BAILY GARNER

GEOMETRY IMPORT HACKS

(Tips & Tricks)

CONTENTS

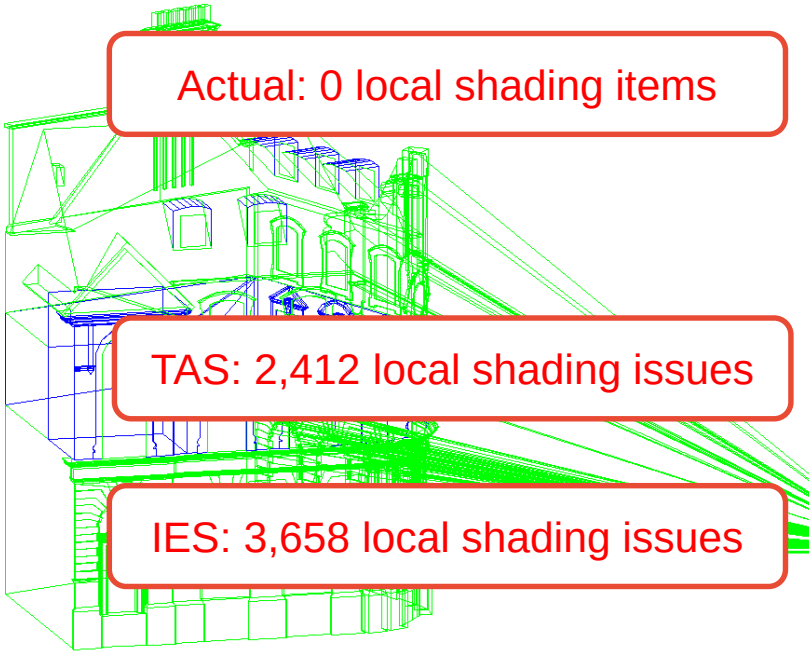
- Background
- Scope
- Possible Workflows & Issues
- Case Study
- Best Practice & Solutions

Background

- Tom James
  - Mechanical Engineer
  - Quantity Surveyor
  - BIM technician for 10 years
  - Software developer for 7 years
- Baily Garner
  - Multidisciplinary consultancy
  - 170 staff in 3 UK offices
  - Residential, education, health & commercial sectors

SCOPE: Why should you care?

- White paper or documentation for BIM integration for each environmental package exist. So… all Architect's use it for each model they produce, right?



Actual: 0 local shading items

TAS: 2,412 local shading issues

IES: 3,658 local shading issues

SCOPE: Included/Excluded Software

INCLUDED

Design Packages

- SketchUp™ (Trimble)
- FormIT™ (Autodesk)
- Dynamo™ (Autodesk)
- Revit™ (Autodesk)
- AutoCAD™ (Autodesk)

Thermal Packages

- IES™ (IES Environmental)
- TAS™ (GDSL)
- Insight 360™ (Autodesk)

EXCLUDED

Design Packages

- ArchiCAD™ (Graphisoft)
- Vectorworks™ (Nemetsc..)
- Microstation™ (Bentley)

Many others.....

Thermal Packages

- Sefaira™ (Cleantech)
- Design Builder™ (Design Builder)

Many others.....

POSSIBLE WORKFLOWS: Export variations?

- 2 direct export methods from Revit:
  - Conceptual mass of surfaces only
  - Spaces/Rooms which imports 3D representations

- Non-surface building representation gbXML files are 4 times larger than surface types

File size comparison:

File Type	Size	Ratio
gbXML (Surfaces)	3.0 MB	100%
gbXML (Solids)	11.3 MB	376%
Revit (purged)	23.2 MB	777%
IFC	9.2 MB	307%

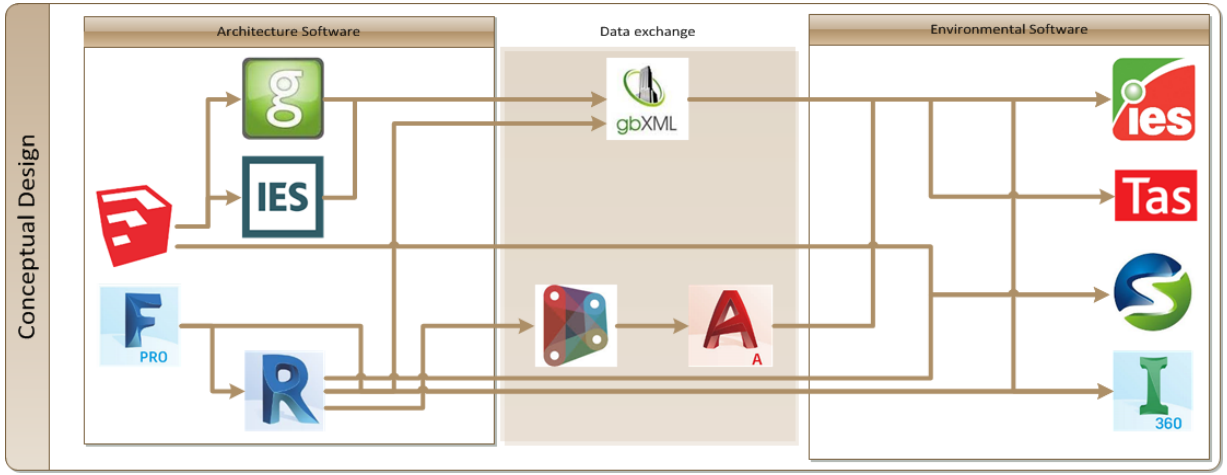
SCOPE: Software Aspirations

Requirement	Why?
CIBSE compliance	No certification without this (SBEMs or EPCs)
IFC Compliance	The international open format is import, despite many of the energy software products not using it.
64 bit	Are you using the capabilities of modern operation systems?
Multithreading	Are you using the capabilities of your local hardware?
Cloud based	Are you using the phenomenal power of the global data hardware?

SCOPE: Geometry input formats for IES

File Format	Pros	Cons
DXF	• Imports zone naming • Imports windows • Imports doors • Imports “thin walls”	• 2D plan of each floor • Single window type • Single door type • No material • No construction layers
gbXML	• Imports zone naming • Imports windows • Imports doors • Imports “thin & thick walls”	• Unreliable geometry transfer
IFC	• Imports materials • Imports construction layers	• Imports “thick walls” only

POSSIBLE WORKFLOWS: All workflows within scope



File Formats

- **DXF** — Drawing Exchange Format
- **DWG** — AutoCAD™ Drawing extension
- **RVT** — Revit™ extension
- **gbXML** — Green Building Extensible Markup Language
- **AXM** — FormIT™ extension
- **MIT** — IES extension
- **SKP** — SketchUp™ extension

SketchUp™ Add-ins

- **gModeller** by Greenspace
- **IES** by IES

SketchUp™ & FormIT™ Cycle

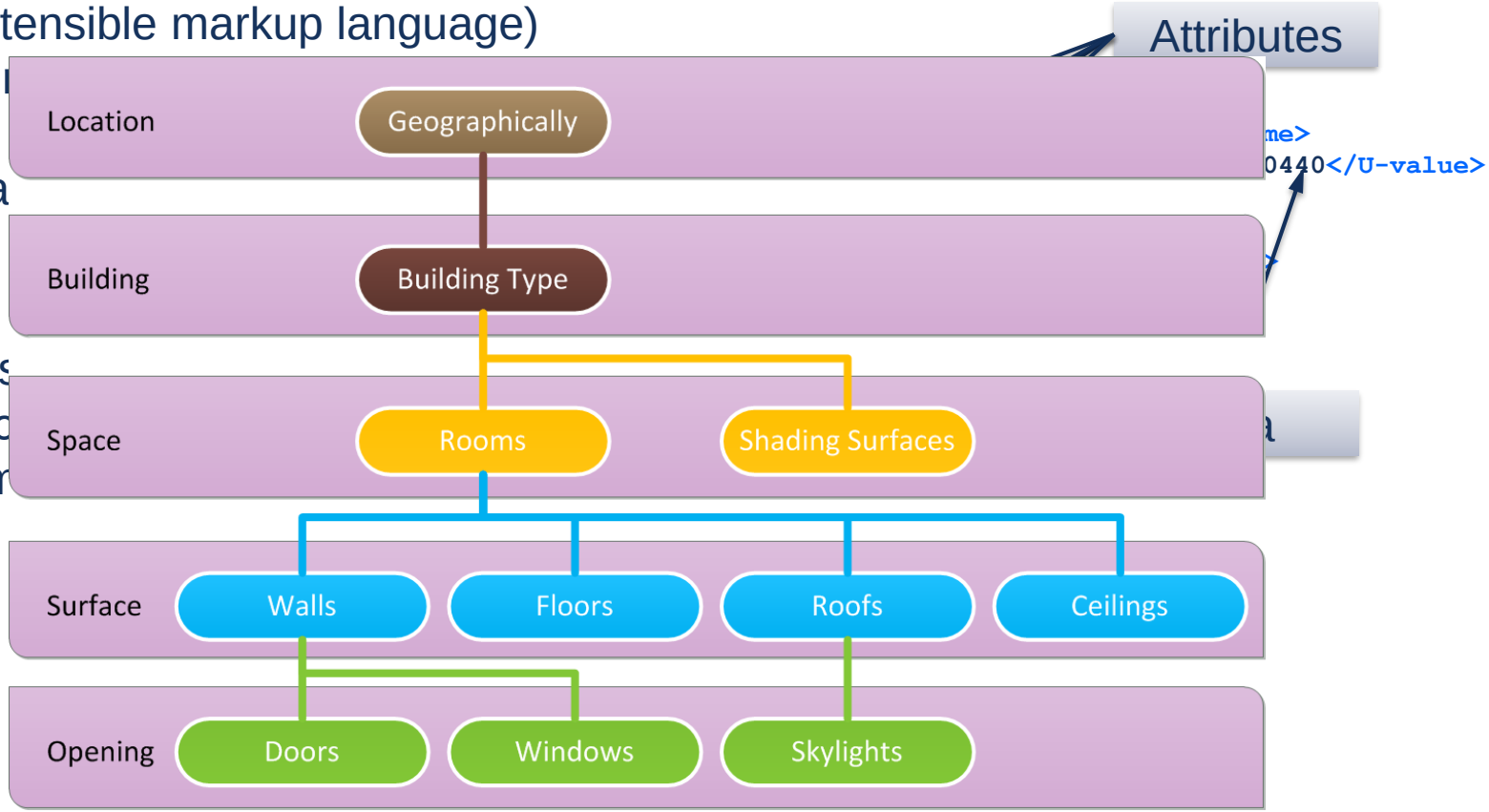
Software Programmes

- Revit™
- FormIT™
- AutoCAD™
- SketchUp™
- Dynamo™
- Model Builder™
- IES™
- Insight360™
- Sefaria™
- TAS™

POSSIBLE WORKFLOWS: What is gbXML?

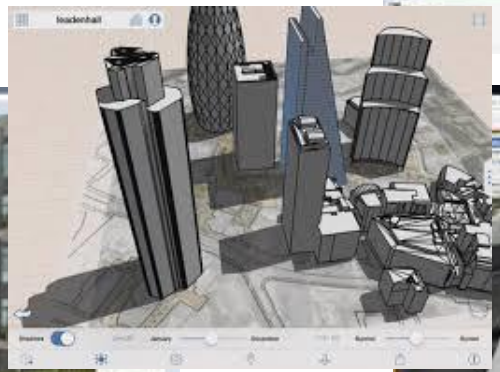
- XML (extensible markup language) is a comm
  contains
  and data

- gbXML is
  has spec
  environm

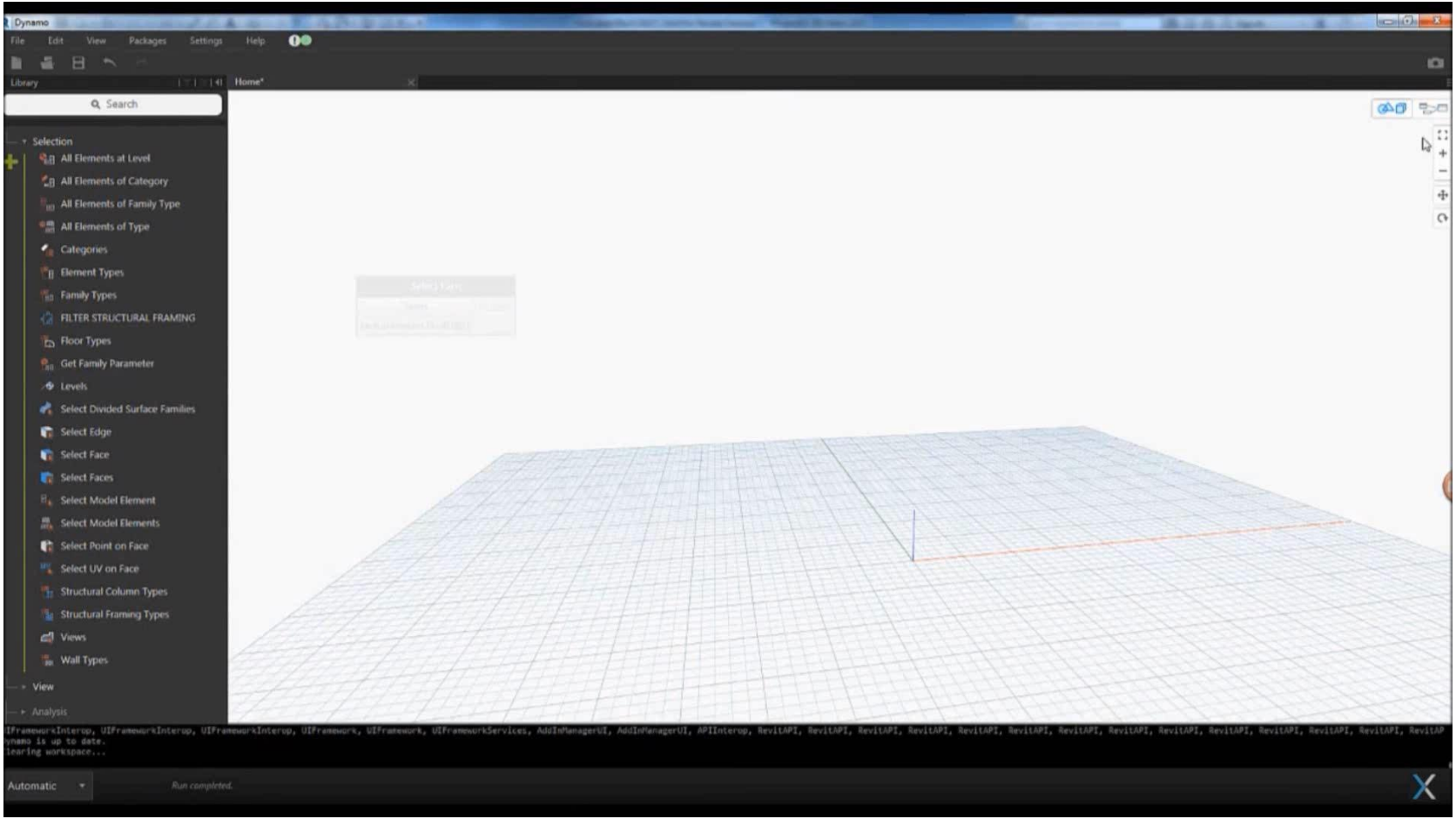


POSSIBLE WORKFLOWS: What is FormIT™

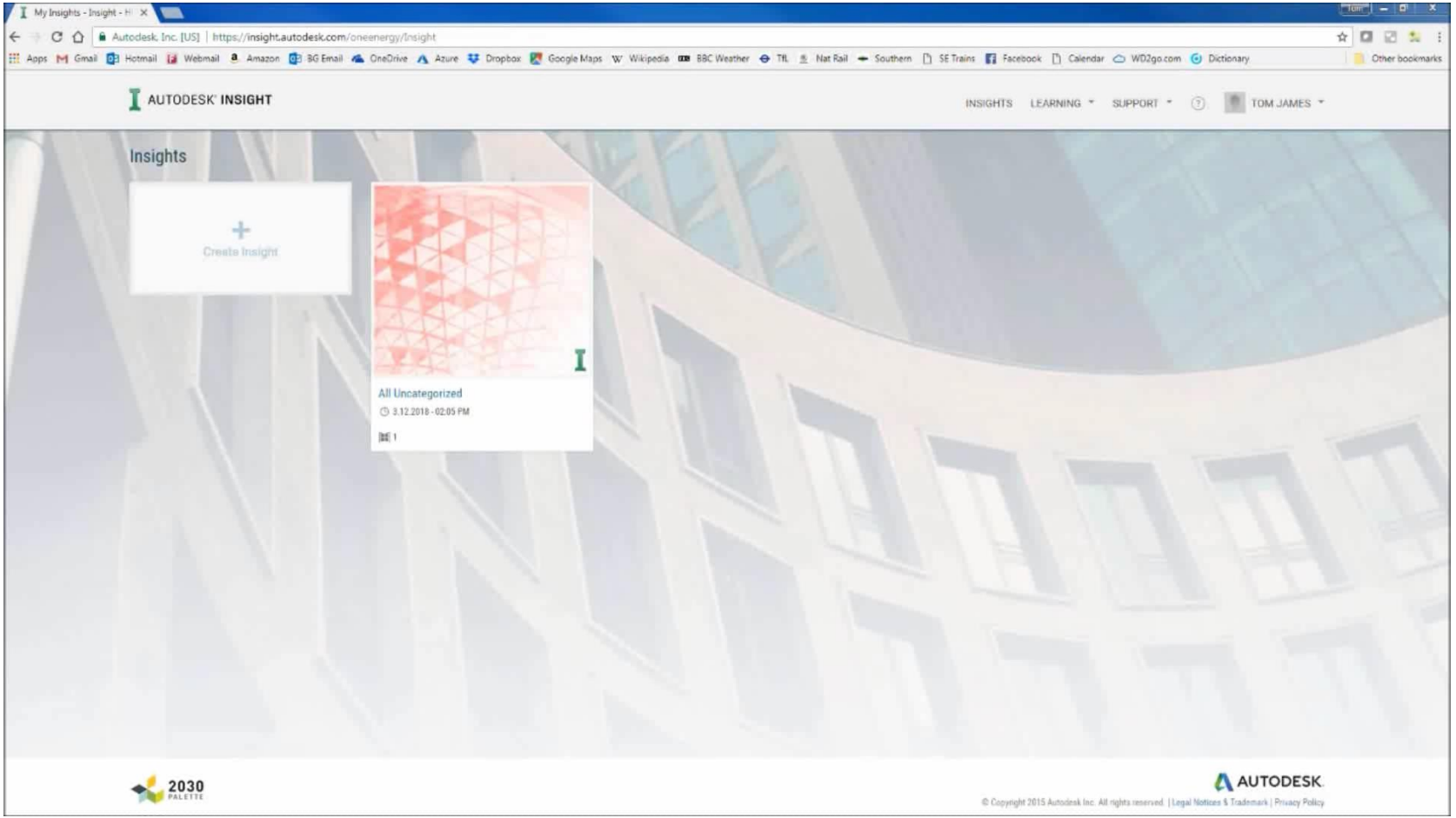
- SketchUp® competitor
- Key features
  - Concept design developer
  - Presentation renders
  - Satellite imager import, GIS and weather locations
  - Thermal and solar analysis



POSSIBLE WORKFLOWS: What is Dynamo™



POSSIBLE WORKFLOWS: What is Insight360?



POSSIBLE WORKFLOWS: Workflow 1

Item	Compliant	Success Rate
CIBSE	Yes	100%
IFC	Yes	100%
Multi-threaded	Version dependent	50%

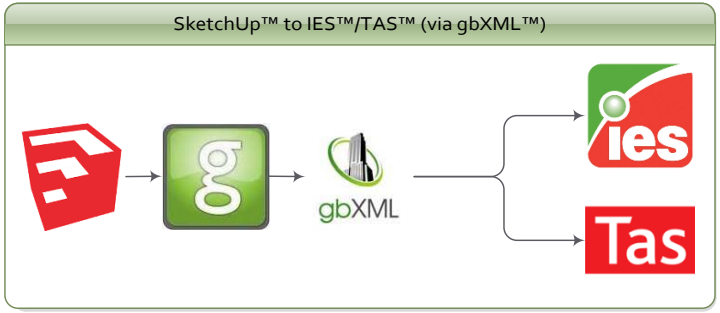
Revit direct exports types:

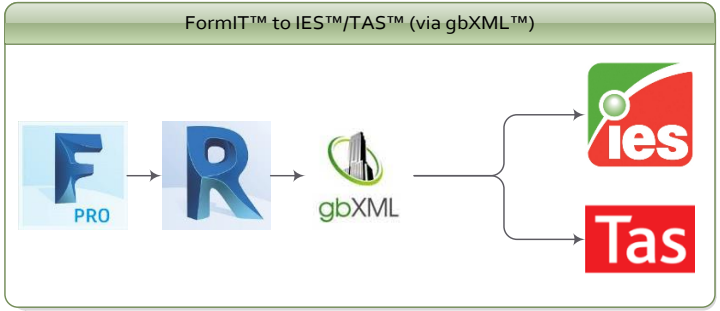
- Conceptual mass of surfaces only
- Spaces/Rooms which imports 3D representations

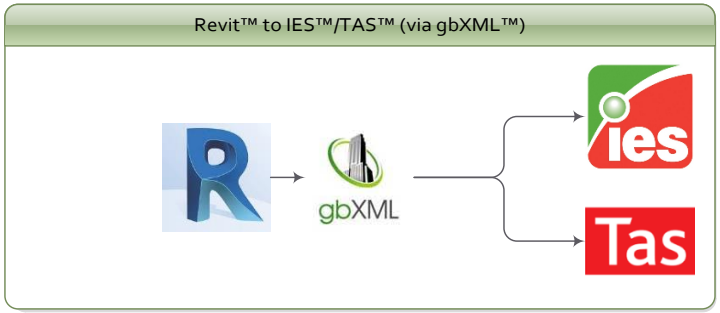
Via Rooms or Spaces:

- 3D Objects produce twin surfaces for each element
- Too detailed
- Wall junctions cause errors

POSSIBLE WORKFLOWS: Workflow 2

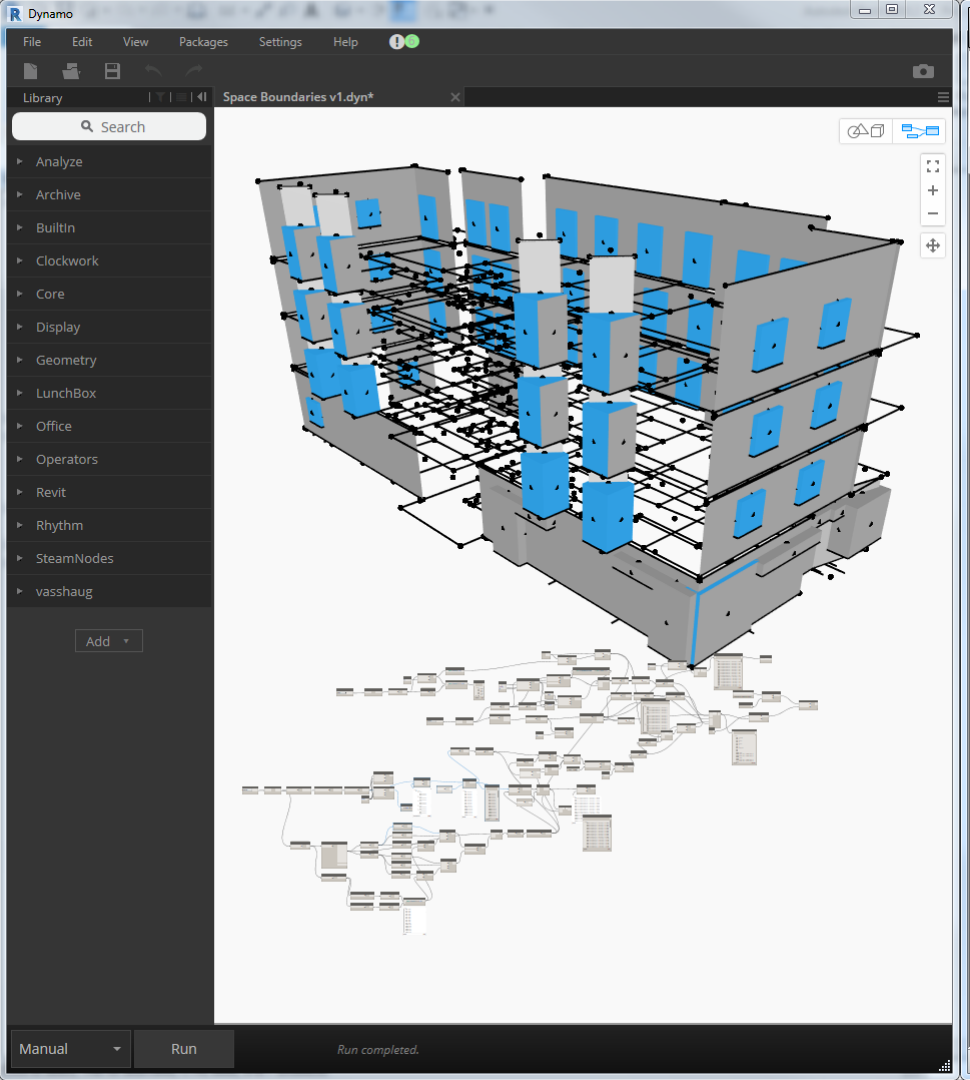


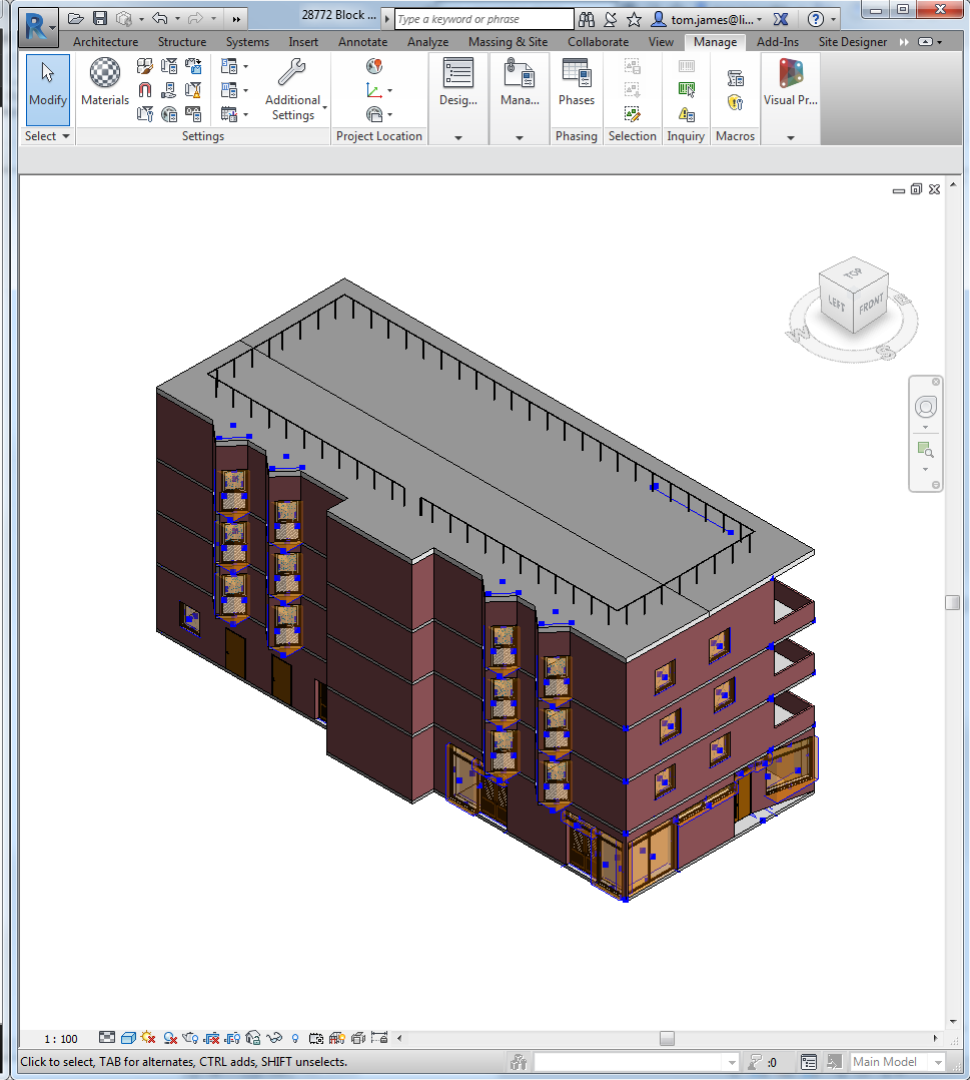




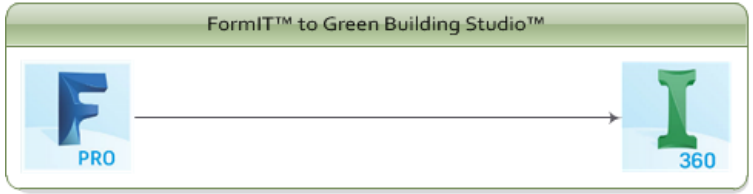
		SketchUp	FormIT	Revit
Item	**Compliant**	**Success Rate**		
CIBSE	Yes	100%	100%	100%
gbXML	Yes	80%	90%	60%
IFC	Yes	0%	0%	100%
Multi-threaded	Version dependent	0%	100%	50%

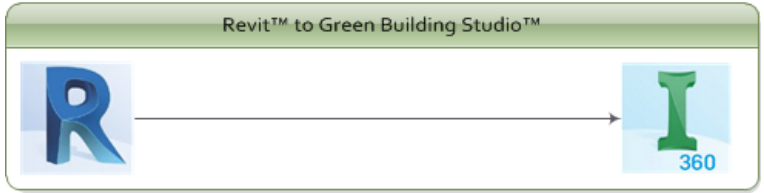
- Windows don't import without openings
- Doors don't import without openings
- IES doesn't have a "watertight" option


Dynamo
File
Edit
View
Packages
Settings
Help
Library
Space Boundaries v1.dyn*
Search
Analyze
Archive
BuiltIn
Clockwork
Core
Display
Geometry
LunchBox
Office
Operators
Revit
Rhythm
SteamNodes
vasshaug
Add
Manual
Run
Run completed.


Architecture
Structure
Systems
Insert
Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
Site Designer
Modify
Materials
Additional Settings
Phases
Visual Pr...
Select
Settings
Project Location
Phasing
Selection
Inquiry
Macros
1 : 100
Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
Main Model

POSSIBLE WORKFLOWS: Workflow 4





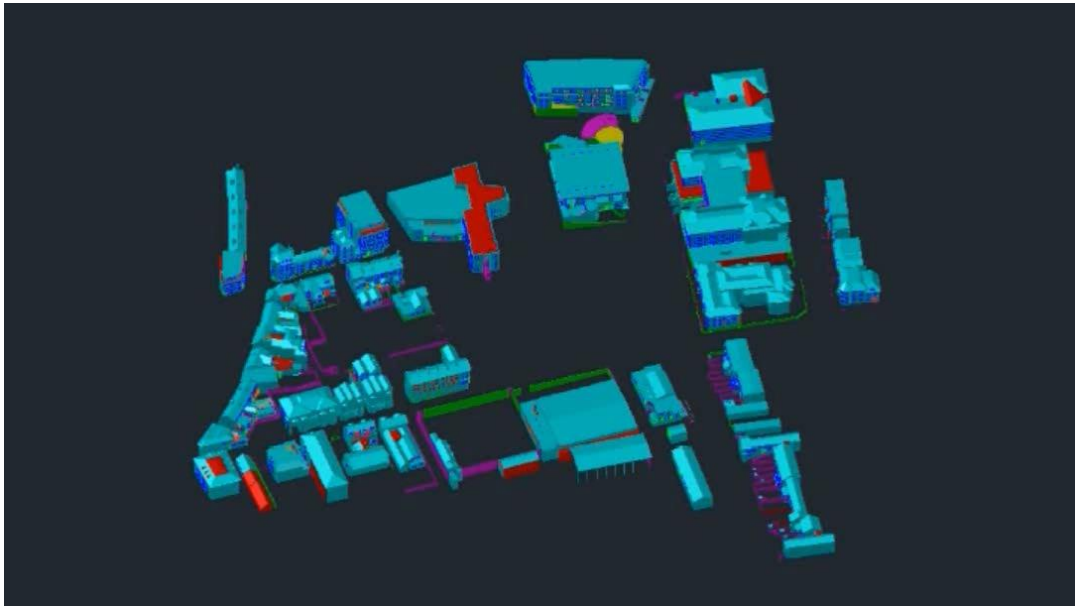
		FormIT	Revit
Item	**Compliant**	**Success Rate**	
CIBSE	No	0%	0%
gbXML	Yes	0%	100%
IFC	Version dependent	0%	100%
Multi-threaded	Version dependent	100%	50%

Insight360 included within:

- AEC Collection (subscription)
- Any Building Design Suite (pre 2018)

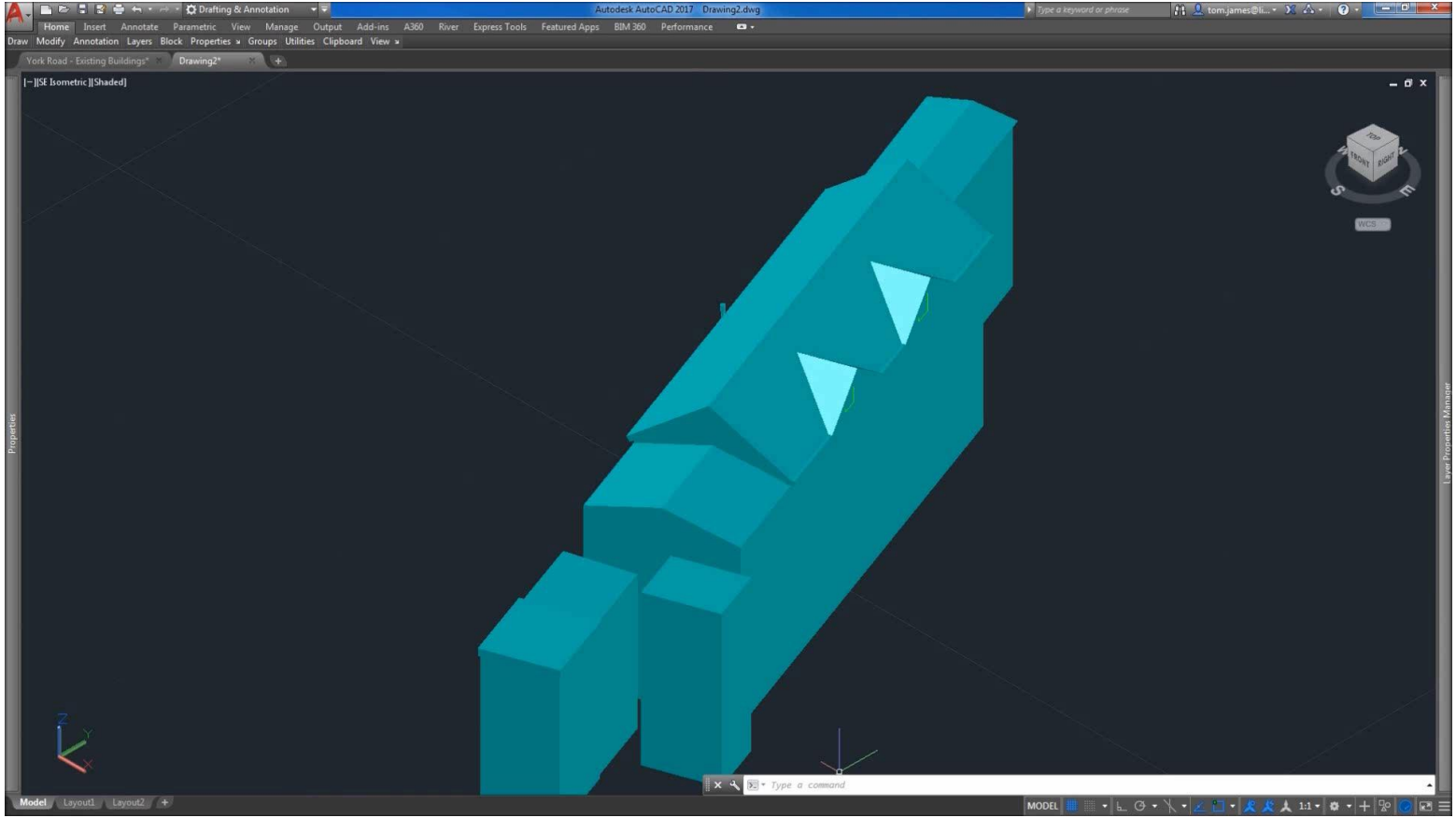
CASE STUDY: Overview

- Daylight shading analysis
- Site survey in AutoCAD 3D solids
- Polyline outlines of windows & doors
- 7 new high rise blocks (6 to 10 floors)

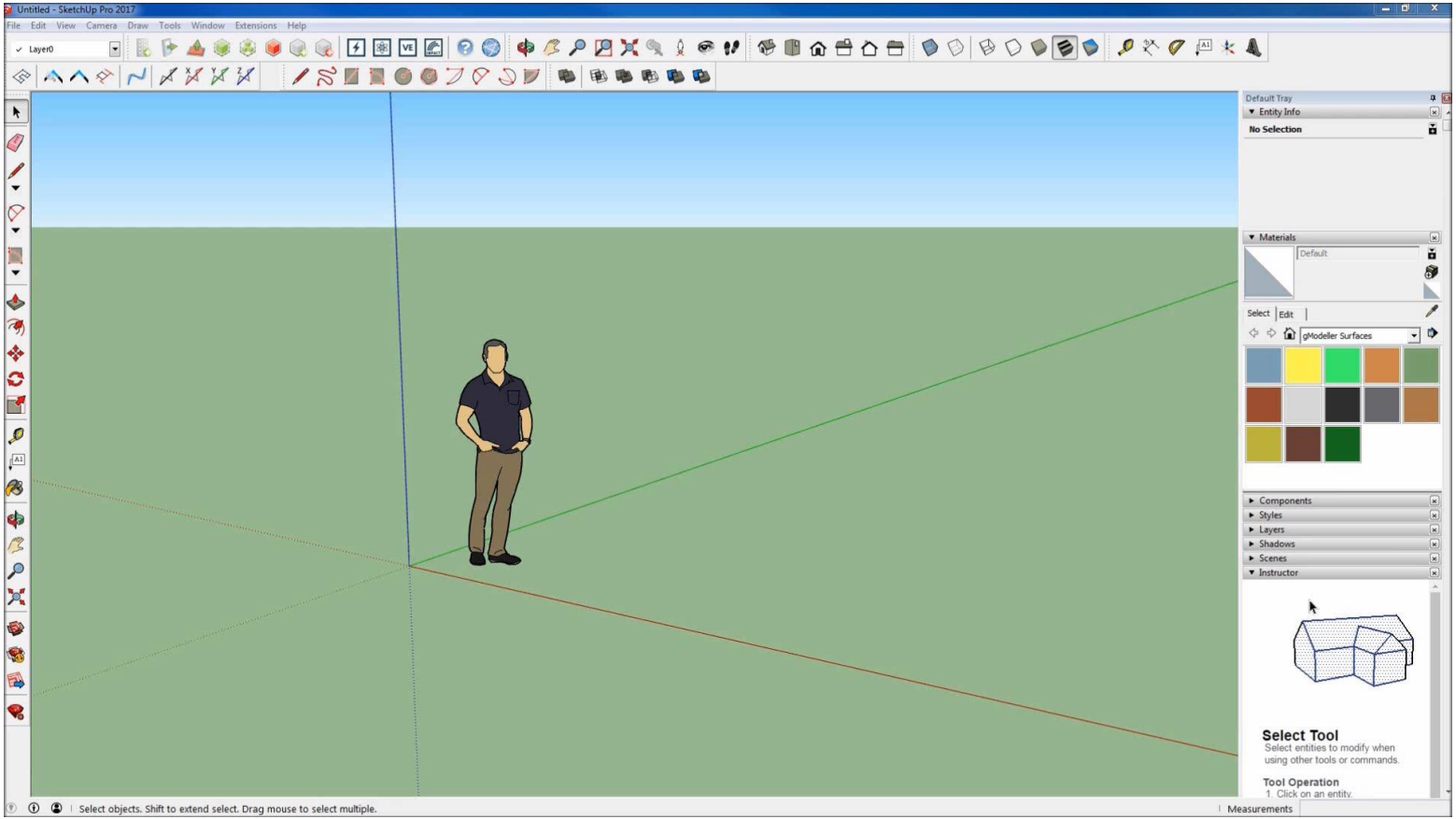


- 47 buildings across Town Centre including actual elevations

CASE STUDY: AutoCAD Process

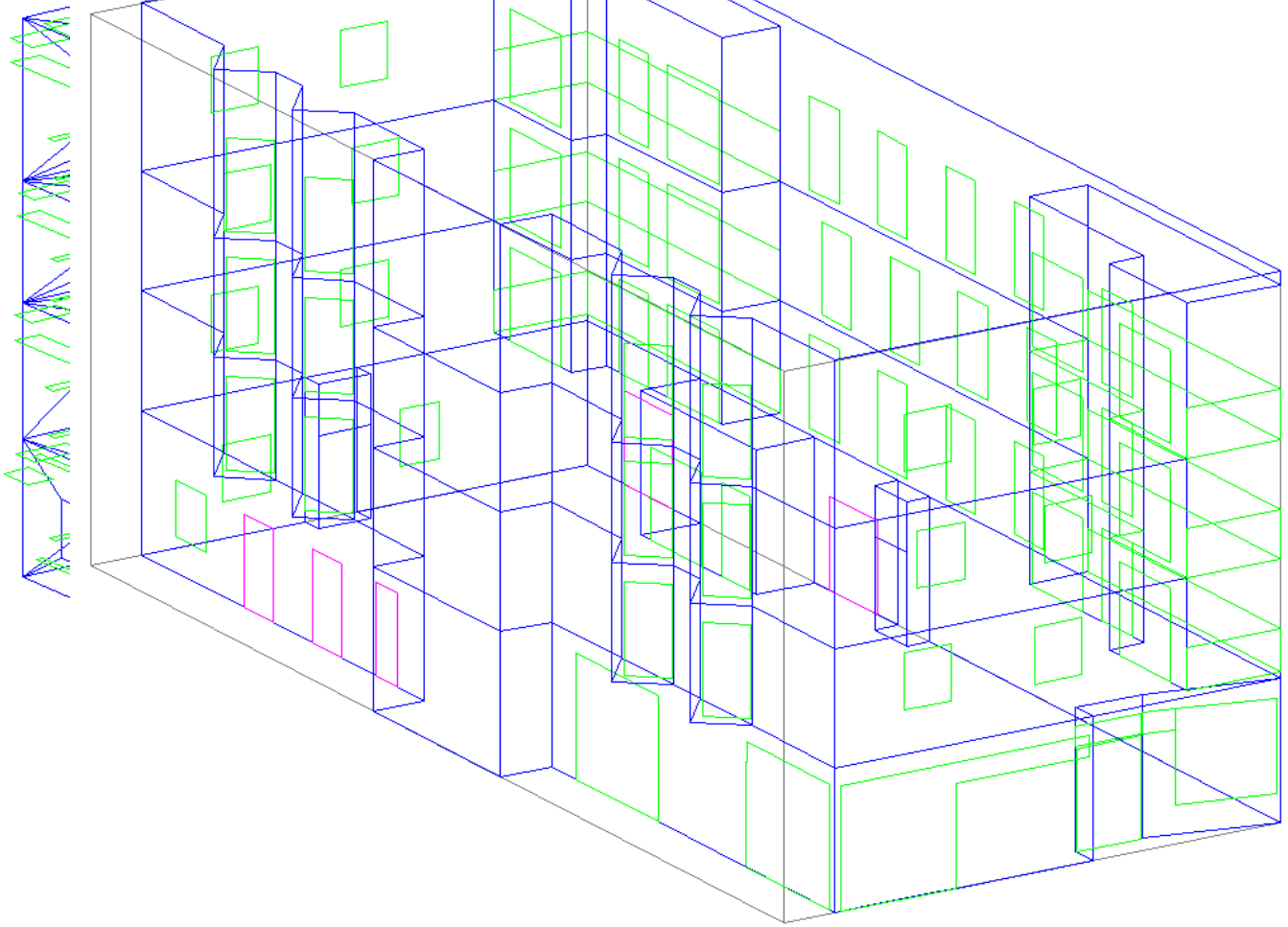


CASE STUDY: SketchUp Process



Revit >

Fron



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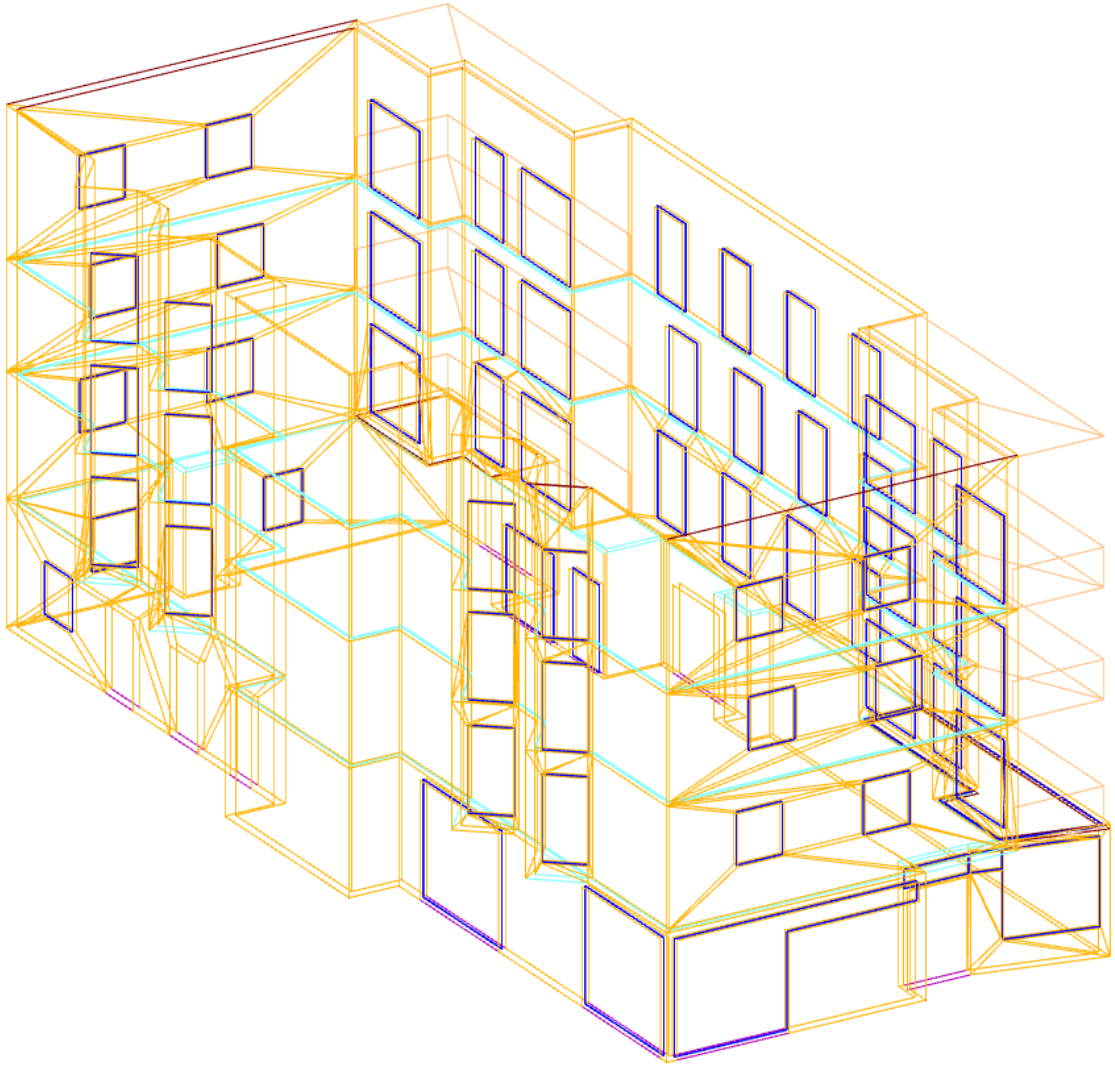
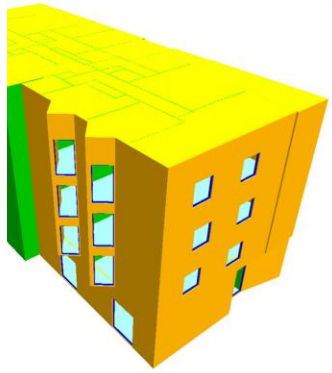
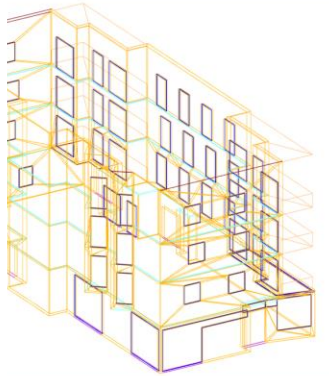
Design Buil



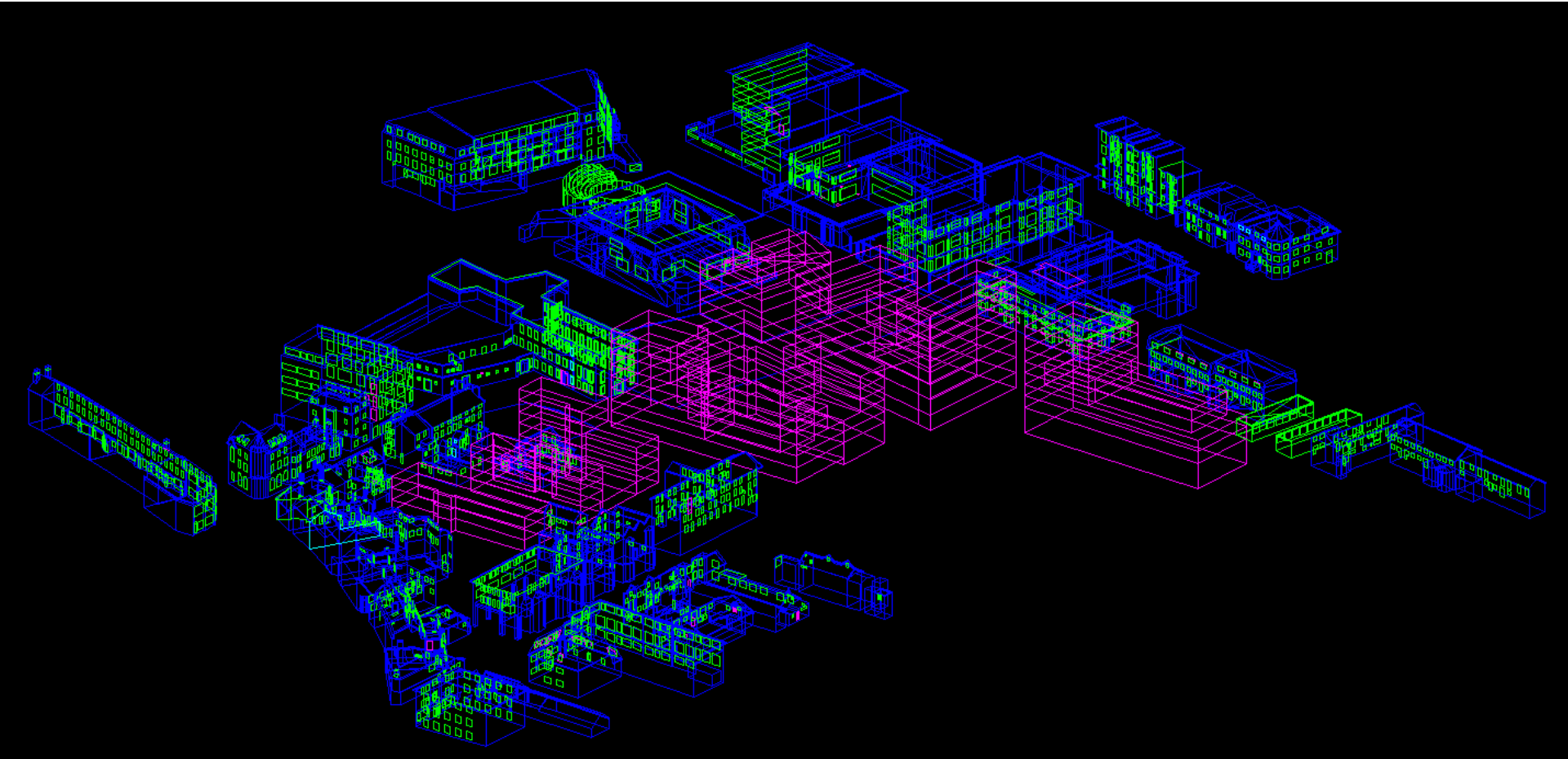
Render



/ireframe (within IES)

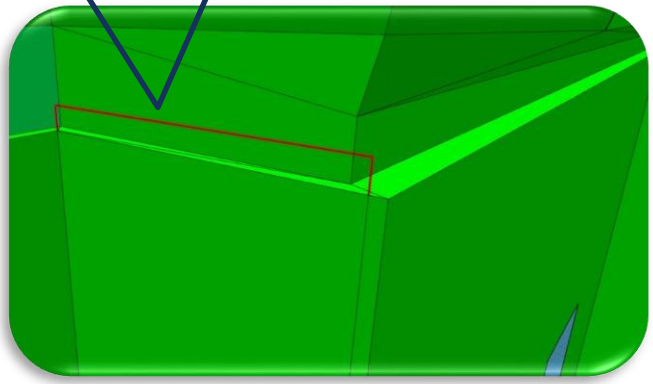


CASE STUDY: Final IES Model

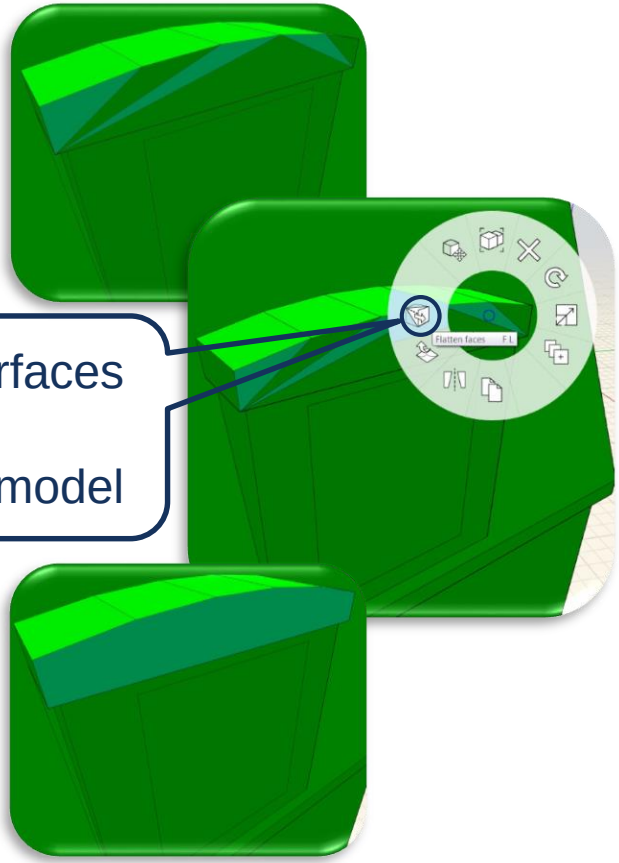


BEST PRACTICE & SOLUTIONS: Simplifying Geometry (in FormIT™)

1. “Watertight mode” highlights issues

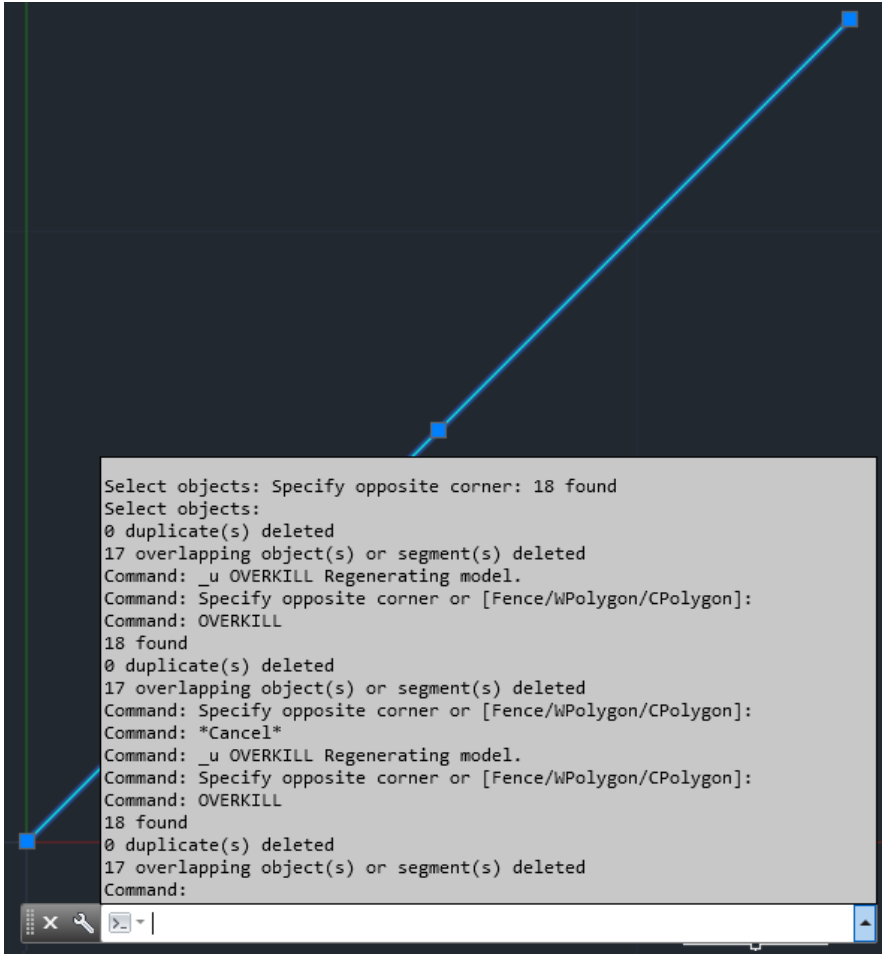


1. Flatten surfaces greatly simplifies model



BEST PRACTICE & SOLUTIONS: Overlapping Lines

- AutoCAD can handle overlapping and co-linear lines
- Using the “OVERKILL” AutoCAD function



SUMMARY

- Scope
- Possible Workflows
- Case Study
- Best Practice & Solutions

Any Questions?

THANK YOU