



ESTIMATION OF COST AND DEMOLITION COST OF SMITHA MEMORIAL CANCER, THODUPUZHA CENTER USING BIM TECHNOLOGY

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Abstract: The Construction industry has the quality of having each product unique and transient. With the current growth of technology other industries have changed and improved their process but the construction industry is still labour intensive and follows the same conventional process of creating drawings by architects or designers and building is erected by contractors. 2D CAD (Two Dimensional Computer Aided Drawing) possesses views like plan, section and elevation, in which modification in one particular view demands manual modification in all other views. This process is hectic and error prone. BIM represents each object as a building component like walls, beam and column. Building model gets automatically updated in each view with modification in any one of the views which saves time and is less error prone. BIM establishes a transparent information technique to all the stakeholders of each element of building from design to demolition

Index Terms - Energy analysis; demolition; cost estimation; demolition estimation

I. INTRODUCTION

The aim of this paper is to present an application of 6D building information modelling (6D BIM) on a real hospital. The building taken for the case study is Dr Advani's Smita Memorial Cancer Hospital & Research Center which is currently constructing a 350 Bedded, 3 lac sq ft of Multispecialty Hospital in Kerala which is due to launch in November 2021. The Hospital has been designed and constructed after a thorough market study of some of the best hospitals in India and Abroad. The location of the Hospital is Thodupuzha which is one of the most developing places in Kerala. The paper is intended to serve as a guide to the building owners to prepare 6D BIM and to provide an insight into the various dynamic solutions.

II. METHODOLOGY

To find the volume of beam/column/wall/slab open the Revit file of the building which has been drawn. Click on the view option and select schedule/quantities from the schedule option. Select the category of which the volume is to be found out. In the field option of the schedule properties add base level, volume, family, and cost fields, and also tick the included elements from the link. Then click on sorting grouping option and in sort by option select the volume option from the drop down menu. Tick the boxes of header and footer and also the grand total. In the drop down menu of grand total select counts and totals then click ok. Then from the property tab select the edit option of formatting, select the volume option and from the drop down menu select calculate totals and click on ok. Now the total volume of preferred objects will be shown.

To calculate the cost the fields option of the schedule property click on f and apply the cost per unit in this as an equation format. Now the cost of the construction of the preferred object will also be displayed.

III. CALCULATION

A. Cost of construction of beam

From revit 2020 total volume of the beam is known as 2703.29 meter cube.

The standard rate for construction of 1 meter cube of beam is 21000 Indian Rupees Adding the obtained standard rate to revit we get the total cost of construction of beam as 5, 67, 69,090 Indian rupees

B. Cost of construction of structural columns

From revit 2020 the total volume of structural columns is known as 3569.63 meter cube. The standard rate for construction of a 1 meter cube of column is 21000 Indian rupees. Adding the obtained standard rate to revit we get the total cost of construction of Structural Columns as 7, 49, 62,230 Indian rupees)

C. Cost construction of walls.

From revit 2020 the total volume of walls is known as 3792.68 meter cube. The standard rate for construction of a 1 meter cube of wall is 7000 Indian rupees. Adding the obtained standard rate to revit we get the total cost of construction of the wall as 2, 65, 48,760 Indian rupees.

D. Cost of construction of slab

From revit 2020 total volume of the slab is known as 2983.55 meter cube.

Thickness of slab is 12cm

Cost of ready mix concrete per meter cube is 5500 Indian rupees. So for RMC of 2983.55 meter cube cost will be equal to 1,64,09,525 Indian Rupees

The steel cost is 40,000 Indian rupees per ton. The minimum steel required is 75kg per meter cube of concrete. Volume of steel required is equal to 2, 23,776 kg

So for that much of steel it would cost 89, 50,650 Indian rupees.

Shuttering rate is Rs 55 per square feet.

Shuttering cost for 267622.13 square feet is 1, 47, 19,217 Indian rupees.

Total cost for construction of slab is $1,47,19,217 + 1,64,09,525 + 89,50,650 = 4,00,79,392$ Indian Rupees

Total cost of building = Cost of beam + Cost of Structural column + Cost of wall + Cost of slab

= 19, 83, 59,472 Indian Rupees

IV. DEMOLITION COST ESTIMATION

Demolition is the process of collapsing or destroying large structures. It's mainly done after the useful life period of the building since it will be dangerous to its occupants and therefore the buildings around it. The most important sources for solid wastes are demolition sites. Nowadays governments are encouraging demolition so as to guard the environment. Considering the large quantity of solid waste occurred during the demolition process it's used for land filling. Demolition is the process of collapsing or destroying large structures. It's mainly done after the useful life period of the building since it will be dangerous to its occupants and therefore the buildings around it. The most important sources for solid wastes are demolition sites. Nowadays governments are encouraging demolition so as to guard the environment. Considering the large quantity of solid waste occurred during the demolition process it's used for land filling.

V. PRE-DEMOLITION PROCESS

The processes before the start of demolition are as follows

A. Surveying of site

Building surveying and structural surveying are the two methods of surveys mainly conducted. These surveys are done to know the various parameters of structure and its surroundings.

B. Removal of hazardous materials

C. Preparation of plan for demolition

It includes the subsequent steps:

- The location of the building to be demolished.
- The topography of the site with its contours, sections and ground levels.
- Details of backfilling.

D. Stability reports

A stability report should include the following:

- A report on the soundness of the building to be demolished.
- A report on stability of neighboring structures

VI. METHODS OF DEMOLITION

The common methods for demolition are as follows:

A. Demolition by Top Down –Manual Method

1. Demolition of cantilever structures:
 - i. The outside walls are demolished first.
 - ii. The structures supported by the cantilever system are removed before the demolition of cantilever beams and slabs.
2. Demolition of slab
The reinforcement is brought to an end after the concrete is removed.

B. Demolition of building by Top Down-Mechanical Method

This method is comparable as that of the manual method the sole difference is that it uses machines for demolition. The mechanical plant is lifted to the highest floor of the building. The concrete is broken away before the cutting of reinforcement.

C. Wrecking ball

Demolition using a wrecking ball is one of the most commonly used methods. It consists of a crane equipped with a steel ball. The wrecking ball weighing up to 6000 kg is either dropped or swung into the building. This process is repeated until the structure is demolished. Only a talented crane operator must perform wrecking ball demolition since it's complicated and will damage the crane.

D. Demolition by implosion

Implosion is the process of demolition of buildings using explosives in order that the structure collapses in an exceedingly matter of seconds. The steps involved within the implosion process are:

1. Management safety plan
It includes the subsequent steps
 - i. Government approvals
 - ii. Blueprints and architectural study
 - iii. Explosive to be used is set
 - iv. Fall control
 - v. Engaging the local people

2. Site preparation

The people from the environment are evacuated on the day of implosion, the roads are blocked.

3. Choosing the suitable explosive

The most commonly used explosive is dynamite. Tiny bore holes are drilled within the columns of the building and explosives are placed carefully. The explosives are placed at crucial points in order to make the collapse of the building quicker and safer.

4. Timing the explosives

The explosives are timed accurately in order that the building falls down into small pieces without disturbing the environment

5. Detonation

The detonation process is typically done from a secure distance having proper visibility. When activated an electrical charge is shipped to the explosives and therefore the explosion occurs.

V. COST FOR DEMOLITION

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According to DAR (Department analysis of rate Delhi) volume 2 2019,

Cost of demolition of 1 cum of R.C.C = 2535 INR

Cost of demolition of 1 cum of wall = 503 INR

Total Cost of demolition of R.C.C in the hospital building= 2, 34, 62,475 INR

Total cost of demolition of wall in hospital building =19, 07, 718 INR

Total cost for demolition of hospital building = 2, 53, 70,193

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