الاتجاهات الحديثة في الادارة الانشائية

نمذجة معلومات البناء BIM

محاضرة تخصصية في ادارة المشاريع الانشائية

قسم الهندسة المدنية / كلية الفارابي الجامعة / 28/11/2017

ا.م.د عباس مهدي عبد / كلية الهندسة – جامعة ديالى

Research area: Construction Modelling & Artificial Intelligent Applications

Building
Information
Modelling

((**BIM**))

نمذجة معلومات البناء (البيم)

Main Outlines:

1. BIM Concepts
2. Tools of Building Modelling
3. Virtual Reality Environment and PM
4. Construction Applications

1-BIM Concepts:
What does BIM mean for Civil Engineers?

- **Building information modeling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of a facility.**
- **The resulting building information models become shared knowledge resources to support decision-making about a facility from earliest conceptual stages, through design and construction, through its operational life and eventual demolition.**

Essential Elements of BIM

- 3D-Dimensional solid model
- Analytical-based (Parametric)
- Building and material Specification
- Cost and Scheduling plans
- Sustainability requirement
- Facilities


Architecture
Project Management
Detailling
BIM
Controle Institution
Engineering Design
Fabrication
Copyright Nemetschek Scia

BIM nD Terminology

3D

Visualization

Clash Analysis

4D

Construction sequencing

Virtual Construction

(3D plus time element)

5D

Estimating

(4D plus cost element)

6D?

sustainability level

(5D plus analysis element)

7D?

Facility Management

(6D plus O&M element)

Minimum BIM requirements

- Data Richness.
- Lifecycle Views.
- Change Management.
- Roles or Disciplines.
- Business Process.
- Timeliness/ Response.
- Delivery Method.

- Delivery Method.
- Graphical Information.
- Spatial Capability.
- Information Accuracy.
- Interoperability/IFC Support

2-Tools of Building Modelling: BIM Software

Architecture

- Autodesk Revit
- Graphisoft ArchiCAD
- Nemetschek Allplan Architecture
- Gehry Technologies - Digital Project Designer
- Nemetschek Vectorworks Architect
- Bentley Architecture
- 4MSA IDEA Architectural Design (IntelliCAD)
- CADSoft Envisioneer
- Softtech Spirit
- RhinoBIM (BETA)

Structures

- Autodesk Revit Structure
- Bentley Structural Modeler
- Bentley RAM, STAAD and ProSteel
- Tekla Structures
- CypeCAD
- Graytec Advance Design
- StructureSoft Metal Wood Framer
- Nemetschek Scia
- 4MSA Strad and Steel
- Autodesk Robot Structural Analysis

Facility Management:

- Bentley Facilities
- FM:Systems FM:Interact
- Vintocon ArchiFM (For ArchiCAD)
- Onuma System
- EcoDomus

Sustainability

Autodesk Ecotect Analysis
Autodesk Green Building Studio
Graphisoft EcoDesigner
IES Solutions Virtual Environment VE-Pro
Bentley Tas Simulator
Bentley Hevacomp
DesignBuilder

MEP

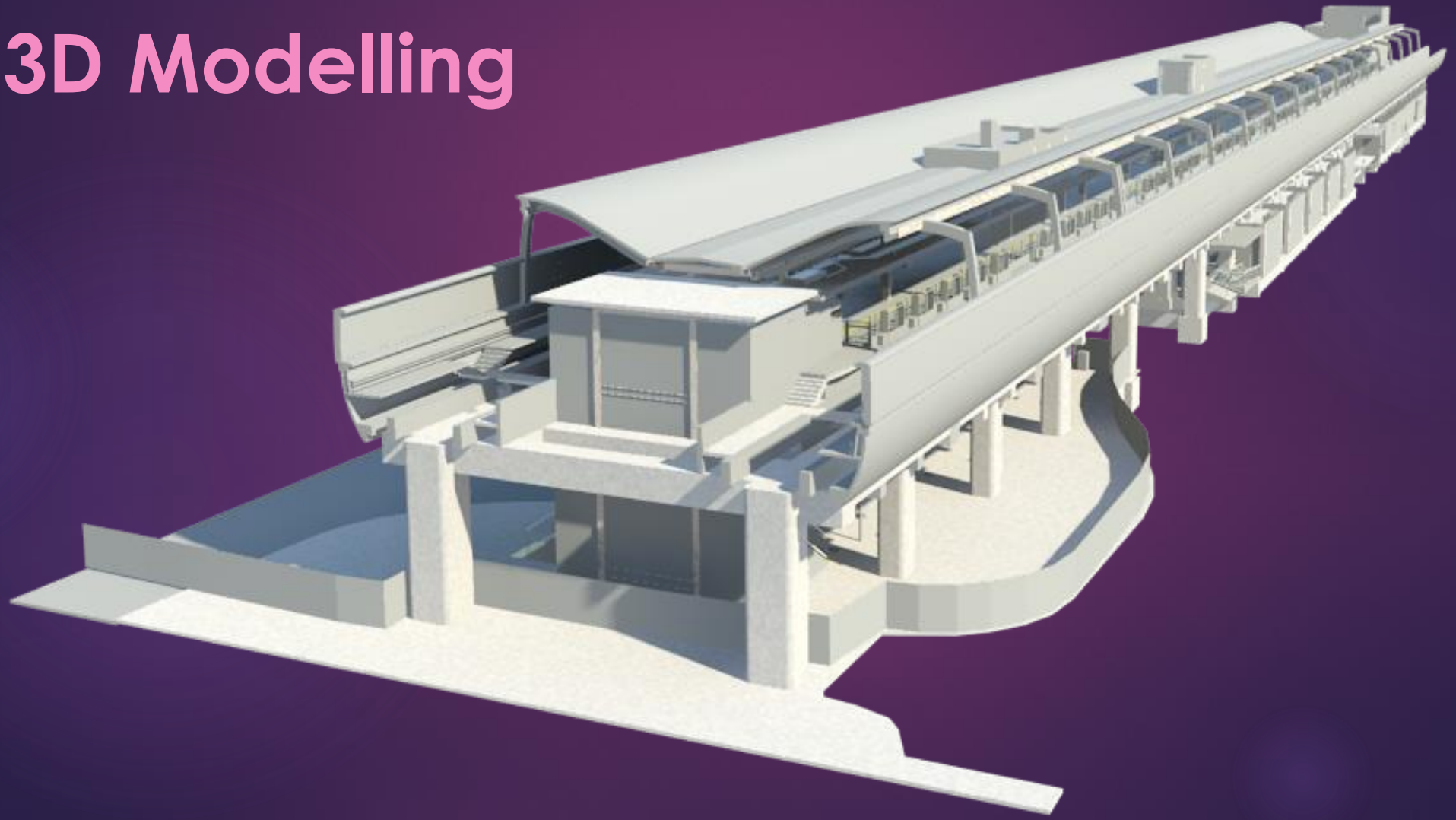
- Autodesk Revit MEP
- Bentley Hevacomp Mechanical Designer
- 4MSA FineHVAC + FineLIFT + FineELEC + FineSANI
- Gehry Technologies - Digital Project MEP Systems Routing
- CADMEP (CADduct / CADmech)
-

Construction

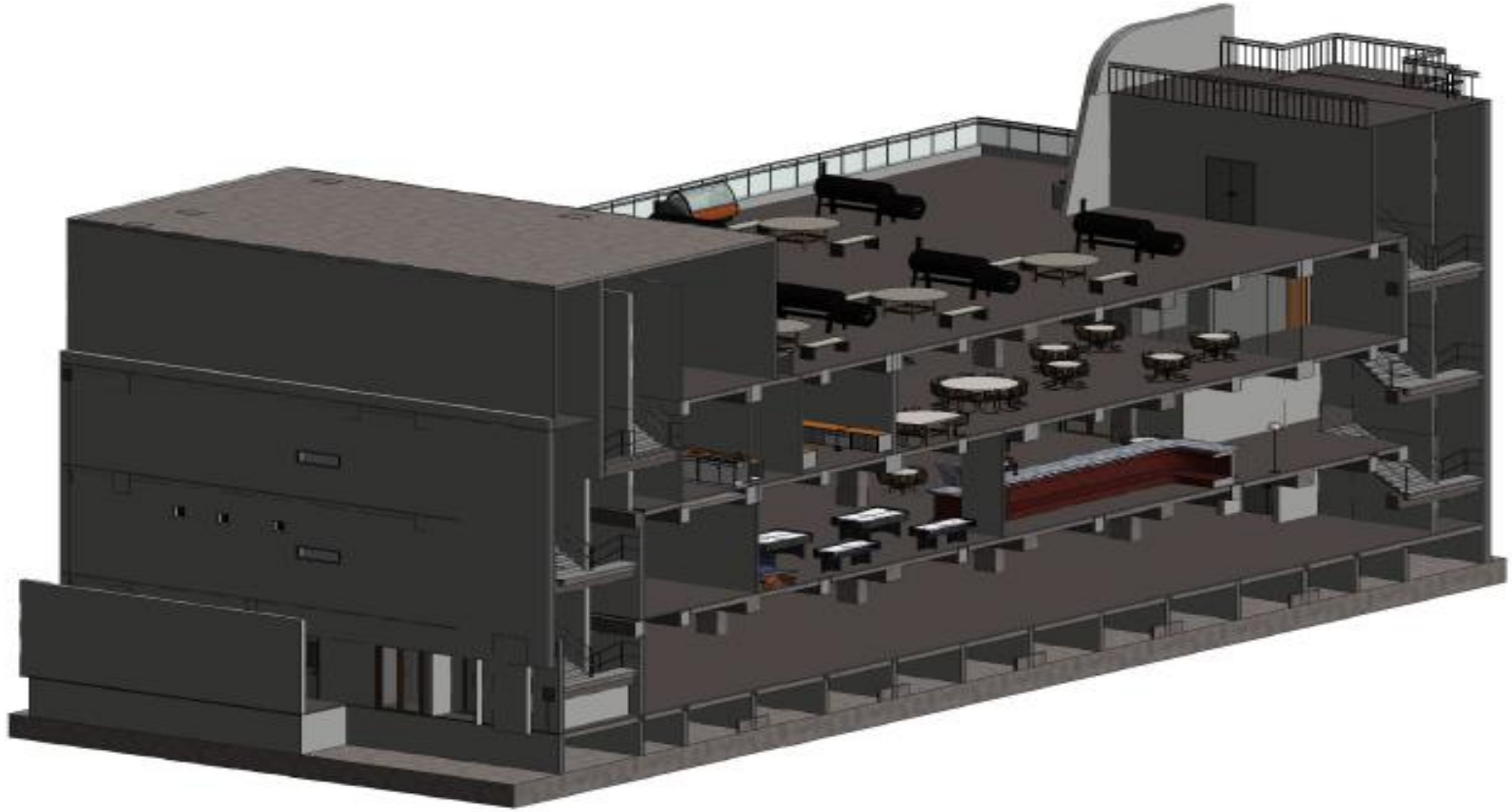
- (Simulation, Estimating and Const. Analysis)
- Autodesk Navisworks
- Solibri Model Checker
- Vico Office Suite
- Vela Field BIM
- Bentley ConstrucSim
- Tekla BIMSight
- Glue (by Horizontal Systems)
- Synchro Professional
- Innovaya

3-Virtual Reality Environment and PM

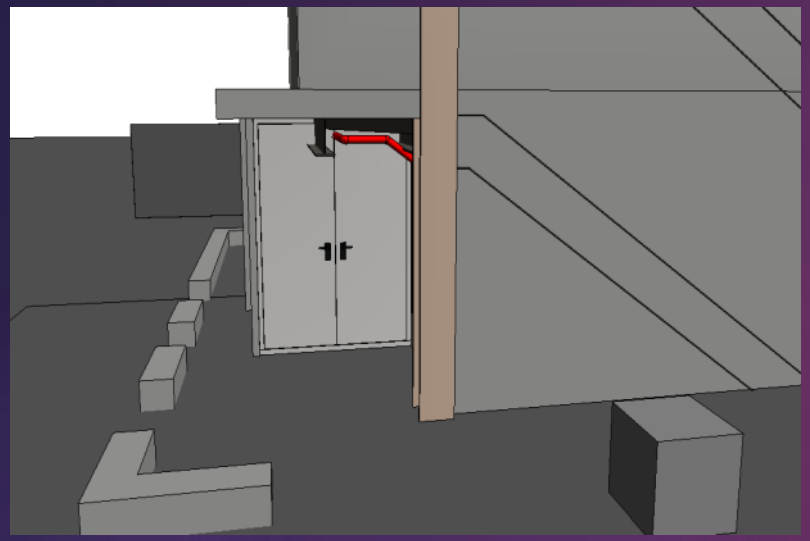
3D Modelling

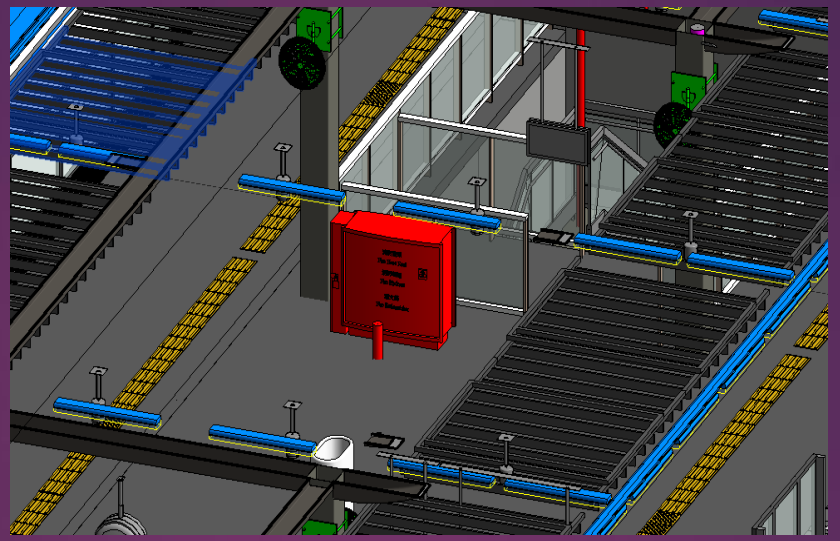


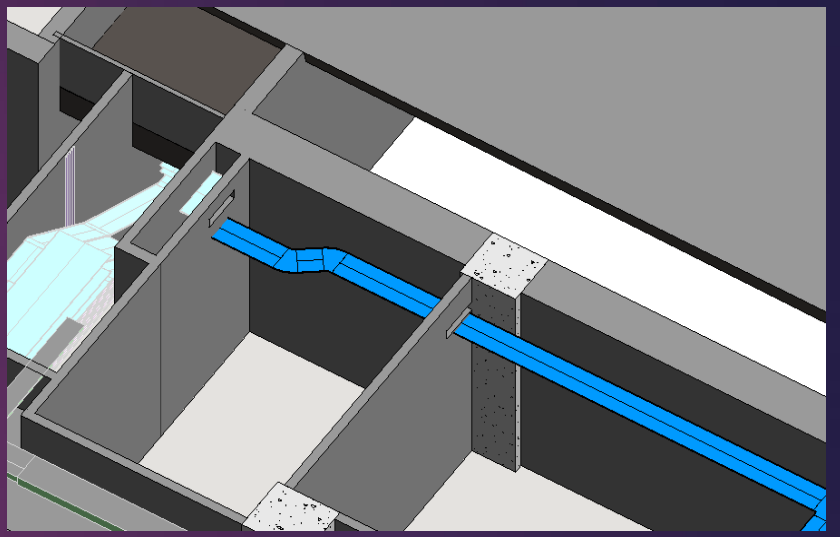
3D Entire Visualization

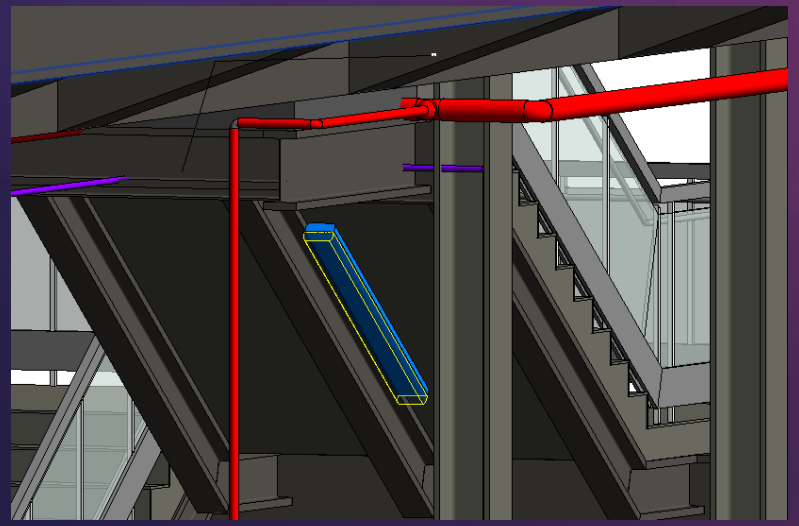


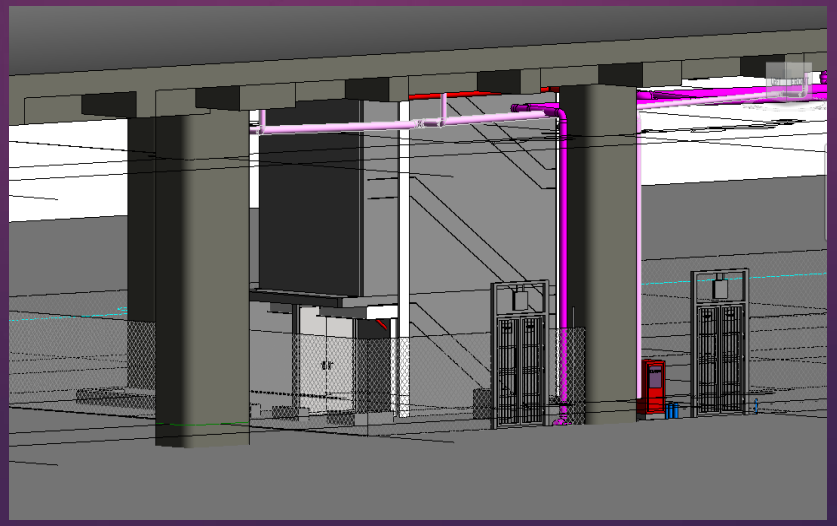
2D or 3D Infinite sectioning

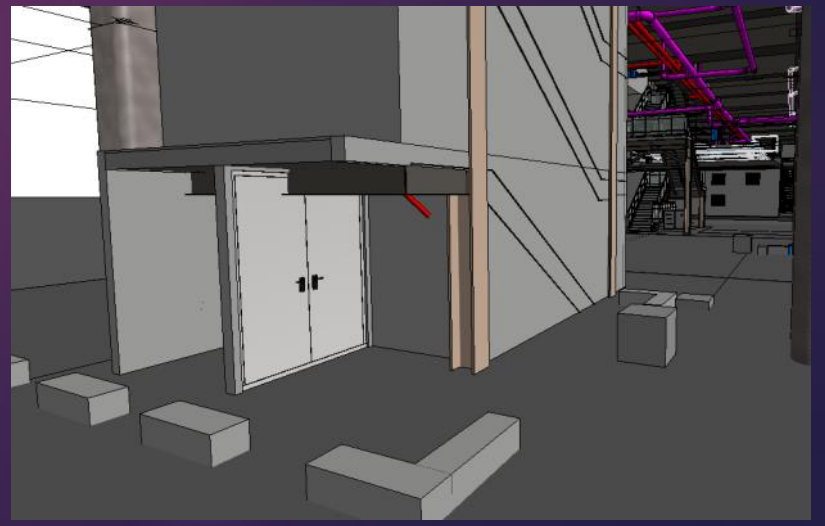






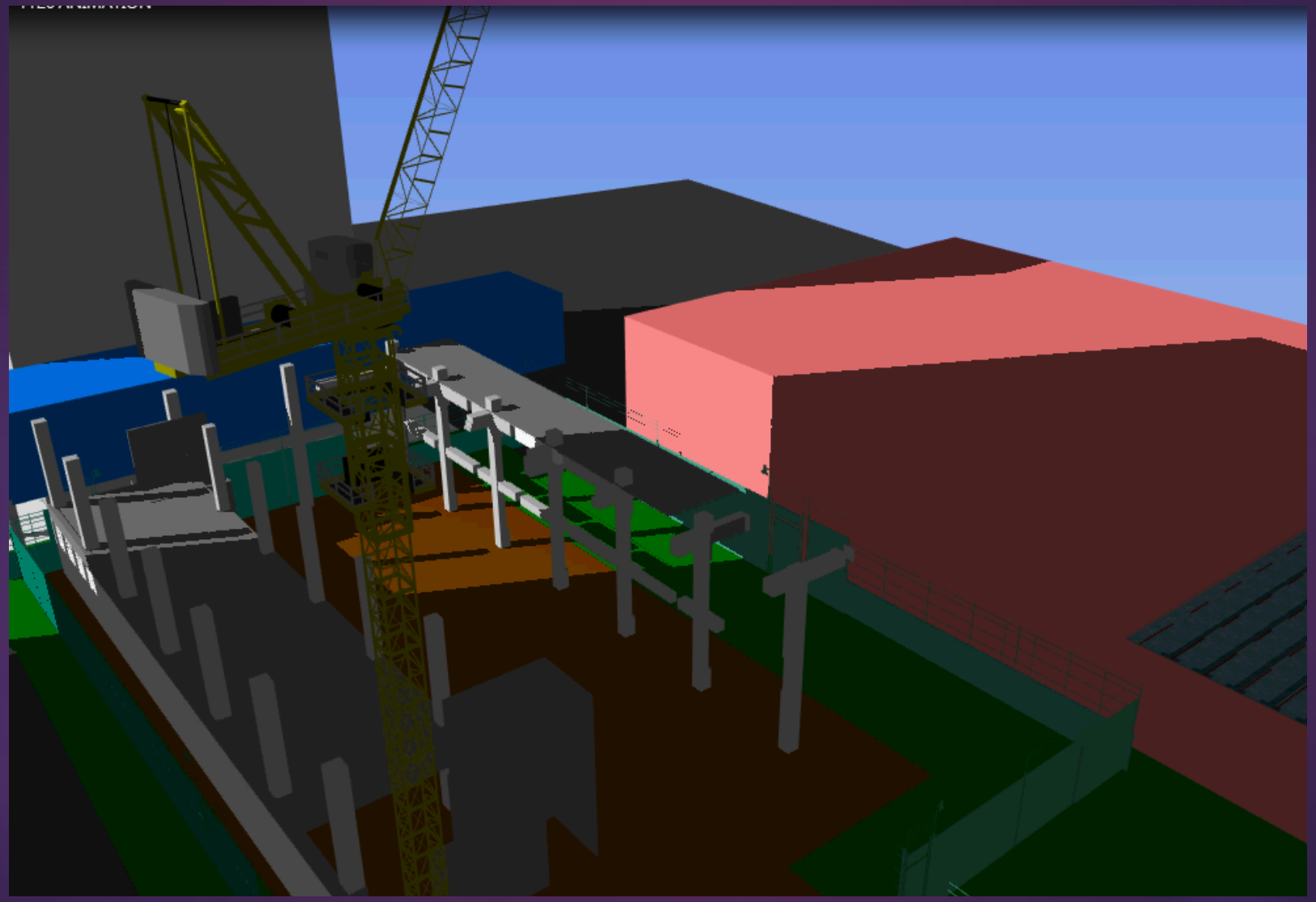






4D Walk Through

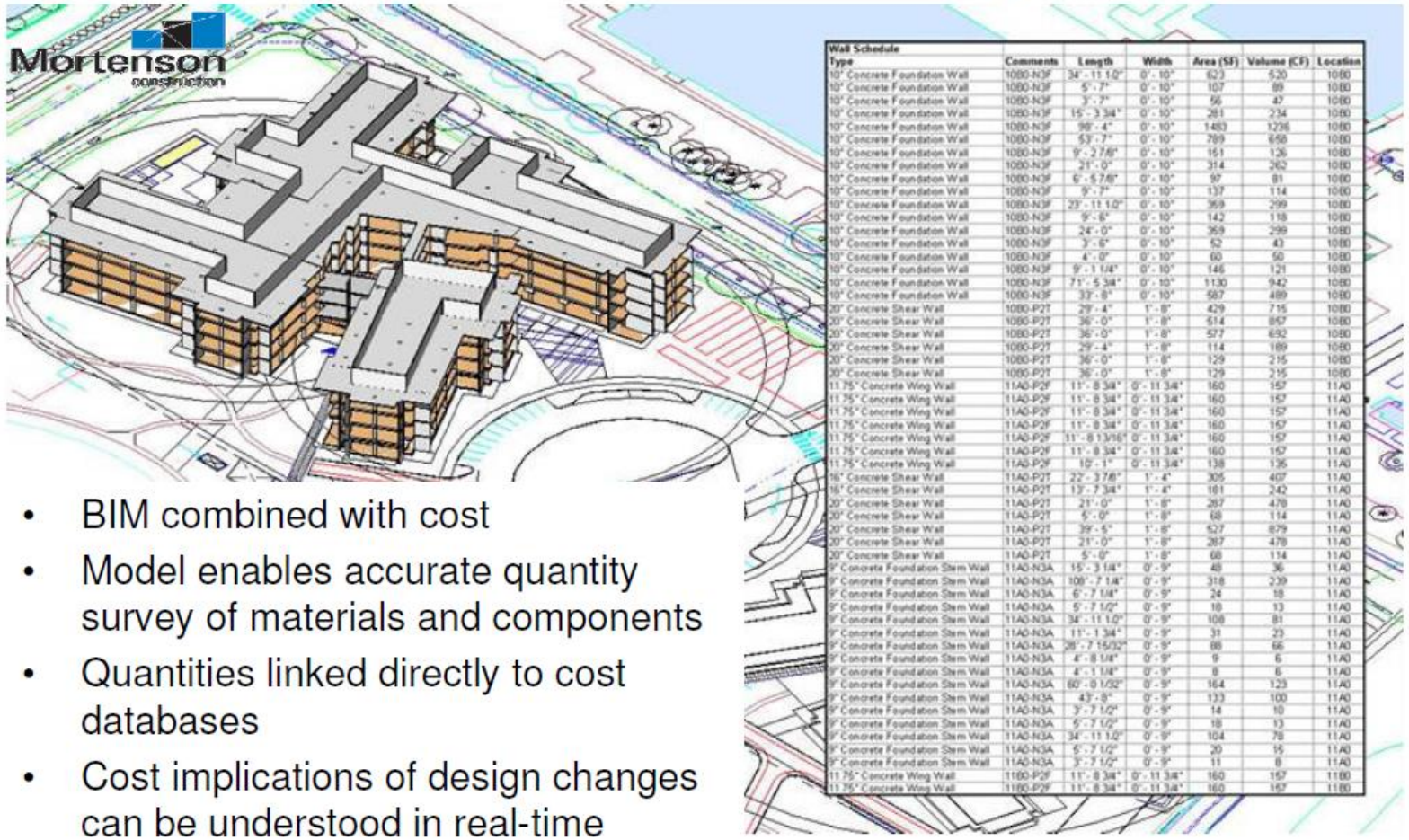
4D Virtual Construction



Play Video

BIM Uses

“5D” Cost Estimating



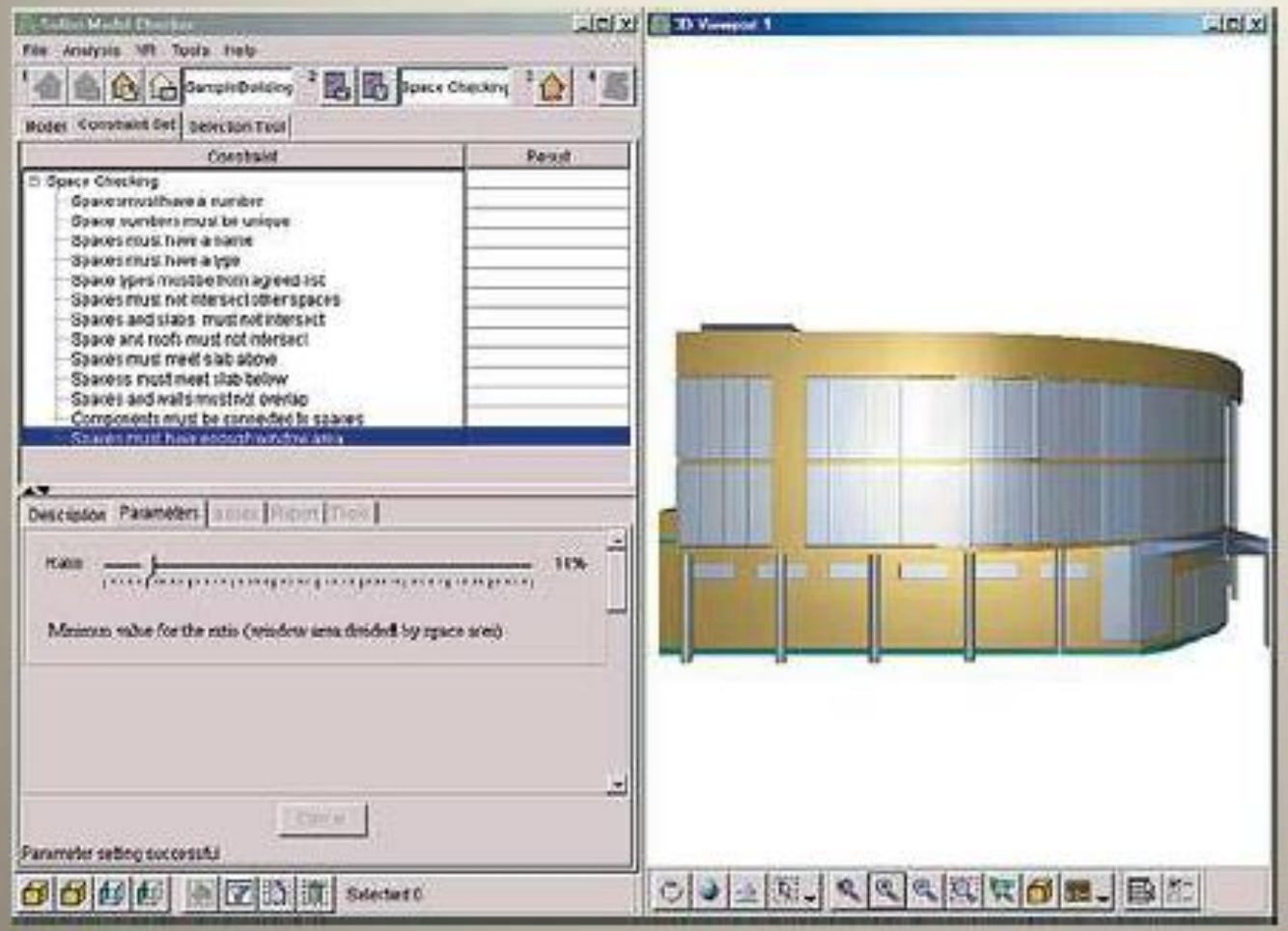
Wall Schedule

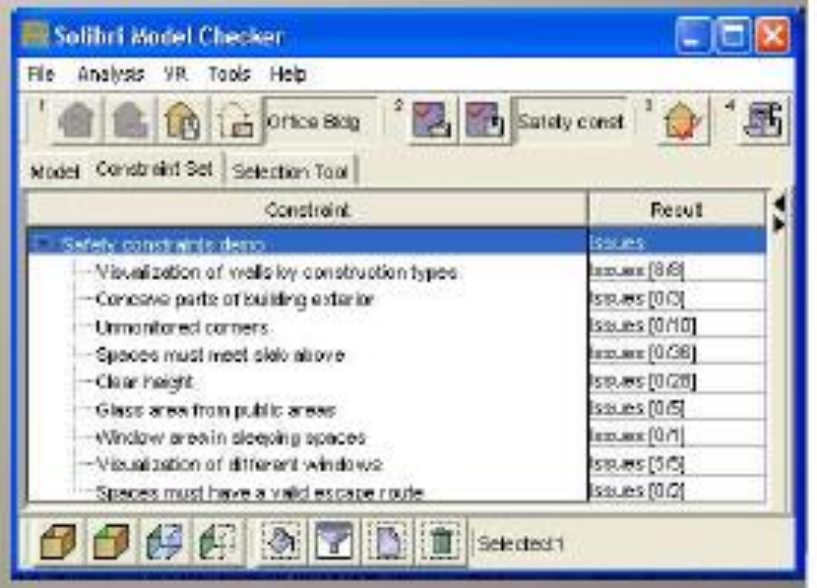
Type	Comments	Length	Width	Area (SF)	Volume (CF)	Location
10" Concrete Foundation Wall	1080-N3F	34' - 11 1/2"	0' - 10"	623	520	1080
10" Concrete Foundation Wall	1080-N3F	5' - 7"	0' - 10"	107	89	1080
10" Concrete Foundation Wall	1080-N3F	3' - 7"	0' - 10"	66	47	1080
10" Concrete Foundation Wall	1080-N3F	15' - 3 3/4"	0' - 10"	281	234	1080
10" Concrete Foundation Wall	1080-N3F	98' - 4"	0' - 10"	1483	1236	1080
10" Concrete Foundation Wall	1080-N3F	53' - 7"	0' - 10"	789	658	1080
10" Concrete Foundation Wall	1080-N3F	9' - 2 7/8"	0' - 10"	151	126	1080
10" Concrete Foundation Wall	1080-N3F	21' - 0"	0' - 10"	314	262	1080
10" Concrete Foundation Wall	1080-N3F	6' - 5 7/8"	0' - 10"	97	81	1080
10" Concrete Foundation Wall	1080-N3F	9' - 7"	0' - 10"	137	114	1080
10" Concrete Foundation Wall	1080-N3F	23' - 11 1/2"	0' - 10"	359	299	1080
10" Concrete Foundation Wall	1080-N3F	9' - 6"	0' - 10"	142	118	1080
10" Concrete Foundation Wall	1080-N3F	24' - 0"	0' - 10"	359	299	1080
10" Concrete Foundation Wall	1080-N3F	3' - 6"	0' - 10"	52	43	1080
10" Concrete Foundation Wall	1080-N3F	4' - 0"	0' - 10"	60	50	1080
10" Concrete Foundation Wall	1080-N3F	9' - 1 1/4"	0' - 10"	146	121	1080
10" Concrete Foundation Wall	1080-N3F	71' - 5 3/4"	0' - 10"	1130	942	1080
10" Concrete Foundation Wall	1080-N3F	33' - 8"	0' - 10"	587	489	1080
20" Concrete Shear Wall	1080-P2T	29' - 4"	1' - 8"	429	715	1080
20" Concrete Shear Wall	1080-P2T	36' - 0"	1' - 8"	514	857	1080
20" Concrete Shear Wall	1080-P2T	36' - 0"	1' - 8"	577	692	1080
20" Concrete Shear Wall	1080-P2T	29' - 4"	1' - 8"	114	189	1080
20" Concrete Shear Wall	1080-P2T	36' - 0"	1' - 8"	129	215	1080
20" Concrete Shear Wall	1080-P2T	36' - 0"	1' - 8"	129	215	1080
11.75" Concrete Wing Wall	11A0-P2F	11' - 8 3/4"	0' - 11 3/4"	160	157	11A0
11.75" Concrete Wing Wall	11A0-P2F	11' - 8 3/4"	0' - 11 3/4"	160	157	11A0
11.75" Concrete Wing Wall	11A0-P2F	11' - 8 3/4"	0' - 11 3/4"	160	157	11A0
11.75" Concrete Wing Wall	11A0-P2F	11' - 8 3/4"	0' - 11 3/4"	160	157	11A0
11.75" Concrete Wing Wall	11A0-P2F	11' - 8 13/16"	0' - 11 3/4"	160	157	11A0
11.75" Concrete Wing Wall	11A0-P2F	11' - 8 3/4"	0' - 11 3/4"	160	157	11A0
11.75" Concrete Wing Wall	11A0-P2F	10' - 1"	0' - 11 3/4"	138	135	11A0
16" Concrete Shear Wall	11A0-P2T	22' - 3 7/8"	1' - 4"	305	407	11A0
16" Concrete Shear Wall	11A0-P2T	13' - 7 3/4"	1' - 4"	181	242	11A0
20" Concrete Shear Wall	11A0-P2T	21' - 0"	1' - 8"	287	478	11A0
20" Concrete Shear Wall	11A0-P2T	6' - 0"	1' - 8"	68	114	11A0
20" Concrete Shear Wall	11A0-P2T	39' - 5"	1' - 8"	527	879	11A0
20" Concrete Shear Wall	11A0-P2T	21' - 0"	1' - 8"	287	478	11A0
20" Concrete Shear Wall	11A0-P2T	5' - 0"	1' - 8"	68	114	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	15' - 3 1/4"	0' - 9"	48	36	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	109' - 7 1/4"	0' - 9"	318	239	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	6' - 7 1/4"	0' - 9"	24	18	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	5' - 7 1/2"	0' - 9"	18	13	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	34' - 11 1/2"	0' - 9"	108	81	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	11' - 1 3/4"	0' - 9"	31	23	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	28' - 7 15/32"	0' - 9"	88	66	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	4' - 8 1/4"	0' - 9"	9	6	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	4' - 1 1/4"	0' - 9"	8	6	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	60' - 0 1/32"	0' - 9"	164	123	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	43' - 8"	0' - 9"	133	100	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	3' - 7 1/2"	0' - 9"	14	10	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	5' - 7 1/2"	0' - 9"	18	13	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	34' - 11 1/2"	0' - 9"	104	78	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	5' - 7 1/2"	0' - 9"	20	15	11A0
9" Concrete Foundation Stem Wall	11A0-N3A	3' - 7 1/2"	0' - 9"	11	8	11A0
11.75" Concrete Wing Wall	11B0-P2F	11' - 8 3/4"	0' - 11 3/4"	160	157	11B0
11.75" Concrete Wing Wall	11B0-P2F	11' - 8 3/4"	0' - 11 3/4"	160	157	11B0

- BIM combined with cost
- Model enables accurate quantity survey of materials and components
- Quantities linked directly to cost databases
- Cost implications of design changes can be understood in real-time

4. Construction Applications

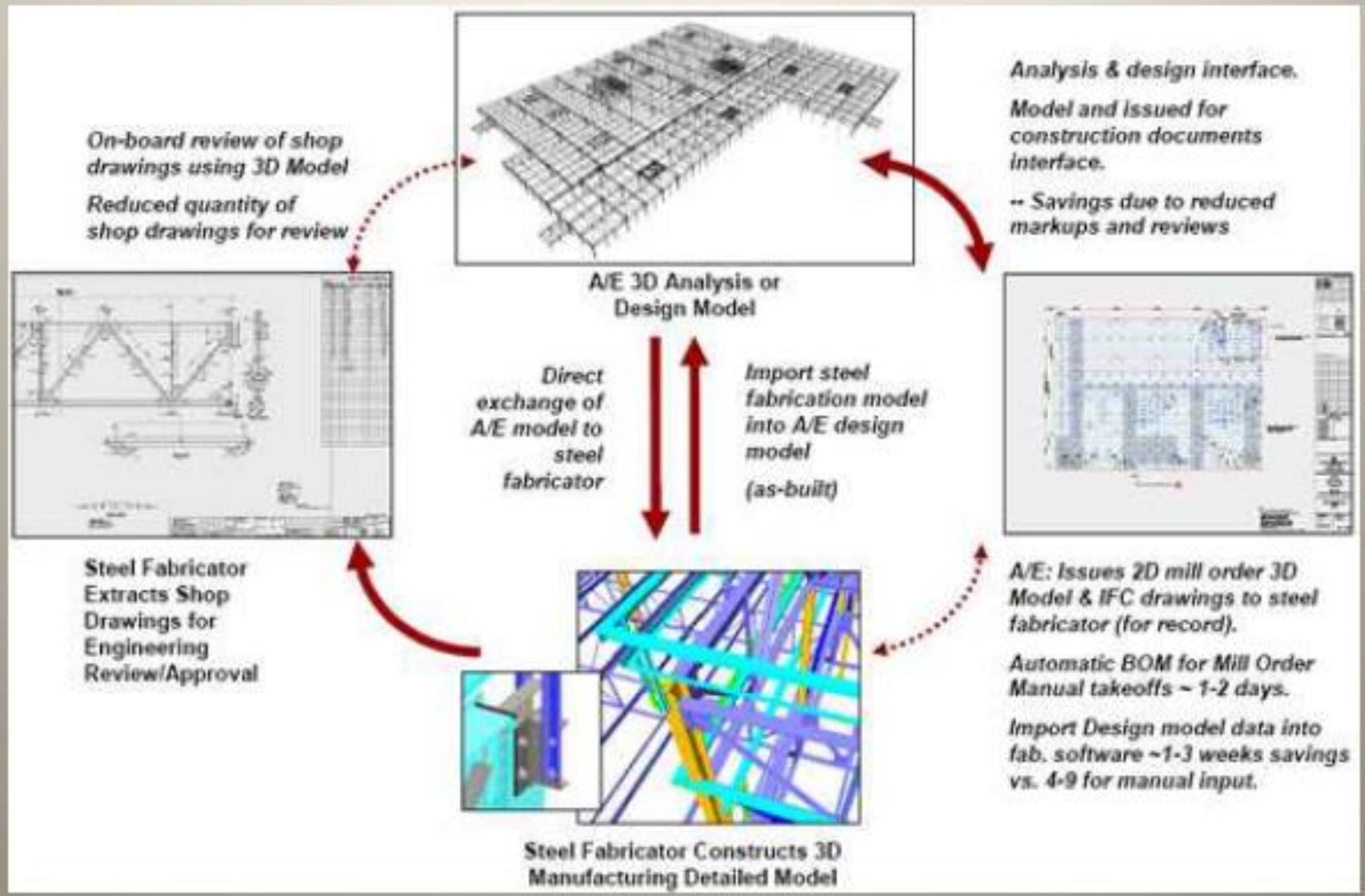
Model Checking



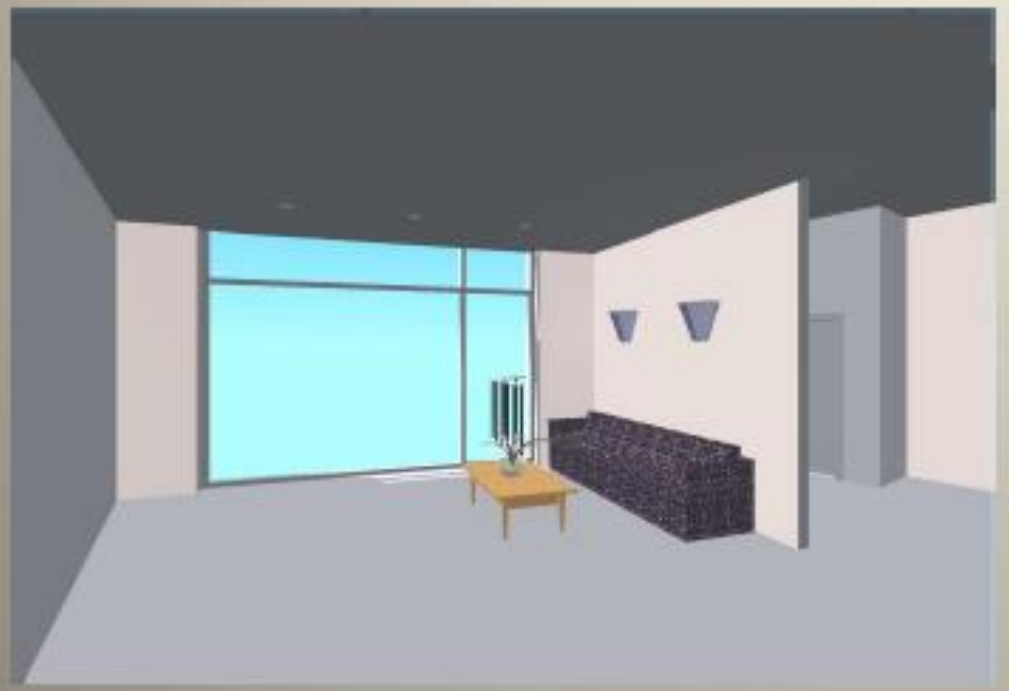


SOLIBRI

Construction - Steel Fabrication



Lighting Analysis



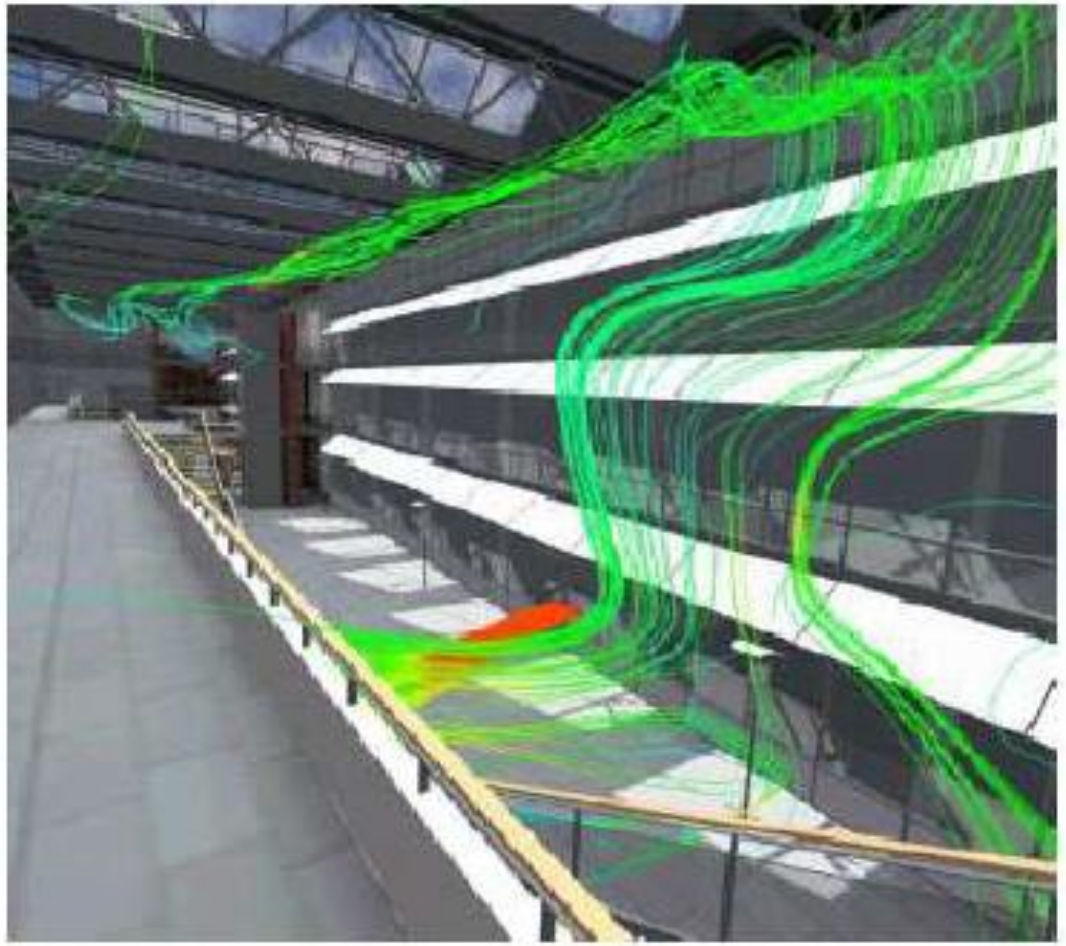
10:00 AM

10:00 PM

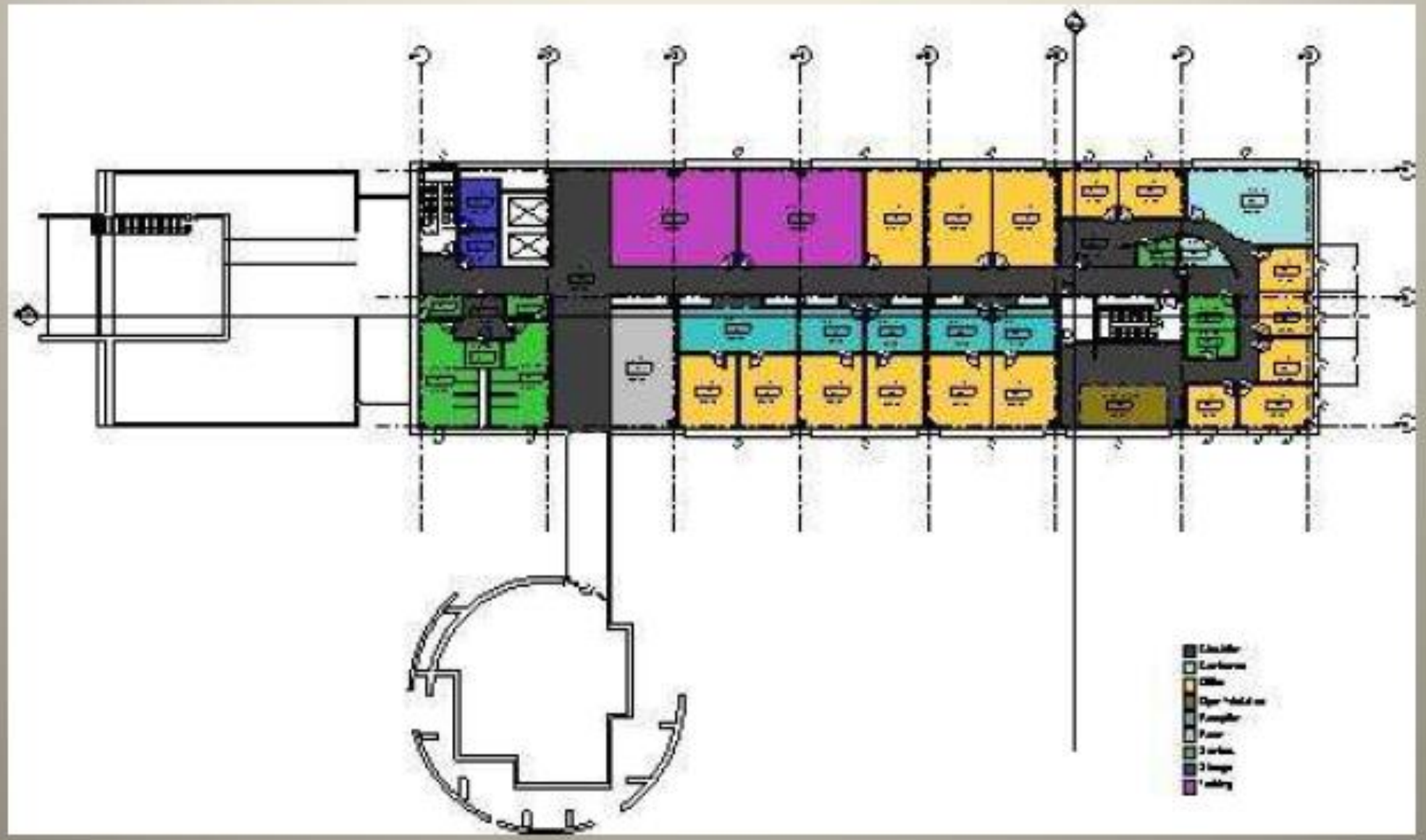
Air Flow Analysis

Office with Cooled Beams

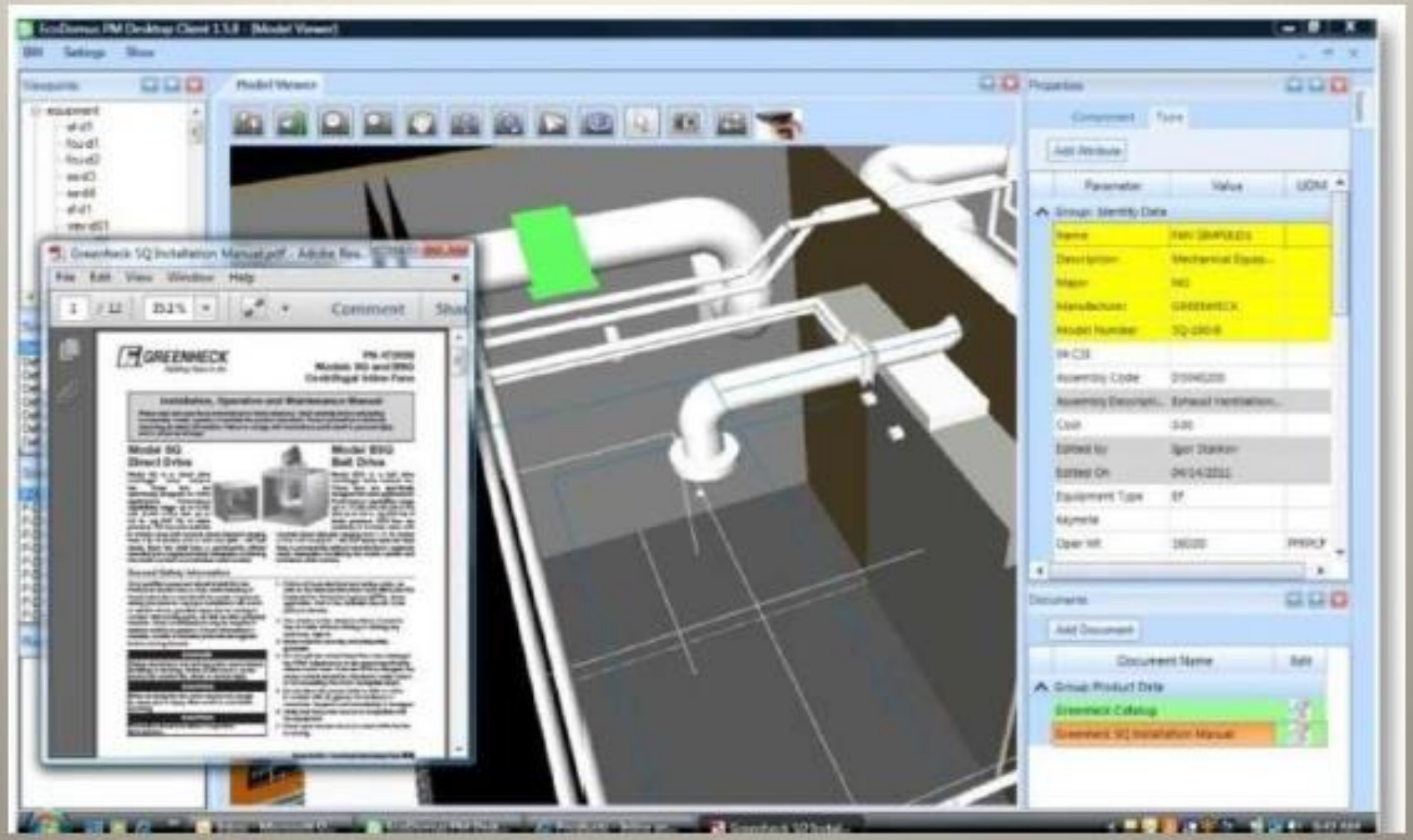
Ventilation in Atrium



Space Management



Facility Management Portals



Courtesy University of Southern California Facility Management Services

Autodesk Revit 2016 - rst_basic_sample_project - Sheet: S001 - Title Sheet

basic sample project

abbas1972

Architecture | Structure | Systems | Insert | Annotate | Analyze | Massing & Site | Collaborate | View | Manage | Add-Ins | Modify | Title Blocks

Modify | Select | Properties | Paste | Cope | Cut | Join | Clipboard | Geometry | Modify | View | Measure | Create | Edit Family | Mode

Modify | Title Blocks

Properties

A1 metric

Title Blocks (1) | Edit Type

Graphics

Scale	1 : 10

Identity Data

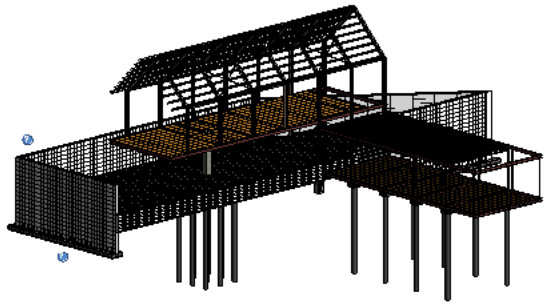
Sheet Name	Title Sheet
Sheet Number	S001
Date/Time Stamp	02/03/15
Sheet Issue Date	02/03/15
Drawn By	AA

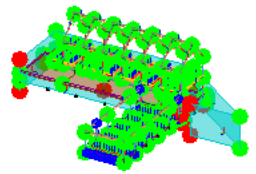
Properties help | Apply

Project Browser - rst_basic_sample_project

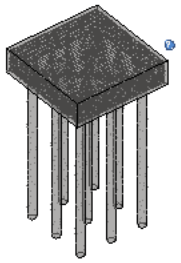
- Views (all)
  - Structural Plans
  - 3D Views
    - 3D View 1
    - 3D View 2
    - 3D View 3
    - 3D View 4
    - Analytical Model
    - Central Pile
    - Central Pile - 3D
    - Structure 3D box section (Framir
    - Structure 3D box Wall
    - Structure (Complete)
    - Structure (Foundation)
    - {3D}

Autodesk® Revit®
Basic Structural Sample Project

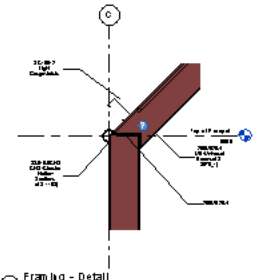




4 Analytical Model



2 Central Pile



3 Framing - Detail

AUTODESK

No.	Description	Date

Autodesk
Sample House
Title Sheet
S001

Click to select, TAB for alternates, CTRL adds, SHIFT unselects.

Main Model | Exclude Options

SLIDE 27 OF 30 | ARABIC (IRAQ) | NOTES | COMMENTS | 89 %

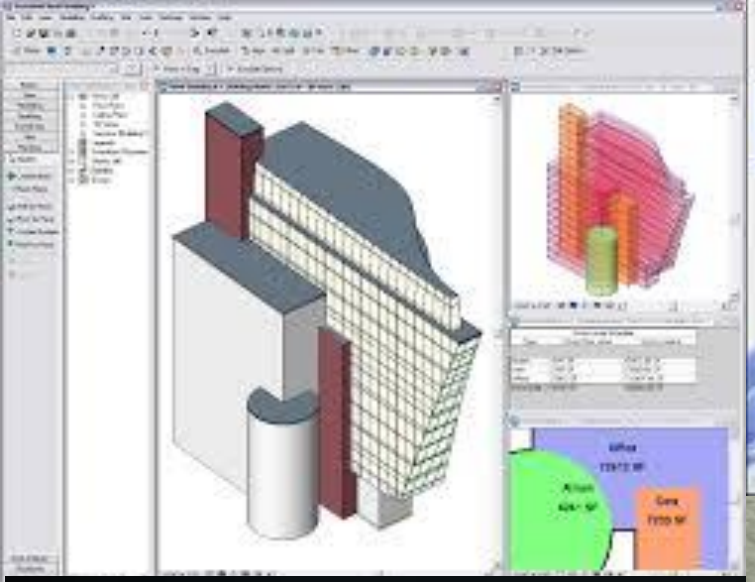
EN | 12:44 م | ٢٠١٥/١١/٠٦

BIM Strategy

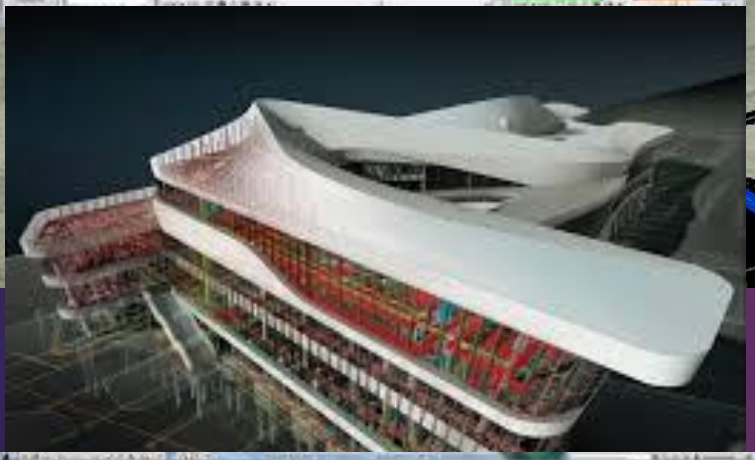
Scandinavian Countries, US (Army, Wisconsin, NYC)	Mandate BIM in public sector starting 2011
UK, Europe (not Southern Europe)	Mandate BIM in public sector before 2016 - Level 2
Singapore	Mandate BIM in both public and private sectors in 2015
Hong Kong HA Hong Kong Civil Engg Hong Kong CIC	All BIM in 2014 ? Roadmap, Sep 2013
China	2011-2015 5-Year Plan BIM
Korea, Germany (and China)	Create own BIM software
Other Asian Countries	Private sector initiation

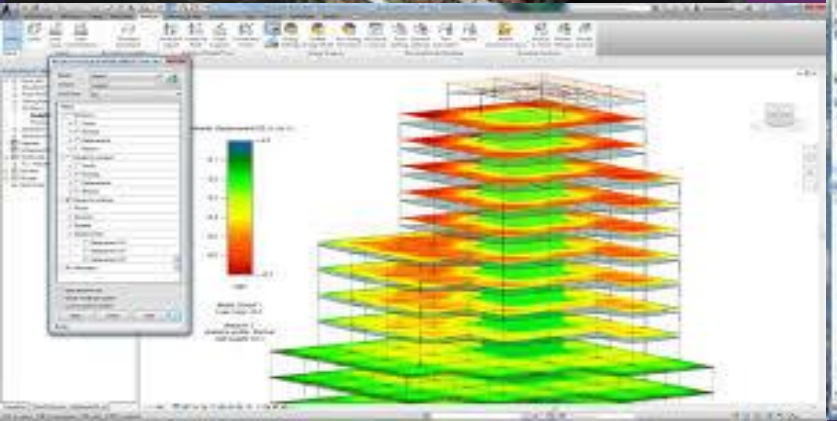
Some BIM Statistics

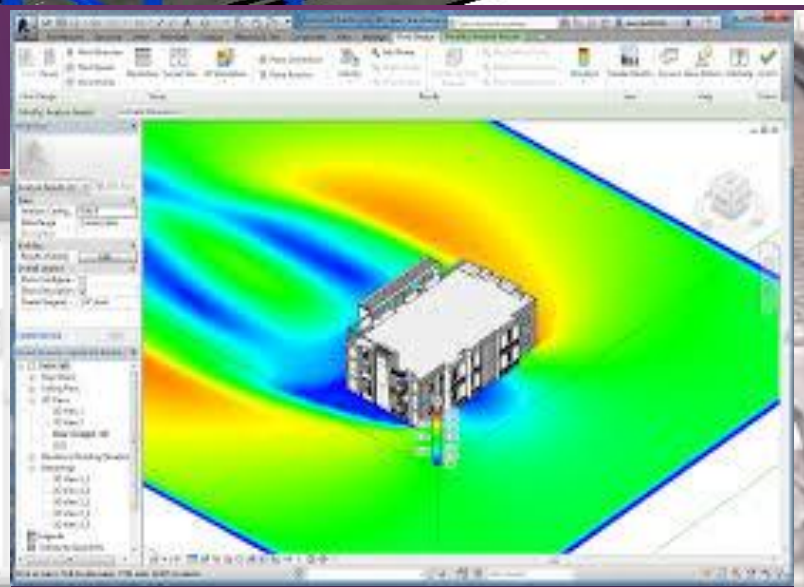
- 7% reduction of project time
- Eliminate 40% unbudgeted changes
- Save about 10% cost due to clashes
- Estimate accuracy ± 3% closer
- Estimation became 80% faster

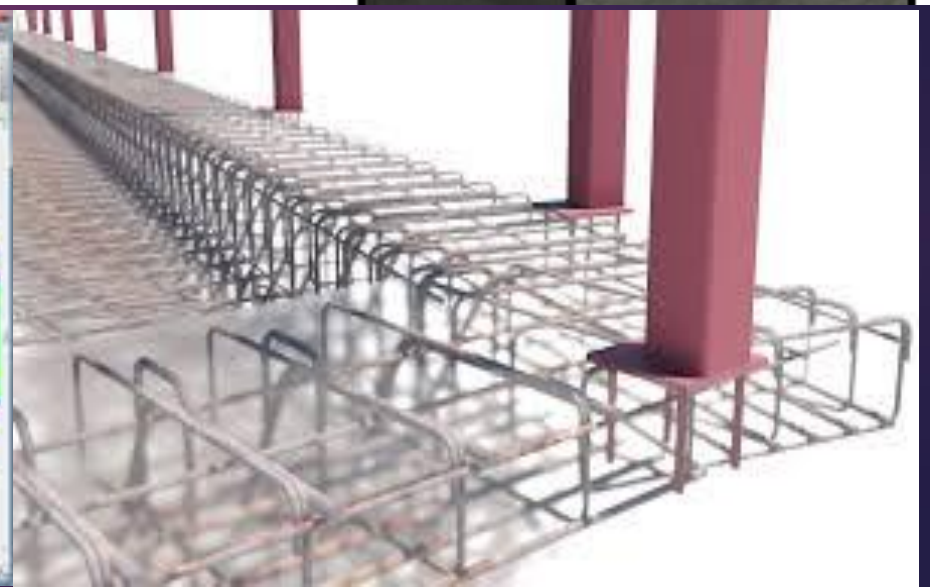



AUTODESK
BUILDING DESIGN SUITE
2014

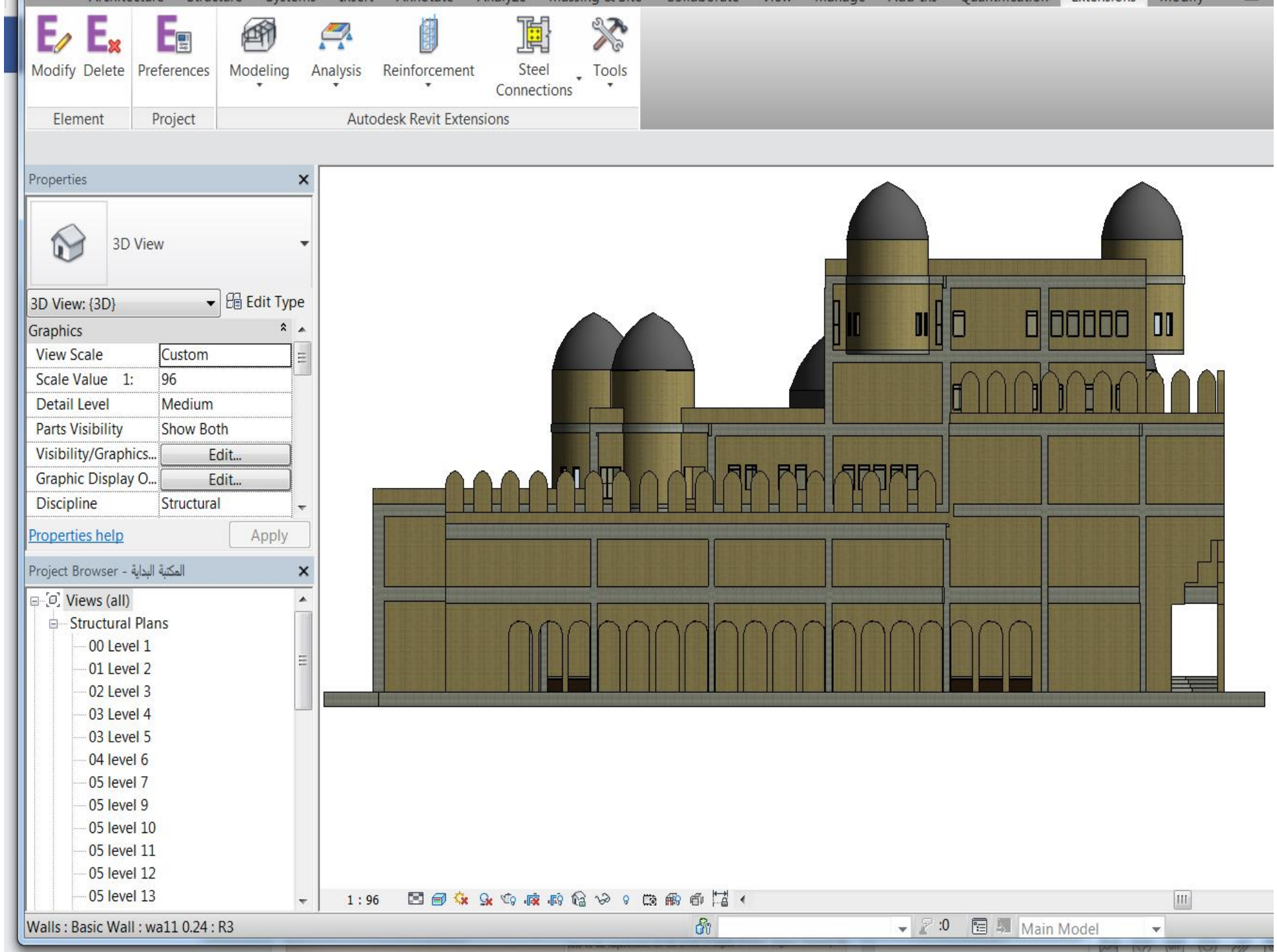


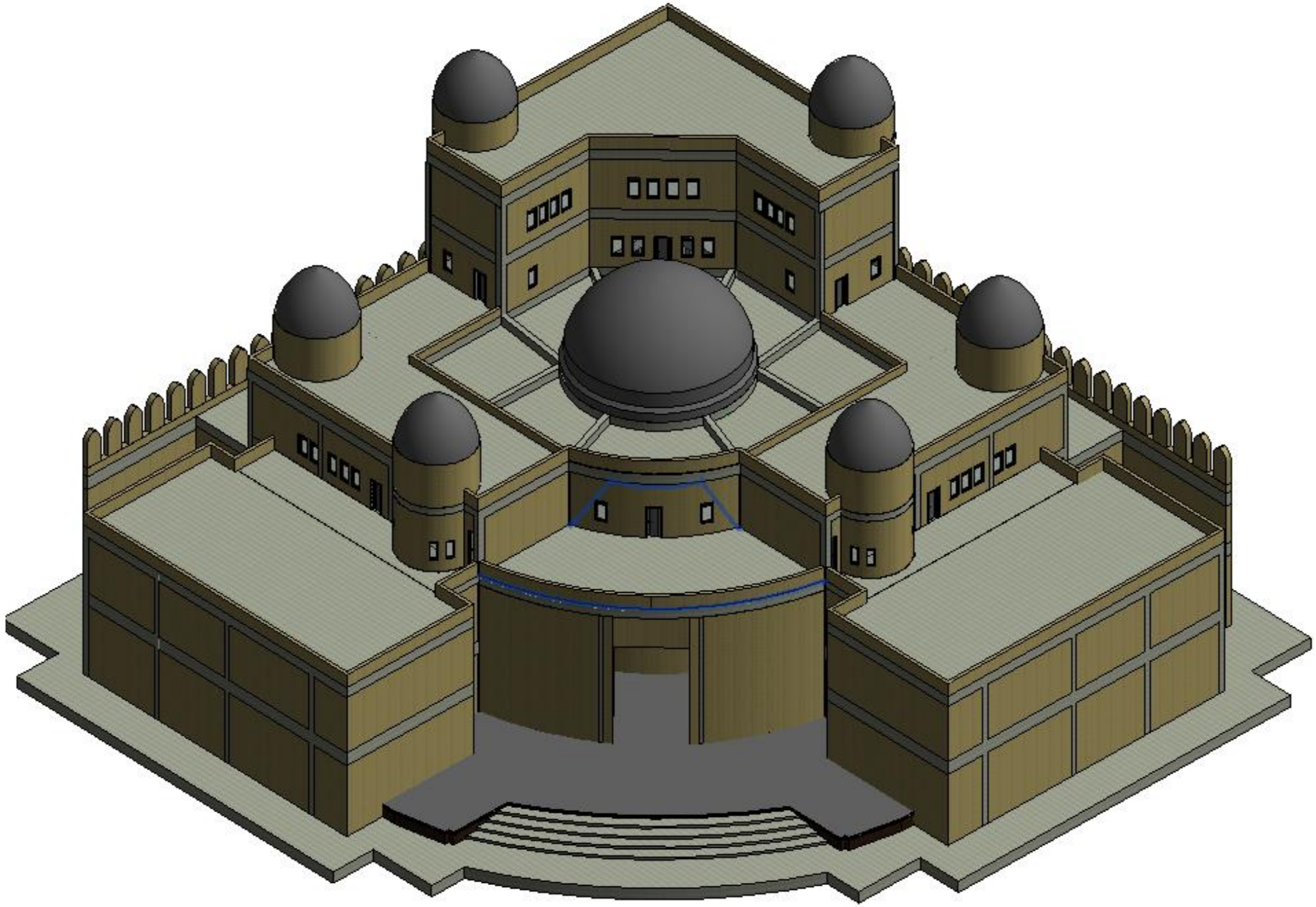


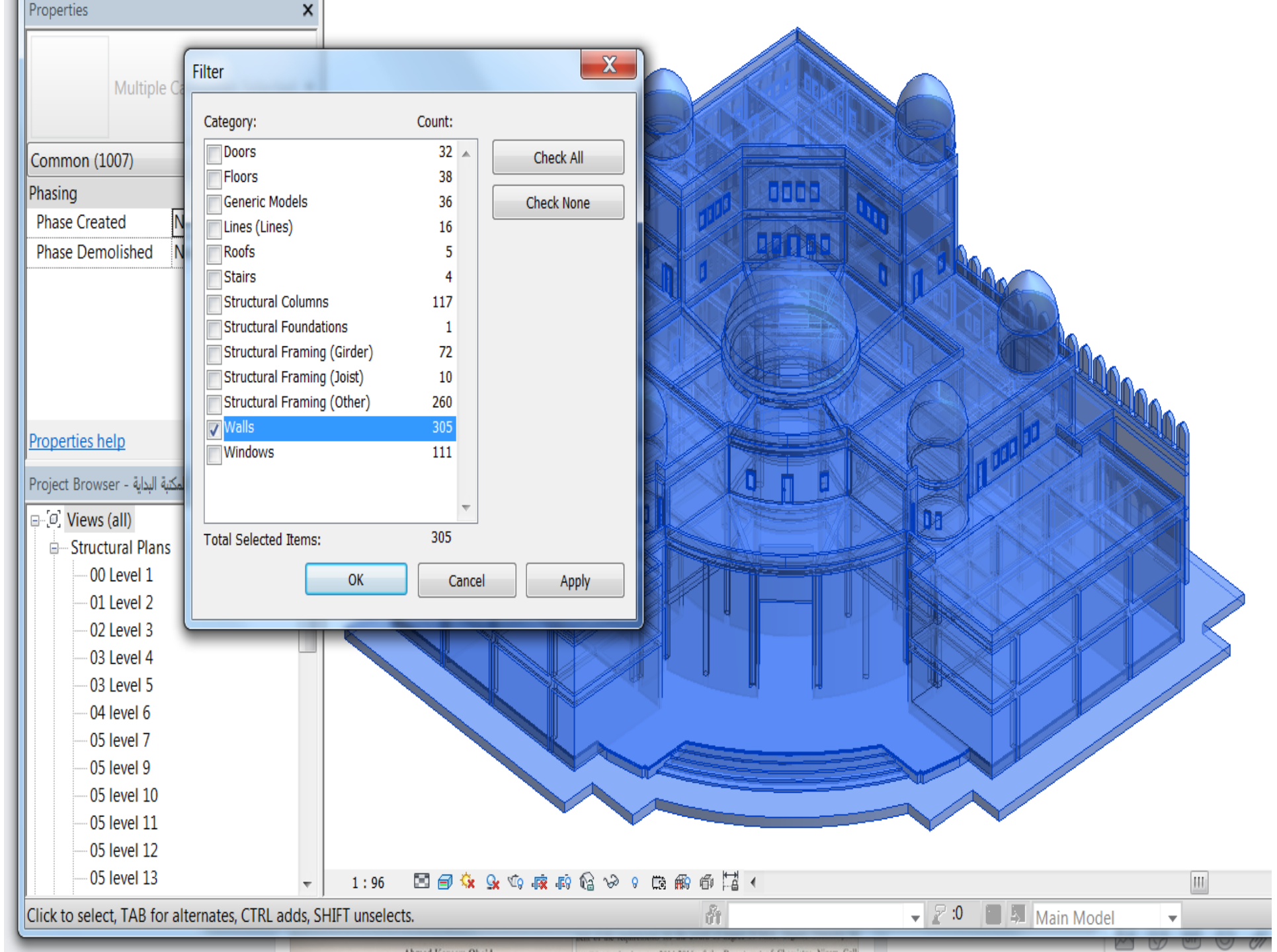




Structural Rebar : Rebar Bar : #3-Grade 40 : Shape
Stirrup - T1 : Shape handle


Modify
Delete
Preferences
Modeling
Analysis
Reinforcement
Steel Connections
Tools
Element
Project
Autodesk Revit Extensions
Properties
3D View
3D View: {3D}
Edit Type
Graphics
View Scale
Custom
Scale Value 1:
96
Detail Level
Medium
Parts Visibility
Show Both
Visibility/Graphics...
Edit...
Graphic Display O...
Edit...
Discipline
Structural
Properties help
Apply
Project Browser - المكتبة البداية
Views (all)
Structural Plans
00 Level 1
01 Level 2
02 Level 3
03 Level 4
03 Level 5
04 level 6
05 level 7
05 level 9
05 level 10
05 level 11
05 level 12
05 level 13
1 : 96
Walls : Basic Wall : wa11 0.24 : R3
Main Model

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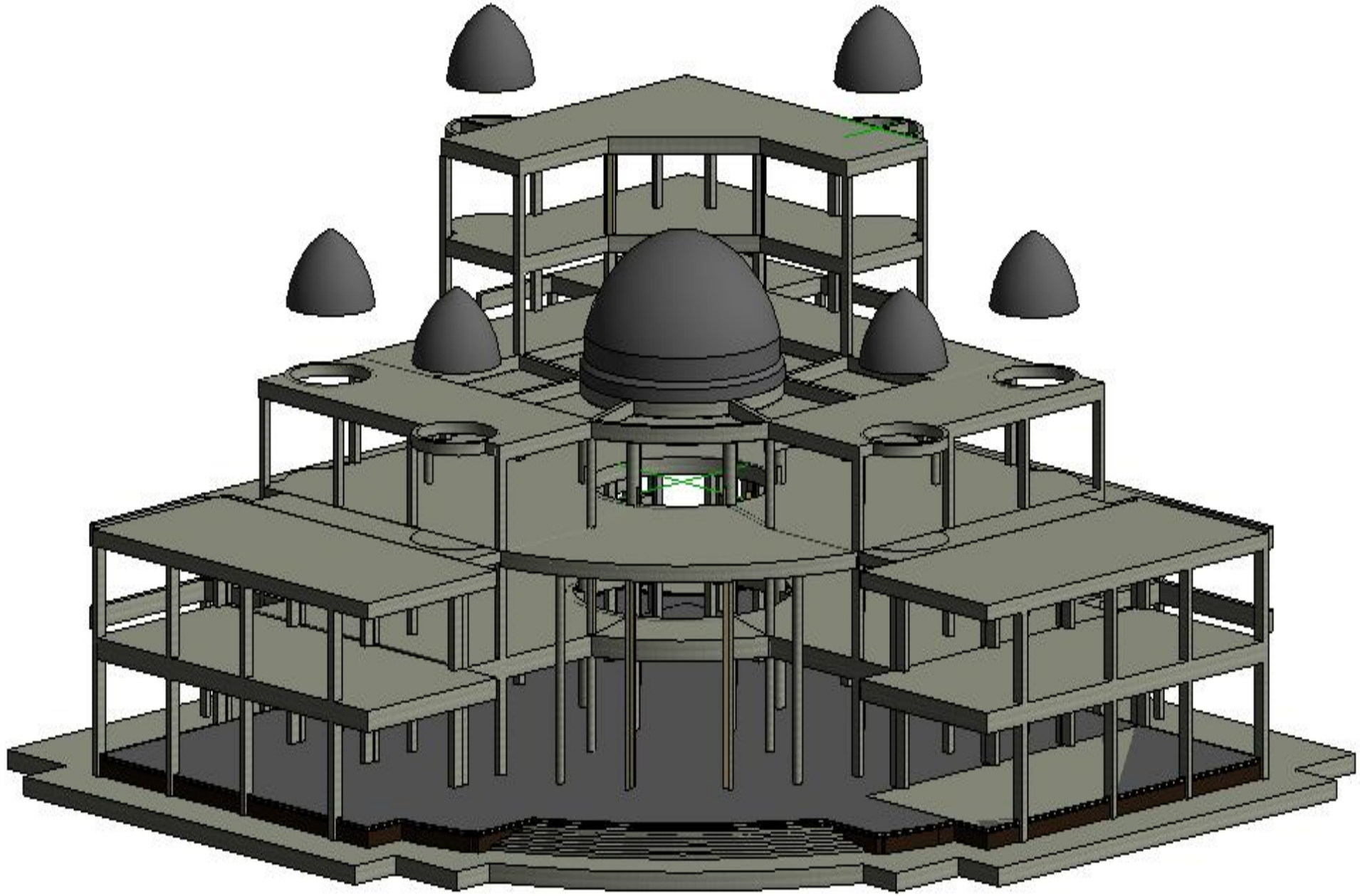
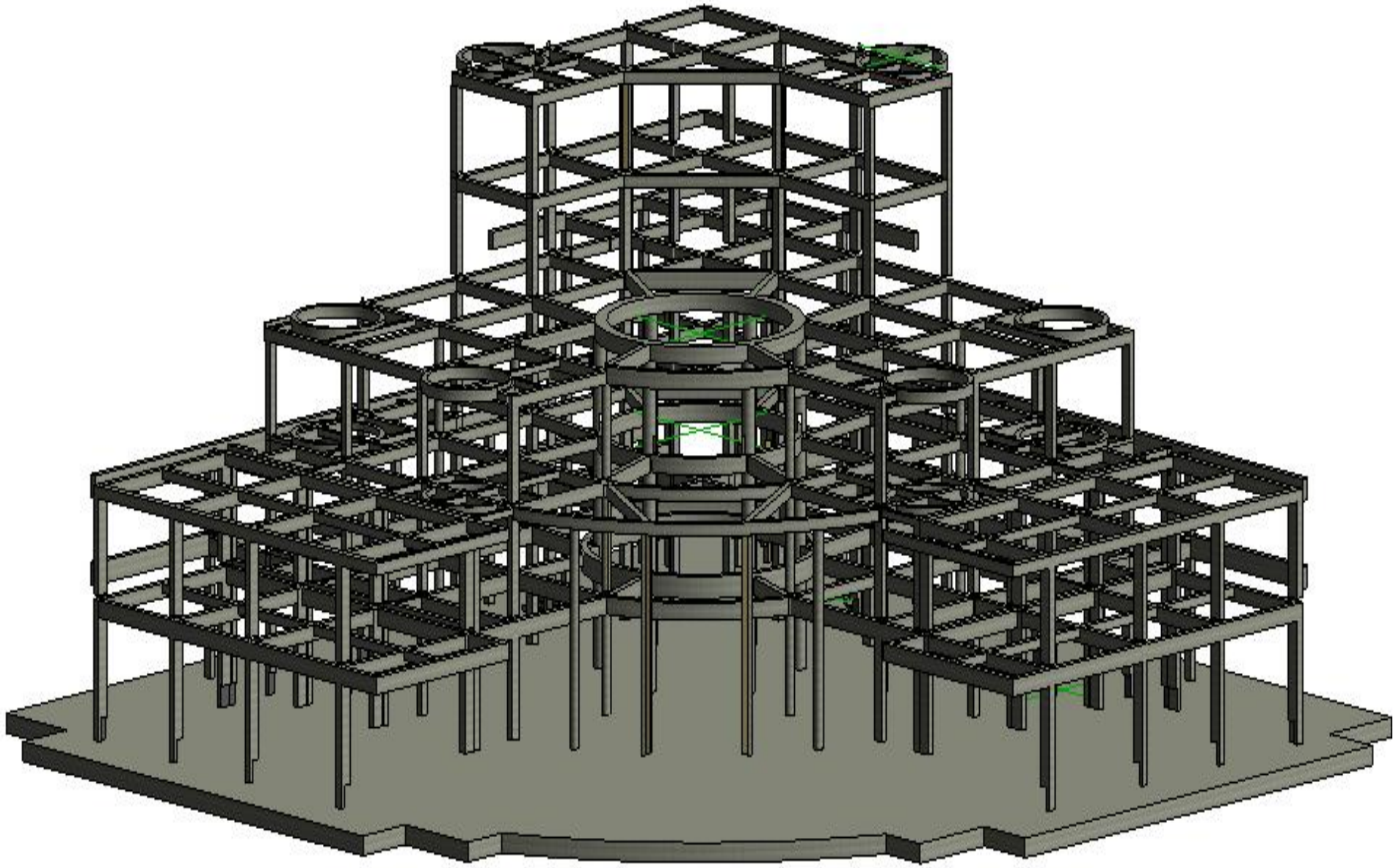
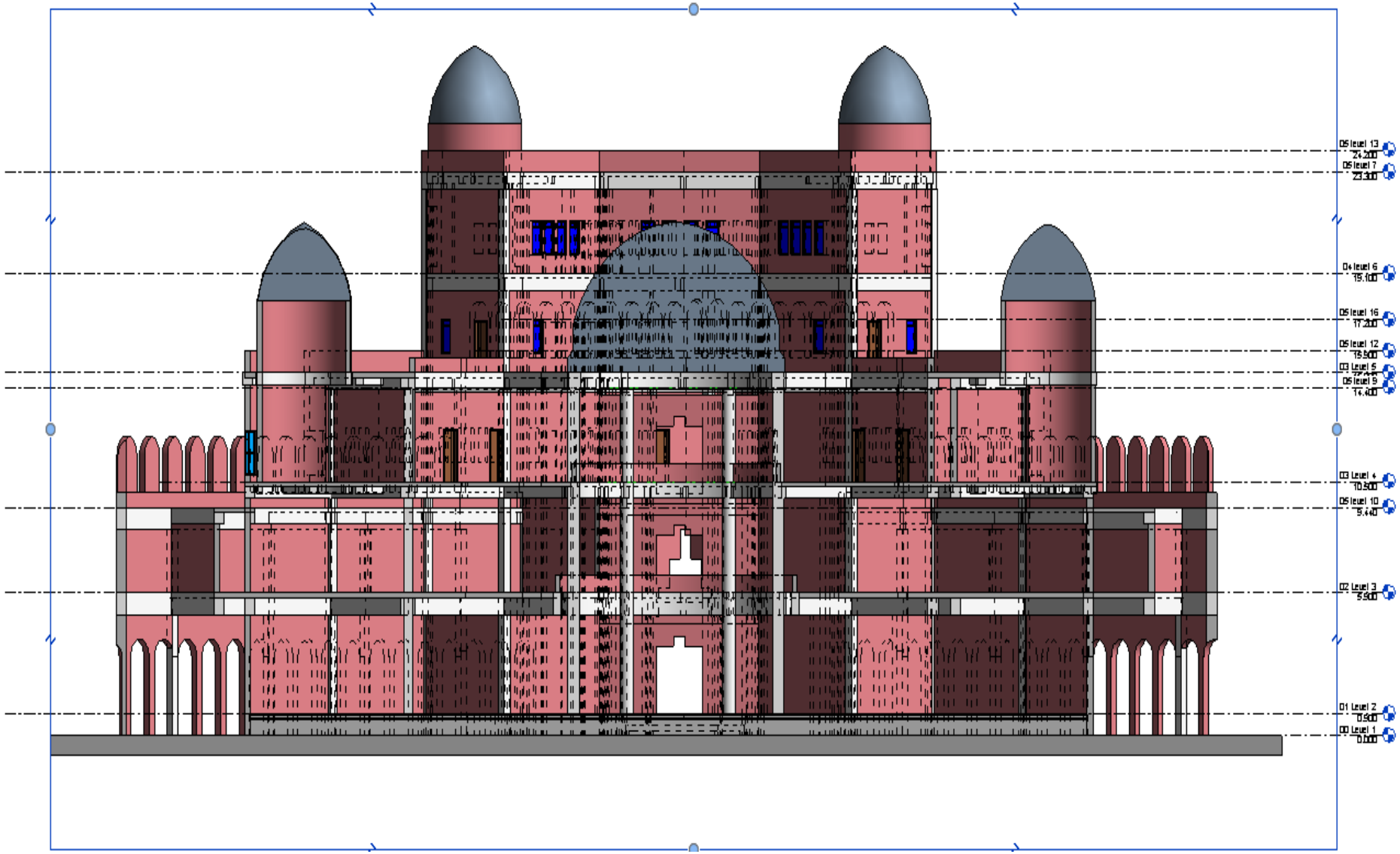
Common (1007)
Phasing
Phase Created
Phase Demolished
Properties help
Project Browser - مكتبة البداية
Views (all)
Structural Plans
00 Level 1
01 Level 2
02 Level 3
03 Level 4
03 Level 5
04 level 6
05 level 7
05 level 9
05 level 10
05 level 11
05 level 12
05 level 13
Filter
Category:
Count:
Doors 32
Floors 38
Generic Models 36
Lines (Lines) 16
Roofs 5
Stairs 4
Structural Columns 117
Structural Foundations 1
Structural Framing (Girder) 72
Structural Framing (Joist) 10
Structural Framing (Other) 260
Walls 305
Windows 111
Check All
Check None
Total Selected Items: 305
OK
Cancel
Apply
1 : 96
Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
:0
Main Model






06 level 13
24.200
06 level 7
23.300
04 level 6
19.100
06 level 16
17.200
06 level 12
15.500
03 Level 5
06 level 9
14.400
03 Level 4
10.500
06 level 10
9.440
02 Level 3
5.900
01 Level 2
0.500
00 Level 1
0.000


05 level 13
24.200
05 level 7
23.900
04 level 6
19.100
05 level 16
17.200
05 level 12
15.900
03 Level 5
05 level 9
14.400
03 Level 4
10.900
05 level 10
5.440
02 Level 3
5.900
01 Level 2
0.900
00 Level 1
0.000

Thank you for your attention