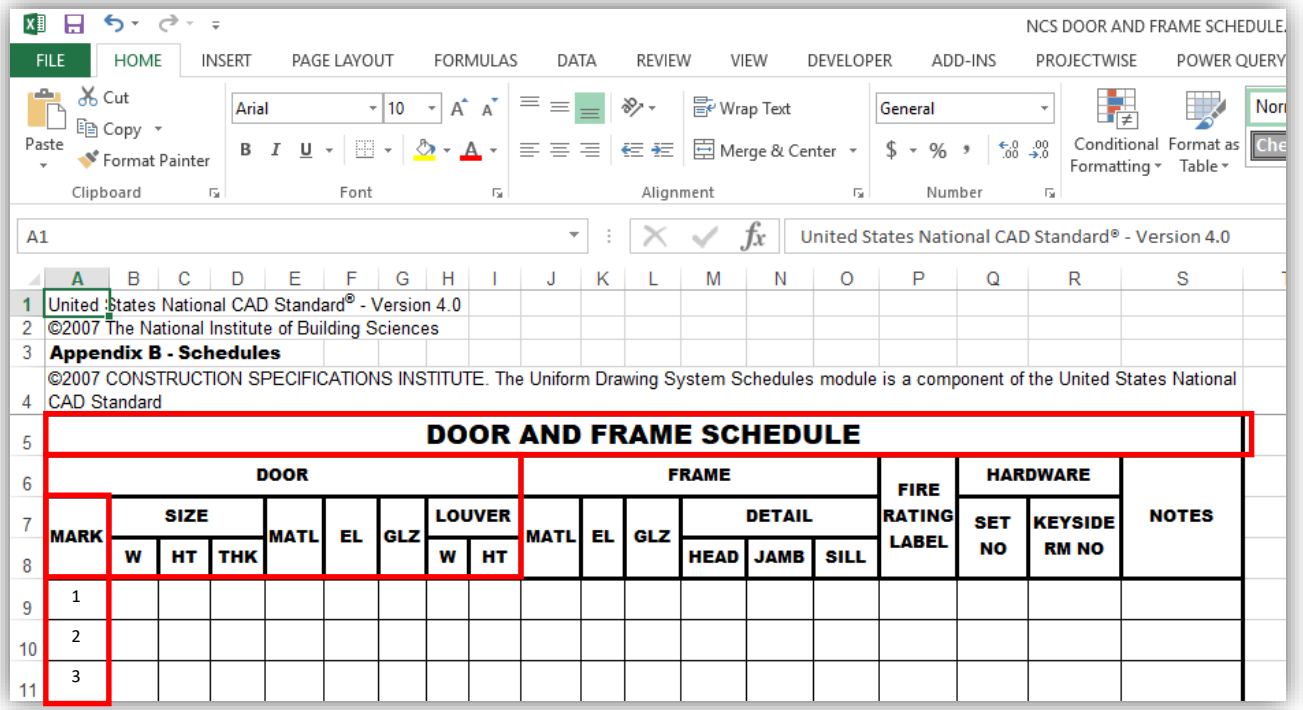
"DOOR|MATL",""

"DOOR|EL",""

"DOOR|GLZ",""

"DOOR|LOUVER|W",""

"DOOR|LOUVER|HT",""

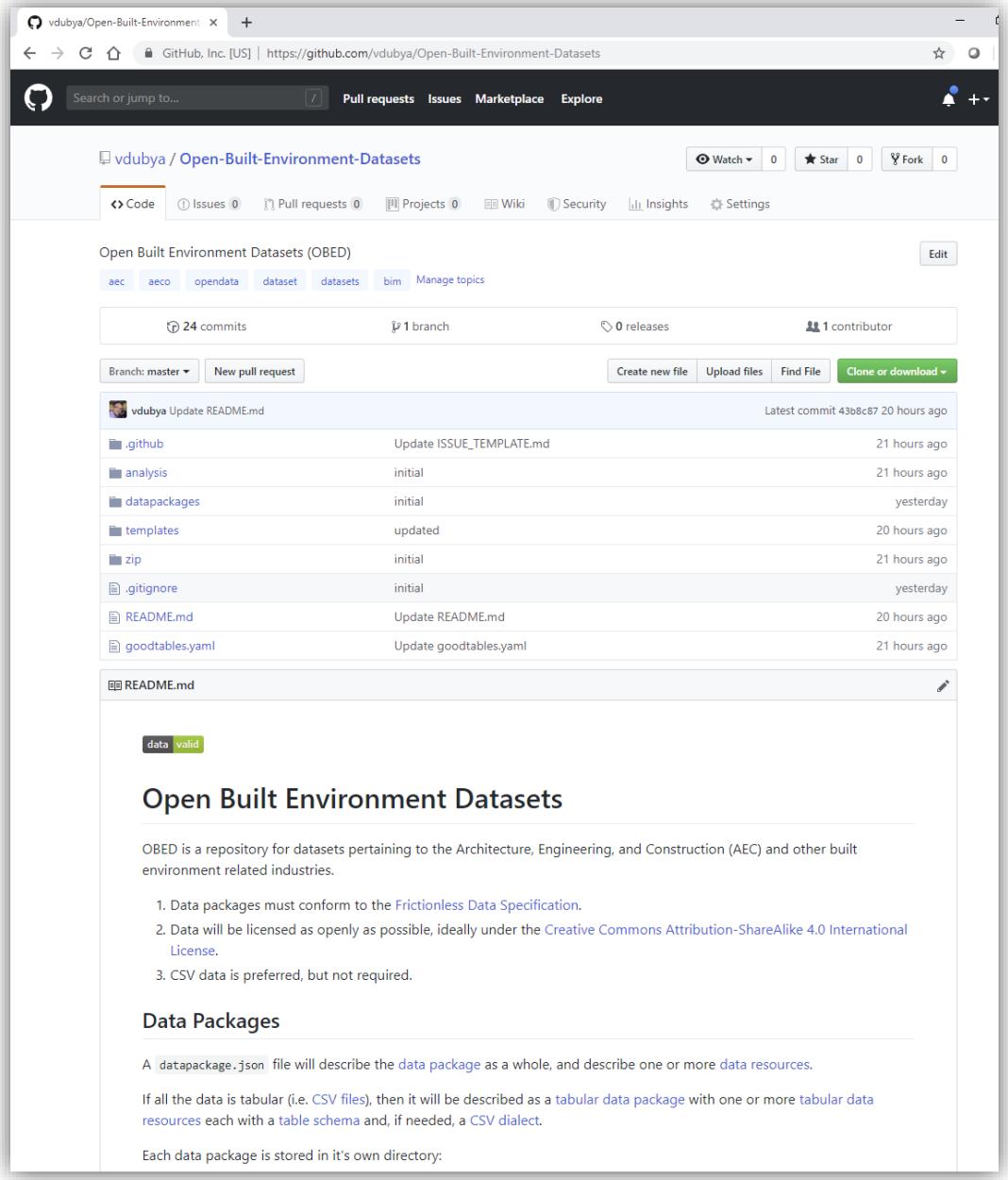



```
"Filename","Schedule Title","IsOnSheet","Column Headers","Parameter Name","Is Shared","Shared Parameter Guid","File Hash",
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","JSN","JSN","True","8632cd76-2ab9-457d-8db7-39197de446a2",
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Nomenclature","Nomenclature","True","f004b755-1952-4a21-al
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Qty","Count","False","","srJ0IoBhfmbM+DJ/eHYlqe7BQxTuqbY3U
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","LF","CustomLength","True","f338df87-67c7-40c3-b0e8-6ebb5a3
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|AR","CAT_Army","True","fa0e0053-bcc4-42e8-881f-6
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|NA","CAT_Navy","True","183e77a6-b75d-41a5-8f81-f
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|AF","CAT_AF","True","053816d3-2f83-4e72-9b30-0a2
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Logistics|VA","CAT_VA","True","abab06e0-bc20-4958-a9a7-acf
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|1","UTIL_1_WaterDrain","True","594b780e-c62e-473
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|2","UTIL_2_Elec","True","28082216-138e-4a2f-9824
"ppmd_templates_BRII2.rvt","BRAR2 - EQUIPMENT SCHEDULE","True","Utilities|3","UTIL_3_MedGas","True","22aflef2-54f0-4b6e-b4
```


DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

BUILDING CONTENT SUMMIT by DBEI

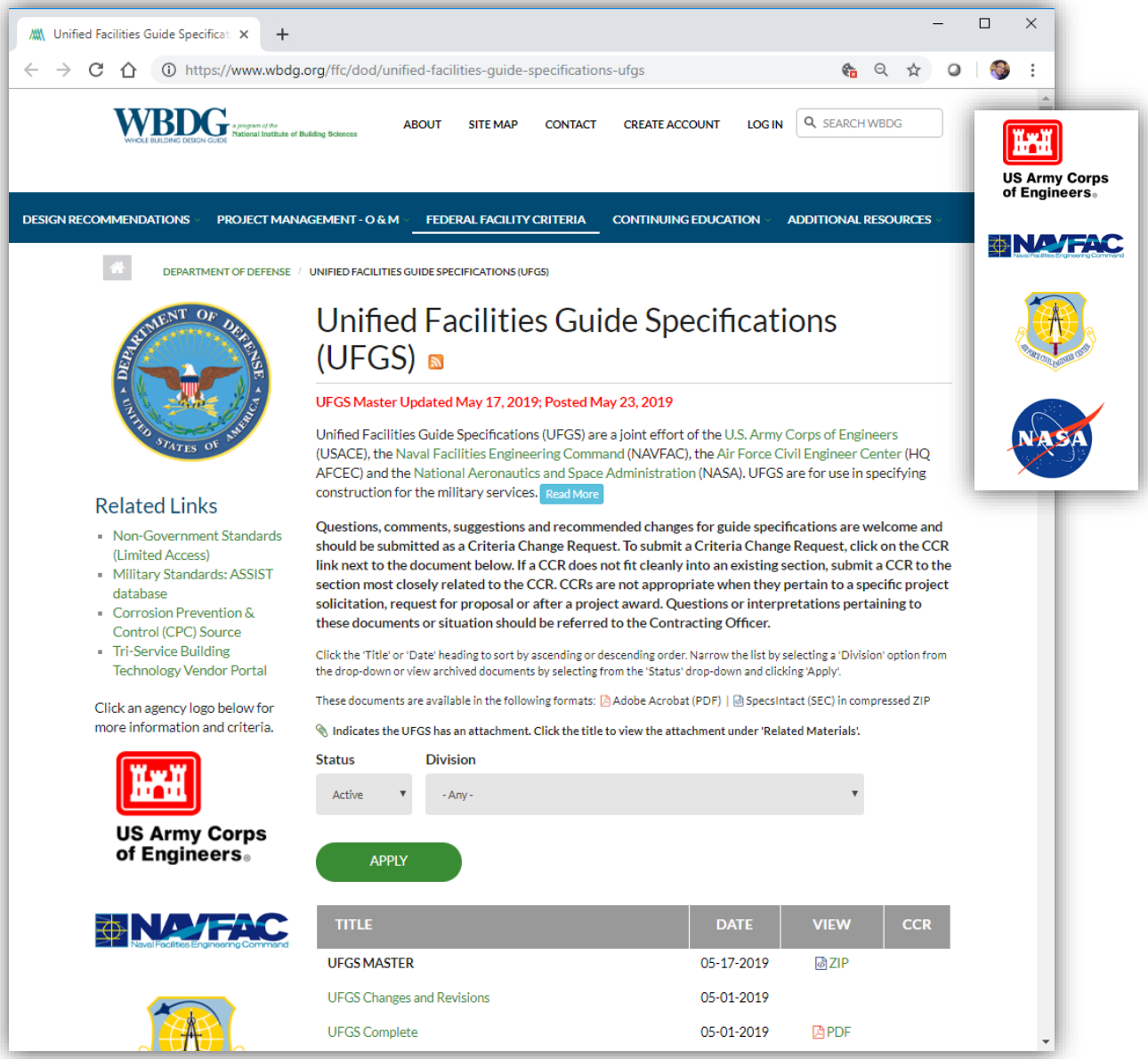
- Second repository for platform neutral data submission
- Data packages based on the Frictionless Data Specification



DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

https://github.com/vdubya/Open-Built-Environment-Datasets

BUILDING CONTENT SUMMIT by DBEI



- Public Domain
  - 21,749 pages
- Regularly updated
  - USACE (and customers)
  - Air Force
  - NAVFAC
  - NASA
- SpecsInTact tagged plaintext
- .pdf, .sec
- Imaginary prize
  - How many times does the word BIM appear?

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE
Advancing people, processes, and technology

https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs

BUILDING CONTENT SUMMIT by DBEI

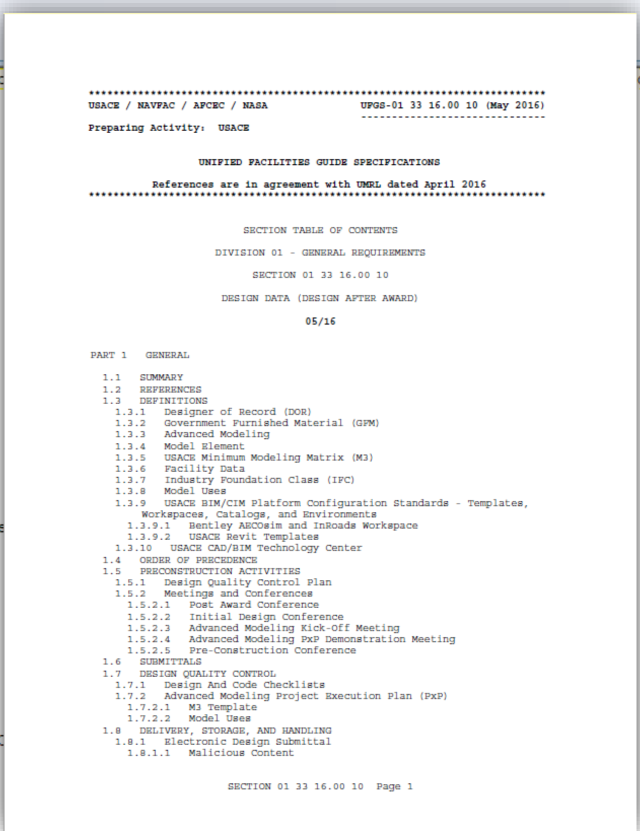
TextPad - D:\van work_BIM Innovation Program\2019.02 BiLT BCS Data Driven Standards__Work In Progress\Specs data\sisgml\Masters\UFGS\01 33 16.00 10.SEC

File Edit Search View Tools Macros Configure Window Help

Document Selector

01 33 16.00 10.SEC


```
<?xml version="1.0" encoding="windows-1252"?><SEC xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocatio
USACE / NAVFAC / AFCEC / NASA                UFGS-01 33 16.00 10 (May 2016)<BRK/>
                                             ------------------------------<BRK/>
Preparing Activity:  <PRA>USACE</PRA>                          <BRK/>
                                              <BRK/>
<BRK/>
<HL4>UNIFIED FACILITIES GUIDE SPECIFICATIONS</HL4><BRK/>
<BRK/>
<HL4>References are in agreement with UMRL dated April 2019</HL4><BRK/>
<AST/><BRK/></HDR>
<BRK/>
<SCN>SECTION 01 33 16.00 10</SCN><BRK/>
<BRK/>
<STL>DESIGN DATA (DESIGN AFTER AWARD)</STL><BRK/>
<DTE>05/16</DTE><BRK/>
<NTE><BRK/>
<AST/><BRK/>
   <NPR>NOTE:  This guide specification covers the requirements for a <SCP>design/build project,
including design development and design submittals.  Use this section in a design/build
project executed by the Army only.</SCP><BRK/>
<BRK/>
Adhere to <URL HREF="http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-300-02">UFC 1-300-02</URL> Unified Facilities
Standard when editing this guide specification or preparing new project specification
sections.  Edit this guide specification for project specific requirements by
adding, deleting, or revising text.  For bracketed items, choose applicable
item(s) or insert appropriate information.<BRK/>
<BRK/>
Remove information and requirements not required in respective project, whether
or not brackets are present.<BRK/>
<BRK/>
Comments, suggestions and recommended changes for this guide specification are
welcome and should be submitted as a <URL HREF="http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs">Criteria C
<AST/><BRK/></NTE>
<BRK/>
<PRT><TTL>PART 1   GENERAL</TTL><BRK/>
<NTE><BRK/>
<AST/><BRK/>
<NPR>NOTE:  This guide specification supplements UFGS <SRF>01 33 00</SRF> SUBMITTAL PROCEDURES,
tailored for Design/Build projects.  Section <SRF>01 33 00</SRF> covers general procedures
primarily with respect to construction submittals.  This section provides requirements
for design submittals and design quality procedures.</NPR><BRK/>
<BRK/>
<NPR>In addition, the guide specification serves as a stand-alone reference point
for all BIM, CIM, GIS, and/or CAD-related requirements for a project.  Consult
all appropriate agency guidance and policies as well as stakeholder requirements
to determine the components of this specification to retain for a particular
project.</NPR><BRK/>
<BRK/>
```
d"><MTA NAME=



USACE / NAVFAC / AFCEC / NASA UFGS-01 33 16.00 10 (May 2016)

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2016

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 33 16.00 10

DESIGN DATA (DESIGN AFTER AWARD)

05/16

PART 1 GENERAL

1.1 SUMMARY
1.2 REFERENCES
1.3 DEFINITIONS
1.3.1 Designer of Record (DOR)
1.3.2 Government Furnished Material (GFM)
1.3.3 Advanced Modeling
1.3.4 Model Element
1.3.5 USACE Minimum Modeling Matrix (M3)
1.3.6 Facility Data
1.3.7 Industry Foundation Class (IFC)
1.3.8 Model Uses
1.3.9 USACE BIM/CIM Platform Configuration Standards - Templates, Workspaces, Catalogs, and Environments
1.3.9.1 Bentley AECOsim and InRoads Workspace
1.3.9.2 USACE Revit Templates
1.3.10 USACE CAD/BIM Technology Center
1.4 ORDER OF PRECEDENCE
1.5 PRECONSTRUCTION ACTIVITIES
1.5.1 Design Quality Control Plan
1.5.2 Meetings and Conferences
1.5.2.1 Post Award Conference
1.5.2.2 Initial Design Conference
1.5.2.3 Advanced Modeling Kick-Off Meeting
1.5.2.4 Advanced Modeling PxP Demonstration Meeting
1.5.2.5 Pre-Construction Conference
1.6 SUBMITTALS
1.7 DESIGN QUALITY CONTROL
1.7.1 Design And Code Checklists
1.7.2 Advanced Modeling Project Execution Plan (PxP)
1.7.2.1 M3 Template
1.7.2.2 Model Uses
1.8 DELIVERY, STORAGE, AND HANDLING
1.8.1 Electronic Design Submittal
1.8.1.1 Malicious Content

SECTION 01 33 16.00 10 Page 1

Explorer Docume... Clip Libr...

Search Results

Search Results Tool Output

1 1 Read Ovr Block Sync Rec Caps

Questions

- Do our standards reflect our most common practices?
  - Without data, how would you know?
- What are the top 5 attributes on the top
  Minimum Viable Product?
- What could we learn from 100 or 1,000 of
- Can we crowd source enough data to have a statistically meaningful dataset?
- Can we start an AECO movement based on data, not just opinions? Can we start tomorrow?

> "Without data, you're just another person with an opinion."
>
> – W. Edwards Deming

Outline

- BIM Data Complexity
- Rise of AI and Data Science
- Legally Valid Data

- How To Extract
- Ways To Analyze
- How To Participate and Contribute

Quick Start Suggestions

- Spreadsheet
  - Filters, Formulas, Pivot Tables
    - Excel “Power Query”, “intelligent suggestions”
    - Google Sheets “Explore”
- Business Intelligence Platforms
  - PowerBI, Google Data Studio
- Databases
- Machine Learning
  - Google Colaboratory (“Colab”)
    - Jupyter Notebook
    - Free VM w/GPU, no setup required, Python 2 or 3, numpy, pandas, TensorFlow, etc

Pages

Overview

Schedule Stats

Schedules By Discipline

Door Schedules Stats

Shared Parameter Stats

Filtered Data

Page 7

OVERVIEW

Revit Files Analyzed	Schedule Instances	Schedules On Sheets	Schedule Types	Model Disciplines
162	4,361	1,207	69	14

	Schedule Title	Schedule Type	Model Discip...	IsOnSheet	IsCOBieS...	IsLEEDS...	IsQTOSp...	Column Headers	Parameter Name
1.	AIR HANDLING UNIT SCHEDULE (AHU)...	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	COOLING COIL|REFRIGERANT TYPE	MH_TEXT01
2.	AIR HANDLING UNIT SCHEDULE (AHU)...	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	HEATING COIL|TOTAL CAPACITY (M...	MH_COIL_HEAT_CAPACITY
3.	SXL - VAH AHU ECONO	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	null	Mark
4.	AIR HANDLING UNIT SCHEDULE (AHU)	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	HEATING COIL|TOTAL CAPACITY (B...	MH_COIL_HEAT_CAPACITY
									Mark
									Comments
7.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	LOCATION	Level
8.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	APPROXIMATE WEIGHT (LBS)	APPROXIMATE WEIGHT
9.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	SUPPLY FAN|MAX CFM	AHU - Max CFM
10.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	SUPPLY FAN|OA CFM	OA CFM
11.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	SUPPLY FAN|ESP (IN WG)	ESP (IN WG)
			Mechanical	TRUE	FALSE	FALSE	FALSE	SUPPLY FAN|HP	Max HP
			Mechanical	TRUE	FALSE	FALSE	FALSE	SUPPLY FAN|VFD	VFD
			Mechanical	TRUE	FALSE	FALSE	FALSE	SUPPLY FAN|ELEC V/PH/HZ	ELEC V/PH/HZ
15.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	DX COOLING COIL|EAT DB (F)	EAT DB
16.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	DX COOLING COIL|EAT WB (F)	EAT WB
17.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	DX COOLING COIL|LAT DB (F)	LAT DB
18.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	DX COOLING COIL|LAT WB (F)	LAT WB
19.	AIR HANDLING UNIT SCHEDULE	AHU	Mechanical	TRUE	FALSE	FALSE	FALSE	HOT GAS REHEAT|LAT DB (F)	LAT DB (F)

1 - 250 / 5313

Proof of concept, NOT statistically relevant findings.

Google Data Studio

Data Last Updated: 7/2/2019 4:39:27 PM | Privacy Policy

SCHEDULE STATS

Count of All Schedule Instances
4,361

Count of Unique Schedule Titles
2,268

Count of Schedules ON A SHEET
1,207

Count of Working Schedules (not on a sheet)
1,536

	Schedule Type	Count
1.	Drawing List	418
2.	Door	321
3.	Room	304
4.	Keynotes	291
5.	Room Finish	156
6.	Wall	120
7.	Equipment	94
8.	Notes	91
9.	Window	81
10.	Egress	69
11.	Code	61
12.	Plumbing Fixture	59
13.	Furniture	40
14.	AHU	39
15.	Louver	35
16.	Pump	31
17.	Occupancy	30
18.	VAV	26
	Grand total	**2,617**

1 - 69 / 69

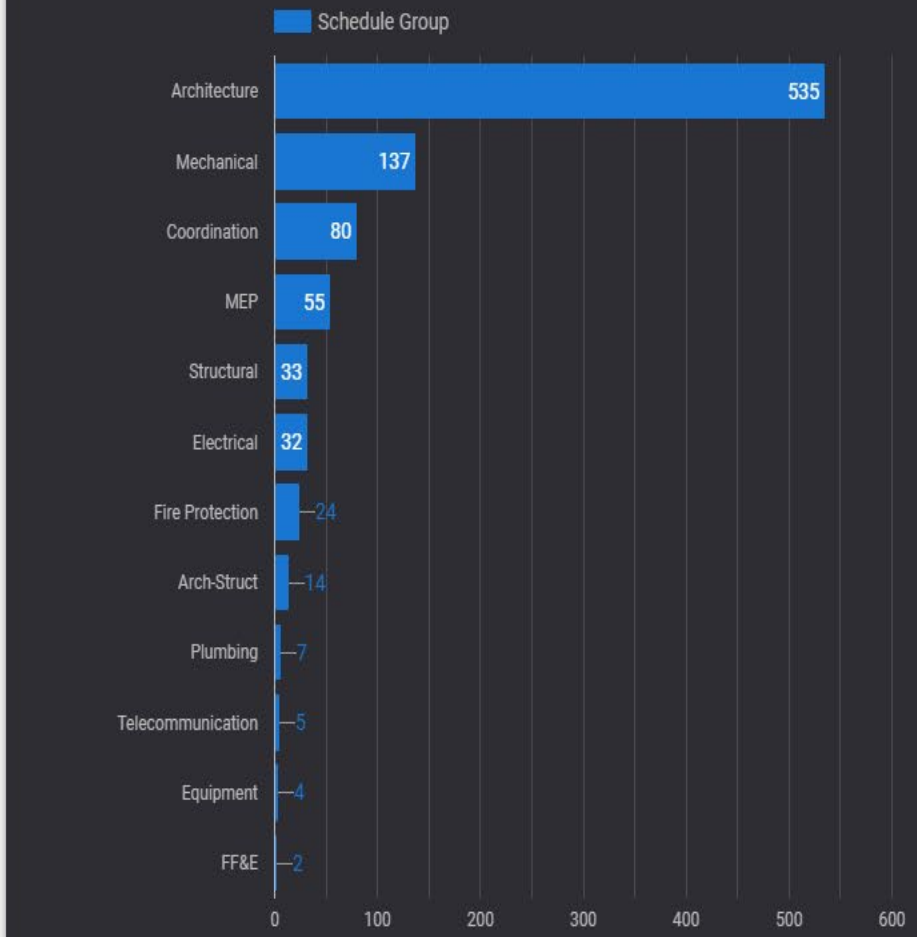
	Schedule Type (ON SHEETS)	Count
1.	Door	168
2.	Drawing List	80
3.	Room	75
4.	Room Finish	67
5.	Equipment	66
6.	Notes	49
7.	Wall	42
8.	Code	37
9.	Louver	27
10.	Keynotes	25
11.	Occupancy	25
12.	Window	22
13.	Egress	17
14.	Signage	16
15.	Lighting Calculations	15
16.	Pump	12
17.	Curtainwall	11
18.	AHU	11
	Grand total	**927**

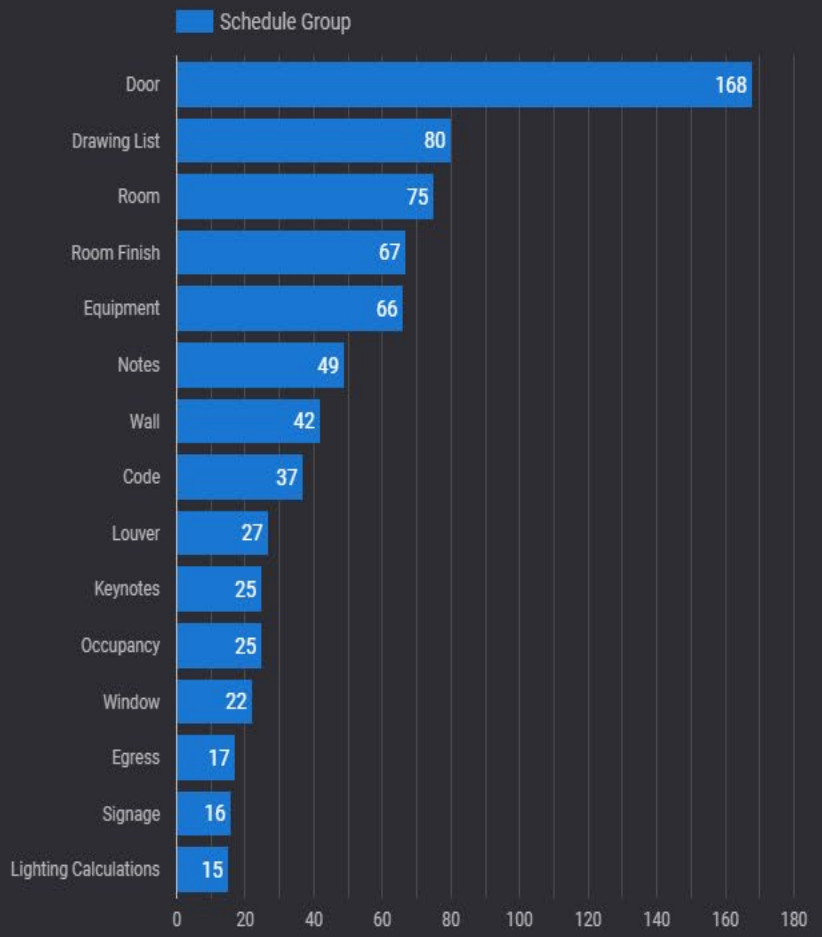
1 - 58 / 58

	Schedule Type (NOT ON SHEETS)	Count
1.	Drawing List	338
2.	Keynotes	267
3.	Room	229
4.	Door	153
5.	Room Finish	89
6.	Wall	79
7.	Window	59
8.	Egress	52
9.	Plumbing Fixture	49
10.	Notes	42
11.	Furniture	32
12.	AHU	28
13.	Equipment	28
14.	Code	24
15.	Room Area	19
16.	Lighting Fixture	19
17.	Ceiling	19
18.	Pump	19
	Grand total	**1,692**

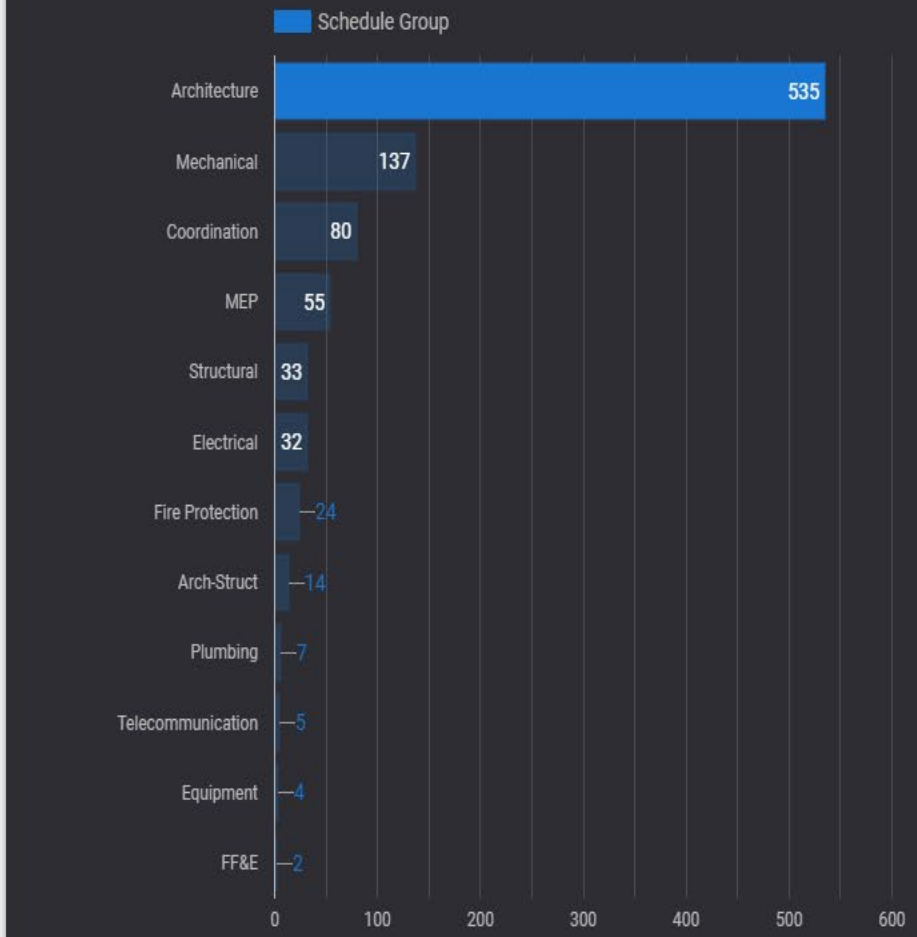
1 - 49 / 49

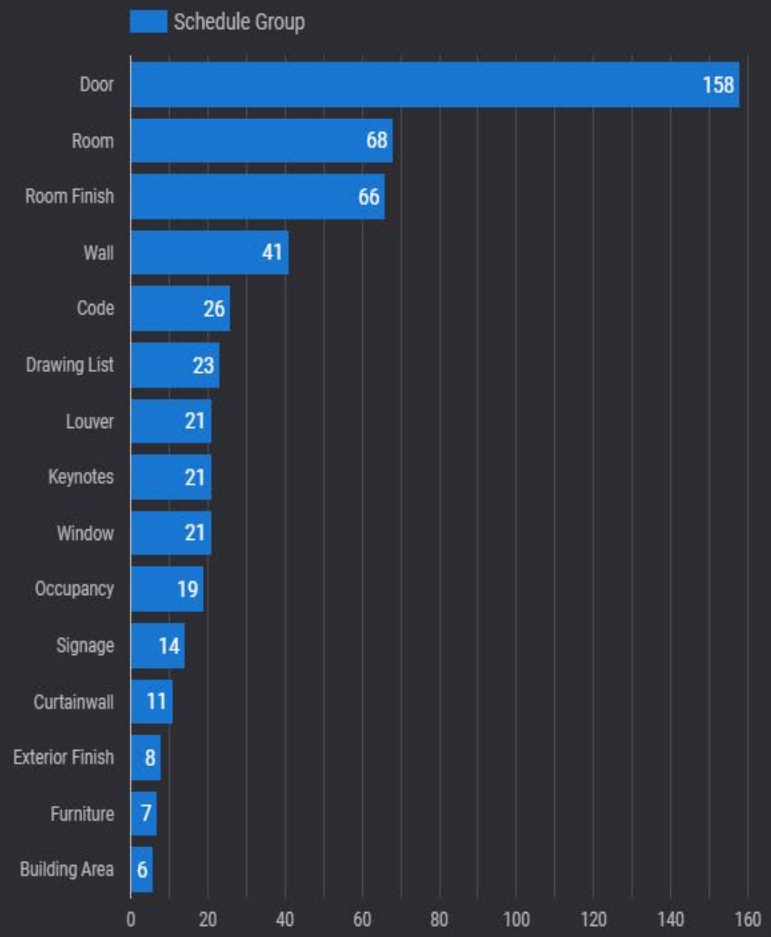
SCHEDULE STATS



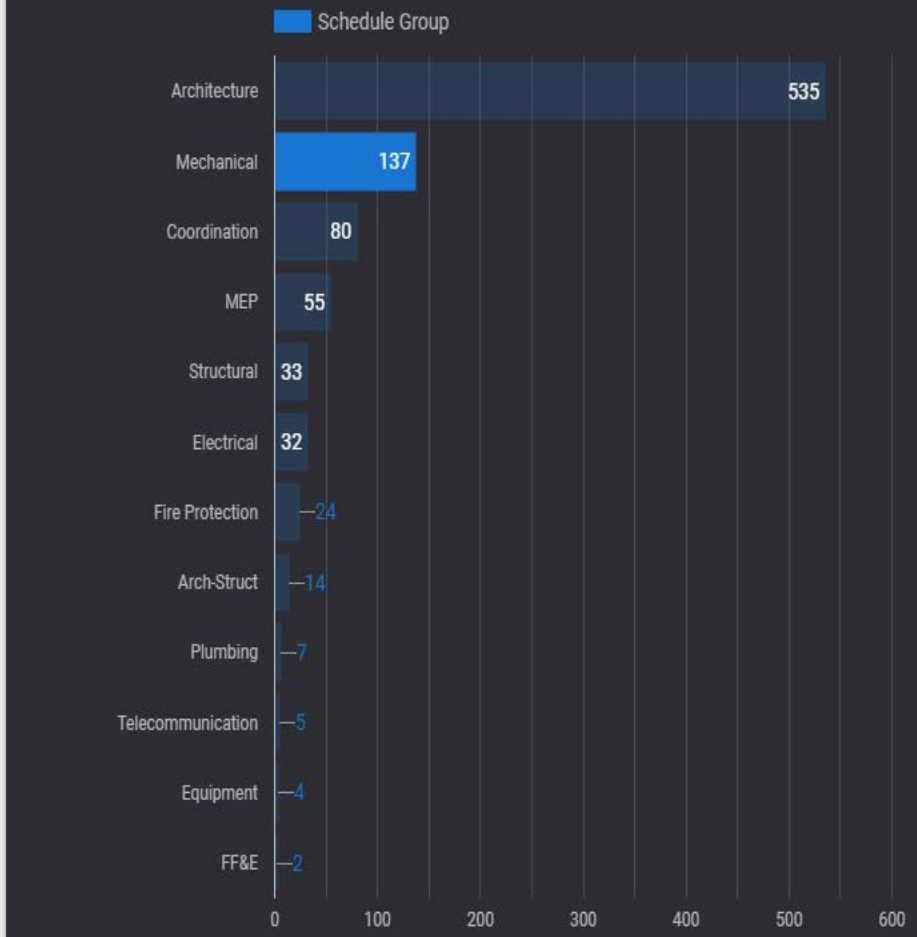


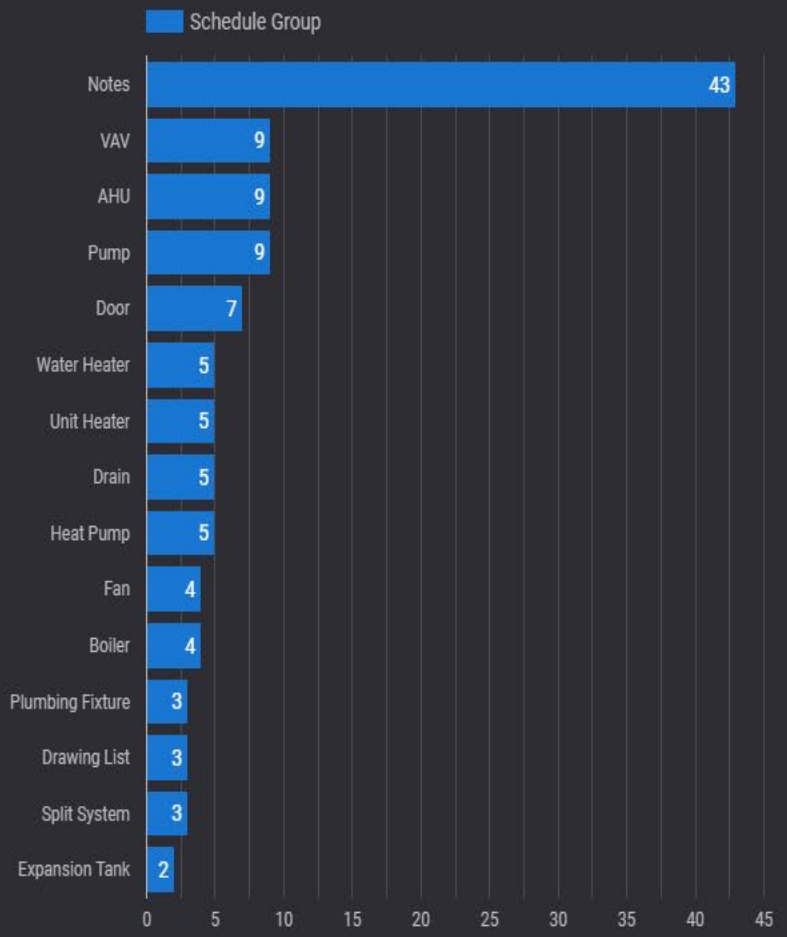
SCHEDULE STATS



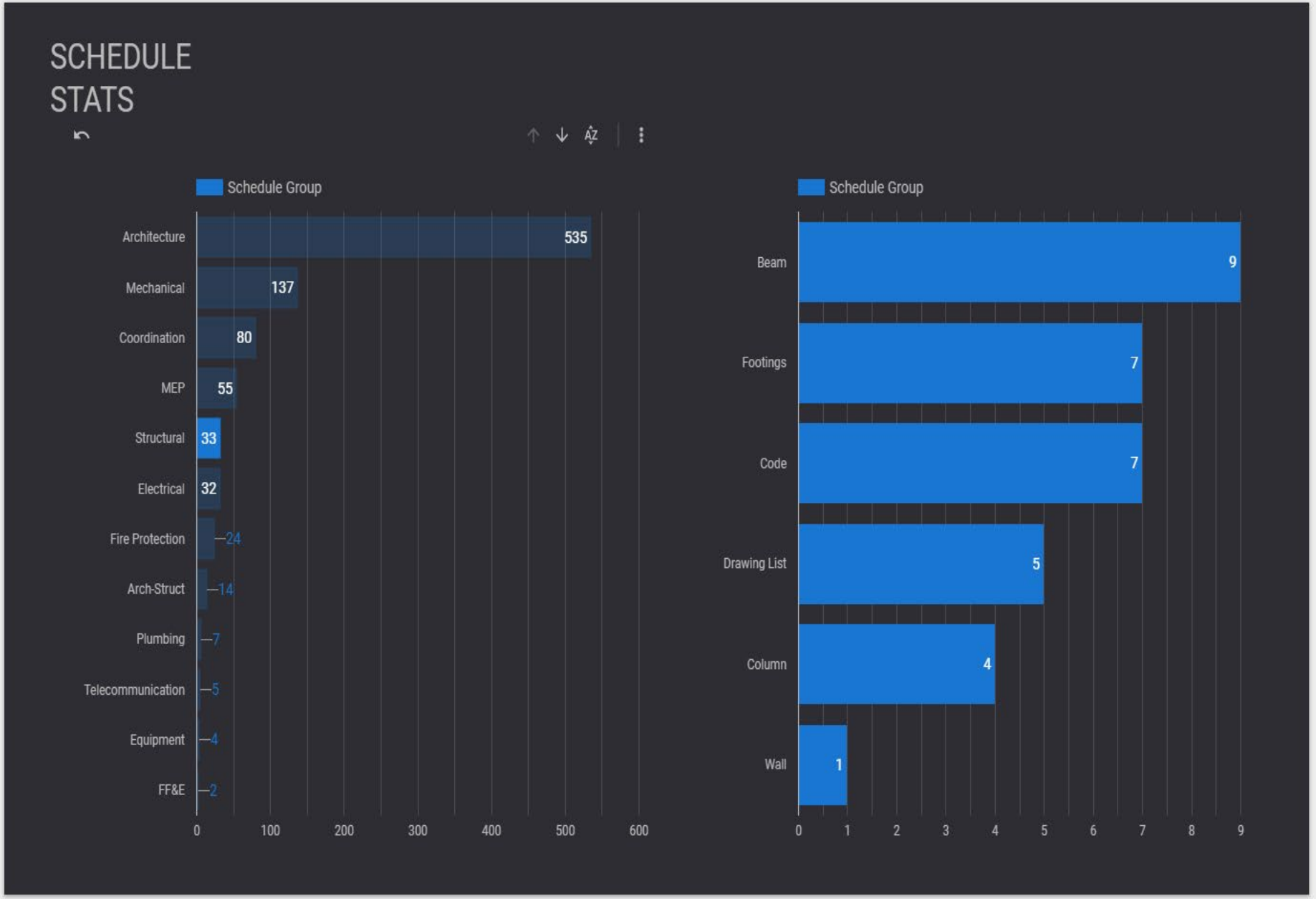


SCHEDULE STATS





SCHEDULE STATS



Pages

Overview

Schedule Stats

Schedules By Discipline

Door Schedules Stats

Shared Parameter Stats

Filtered Data

Page 7

Total Unique Parameters
3,295

Shared Parameters
1,923

NOT Shared Parameters
1,513

	Model Discipline
1.	Architecture
2.	Coordination
3.	MEP
4.	Mechanical
5.	Structural
6.	Arch-Struct
7.	Electrical
8.	Telecommunication
9.	Plumbing
10.	Fire Protection
11.	Equipment
12.	Interiors
13.	FF&E
14.	Security

1 - 14 / 14

	Schedule Type	Schedule Type ▾
1.	Door	3,821
2.	Drawing List	2,855
3.	Room	2,459
4.	Room Finish	1,912
5.	Equipment	1,072
6.	Window	1,071
7.	Wall	850
8.	AHU	772
9.	Keynotes	583
10.	Furniture	512
11.	Louver	362
12.	Plumbing Fixture	354
13.	Pump	344
14.	Egress	256
15.	Lighting Fixture	243
16.	Code	240
17.	VAV	237

1 - 70 / 70

	lowercase H...	Column Headers ▾
1.	name	604
2.	type	548
3.	mark	491
4.	description	476
5.	sheet number	410
6.	count	372
7.	area	343
8.	notes	339
9.	number	328
10.	level	309
11.	comments	292
12.	sheet name	271
13.	family	225
14.	jsn	224
15.	family and type	218
16.	manufacturer	206
17.	remarks	204

1 - 100 / 4472

	Parameter Name	Parameter Na...
1.	Mark	655
2.	Comments	596
3.	Count	587
4.	Name	504
5.	Sheet Number	489
6.	Number	469
7.	Sheet Name	464
8.	Type Mark	443
9.	Area	437
10.	Width	437
11.	Level	388
12.	Type	353
13.	Height	335
14.	Description	314
15.	Family	307
16.	Key Value	304
17.	Keynote Text	304
18.	Type Comments	280

1 - 100 / 3295

Total Unique Parameters
1,522

Shared Parameters
814

NOT Shared Parameters
746

	Model Discipline
1.	Architecture
2.	Coordination
3.	MEP
4.	Mechanical
5.	Structural
6.	Arch-Struct
7.	Electrical
8.	Telecommunication
9.	Plumbing
10.	Fire Protection
11.	Equipment
12.	Interiors
13.	FF&E
14.	Security

1 - 14 / 14

	Schedule Type	Schedule Type ▾
1.	Door	3,326
2.	Room Finish	1,841
3.	Drawing List	1,409
4.	Room	1,249
5.	Window	858
6.	Wall	685
7.	Furniture	424
8.	Keynotes	382
9.	Louver	265
10.	Code	228
11.	Egress	205
12.	Equipment	134
13.	Curtainwall	124
14.	Ceiling	122
15.	Plumbing Fixture	118
16.	Occupancy	114
17.	Signage	97

1 - 26 / 26

	lowercase H...	Column Headers ▾
1.	name	351
2.	area	256
3.	type	255
4.	number	211
5.	comments	198
6.	sheet number	188
7.	description	175
8.	key	163
9.	fire rating	156
10.	level	152
11.	room name	149
12.	family and type	138
13.	mark	137
14.	note	133
15.	count	128
16.	sheet name	110
17.	jsn	108

1 - 100 / 2266

	Parameter Name	Parameter Na...
1.	Comments	366
2.	Name	350
3.	Type Mark	340
4.	Area	333
5.	Width	333
6.	Number	308
7.	Height	273
8.	Mark	266
9.	Sheet Number	220
10.	Sheet Name	211
11.	Level	209
12.	Count	209
13.	Keynote Text	202
14.	Key Value	202
15.	Fire Rating	164
16.	Family and Type	155
17.	Description	150
18.	Family	135

1 - 100 / 1522

Data Last Updated: 7/2/2019 4:46:45 PM | Privacy Policy

Total Unique Parameters
272

Shared Parameters
160

NOT Shared Parameters
125

	Model Discipline
1.	Architecture
2.	Coordination
3.	Arch-Struct
4.	Mechanical
5.	Structural
6.	Electrical
7.	Telecommunication
8.	Fire Protection

1 - 8 / 8

	Schedule Type	Schedule Type ▾
1.	Door	3,326
2.	Room Finish	1,841
3.	Drawing List	1,409
4.	Room	1,249
5.	Window	858
6.	Wall	685
7.	Furniture	424
8.	Keynotes	382
9.	Louver	265
10.	Code	228
11.	Egress	205
12.	Equipment	134
13.	Curtainwall	124
14.	Ceiling	122
15.	Plumbing Fixture	118
16.	Occupancy	114
17.	Signage	97

1 - 26 / 26

	lowercase H...	Column Headers ▾
1.	fire rating	88
2.	door|material	76
3.	door|type	76
4.	frame|type	75
5.	frame|material	75
6.	door|size|height	70
7.	door|size|width	70
8.	stc	54
9.	door|under cut	50
10.	hardware set	50
11.	comments	49
12.	door number	41
13.	remarks	40
14.	type	38
15.	frame|finish	38
16.	door|finish	38
17.	name	37

1 - 100 / 655

	Parameter Name	Parameter Na...
1.	Mark	174
2.	Height	146
3.	Width	140
4.	Comments	117
5.	Thickness	100
6.	Frame Material	99
7.	Fire Rating	96
8.	Type Mark	78
9.	Finish	78
10.	Head	71
11.	Jamb	71
12.	Frame Finish	69
13.	Material	68
14.	Hardware	65
15.	Under Cut	63
16.	AR_DOOR_TYPE	59
17.	To Room: Name	47
18.	Frame Type	46

1 - 100 / 272

Pages

Overview

Schedule Stats

Schedules By Discipline

Door Schedules Stats

Shared Parameter Stats

Filtered Data

Page 7

Total Unique Parameters
5

Shared Parameters
4

NOT Shared Parameters
1

	Model Discipline
1.	Architecture
2.	Arch-Struct

1 - 2 / 2

	Schedule Type	Schedule Type ▾
1.	Door	88
2.	Wall	68

1 - 2 / 2

	lowercase H...	Column Headers ▾
1.	fire rating	88
2.	door|material	76
3.	door|type	76
4.	frame|type	75
5.	frame|material	75
6.	door|size|height	70
7.	door|size|width	70
8.	stc	54
9.	door|under cut	50
10.	hardware set	50
11.	comments	49
12.	door number	41
13.	remarks	40
14.	type	38
15.	frame|finish	38
16.	door|finish	38
17.	name	37

1 - 100 / 655

	Parameter Name	Parameter Na...
1.	Fire Rating	55
2.	AR_DOOR_FIRE_RATING	15
3.	HW_DOOR FIRE RATING	14
4.	spA_Fire Rating	3
5.	Fire Rating Door Window	1

1 - 5 / 5

Pages

Overview

Schedule Stats

Schedules By Discipline

Door Schedules Stats

Shared Parameter Stats

Filtered Data

Page 7

Total Unique Parameters
6

Shared Parameters
2

NOT Shared Parameters
5

	Model Discipline
1.	Architecture
2.	Arch-Struct

1 - 2 / 2

	Schedule Type	Schedule Type
1.	Door	76

1 - 1 / 1

	lowercase H...	Column Headers
1.	fire rating	88
2.	door|material	76
3.	door|type	76
4.	frame|type	75
5.	frame|material	75
6.	door|size|height	70
7.	door|size|width	70
8.	stc	54
9.	door|under cut	50
10.	hardware set	50
11.	comments	49
12.	door number	41
13.	remarks	40
14.	type	38
15.	frame|finish	38
16.	door|finish	38
17.	name	37

1 - 100 / 655

	Parameter Name	Parameter Na...
1.	Material	36
2.	HW_DOOR MATERIAL	14
3.	AR_DOOR_MATERIAL	13
4.	Door Material	8
5.	Finish	3
6.	MATERIAL	2

1 - 6 / 6

Data Last Updated: 7/2/2019 4:48:00 PM | Privacy Policy

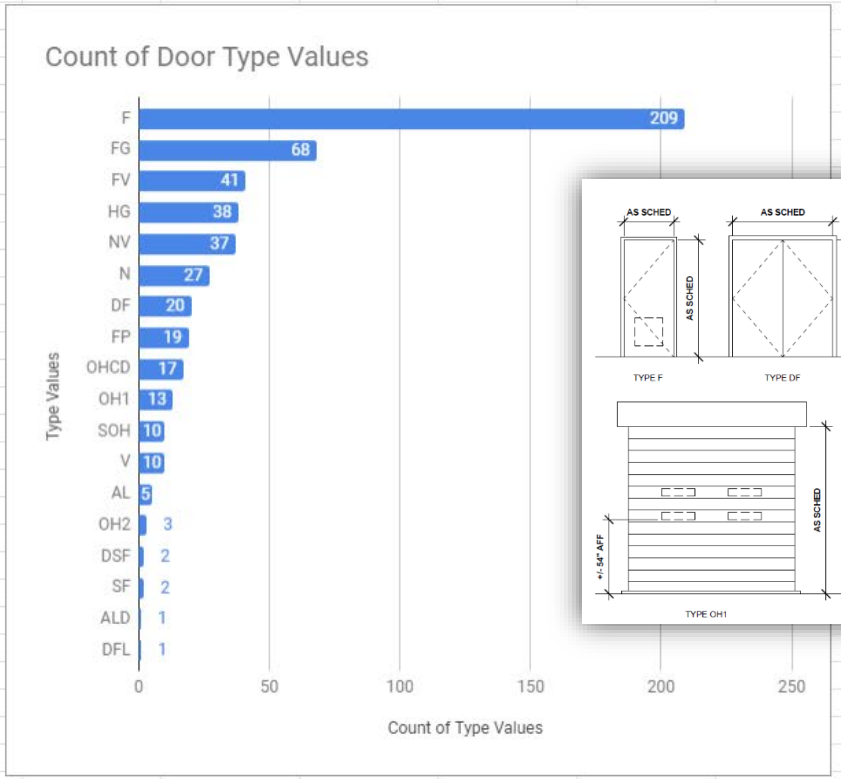
20190531 door schedules .XLSX

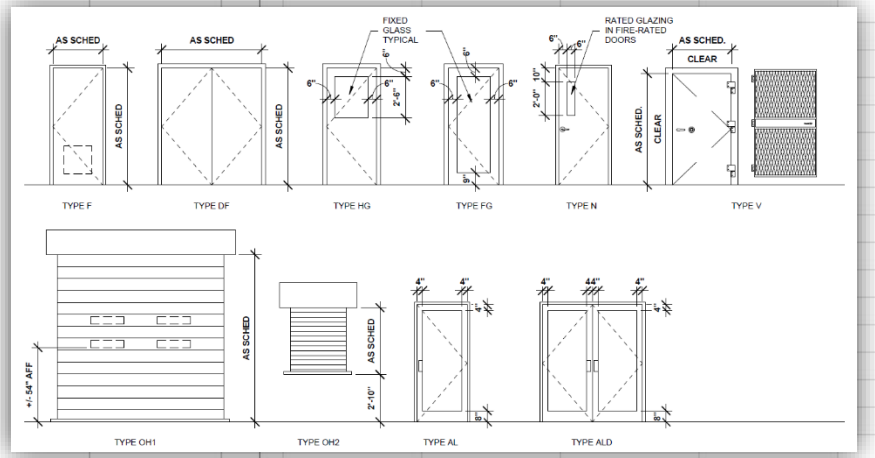
File Edit View Insert Format Data Tools Help All changes saved in Drive

Share

=countif($A$2:$A$524,A4)

Door Type Values	Count
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209





Explore

For A1:B524 EDIT

ANSWERS

Ask a question about your data

Count of Door Type Values

Histogram of Count

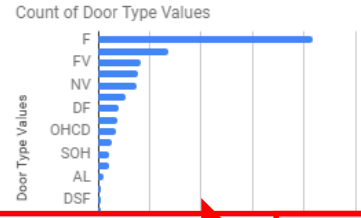
What percentage of Door Type Values is F

PIVOT TABLE

Average of Count for each Door Type Values

Door Type Values	AVERAGE of Count
AL	3
ALD	1
DF	10.5
DFL	1
DSF	1.5
F	105
FG	34.5

ANALYSIS



Schedule Types | Schedule Header Mappings | Sheet1 | Abbreviation Mappings | Drawing Types | !Table 6 | !Table 11 | !Table 16 | !Table 17 | !Table 26 | !Ta

Explore

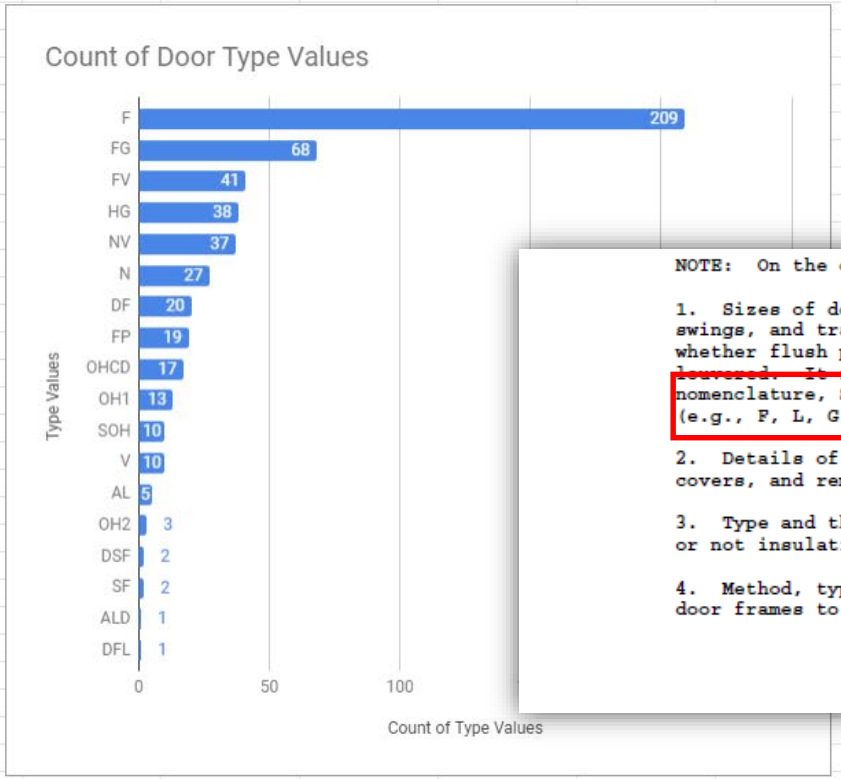
20190531 door schedules .XLSX

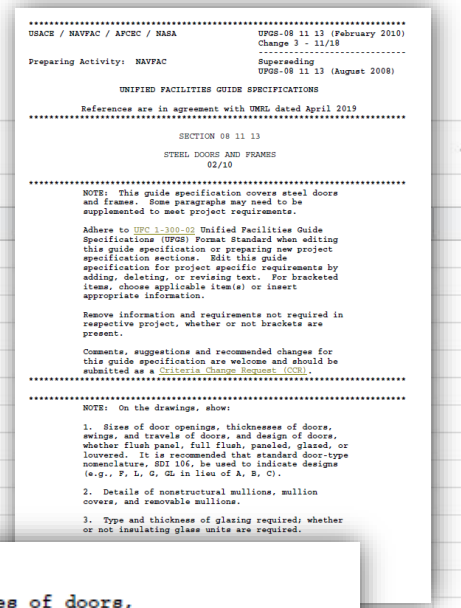
File Edit View Insert Format Data Tools Help All changes saved in Drive

Share

=countif($A$2:$A$524,A4)

Door Type Values	Count
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209





USACE / NAVFAC / AFCEC / NASA — UFGS-08 11 13 (February 2010) Change 3 - 11/18

Preparing Activity: NAVFAC — Superseding UFGS-08 11 13 (August 2008)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2019

SECTION 08 11 13

STEEL DOORS AND FRAMES
02/10

NOTE: This guide specification covers steel doors and frames. Some paragraphs may need to be supplemented to meet project requirements.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

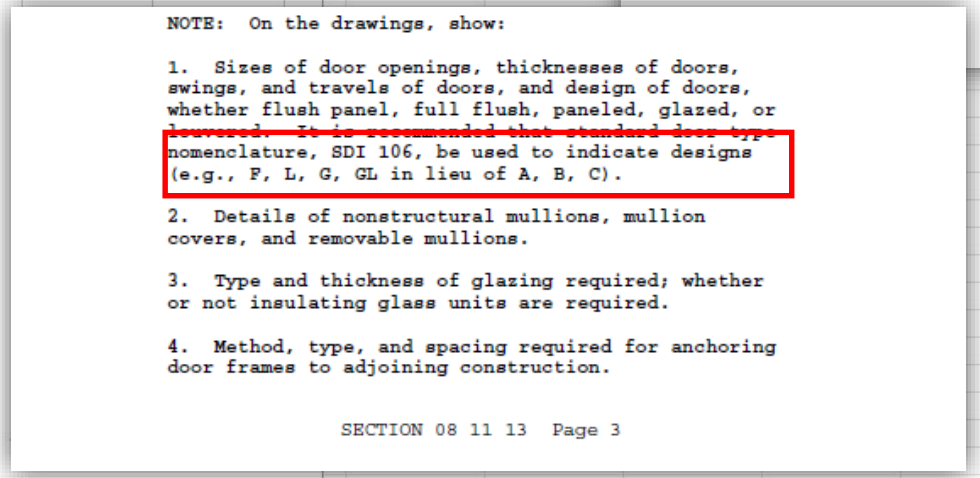
Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

NOTE: On the drawings, show:

1. Sizes of door openings, thicknesses of doors, swings, and travels of doors, and design of doors, whether flush panel, full flush, paneled, glazed, or louvered. It is recommended that standard door-type nomenclature, SDI 106, be used to indicate designs (e.g., F, L, G, GL in lieu of A, B, C).

2. Details of nonstructural mullions, mullion covers, and removable mullions.

3. Type and thickness of glazing required; whether or not insulating glass units are required.



NOTE: On the drawings, show:

1. Sizes of door openings, thicknesses of doors, swings, and travels of doors, and design of doors, whether flush panel, full flush, paneled, glazed, or louvered. It is recommended that standard door-type nomenclature, SDI 106, be used to indicate designs (e.g., F, L, G, GL in lieu of A, B, C).

2. Details of nonstructural mullions, mullion covers, and removable mullions.

3. Type and thickness of glazing required; whether or not insulating glass units are required.

4. Method, type, and spacing required for anchoring door frames to adjoining construction.

SECTION 08 11 13 Page 3

Explore

For A1:B524 EDIT

ANSWERS

Ask a question about your data

Count of Door Type Values

Histogram of Count

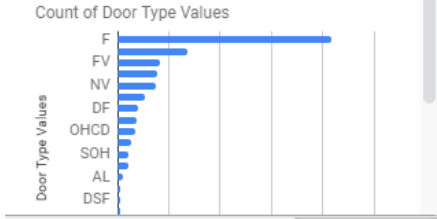
What percentage of Door Type Values is F

PIVOT TABLE

Average of Count for each Door Type Values

Door Type Values	AVERAGE of Count
AL	3
ALD	1
DF	10.5
DFL	1
DSF	1.5
F	105
FG	34.5

ANALYSIS



Schedule Types | Schedule Header Mappings | Sheet1 | Abbreviation Mappings | Drawing Types | !Table 6 | !Table 11 | !Table 16 | !Table 17 | !Table 26 | !Ta

Explore

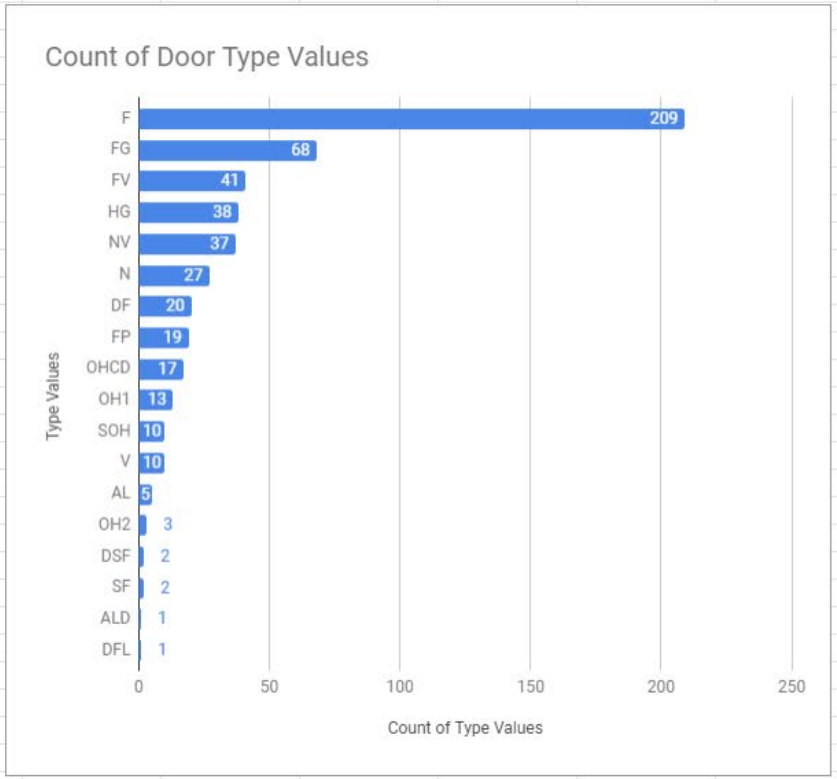
20190531 door schedules .XLSX

File Edit View Insert Format Data Tools Help All changes saved in Drive

Share

=countif($A$2:$A$524,A4)

Door Type Values	Count
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209
F	209



Answers

What percentage of Door Type Values is

For A1:B524 EDIT

QUESTION

What percentage of **Door Type Values** is **F**

ANSWER

Share of Door Type Values of F in Door Type Values

39.85%

Hide formula

Click to copy or drag to insert

```
=TEXT(COUNTA(IFERROR(FILTER(A3:A524,TO_TEXT(A3:A524)="F")))/COUNTA(IFERROR(A3:A524)),"0.00%")
```

RATE THIS ANSWER

Schedule Types | Schedule Header Mappings | Sheet1 | Abbreviation Mappings | Drawing Types | !Table 6 | !Table 11 | !Table 16 | !Table 17 | !Table 26 | !Ta

Explore

SDI 111-D

Door, Frame and Hardware Schedule

ITEM NO.	LOCATION			QTY.	HAND	LABEL (1)	FRAMES							DOORS				HARDWARE							
	ARCH. NO	FROM	TO				GAUGE (4)	ELEV. (6)	DEPTH	ANCHOR/ WALL TYPE	DETAILS			GAUGE (4)	TYPE (5)	DOOR OPENING		HDWE GROUP NO.	HINGES	LOCK	CLOSER	(2)			
											HEAD	JAMB	SILL			WIDTH	HEIGHT								

General Notes:

(1) If a fire door is required, it is to be designated in the "Label" column of schedule with appropriate hourly rating. Also, note in the "Remarks" colu door is to have an Underwriters' Laboratories (UL) Factory Mutual (FM), or Warnock Hersey (WHI) label.

(2) Thresholds, when required, are to be noted in "Hardware" column of schedule.

(3) Any special item not listed in schedule for doors, frames, or hardware is to be shown in the "Remarks" column.

(4) Indicate gauge of material for steel. When materials other than steel are used, indicate AL for aluminum or WD for wood.

(5) Refer to SDI-106 for Recommended Standard Door Design Nomenclature.

(6) When frame elevations are indicated, supplemental drawings must be attached.

(7) Doors provided with 3/4" undercut unless otherwise specified.

Fact File

Compilation of SDI Technical Documents and ANSI/SDI Standards and Test Methods

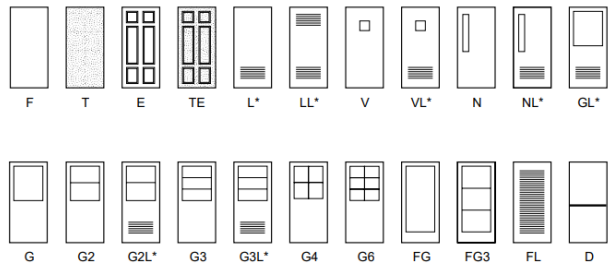
STEEL DOOR INSTITUTE

Standards As Tough As Steel.™

Updated April 2019

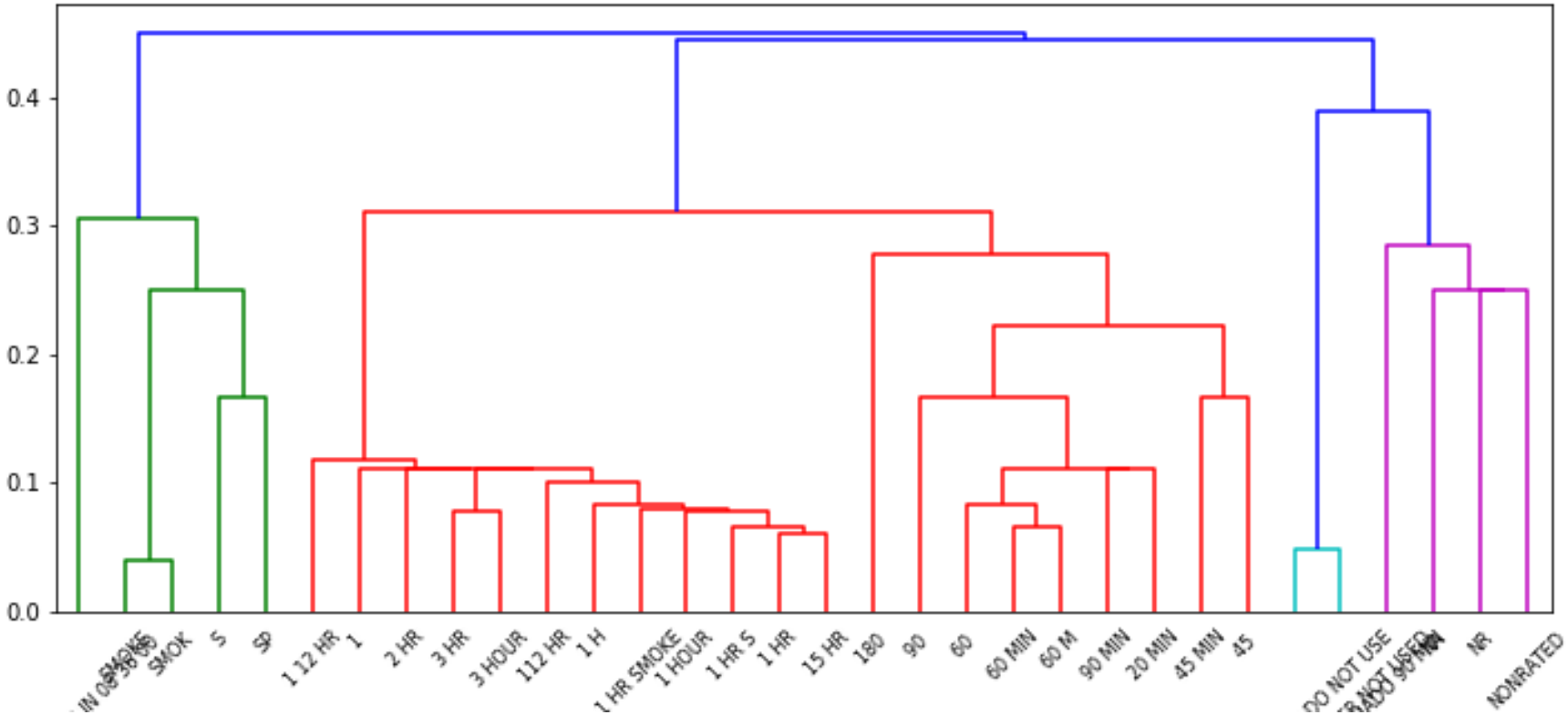
Please visit www.steeldoor.org for the latest version of the Fact File.

Steel Door Institute
Standard Door Design Nomenclature



* Add suffix I to indicate inserted louver
Add suffix P to indicate pierced louver
Add suffix A to indicate air condition grille

Machine Learning Example
Hierarchical Agglomerative Clustering



ALLEGION
PIONEERING SAFETY™

- Proof of concept for dataset analysis

Colab Python Notebook - WordCloud.ipynb

File Edit View Insert Runtime Tools Help

COMMENT SHARE

CODE TEXT CELL CELL CONNECT EDITING

```
#setup and authenticate with google to prepare to load data
!pip install --upgrade -q gspread

from google.colab import auth
auth.authenticate_user()

import gspread
from oauth2client.client import GoogleCredentials

gc = gspread.authorize(GoogleCredentials.get_application
```

- ML collaborative workspace
- Example
  - Connect to data source
  - Create pandas DataFrame
  - Adjust data structure
  - Visualize using WordCloud and matplotlib

```
# open google sheet and read data
worksheet = gc.open('masterlist v16').sheet1

# get_all_values gets list of all rows.
rows = worksheet.get_all_values()

# convert to a Pandas DataFrame
import pandas as pd
df = pd.DataFrame.from_records(rows)

# display small sample to verify
df.head()
```

	0	1	2	3	4	5								
0	ID	File Group	Schedule Group	Model Discipline	Schedule Title	Schedule Type								Column Valu
1	1	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRUE	FALSE	FALSE	FALSE	Number	Number	FALSE	1|3|4|6|7|8|9|10|11|12|13|14|15|16|17|18||2|19
2	2	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRUE	FALSE	FALSE	FALSE	Name	Name	FALSE	COMMON ARE (UNOCCUPIED)|OFFICE|ACCESSOF STOR
3	3	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRUE	FALSE	FALSE	FALSE	Area	Area	FALSE	2377 SF|4844 SF|31 SF|23 SF|365 SF|2 SF|80 S
4	4	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRUE	FALSE	FALSE	FALSE	Area Type	Area Type	FALSE	Building Common Area|Office Area|Buildi Comm

```
# convert first row to dataframe header
headers = df.iloc[0]
newdf = pd.DataFrame(df.values[1:], columns=headers)

# display small sample to verify headers
```

Colab Python Notebook - WordCloud.ipynb

File Edit View Insert Runtime Tools Help

COMMENT SHARE

CODE TEXT CELL CELL

RAM Disk EDITING

```
# convert first row to dataframe header
headers = df.iloc[0]
newdf = pd.DataFrame(df.values[1:], columns=headers)

# display small sample to verify headers
newdf.head()
```

	ID	File Group	Schedule Group	Model Discipline	Schedule Title	Schedule Type	IsOnShe	lumn Value
0	1	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRU	17|18||2|19.
1	2	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRU	MMON ARE. ORY STOR.
2	3	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRU	SF|244 SF|8 S.
3	4	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRU	Area|Buildin Comm.
4	5	1	1	Architecture	Area Schedule (Rentable)	Room Area	TRU	LOOR|FIRS FLOOR|FIRST FLOO.

- Google Colaboratory (“Colab”)
- Jupyter Notebook
- Free VM w/GPU, no setup required, Python 2 or 3, numpy, pandas, TensorFlow, etc

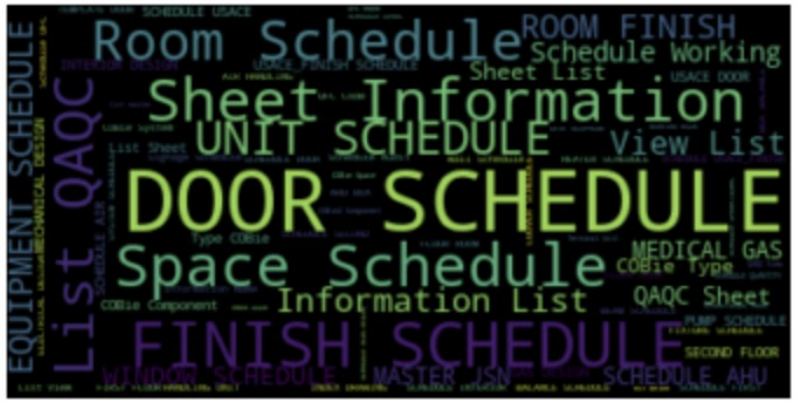
[4]

```
#print("There are {} rows and {} features in this dataset. \n".format(df.shape[0],df.variety.shape[1]))

newdf2 = newdf.loc[:,'Schedule Title']
text = newdf2.to_string()

# Create and generate a word cloud image:
from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
wordcloud = WordCloud().generate(text)

# Display the generated image:
import matplotlib.pyplot as plt
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis("off")
plt.show()
```



Outline

- BIM Data Complexity
- Rise of AI and Data Science
- Legally Valid Data

- How To Extract
- Ways To Analyze
- How To Participate and Contribute

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE

BUILDING CONTENT SUMMIT by DBEI

Participation Ideas

Everyone	Identify problems needing solutions possibly suited for ML
Design / Construction	**Download and run macro** **Data extraction and submission for analysis**
Data Scientists / Researchers	ML algorithms and analyses
Software Services	Submit ideas of use cases well suited for ML
Reusable Content Producers	Identify problems needing solutions possibly suited for ML
Owners	**Download and run macro** **Data extraction and submission for analysis**

Reach out to:

- Randall Stevens, rstevens@getavail.com
- Van Woods, van.woods@usace.army.mil

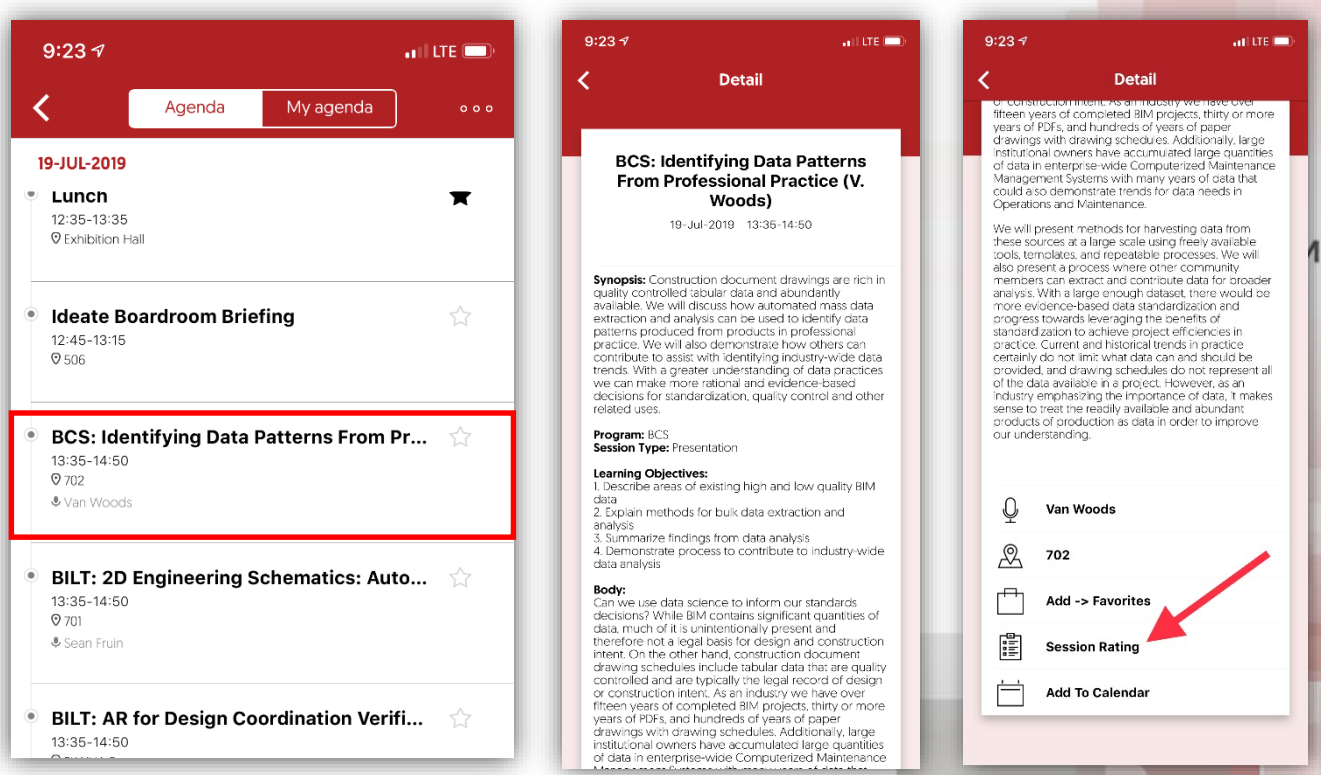
REMINDER

Speaker and Session Feedback is Appreciated

1. Go to *Sessions*
2. Select this Session
3. Select *Session Rating*

I would personally appreciate and benefit from HONEST feedback…I'd like the data!

THANK YOU!!



REMINDER

Session materials are available on the Conference App

Session 2.3

"Identifying Data Patterns from Professional Practice"

Van Woods

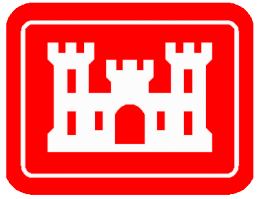
Questions?

"Identifying Data Patterns from Professional Practice"

Van Woods

US Army Corps of Engineers

van.woods@usace.army.mil
@vanwoods



US Army Corps of Engineers®

DBEI DIGITAL BUILT ENVIRONMENT INSTITUTE