

Lecture- 5

Building Information Modeling (BIM) : an overview

by

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(Deemed to be University)

BIM – Definition

Building information modeling is an innovative approach to building design, construction, and management that is characterized by the continuous availability of highly accurate, consistent and reliable building information.

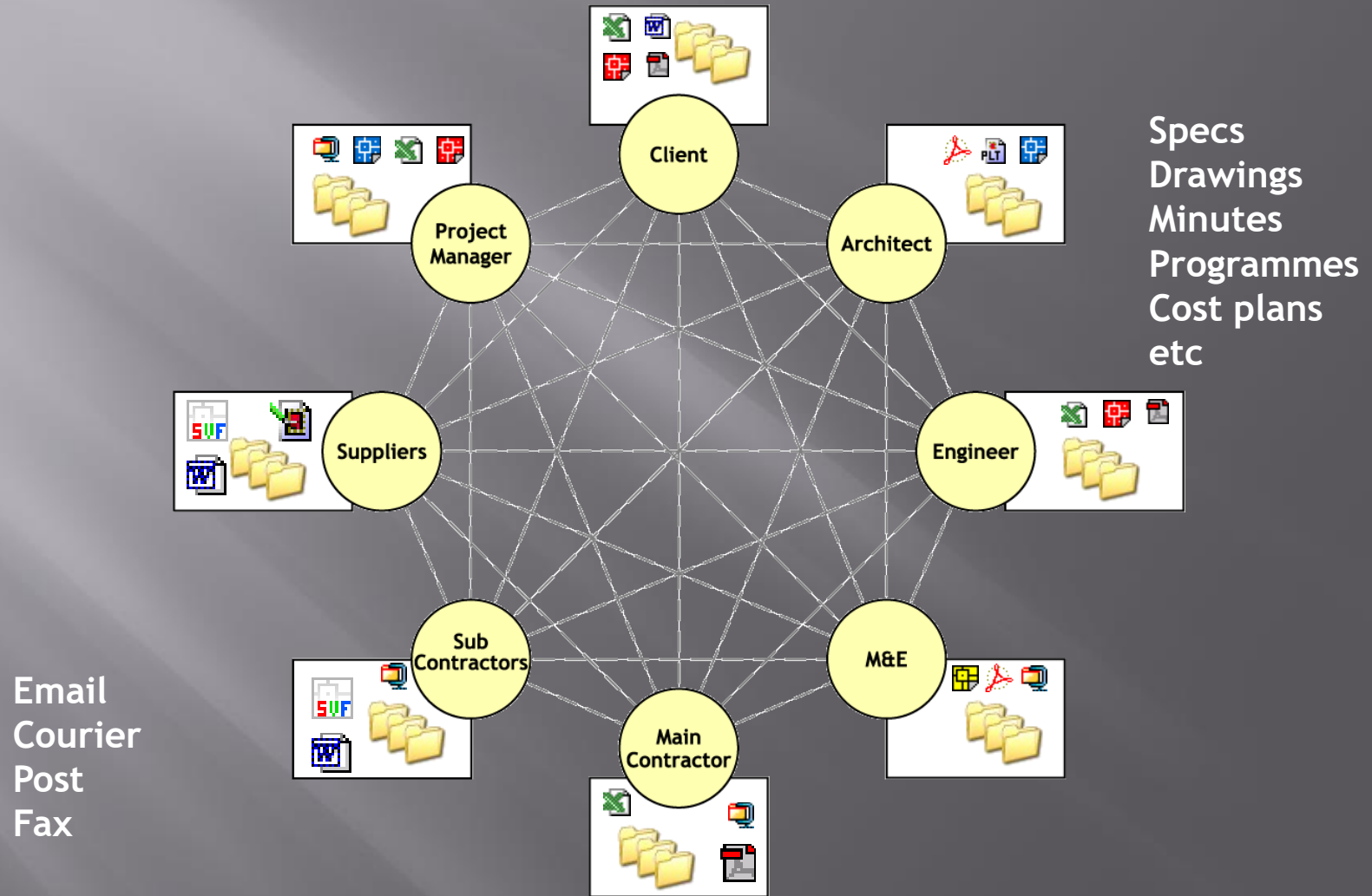
BIM allows the project team to visualize, simulate, and analyze a project before construction even begins using a three-dimensional model representing all of the physical and functional characteristics of a facility.

**BIM Seamlessly Bridging Communication
Throughout the Building Process**

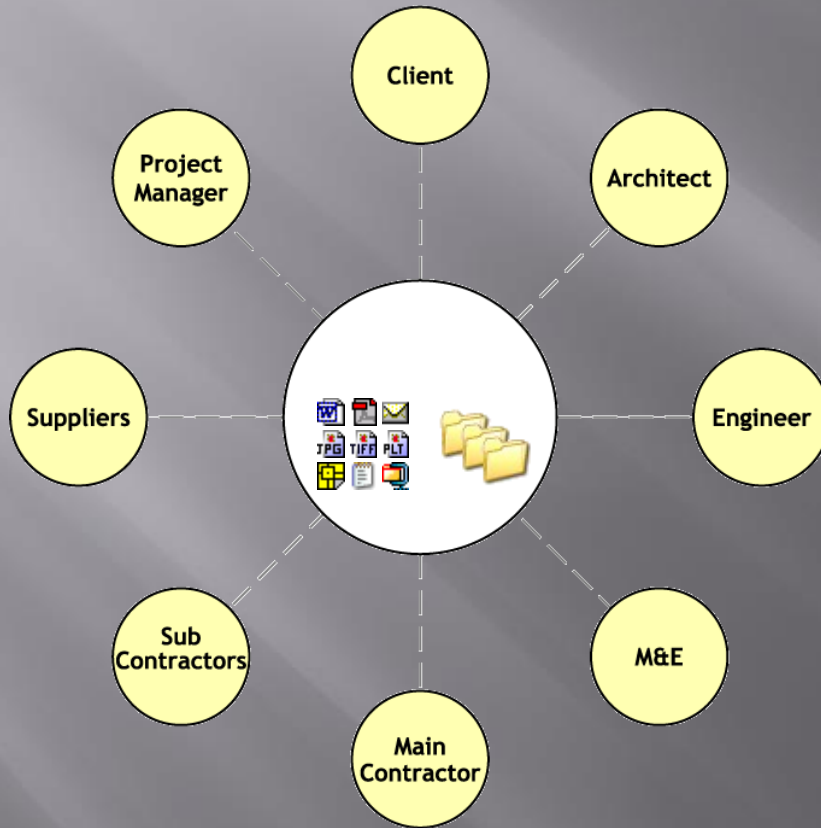
BIM – Definition

- The American Institute of Architects (AIA) defines BIM as “a model-based technology linked with a database of project information”
- Three-dimensional, virtual representation of a design project
- It adds 4th dimension of time and 5th dimension of cost to the 3D model
- “Cloud” allows different members of cross-functional team to work on the project
- It covers
 - Geometry
 - Spatial relationships
 - Geographic information
 - Quantities and
 - Properties of building components.

Traditional Collaboration in Construction(C. 1990s)



Online collaboration (c. **2000s**)

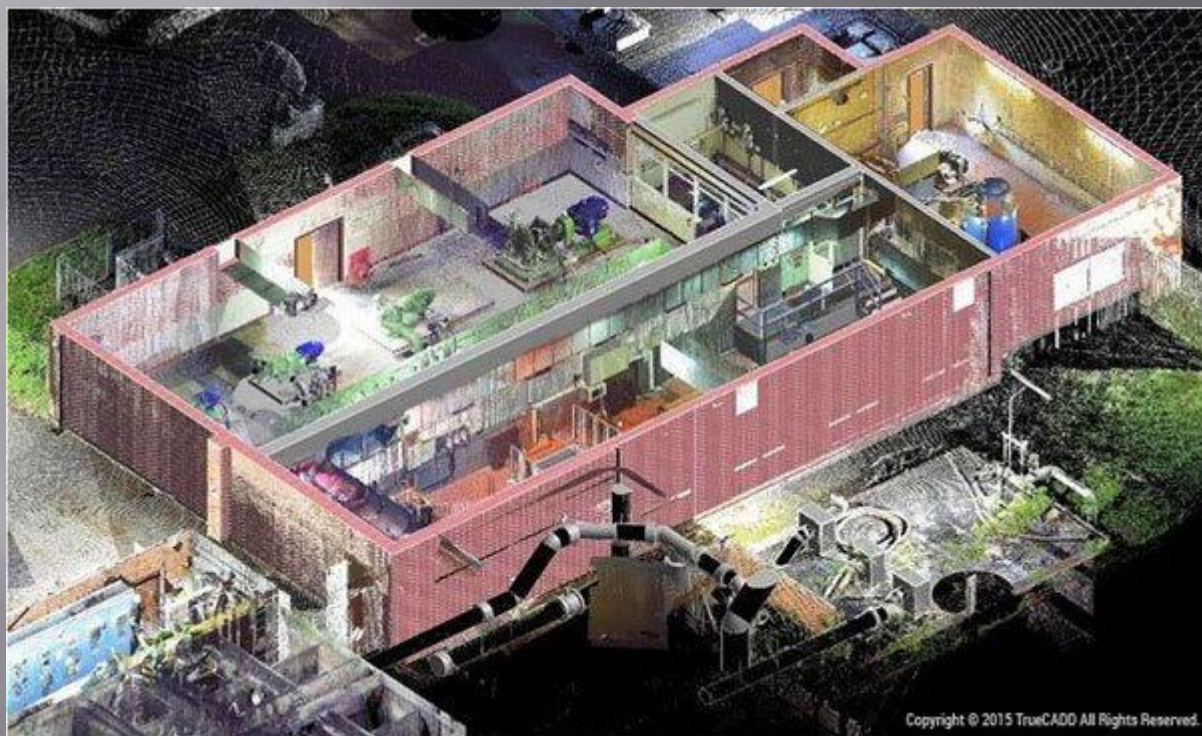


Online file management

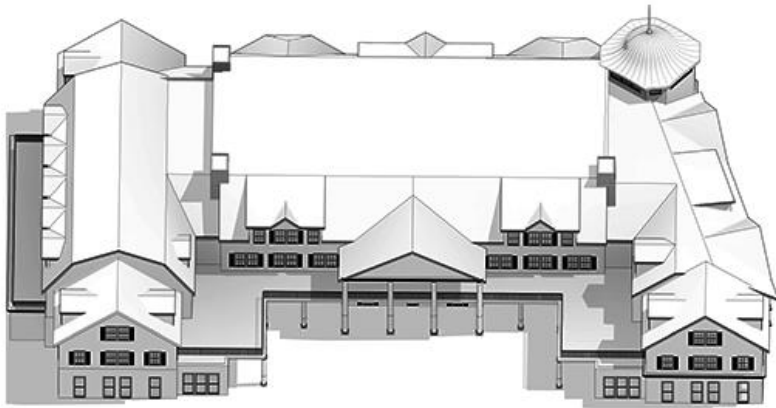
- Single central repository
- Fewer interoperability issues
- Less paper
- Latest information
- Complete project record
- Full information audit trail
- Greater re-use of information

But ...

- nearly all still 2D
- email often used instead



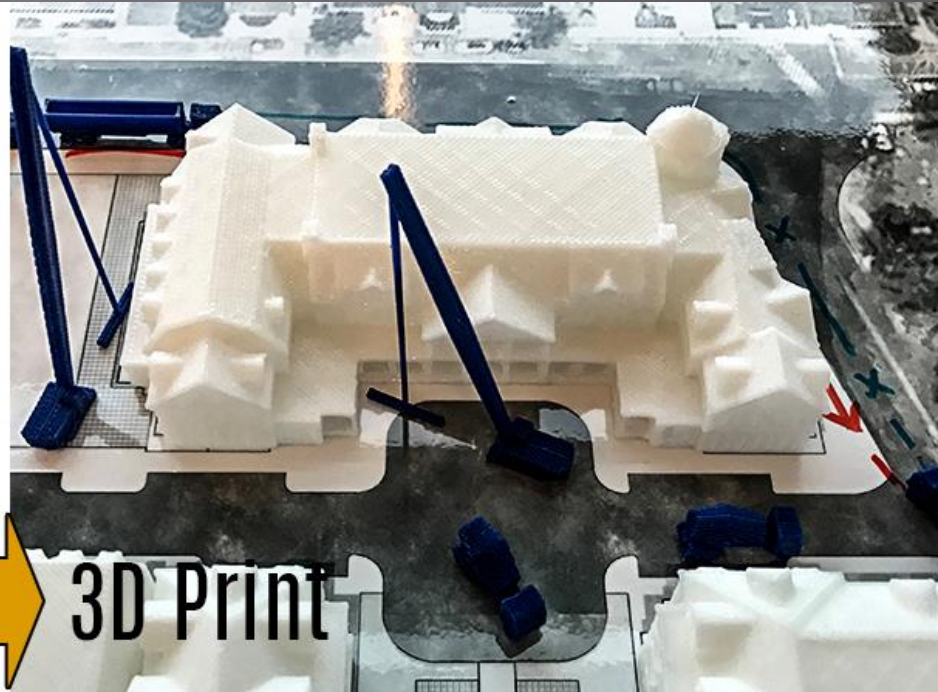
TheRevitKid.com!



Revit



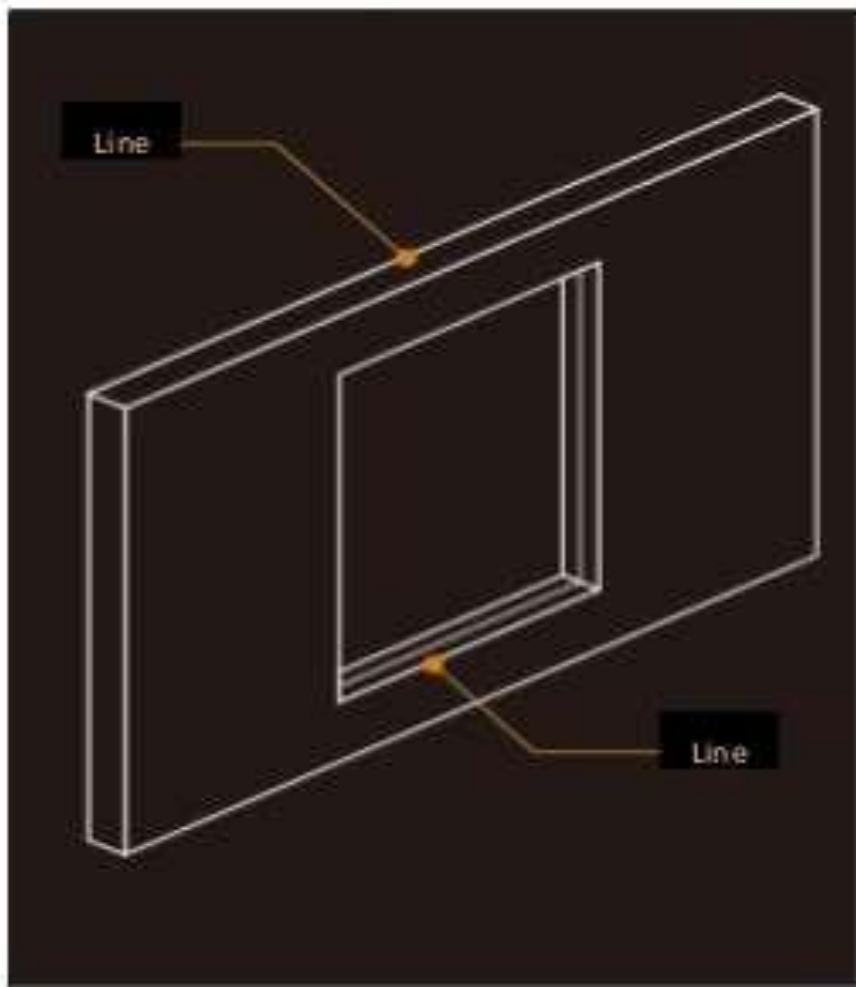
3D Print



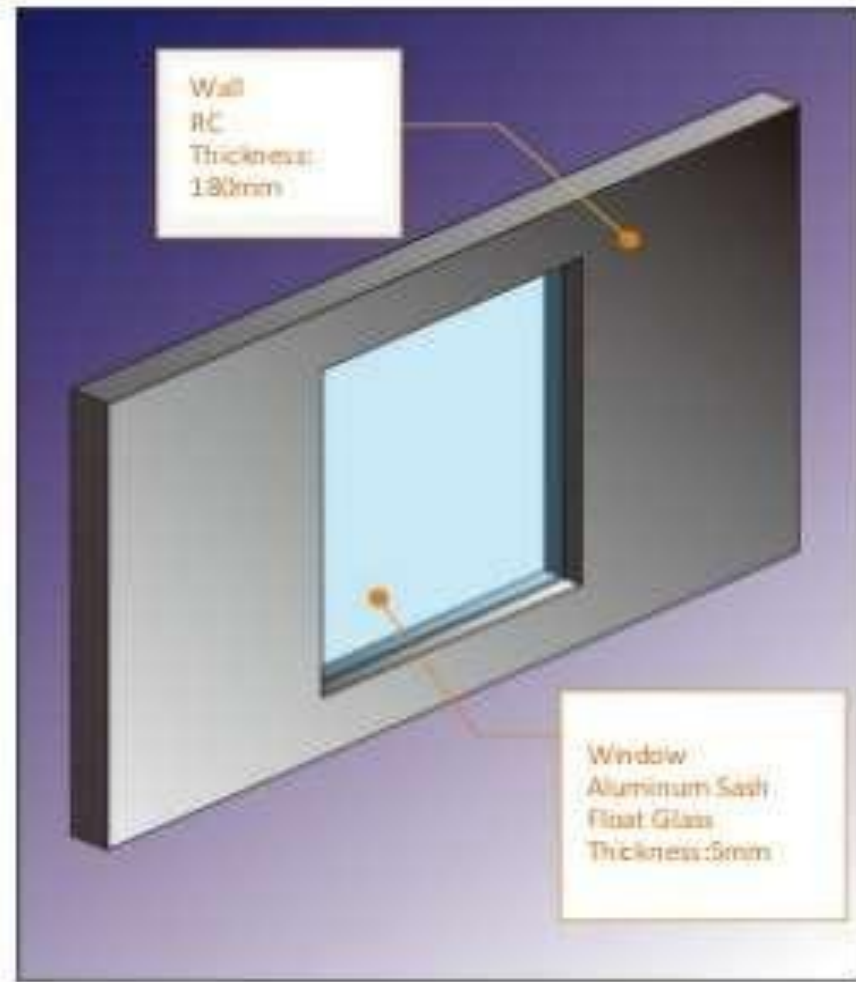
Some Key Terms:

- CAD
- 3D BIM
- 4D BIM
- 5D BIM

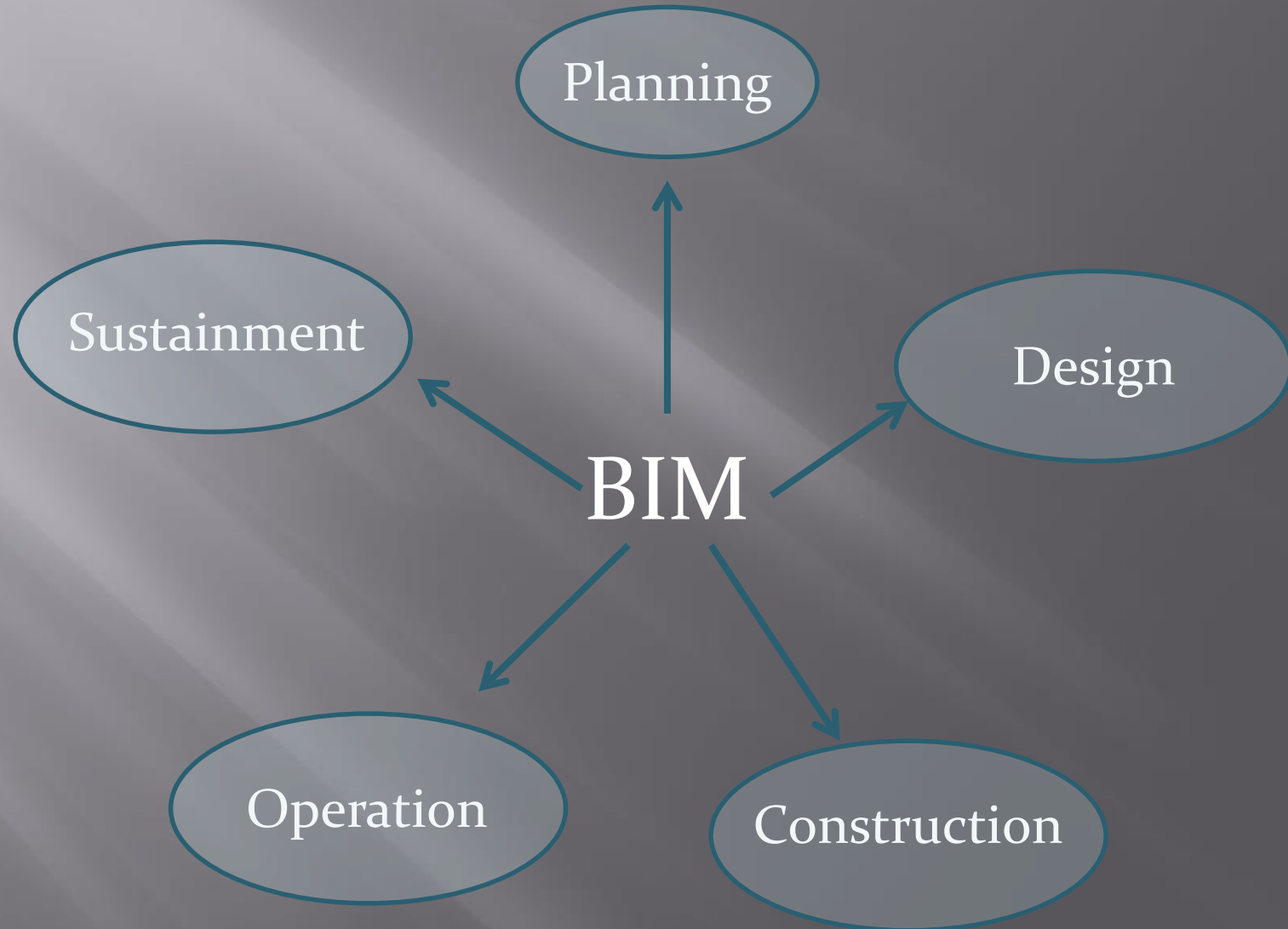
CAD



BIM



BIM used in various phases of a project



Advantages of using BIM

- Interoperability (the ability of computer systems or software to exchange and make use of information)
- Automation in construction
- Lower the risk
- Improved visualization
- Improved productivity and quality
- Increased coordination of construction documents
- Embedding and linking of vital information such as vendors for specific materials, location of details and quantities required for estimation and tendering
- Increased speed of delivery
- Reduced costs

USES OF BIM

Collaboration and Access

- Clash detection and coordination
- Conceptual design and feasibility evaluation
- Field management
- Time management
- Cost estimation

Simulation

- Mechanical simulation
- Air and fluid flow
- thermal comfort
- Energy analysis
- Structural analysis

Visualization

- Design
- Rendering

Illustration of Rendering

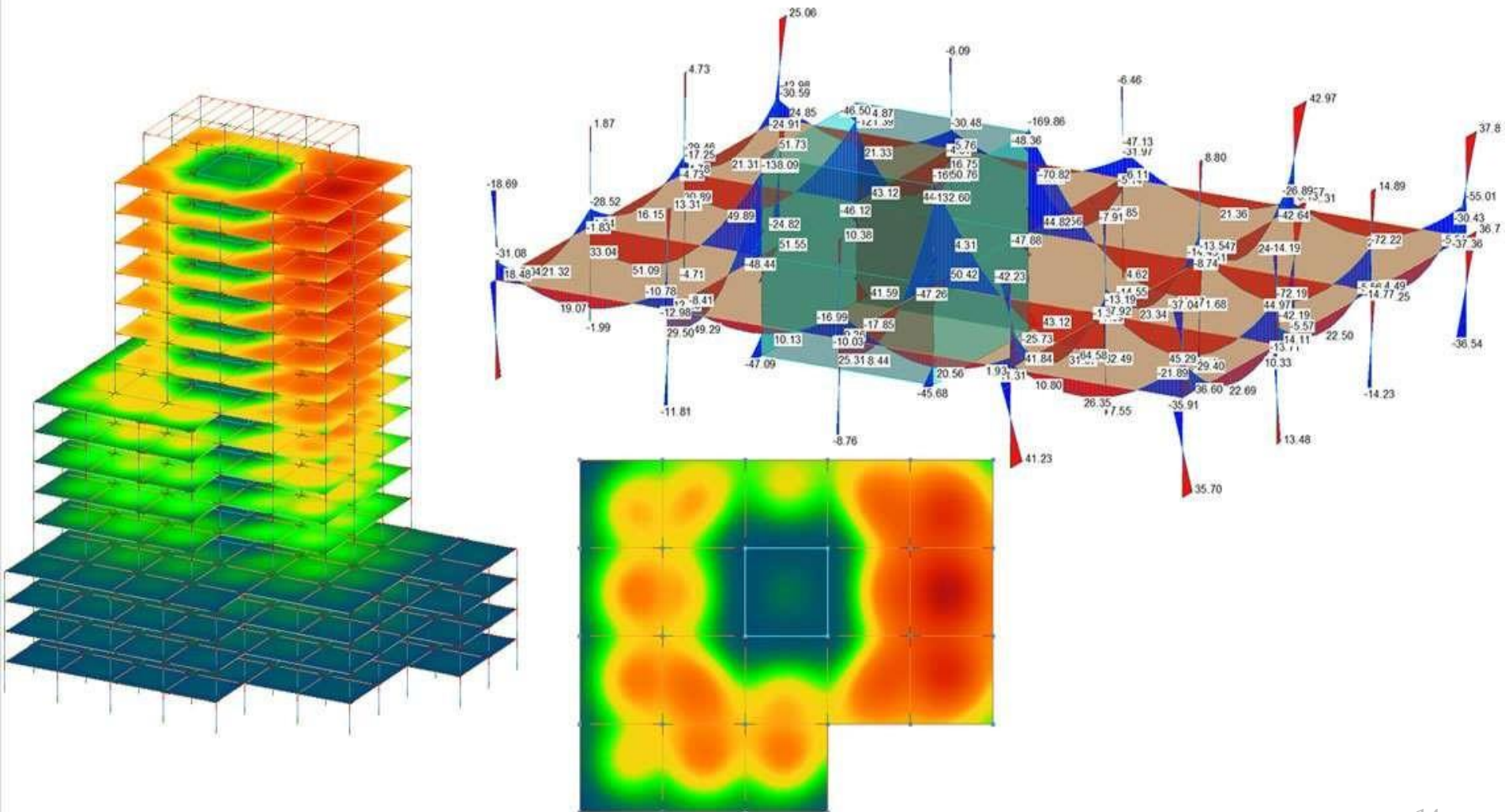
- Model Graphics Style



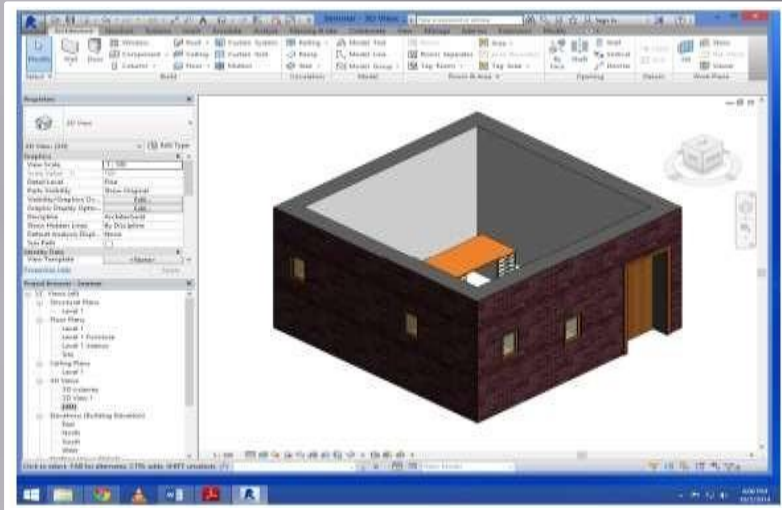
- Rendering



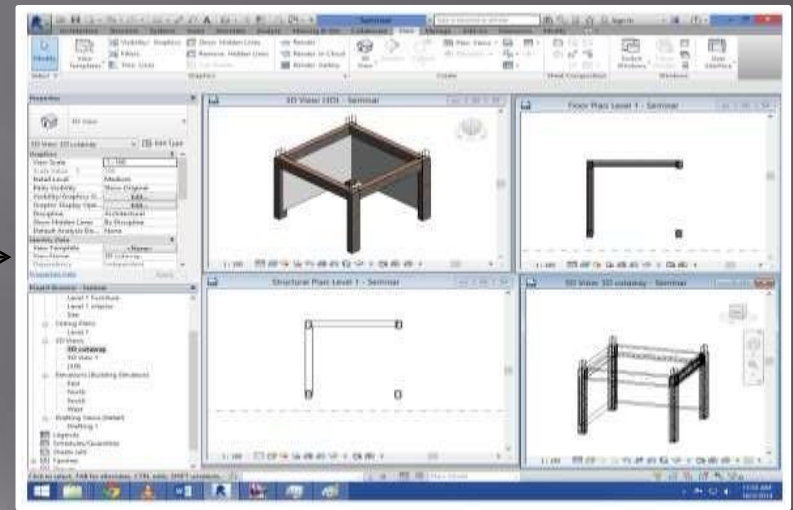
Structural analysis



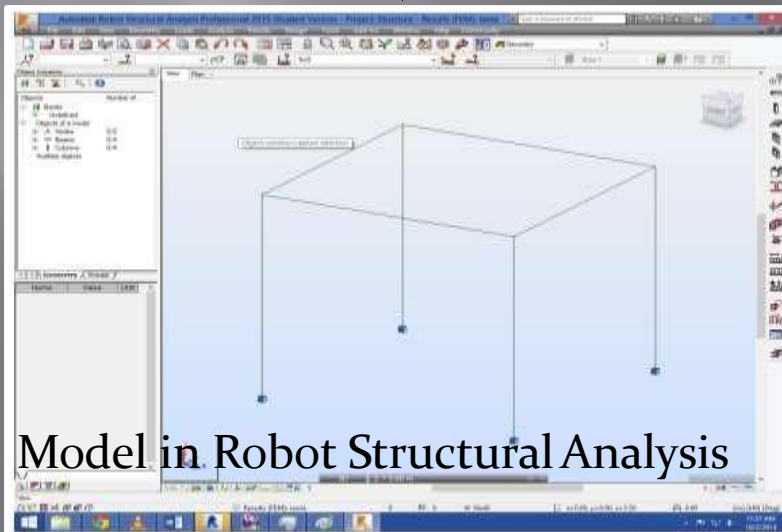
Application of BIM in Structural Engineering



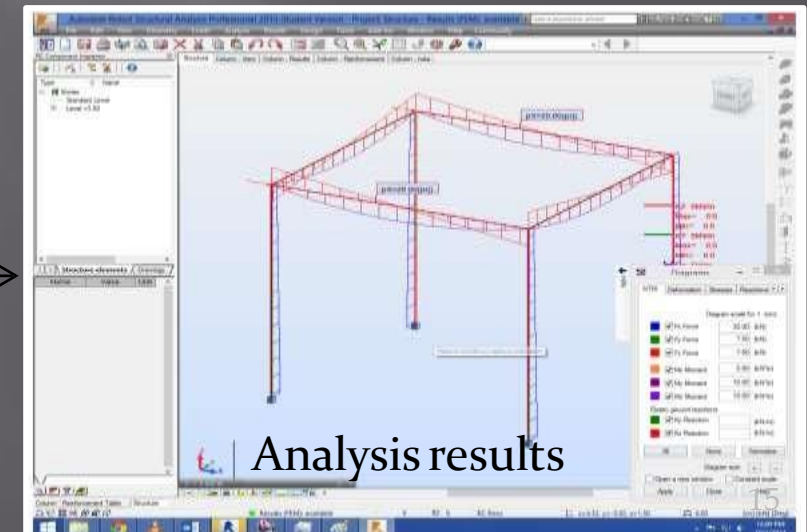
Model creation



Conversion for analysis

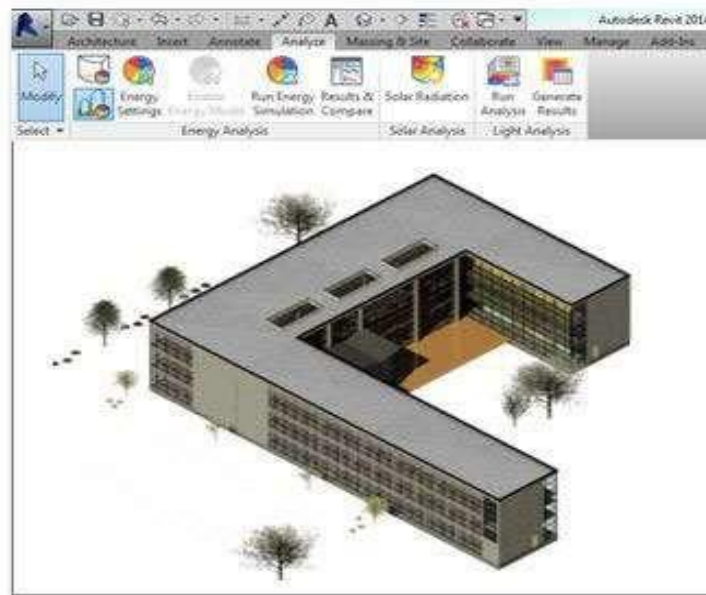


Model in Robot Structural Analysis

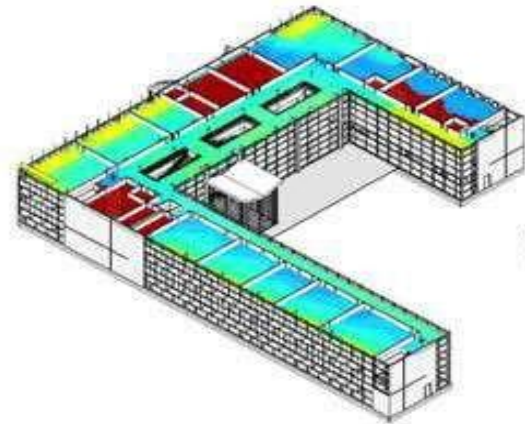


Analysis results

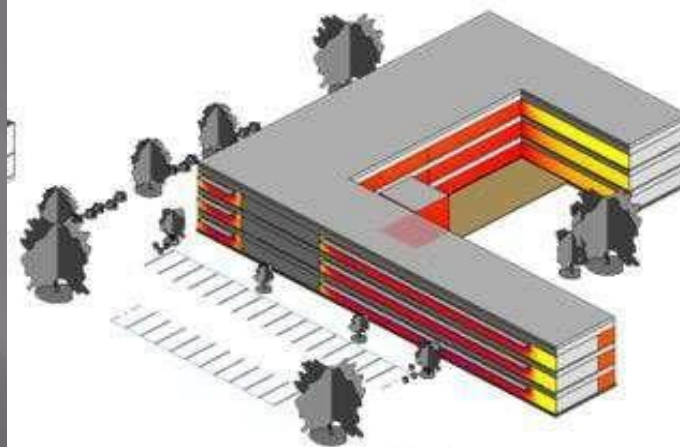
Simulation of light, solar and energy in model



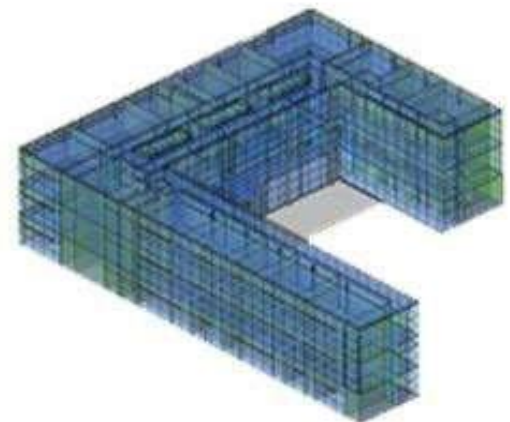
Architectural Model



Light



Solar



Energy

BIM in BPA

BIM

Building
Information
Modeling

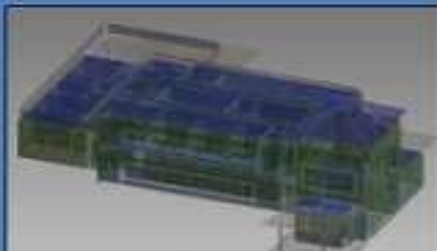


- Visualization
- Structural analysis
- Cost
- Documentation
- Fabrication/Construction
- Etc...

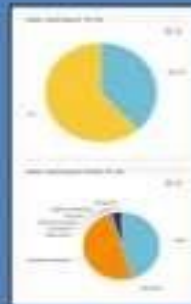
Building Performance Analysis (BPA)

Whole Building Energy Analysis

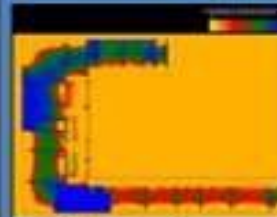
- Conceptual Models
- Detailed Models



Energy Analysis Model (EAM)



Other Performance Studies



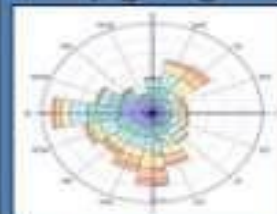
Lighting &
Daylighting



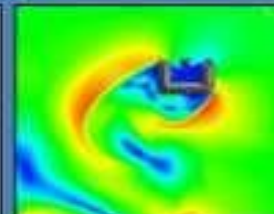
Sun &
Shadows



Solar
Radiation



Climate
Analysis



Airflow &
Ventilation



Lifecycle
Analysis

Scheduling and Estimation

Autodesk Revit 2015 - Project2_Jamal.rte

Architecture Structure Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify Modify Schedule/Quantities

Properties Walls Material: Na... Format Calculated Unit Insert Delete Resize Hide Unhide All Merge Insert Clear Group Ungroup Unmerge Image Cell Shading Borders Reset Font Align Horizontal Align Vertical Highlight in Model

Properties Parameters Columns Rows Titles & Headers Appearance Element

Modify Schedule/Quantities

Project Browser - Project2_Jamal.rte

- Views (all)
 - Floor Plans
 - Level 1
 - Level 2
 - Site
 - Ceiling Plans
 - Level 1
 - Level 2
 - 3D Views
 - (3D)
 - Elevations (Building Elevation)
 - East
 - North
 - South
 - West
 - Legends
 - Schedules/Quantities
 - Wall Material Takeoff**
 - Wall Material Takeoff
 - Sheets (all)
 - A101 - Unnamed
 - A102 - Unnamed
 - A103 - Unnamed
 - A104 - Unnamed
 - A105 - Unnamed
 - Families
 - Groups
 - Revit Links

Properties

Schedule: Wall Material Takeoff Edit Type

Identity Data

View Template: <None>

View Name: Wall Material Takeoff

Dependency: Independent

Phasing

Phase Filter: Show All

Phase: New Construction

Other

Fields: Edit...

Filter: Edit...

Sorting/Grouping: Edit...

Formatting: Edit...

Appearance: Edit...

Floor Plan: Level 1 - Project2_Jamal.rte

Schedule: Wall Material Takeoff - Project2_Jamal.rte

<Wall Material Takeoff>

Type	Count	Width	Material Width	Length	Area	Volume	Material Area	Material Volume	Material Unit Cost	Material Total Cost
Wall Exterior	1	0.33	0.10	5.17	16 m²	5.36 m³	16 m²	1.63 m³	10	163
Wall Exterior	1	0.33	0.10	4.17	12 m²	3.96 m³	12 m²	1.20 m³	10	120
Wall Exterior	1	0.33	0.10	5.17	13 m²	4.39 m³	13 m²	1.33 m³	10	133
Wall Exterior	1	0.33	0.10	4.17	11 m²	3.72 m³	11 m²	1.13 m³	10	113
Wall Exterior	1	0.33	0.10	2.27	6 m²	2.08 m³	6 m²	0.63 m³	10	63
Wall Exterior	1	0.33	0.10	0.80	3 m²	1.12 m³	3 m²	0.34 m³	10	34
Wall Exterior	1	0.33	0.10	2.34	7 m²	2.15 m³	7 m²	0.65 m³	10	65
7							69 m²	6.90 m³		528
Wall Exterior	1	0.33	0.10	5.17	16 m²	5.36 m³	16 m²	1.63 m³	10	163
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7							69 m²	6.90 m³		528
Partitions 10cm	1	0.12	0.10	2.57	7 m²	0.89 m³	7 m²	0.72 m³	5	36



2. Infrastructure



3. Manufacturing Plant



1. Construction



4. Oil and Gas



5. Utilities

Examples of BIM Software

- **Revit** by Autodesk
- **ArchiCAD** by Graphisoft
- **Microstation** by Bentley System
- **Tekla** by Trimble®

Conclusions

- BIM is an innovative way to virtually design and manage projects
- Predictability of building performance and operation is greatly improved
- BIM accelerates collaboration within project teams which will lead to
 - improved profitability
 - reduced costs
 - better time management and
 - improved customer–client relationships

Reference - Articles

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THANK YOU

