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Green building using Building Information Modeling (BIM)

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Abstract - In today's environmental condition, the available renewable resources is decreasing which brings us to green building. We intend to bring this using Building Information Modeling (BIM) with entire details of the building. Energy analysis of the building is satisfied. The importance of this building is that, it consumes less energy and the pollution as well, because the more we use non-renewable energy the higher the risk of pollution.

Key Words: Building Information Building, Green building, Revit.

1.INTRODUCTION

The construction growth intersects with environmental concerns and the rising cost of energy, the concept of sustainable design drafting, specifying, building, and operating structures to minimize their ecological impact green building solutions are gaining ground. Although green building remains an admirable goal, it is not always easy to achieve. Depending on building techniques and strategies selected, long-term gains and short-term costs all too frequently collide in a tight economy. Additionally, the sheer volume of documentation from two-dimensional paper drawings to spreadsheets of engineering data yields a primordial soup of information that needs a spark to brings sustainable design options to life.

The proposed taxonomy indicates that the nexus between BIM and green buildings needs to be understood based on three dimensions, namely project phases, green attributes and BIM attributes. Following the proposed taxonomy, this paper systematically illustrated 1) the applications of BIM in supporting the design, construction, operation, and retrofitting processes of green buildings; 2) the various functions of BIM for green building analyses such as energy, emissions, and ventilation analysis; 3) the applications of BIM in supporting green building assessments (GBA); and 4) research gaps and future research directions in this area. Through critical review and synthesis of BIM and green buildings based on evidence from both academic research and industrial practices, this paper provides important guidance for building researchers and practitioners to better align BIM development with green building development in the future.

1.1 Objective

1. To bring parametric 3D-model of the green building, we aim to construct.

2. Resource allocation and scheduling the amount of time taken for the construction of building.

3. Estimating the cost and monitoring quantity required for building to construct.

1.2 Need for study

1. BIM is the future of our industry, build the gap between old and new ways of practicing with increased software capabilities.

2. Structural quality of building is improved.

3. The importance of this building is that, it consumes less energy and the pollution as well, because the more we use non renewable energy the higher the risk of pollution.

1.3 Importance of Green building

The growth and development of our communities has a large impact on our natural environment. The manufacturing, design, construction and operation of the buildings in which we live and work are responsible for the consumption of many of our natural resources.

A sustainable green building can save our natural resources by reducing environmental impacts, lowering transportation costs, and decreasing water consumption. Not only do green buildings have environmental benefits, but they also have economic and social benefits. Green buildings create jobs, inspire growth and innovation in the local community, enhance occupant health and comfort, maintain a healthier indoor environment and air quality, minimize strain on public infrastructure and improve overall quality of life. Green buildings also have economic benefits. They reduce operating costs, improve occupant productivity, and enhance profits. Therefore, green buildings have the power to change our way of life and transform the future by being sustainable today.

1.4 ADVANTAGES OF GREEN BUILDING

Green buildings can reduce the pollution generated at a very high rate. At this rate the available natural resources

will become very less, to overcome this situation in the future, green building is the only solution.

2. BUILDING INFORMATION MODELING

BIM (Building Information Modeling) is an intelligent 3D model-based process that gives architecture, engineering, and construction (AEC) professionals the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure.

3. COMBINING BIM AND GREEN BUILDING

When this idea of green building hit us, we thought in the fast pacing world, within a small time limit, the project has to be completed. So we decided to imply BIM into this project and join hands with the technology.

One of our main aim was to make entire details of the building available for anyone working in the project. So one work cannot delay another and all works become independent.

4. LEED CERTIFICATION

Projects pursuing LEED certification earn points across several categories, including energy use and air quality. Based on the number of points achieved, a project then earns one of four LEED rating levels: Certified, Silver, Gold or Platinum.

4.2 Certification Level Points Required

Certification level	Points required
LEED certified	26 to 32
LEED Silver certified	33 to 38
LEED Gold certified	39 to 51
LEED Platinum certified	52 or more

5. PRINCIPLES OF GREEN BUILDING

Principle 1: Designers need to strive to ensure that all material and energy inputs and outputs are as inherently nonhazardous as possible.
Principle 2: It is better to prevent waste than to treat or clean up waste after it is formed.
Principle 3: Separation and purification operations should be designed to minimize energy consumption and materials use.
Principle 4: Products, processes, and systems should be designed to maximize mass, energy, space, and time efficiency.
Principle 5: Products, processes, and systems should be"output pulled" rather than "input pushed" through the use of energy and materials.
Principle 6: Embedded entropy and complexity must be viewed as an investment when making design choices on recycle, reuse, or beneficial disposition.
Principle 7: Targeted durability, not immortality, should be a design goal.
Principle 8: Design for unnecessary capacity or capability (e.g., "one size fits all") solutions should be considered a design flaw.
Principle 9: Material diversity in multicomponent products should be minimized to promote disassembly and value retention.
Principle 10: Design of products, processes, and systems must include integration and interconnectivity with available energy and materials flows.
Principle 11: Products, processes, and systems should be designed for performance in a commercial "afterlife".
Principle 12: Material and energy inputs should be renewable rather than depleting.

Fig -1: Front elevation of the green building

Fig-2: Side elevation of the building

Fig-3: First floor

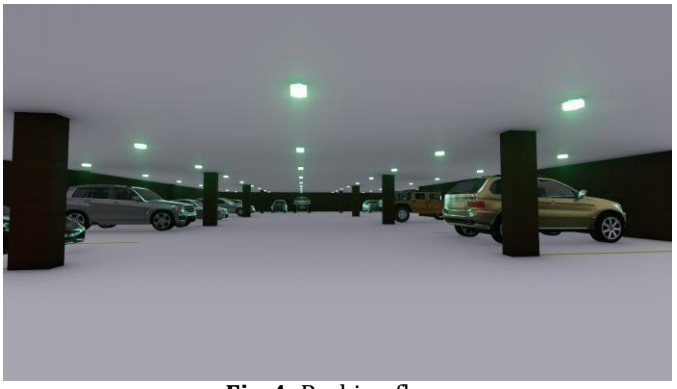

Fig-4: Parking floor

Fig-5: Ground floor

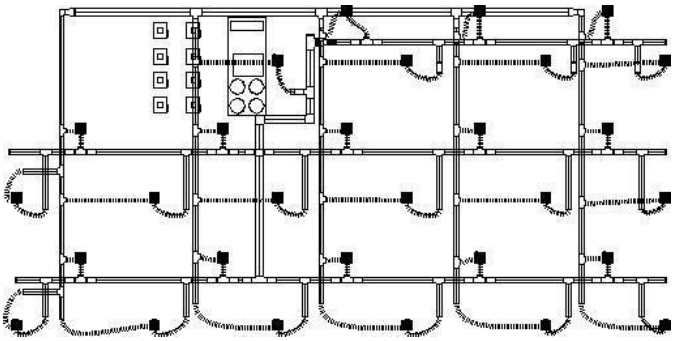

Fig-6: HVAC connections provided

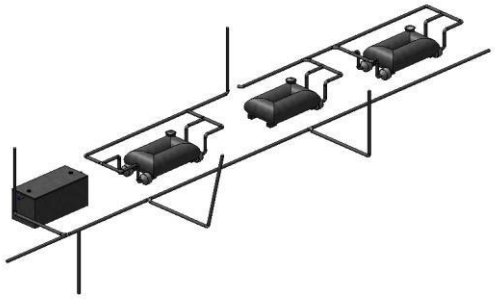

Fig-7: Grey water recycling and rain water harvesting plants (Underground)

6. DETAILING

VARIABLES	DESCRIPTION
External wall	Flyash bricks with air cavity of 9 inch, thermal layer 50 mm
Roof	Glasroc sheathing layer EPDM membrane layer
Ceiling	Gyproc sheathing layer
Floor	Vinyl flooring 2 mm thick

7. ABSTRACT COST ESTIMATE

S. No	ITEM	QUANTITY	UNITS	AMOUNT
1	Site clearance	972	m^2	Rs.2,965
2	Excavation	3207.6	m^3	Rs.1,,43,700
3	Foundation m15 concrete	18.5	m^3	Rs.64,007
4	Parking floor columns (m20 concrete)	8.1	m^3	Rs.90,005
5	Basic foundation wall (m15 concrete)	112	m^3	Rs.3,75,746
6	Parking floor finish (m15 concrete)	23	m^3	Rs.79,220
7	Parking floor slab, ground floor slab, first floor slab, second floor slab (m15 concrete)	145	m^3	Rs.23,70,692
8	RS joist for ground floor, first floor, second floor	69	no.s	Rs.6,60,960
9	ISMB 350 beams for ground floor, fiRSt floor, second floor	69	no.s	Rs.13,01,640
10	Rectangular hollow section 150x100x12.5mm	81	no.s	Rs.28,62,000
11	Exterior walls: flyash bricks	53682	no.s	Rs.3,32,292
	Cement mortar for exterior walls	138	m^3	Rs.1,66,229

	Cement plastering 1:6 for walls	16.6	m^3	Rs.18,674
12	Curtain walls	871.2	m^2	Rs.3,93,855
13	Parapet walls: flyash bricks	7086	no.s	Rs.43,862
	Cement mortar for exterior walls	18.22	m^3	Rs.1,01,563
	Cement plastering 1:6 for walls	3	m^3	Rs.5000
14	Vinyl floor finish 2mm thick	922.32	m^2	Rs.5,53,392
16	Roof layer1: glasroc sheathing layer	405	m^2	Rs.68,438
17	Roof layer2: epdm membrane	405	m^2	Rs.11,13,750
18	False ceiling gyproc sheathing layer	2916	m^2	Rs.4,92,750
19	Thermal layer 50mm rigid insulation for ground floor, first floor, second floor	867	m^2	Rs.4,33,359
20	Thermal layer 50mm rigid insulation for parking floor	404.12	m^2	Rs.2,02,060
21	Membrane layer 5mm vapour retarder first floor, second floor, third floor	867	m^2	Rs.38,148
22	Membrane layer 5mm vapour retarder parking floor	404.12	m^2	Rs.55,929
23	Paint	673	m^2	Rs.23,555
		Total cost		Rs.12,193,782

8. CONCLUSION

Satisfying all the conditions for a green building, we succeeded in bringing out the entire details of the green building. Combining the concept of the green building and BIM was successfully made. We have successfully achieved the following,

1.Optimizing building envelope by using high performance insulation, windows glazing, roof materials, walls and foundations, as appropriate to local climate.

2.The grey water recycling plant are installed to treatment of wastes and that treated water is used for landscaping purposes.

3.HVAC system is installed for good indoor air quality system.

4.Solar panels are installed for electricity purposes.

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