ESTIMATION AND COSTING OF A BUILDING

A

PROJECT REPORT

submitted in partial fulfilment for the requirement of the Degree of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision

Of

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TO

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

WAKNAGHAT, SOLAN-173234

HIMACHAL PRADESH, INDIA

MAY 2022

STUDENT'S DECLARATION

I hereby declare that the work presented in the Project report entitled **"Estimation and costing of a building"** submitted for partial fulfilment of the requirements for the degree of Bachelor of Technology in Civil Engineering at **Jaypee University of Information Technology, Waknaghat** is an authentic record of my work carried out under the supervision of **Dr. Arnav Anuj Kasar.** This work has not been submitted elsewhere for the reward of any other degree/diploma. We are fully responsible for the contents of my project report.

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CERTIFICATE

This is to certify that the work which is being presented in the project report titled **"Estimation and costing of a building** "in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering submitted to the Department of Civil Engineering, **Jaypee University of Information Technology, Waknaghat** is an authentic record of work carried out by **Shubham(181605) & Varun Kapil(181606)** during a period fromJanaury,2022 to May, 2022 under the supervision of **Dr. Arnav Anuj Kasar** Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat.

The above statement made is correct to the best of our knowledge.

Date: …………………

Signature of Supervisor	Signature of HOD
Dr. Arnav Anuj Kasar	Dr. Ashish Rohila
Assistant Professor	Professor and Head of
Department of Civil Engineering	Department of Civil Engineering
JUIT, Waknaghat	JUIT, Waknaghat

ACKNOWLEDGEMENT

The completion and success of this project requires a lot of guidance and assistance from many people. We are extremely thankful to have got this all along the final completion of our project. Everything we have done only due to such supervision and continuous assistance.

We are indebted to our project guide **Dr. Arnav Anuj Kasar**, Assistant Professor, Department of Civil Engineering, Jaypee University of Information Technology. We are extremely thankful to the sir for his continuous support and his guidance for the completion of the project.

Thank you

Shubham

Varun Kapil

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INTRODUCTION

Knowing the predicted construction cost, also known as the estimated cost, is essential for any engineering projects. The process of determining the different amounts of work and estimated expenditures connected with a certain task or project is known as estimation. The work is finished in part or the requirements are revised if the available funds are less than the projected cost. Estimation is a method of estimating how long a task will take to complete. The estimate is required to request tenders and quotes, as well as to establish a contract. The estimate is also required for cost control during the job's completion.

An estimate indicates if the proposed method is feasible given the cash and budget constraints. It is a method of calculating the amounts of different types of the work and expected costs associated with them.

The estimated cost of a task, as well as whether or not a budget is available, is a close approximation of the real cost. The overall estimated project cost is the sum of these anticipated cost of the project. A task's expected cost is a near approximation of the actual cost.

Fundamental goal of an estimate is to provide information about the project's likely cost before it is completed. If the estimate is thoroughly and precisely created, the gap between the estimated and real cost will be minimal. Estimation necessitates a solid understanding of building techniques and material costs. It is not the same as calculating the precise cost when the job is completed.

If there are no unexpected or unanticipated conditions, the real cost of the of the planned job should not be used after completion deviate by more than 5% to 10% of a total cost estimate for a good estimate. In addition to expertise, experience, insight, and sound judgement, labour is required. A cost estimate for a construction project. project is the estimated cost of the project based on plans and specifications.

Before beginning any estimate for a building, road, or bridge, make sure the designs are completely dimensioned. Check the inner and outside dimensions before beginning the estimate to avoid issues later. To avoid omission of any component, the estimate should be broken down into sub-heads. To minimise future claims from contractors, the nomenclature of each item should follow the approved rate schedule. All things should be computed in the units that the payment will be made in (chapter on, units) Attached should be a full report organised by subheads. This should be self-explanatory and provide all necessary details. Every thorough estimate should include detailed drawings with a north line on the design. Every item should have detailed specifications attached so that the job may be completed correctly, and the specifications should be based on the most recent version of the P.W.D. requirements.

Provision for power and water supplies should be incorporated in order to make the estimate thorough.

An abstract of cost including the cost of each sub-head and the overall cost should be supplied at the conclusion of the estimate. In the end of the cost abstract, a provision for contingencies and petty establishment of 5% should be inserted.

The fee per square metre should be calculated and included in the building estimate's abstract at the conclusion. This is useful for future reference.

In the event of a road estimate, a rate per kilometre should also be calculated.

The road estimate should include the unique characteristics of the chosen alignment, as well as whether the soling is made of bricks or stone, in the estimate report.

In the case of bridges and culverts, the rate per metre (width) must be calculated.

Different elements of cost estimation in project management: -

Direct costs:

A direct cost is a price that is involved in the production of goods or services. Direct materials, direct labour, and direct equipment are three of the most common direct expenditures. In some circumstances, an indirect cost can be classified as a direct cost. The pay of a manager in charge of many concrete batch plants, for example, would be regarded an indirect cost for each batch plant. The pay of that manager, on the other hand, would be a direct expense for the department that includes all of those concrete batch facilities.

Indirect costs:

Indirect costs that affect the whole organisation involve devaluation, general supplies, and overhead expenditures. These are not only spent on one thing. Overhead, ongoing costs, project management costs, and operational costs are all examples of indirect charges. Indirect costs are usually recurring. However, they may be altered.

Indirect expenditures can be either fixed or variable. Indirect costs include things like administration, personnel, and security. These are non-manufacturing expenditures. Some indirect costs might be classified as overhead. Certain overhead expenses, on the other hand, are direct expenditures that may be linked to a specific project.

1.1 TYPES OF ESTIMATES

1.1.1 Preliminary cost estimate.

1.1.2 Plinth area cost estimate.

1.1.3 Cube rate cost estimate.

1.1.4 Approximate quantity method cost estimate.

1.1.5 Detailed cost estimate.

1.1.6 Revised cost estimate.

1.1.7 Supplementary cost estimate.

1.1.8 Annual repair cost estimate.

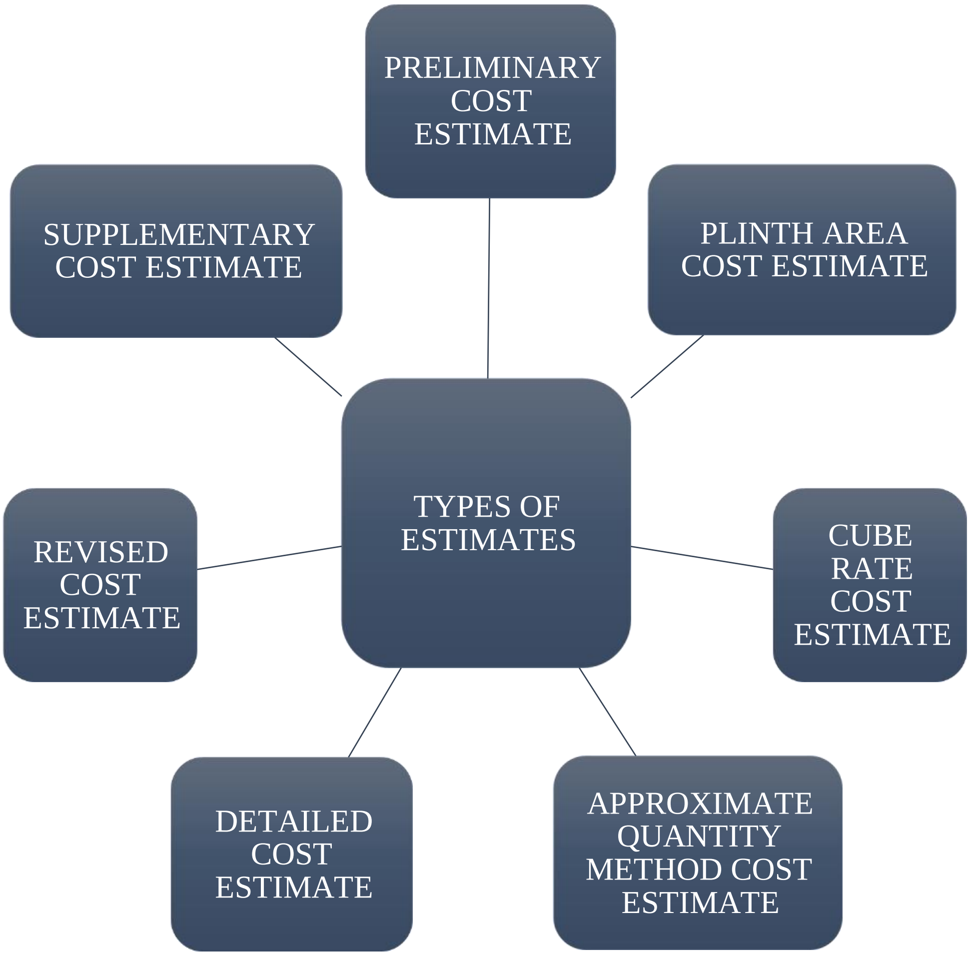


Figure 1.1-Types of estimates

1.1.1Preliminary cost estimate:

It is also known as an abstract cost estimate, an approximate cost estimate, or a budget estimate. This estimate is often generated in early phases of a project to establish the estimated cost. The appropriate sanctioning authority can use this assessment to determine the financial situation and policy for the administrative department.

It is a cost estimate made at the conceptual stage of a project. When project designs and budgets are finalised, a preliminary estimate is prepared. There are no specs. It calculates a building's total budgeted price project. In addition to new construction, it can be readied for destruction and repair construction.

1.1.1 Plinth area cost estimate.

The plinth area rate of a building, which is the cost of a similar structure with the same specifications in the same location, is used to compute a plinth area cost estimate.

This estimate should only be used as a guideline. It is used to calculate the plinth area of a building, which is then multiplied by the plinth area rate to get a building estimate. (Plinth area rate per sq. m x building plinth area) It allows you to receive the correct building cost without having to calculate the specifics.

Plinth area is calculated by multiplying the building's plinth area by the plinth area rate. If we need a plinth area estimate of 100 m^2 certain location and the plinth area rate of a nearby building is 2000 per m^2, the plinth area estimate is 100 X 2000 = 200000.

The plinth area does not include open spaces such as courtyards. If the building is multi-story, each floor level's plinth area is calculated independently.

1.1.2 Cube rate cost estimate.

A building's cube rate cost estimate is calculated by multiplying the plinth area by the height of the structure. The height of a building should be measured from the ground to the top of the roof. It is better suited to multi-story structures.

This approach is more precise than the plinth area method. The rate per cubic metre is calculated based on the costs of similar types of structures in the same region. This form of estimate ignores the foundation, plinth, and parapet above the roof level.

The everlasting dimensions of the building should be measured at the floor level, and the height should be measured from the floor level to the roof (or half way up a sloped roof). The height of a storied building should be measured from one storey's floor level to the top of the next higher story. The foundation, plinth, and parapet above the roof are not considered for determining cubical content. Because the height is also compared, the cube rate estimate is more accurate than the plinth area estimate.

1.1.3 Approximate quantity method cost estimate.

The entire wall length of the construction is measured and multiplied by the rate per running metre to get the cost of the structure using the approximate quantity approach. The rate per running metre for the foundation and superstructure are computed independently.

In the case of a foundation, the rate per running metre is determined by taking into account costs such as excavation and brickwork up to the plinth. In the case of superstructures, quantities such as wall brickwork, woodwork, and floor finishing are taken into account when determining the rate per running metre.

1.1.4 Detailed cost estimate.

When the preliminary estimates have been accepted by the relevant administrative authority, a detailed cost estimate is created. This is a fairly precise estimation. The cost of each piece of work is computed independently once the quantity of work is measured. Different item rates are offered based on current practical prices, and the overall anticipated cost is determined. For eventualities, 3 to 5% of the expected cost is included as miscellaneous expense.

The following details and documentation should be included in the detailed estimate.

-Report

-Overall Specifications

Plans, elevations, sectional views, and detailed drawings are examples of drawings/plans.

-Building foundations, beams, slabs, and other structural elements

-Schedule of rates

1.1.5 Revised cost estimate.

A revised cost estimate is a comprehensive estimate created when the initial sanctioned estimate amount is surpassed by more than 5%. The rise might be owing to a rapid increase in the cost of materials, transportation, and other factors. On the last page of the updated estimate, the cause for the modification should be stated. When the sanctioned amount is

exceeded owing to changes in rates or the inclusion of works that are reasonably reliant on the work that was originally sanctioned, a revised cost estimate is necessary.
As a result of the considerable variation from the initial concept, a new estimate is required. It's supported by a comparison statement abstract that shows the likely differences in quantity, pace, and amount for each piece of work in the project. Due to a change in the rate or number of materials, a revised estimate is required; no additions or revisions to the designs are required.

1.1.6 Supplementary cost estimate.

A supplemental cost estimate is a thorough estimate that is created on the spot when more work is required while the initial job is being completed. The estimate sheet should include the initial estimate cost as well as the entire cost of work, including any additional costs that require approval.

Supplemental is necessary because supplementary works are somewhat independent of the activity that was initially sanctioned. As a result, the supplemental estimate is required owing to a structural material departure from the design that was previously accepted. There is no need for a comparison abstract form. This is merely a rough estimate for extra work. The initial estimate and total amount of the punishment necessary, including the supplemental amount, are shown in the abstract. Due to certain additional works or a change in design, a supplemental estimate is required, which may necessitate drawing additions or modifications.

1.1.7 Annual repair cost estimate.

The annual repair cost estimate, also known as the annual maintenance estimate, is used to calculate the cost of building maintenance in order to keep the structure safe. During establishing an annual maintenance estimate for a structure, factors such as whitewashing, painting, and minor repairs are taken into account. It's utilised for yearly or one-time repair estimates. These estimations are made in order to keep the created piece in excellent working order. When contemplating repair work, whitewashing, painting, plastering, patching, and sanitary work, among other things, In the event that material costs have increased since the yearly repair estimate, a special repair estimate is issued.

1.2 PURPOSE OF ESTIMATION & COSTING

1. Determine the likely cost of the project.
2. Determine the various types and quantities of necessary materials.
3. Determine the different labour types and amounts necessary.
4. To provide an estimate of how long the task will take to complete.
5. Use the benefit-cost ratio to justify investment.
6. Assist in the establishment of a standard rent and property value.
7. A public construction estimate is required for administrative approval, technical sanction, and funding.
8. For timely material acquisition in accordance with expected amounts.
9. To plan a building timeline and establish construction programming
10. To assign a deadline to specific building tasks.
11. Organize labour according to the job.
12. Determine the tools, equipment, and plants required.
13. Tender invitations and bill preparation
14. Calculate the cost-benefit ratio
15. A valuation estimate is necessary for an existing correctly.

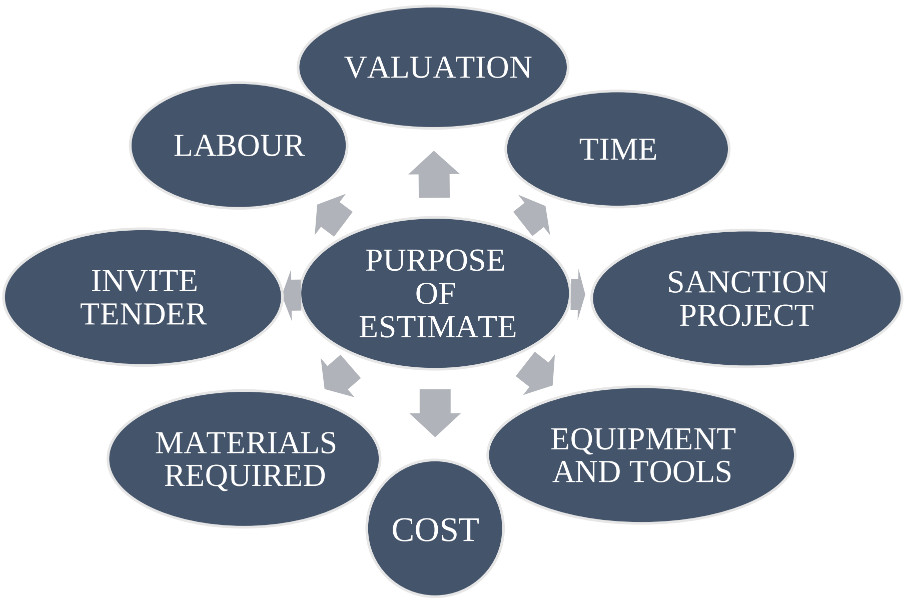


Figure 1.2- Purpose of estimate

1.3 IMPORTANCE OF ESTIMATION & COSTING

1. The estimate is required for determining the project's budget.
2. It is essential for determining the project's required quantities of supplies and personnel.
3. The projected project's completion period must be established.
4. Checking the work done by contractors during and after the execution is also beneficial.
5. It is essential for the project's tender preparation.
6. It is required for land and building appraisal.
7. Controlled material requirements, such as cement and steel, can be estimated in order to submit applications to the regulating authorities.

1.4 DATA REQUIRED FOR ESTIAMTING

1.4.1 Drawings which include plans, elevations, sections, etc.

For the computation of material amounts, drawings are necessary. Before producing an estimate, drawings depicting plans, elevations, various sections, and other pertinent detail with clear and full proportions are highly important.

1.4.2 Specifications

The type and quality of the job, the materials to be used, and the craftsmanship to be done are all described in the specification, which is crucial for the task to be completed.

There are two types of specifications: -

1.4.2.1 General specification: -

This provides an overview of the nature, class, and materials that may be employed in various forms of work.

1.4.2.2 Detailed specification: -

It provides a full description of the numerous components of work, including the amounts and quantities of materials used, the technique of preparation, the proportions used, craftsmanship, and work execution.

1.4.3 Rates

Rates are necessary for calculating estimations by multiplying material quantities by unit rates. To prepare an estimate, you'll need the unit prices for each item of work.

Each item's unit rates come from: - -Various materials' rates are utilised in building.

-Material transportation costs

-Labour wages

1.4.4 Methods of measurement

To establish the right amounts of work, an updated technique of measurement for standard deductions or additions is also required.

1.4.4.1 Different methods of taking estimating & costing

a) Centre line method: -

This strategy is most commonly utilised when the offsets are symmetrical and the structure is roughly rectangular in form. This centreline serves as the length for the estimate's whole computations. If deductions are not taken into account, estimations may be incorrect. The same portion should be on all of the walls.

b) Crossing Method: -

For calculating amounts, the lengths and breadths of the masonry walls at the plinth level is used. As with the centreline approach, the symmetrical offset is important. Calculating the entire circumference of the structure and subtracting four times the thickness of the wall on it yields the centreline length.

c) Out to Out and Into In (Long wall and short wall) Method: -

The long wall is defined as the wall that runs the length of the room, while the short wall is defined as the wall that is right-angled to the long wall. Calculate the centreline lengths of each wall first to get the length of the longwall or short wall. The length of the longwall (out to out) may then be calculated by adding half the width at each end to the centreline length. As a result, the length of the short wall is calculated by subtracting half of its centreline length from either end.

d) Bay Method: -

When there are several bays in a structure, this strategy is commonly used. The overall cost of the building is calculated by multiplying the cost of one classroom by the number of bays in that building. End walls and frame changes need the additional expense.

1.5 DIFFERENT SITE CONDITIONS WHICH AFFECT THE OVERALL COST

1. Different type of work needs a specific construction method. Construction can vary from a simple house or office to a dam, tunnel, multi-story structure, bridge, or road that is already in use; each of these projects requires totally different construction processes, technology, and formwork.
2. The quality of labour and the output of labour depend on location.
3. Ground conditions vary and impact building methods; for example, excavation might be dry, wet, hard, soft, shallow, or deep, requiring various efforts.
4. The method of building is also influenced by the availability of construction machinery.
5. The site's accessibility must be reasonable. If the access is inadequate, temporary roads may be constructed.

1.6 ESSENTIAL QUALITIES OF A GOOD ESTIMATOR

1. An understanding of building details. Construction work experience.
2. Having knowledge on the materials necessary, the machinery required, overhead issues, and various expenses.
3. Sound judgement in relation to various locations, jobs, and workers.
4. Choosing an effective strategy for creating an estimate.
5. He must have a solid understanding of the structural designs for which he will create an estimate. Ability to be meticulous, hardworking, and precise.
6. Ability to gather, classify, and analyse estimate data.
7. The ability to visualise all of the processes in the construction process.
8. He must also be well aware on the specifications outlining the nature and classes of work, as well as the materials to be used, because the rates at which different types of work may be completed are determined by the specifications.

9. Before generating the estimate, the estimator should go to the job site and assess the situation.
10. If a huge structure is being built, for example, the estimator or his representative should go to the site and:

-Make a design of the location displaying all relevant aspects

-Collect all accessible soil data Obtain information about light, electricity, and water.

-Secure information concerning banking facilities.

Note conditions of streets leading to railway yards and to material dealers.

- Investigate general efficiency of local workman**.**

1. He should have good imagination.
2. He should be highly qualified.
3. He should be disciplinary in nature.

CHAPTER-2
LITERATURE REVIEW

Issues in Project Cost Estimation and Possible Solutions (From the International Journal of Engineering and Technical Research (IJETR), Volume 2, Issue 5, May 2014):

One of the most important and extensively used project management is project costing. Because of the complexity of projects and the inherent unpredictability of financial performance, development finance, and cost and schedule monitoring and management, exact budget demands are hard to estimate properly. This same trait causes projects to stray from their original plans.

The major goal of this study is to identify the elements that influence project cost estimate accuracy and to define the various methodologies for project cost estimation in construction projects. The study was prompted by most construction experts' incapacity to arrive at a preliminary and trustworthy project cost estimate throughout project implementation, which has resulted in visible difficulties such as project cost overruns and abandonment. The study gathered the opinions of fifty-three project specialists in Owerri, Imo State, who had worked on similar building projects.

The primary goal of this study, titled "Project Cost Estimation-Issues and Possible Solutions," is to: 1. Identify and analyse factors impacting the accuracy of cost estimates in the study area. 2. To determine and evaluate types of cost estimation models/methods applicable in the area of study.

A Study on the Estimation and Costing of a Seven-Story Residential Building in Dhaka City (Ayesha Binta Ali, Molla Habibur Rahman, 1Lecturer, Ahsanullah University of Science and Technology, Dhaka, Bangladesh.):

All engineering operations involve estimating and costing to determine the likely cost of a development. If the predicted cost exceeds the available funds, efforts are taken to lower the cost by decreasing the scope of work or altering the specification. In this article, BNBC 1993 was used to estimate and cost a seven-story residential construction in Dhaka.

Supplies, transportation, labour, scaffolding, equipment and paints, setup and supervision, and an appropriate profit margin for the contractor are all included in the estimate for the complete operation. In Bangladesh, the normal practise of estimating and costing is done manually, and owing to the inefficient method in which the process is carried out, various errors in costing persist, making good forecasting impossible. The study's particular goals are as follows: 1. Prepare a complete cost estimate for a seven-story residential project. 2. To compare the study's pricing to current rates. 3. Compare project costs to PWD rates. Drawing, design, financial considerations, estimating, and legal considerations are all included in any building estimations.

Building estimating and costing methodologies compared (International Journal of Innovative and Emerging Research in Engineering Volume 4, Issue 4, 2017):

The goal of the article is to compare the two ways and then determine which method is more accurate for estimating the quantity of work under each item of work. This is a comparison of the methodologies on a theoretical level. In today's world, estimation sheets are created on computers using various software programmes and excel sheets.

This research aims to offer a deeper understanding of the original theoretical methodology and, as a consequence, to suggest the most appropriate building method. There are other ways for calculating quantity estimation and costing, but the building structure and the methods mentioned above have been used. Estimating is used in civil engineering projects to determine the estimated and likely cost before work begins; this cost is derived via estimation. All of the needed quantities are presented with their appropriate rates during the estimating procedure. The project's total cost is computed by the estimator. He should be a seasoned professional.

A Case Study in Multi-Storey Building Estimation and Costing (International Journal of Advanced Research in Science, Engineering, and Technology, Vol. 6, Special Issue, August 2019):

Detailed estimation approaches for multi-story building construction (APARTMENT BUILDING), covering cost estimating, hard bid, negotiated price, conventional, management contracting, construction management-at-risk, design, and design-build-bridging. A multistory building is one that is mostly used for commercial purposes. The deal of estimate and costing of a multi-story apartment building with all specifications inside the clients' budget is done in this article. The estimator may change some parameters in the building design based on site circumstances, the customer's budget, material availability needs, and other considerations. We estimate and cost the (G+5) apartment building in our project using a stepby-step process using volumetric analysis and quantity surveying calculations.

DUNDIGAL, HYDERABAD - 500 043 ESTIMATION AND COSTING (DEPARTMENT OF CIVIL ENGINEERING INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)):

In this paper we learnt about technical terms like: -

ESTIMATE: An estimate is a calculation of the expected or likely cost of a project that is generally done before it begins. It is, in fact, calculations or computations of numerous engineering job items.

QUANTITY SURVEY: A quantity survey is a schedule of all work items in a structure. These figures are derived from the building's blueprint. Thus, a quantity survey provides the amount of work completed for each item, whereas pricing provides the entire cost. In a nutshell, quantity surveying entails calculating the number of materials needed to execute the project.

SPECIFICATIONS: Detailed specifications are necessary to describe the type, quality, and class of work, materials to be utilised in various areas of the job, material quality, proportions, method of preparation, craftsmanship, and work execution.

RATES: For producing an estimate, the rates of various items of work, materials to be utilised in the building, and wages of various categories of labour (skilled and unskilled) should be accessible. It's also important to know how much transportation costs. The "Schedule of Rates" should be followed as closely as feasible, alternatively the rates may be calculated using the "Analysis of Rates" approach.

Umesh Kumar Yadav 1 Anurag Wahane 2 B.E. Student, Civil Engineering, CIET, Raipur, C.G., India Assistant Professor, Civil Engineering Dept., CIET, Raipur, C.G., India):

Many various aspects of a project are influenced by the quantity of goods, rate of items, and labour cost. In order to prepare an estimate, the quantities of various pieces of work are estimated using the basic mensuration technique, and an abstracted cost is computed from these numbers, which is the current cost. Layout drawings may be used to determine precise concrete and brickwork amounts (given by competent authority). There are several ways for evaluating residential, educational, and other significant structures.

CHAPTER -3

PLANNING OF A BUILDING

3.1 MODELLING OF A BUILDING USING REVIT SOFTWARE: -

For each structural element, the Revit Architecture programme will provide a plan view, 3D models with good elevation, detailed diagrams, and schedules. Every project we completed in Revit will have 2d, 3d, section views, elevations with details and schedules, and quantities. Revit Architecture collects information about each structural element's material, realistic visualisation, and design, such as thickness and height, and in the schedule, it will give a number of data points such as cost type, number of bricks, number of doors, number of windows, and so on, across all other representations of the project. We can have all of these 2D, 3D, and sectional views, elevations, and detailed drawings on one sheet in Revit.

3.1.1 REVIT USES IN CIVIL ENGINEERING: -

1. We can utilise Revit in civil engineering to correctly streamline data with architecture.
2. The precise positioning of beams and columns may be used to generate a structural model.
3. Civil engineers may readily generate structural models in Revit using its extensive range of tools; the models can then be upgraded and exported to any design analysis programme for analysis and design. In any other structural design programme, creating such crossplatform compatible models is arduous.
4. Revit may also be used to compute prices and extract quantities linked to the volume of concrete required for beams, columns, slabs, and other structural elements.
5. Bar bending schedules, including the weight of steel required and the cost spent, may be simply created using Revit.
6. Both RCC and steel structures, as well as correct structural connections, may be simply designed in Revit.
7. Parametric structural steel connections can be customised to meet specific needs.

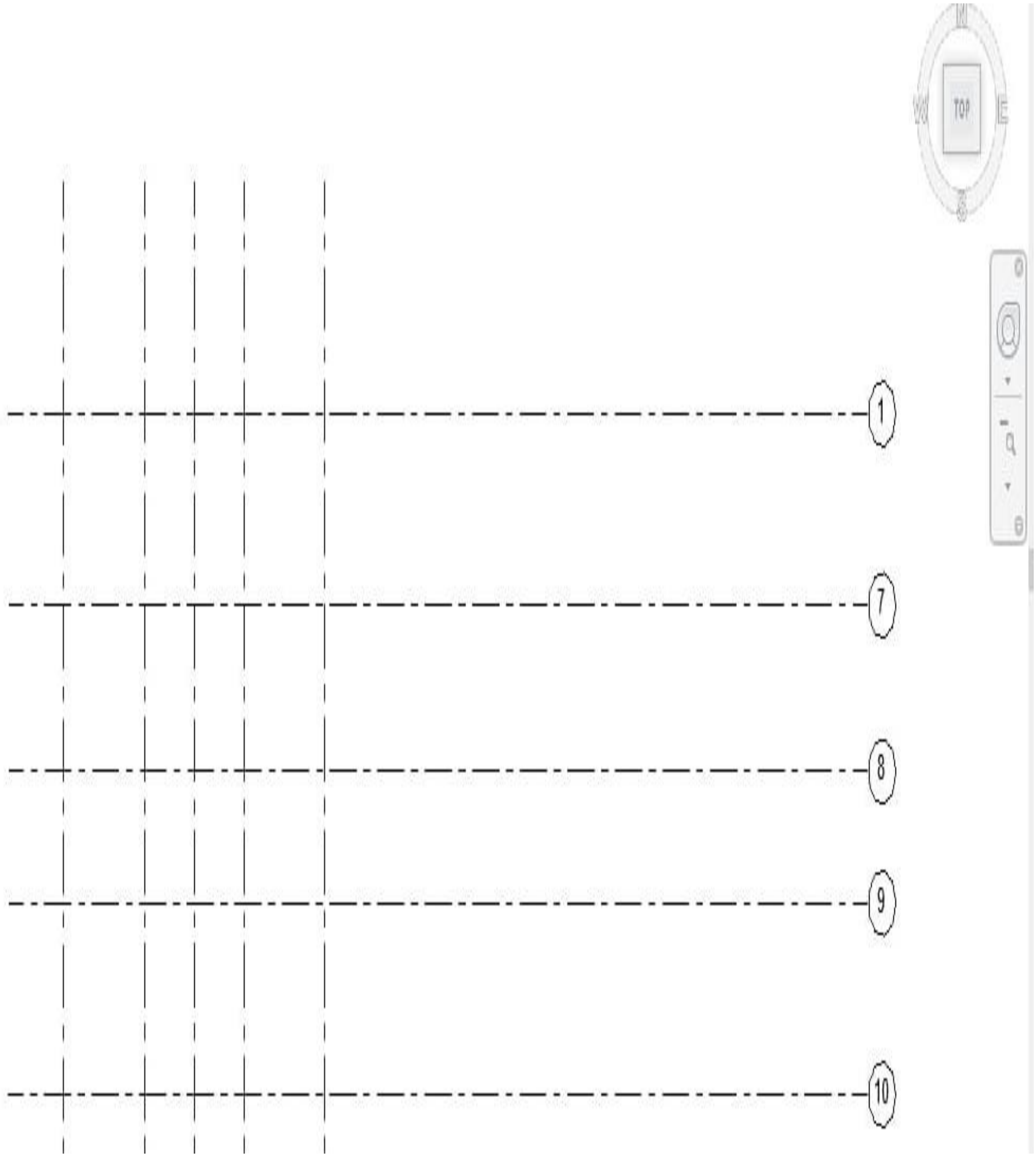


Figure 3.1- Grid plan of foundation

Figure 3.1.1- Plan of columns

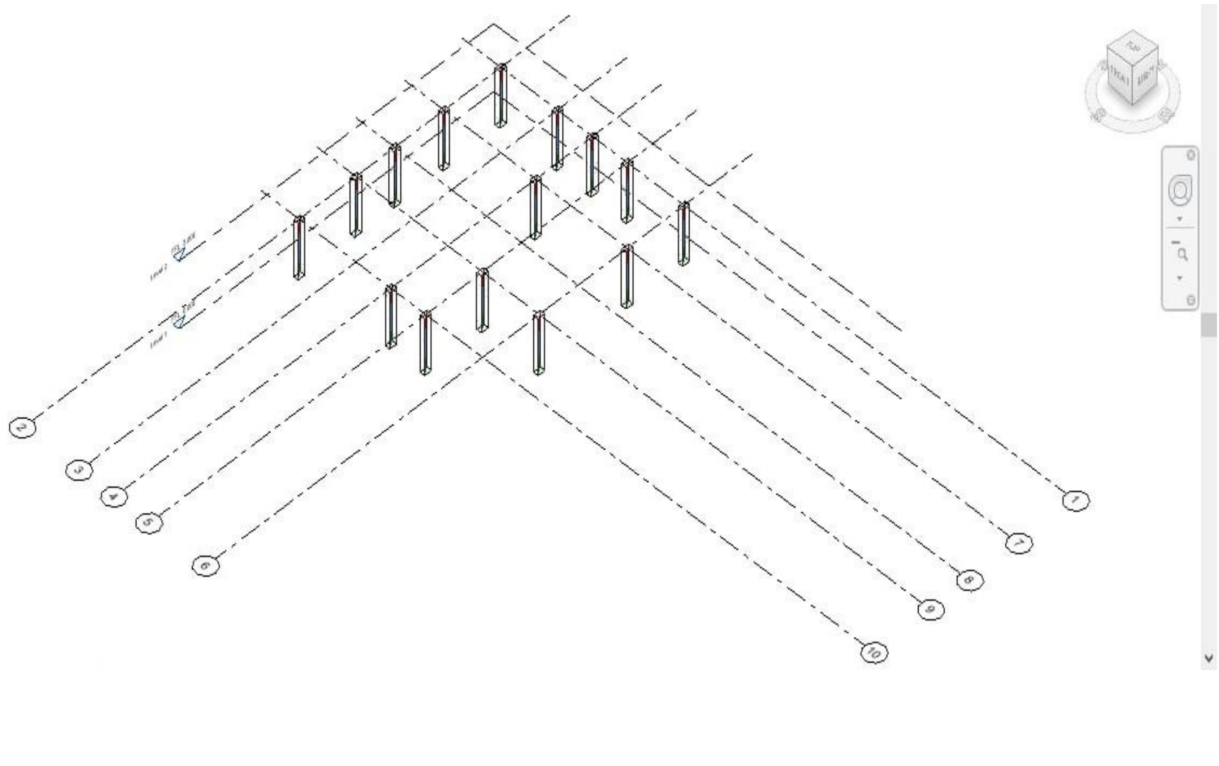


Figure 3.1.2- 3D view of columns

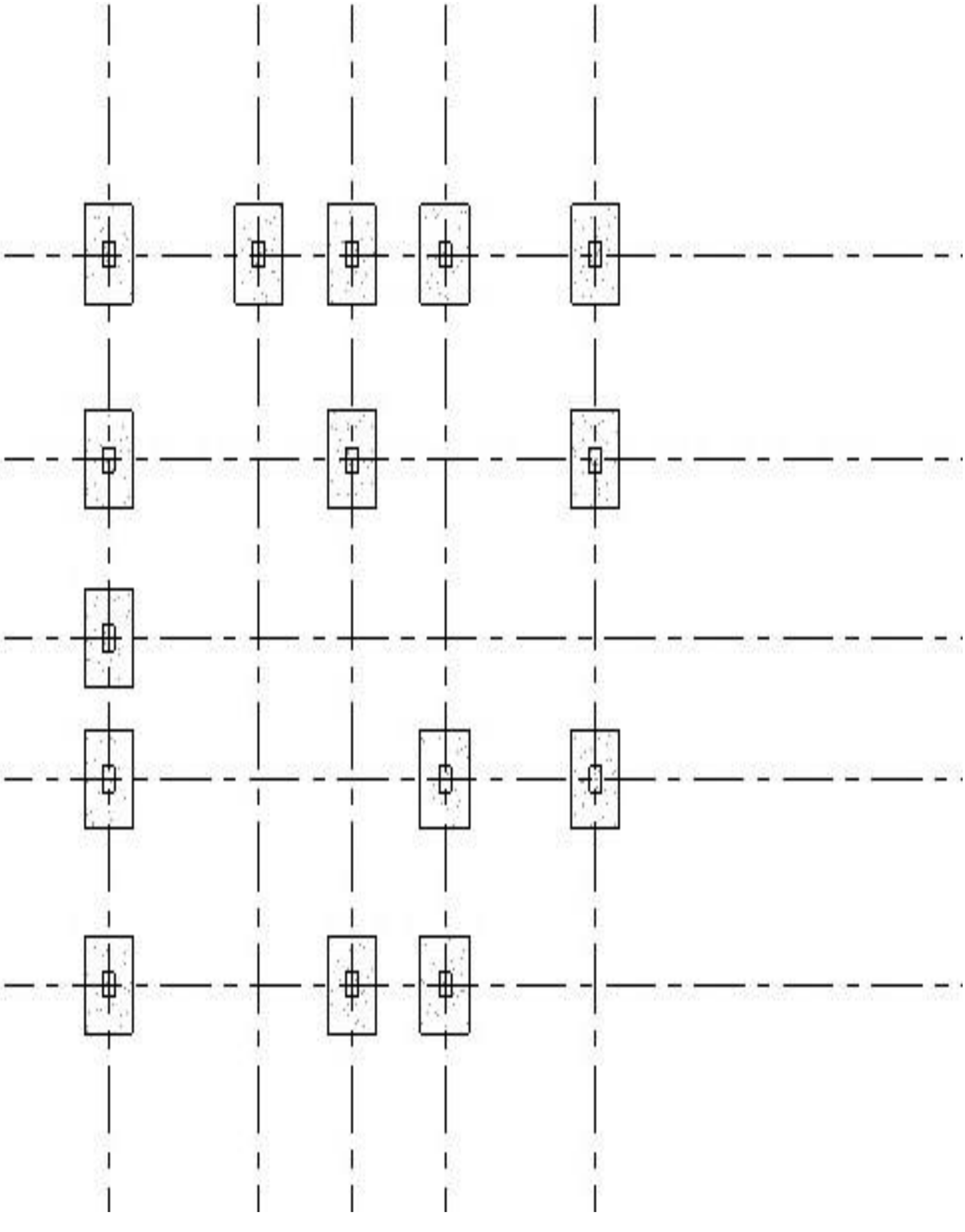


Figure 3.2 - foundation plan

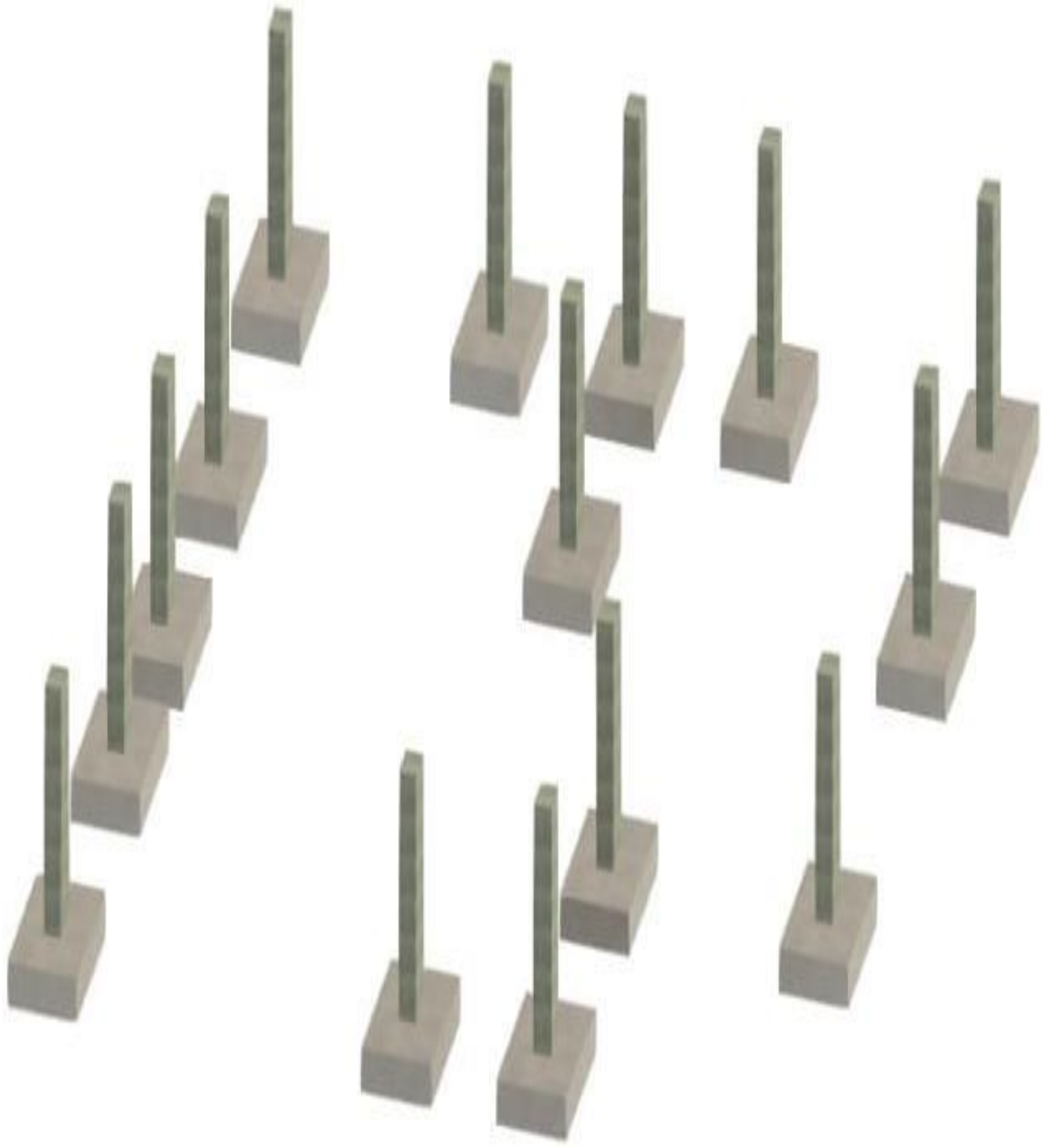


Figure 3.2.1 - 3D view of foundation

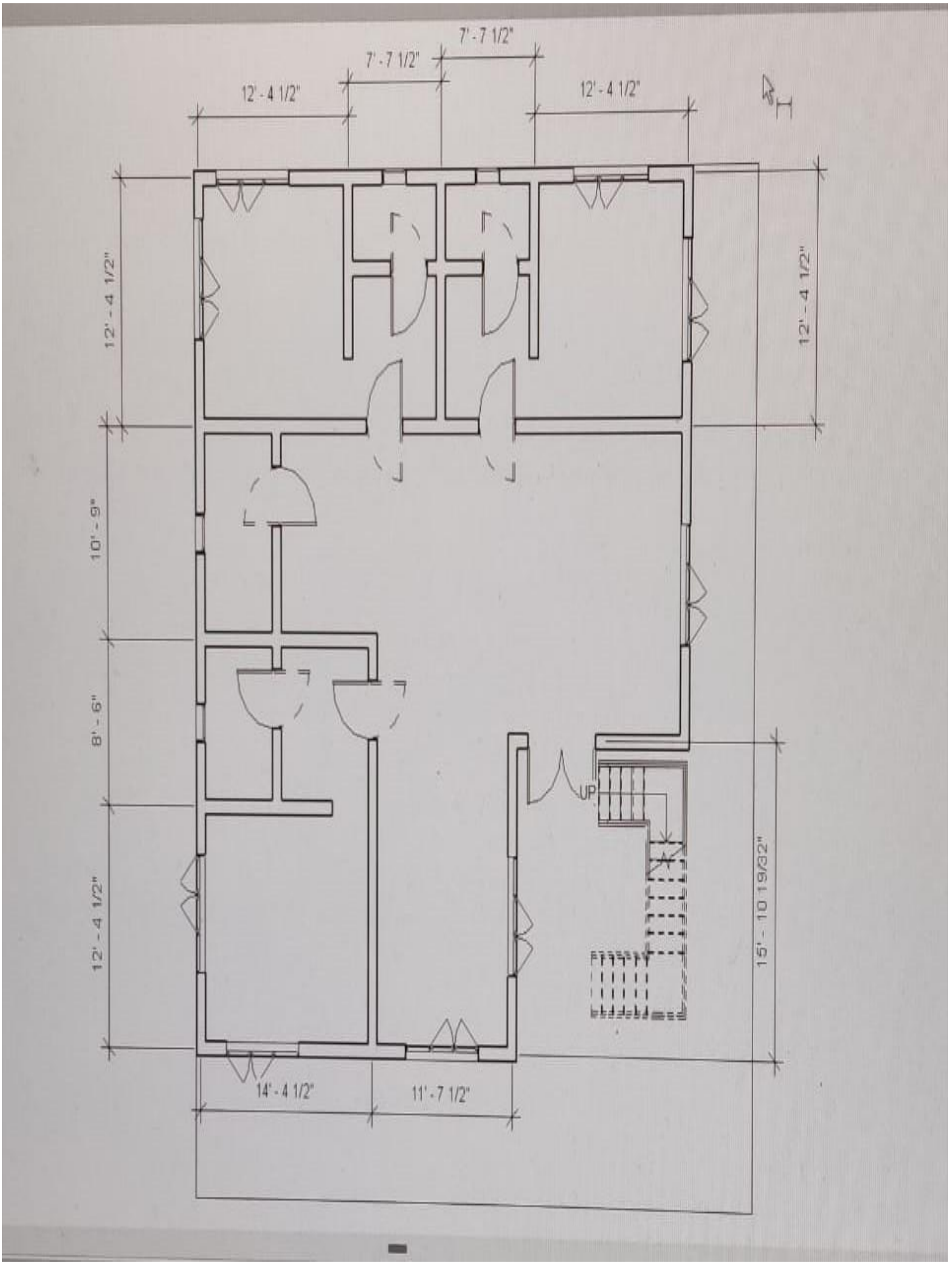


Figure 3.3- Dimension plan

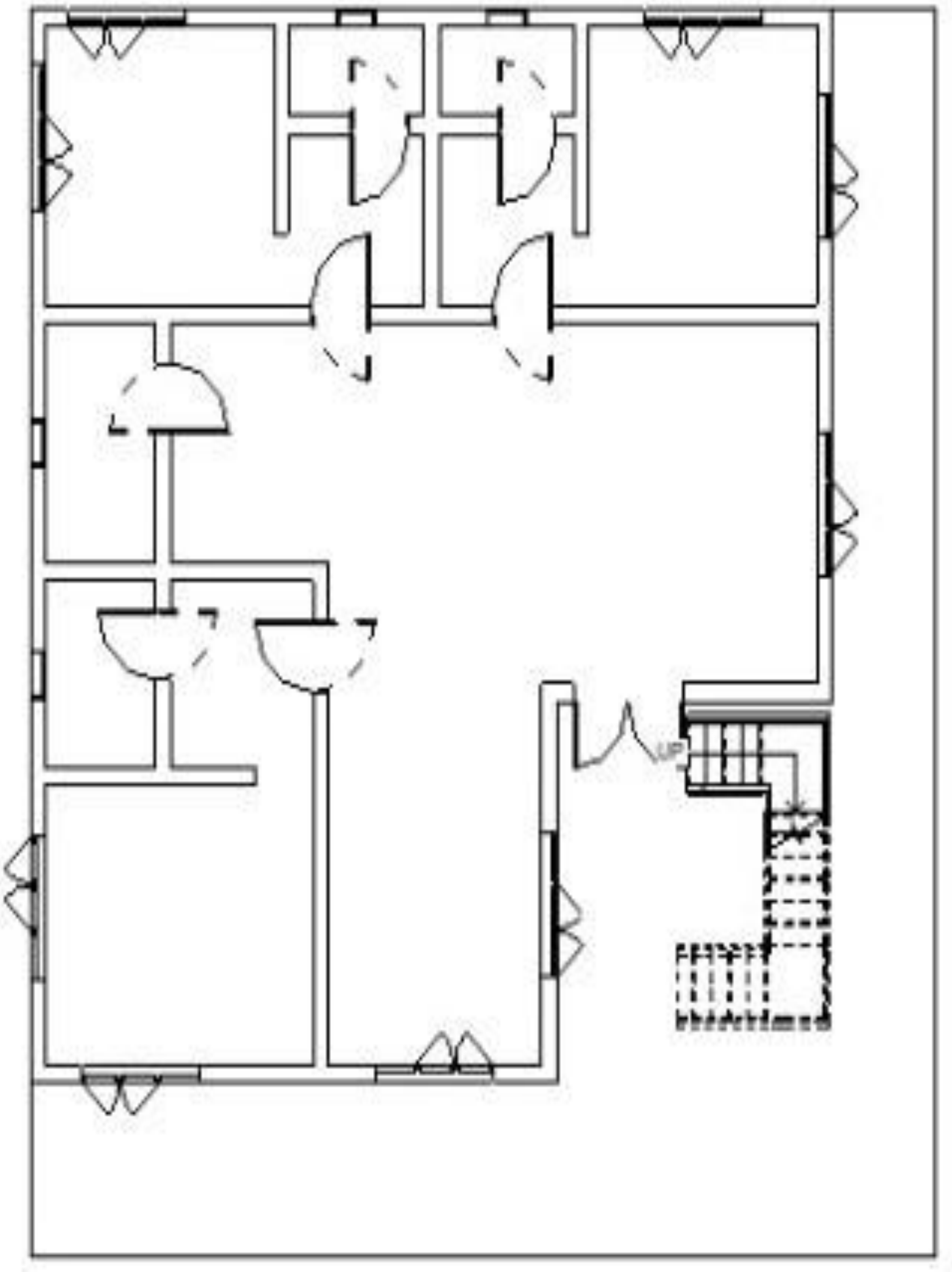


Figure 3.3.1- Plan view of first floor

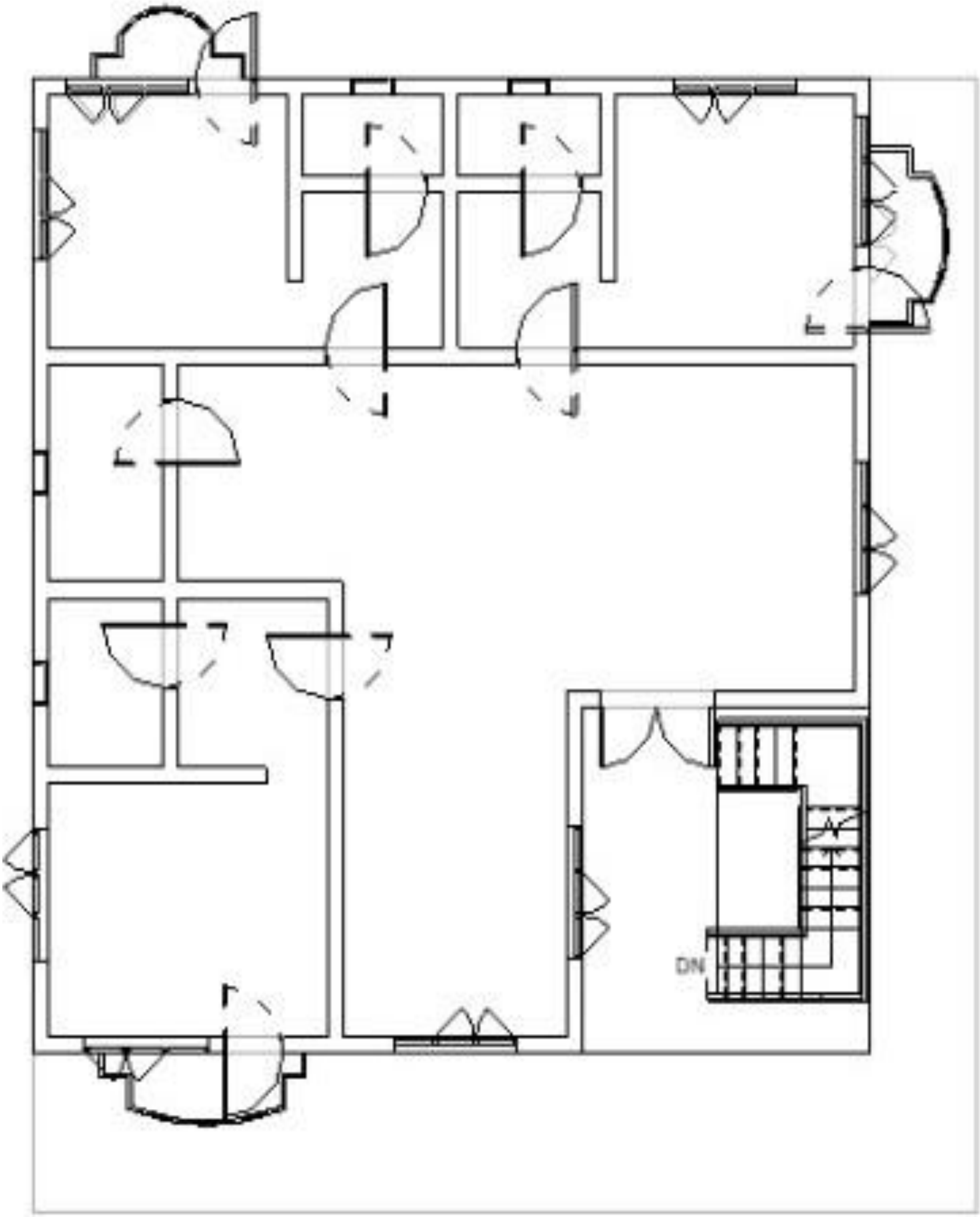


Figure 3.3.2- Plan view of second floor

Figure 3.4- 3D view of first floor

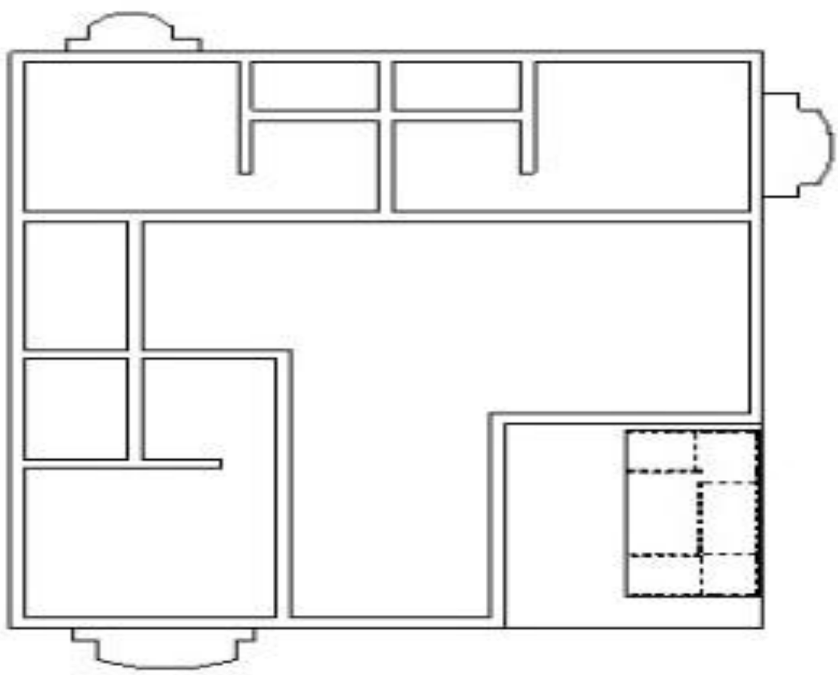


Figure 3.5 - Ceiling plan

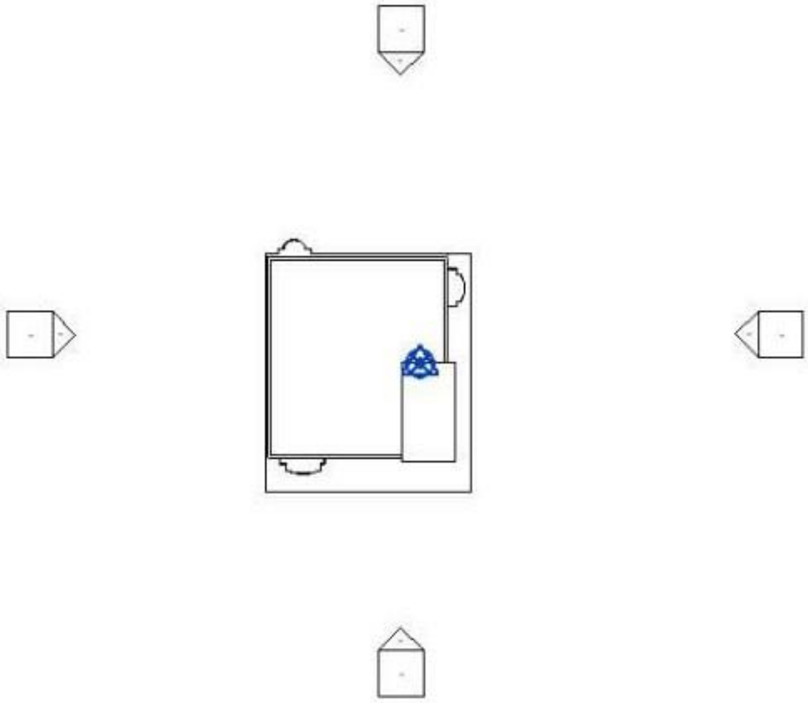
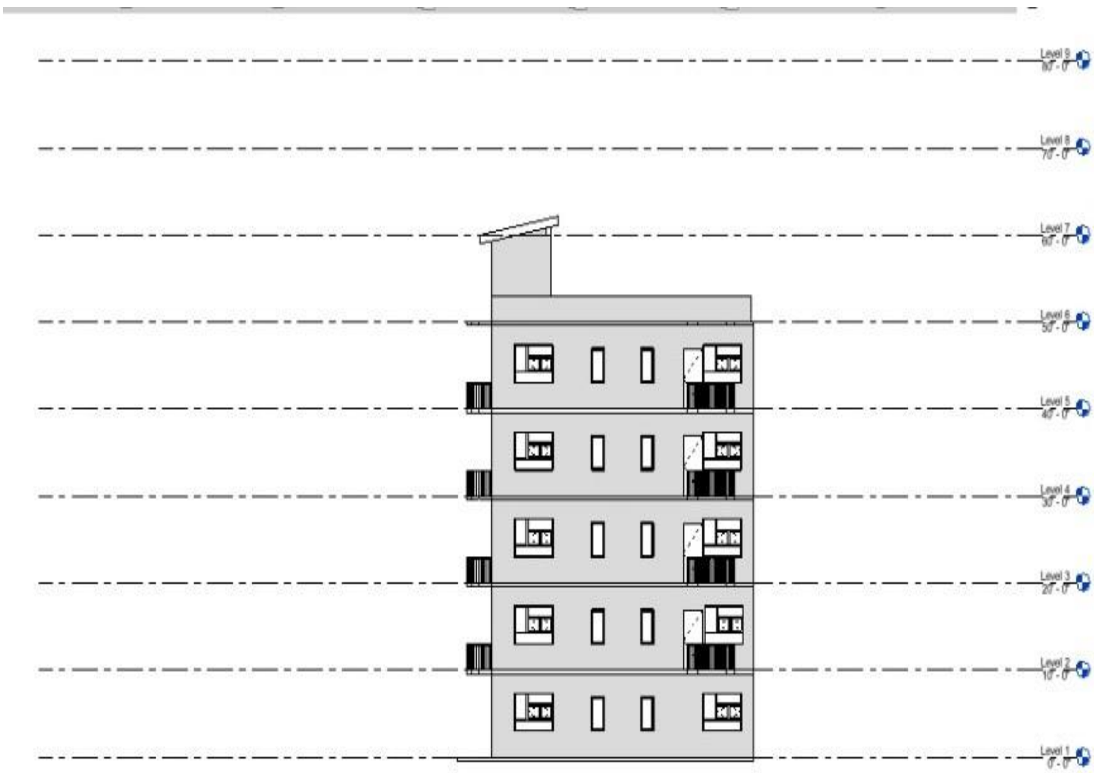


Figure 3.6- Floor plan



*

Figure 3.7 - North elevation of building

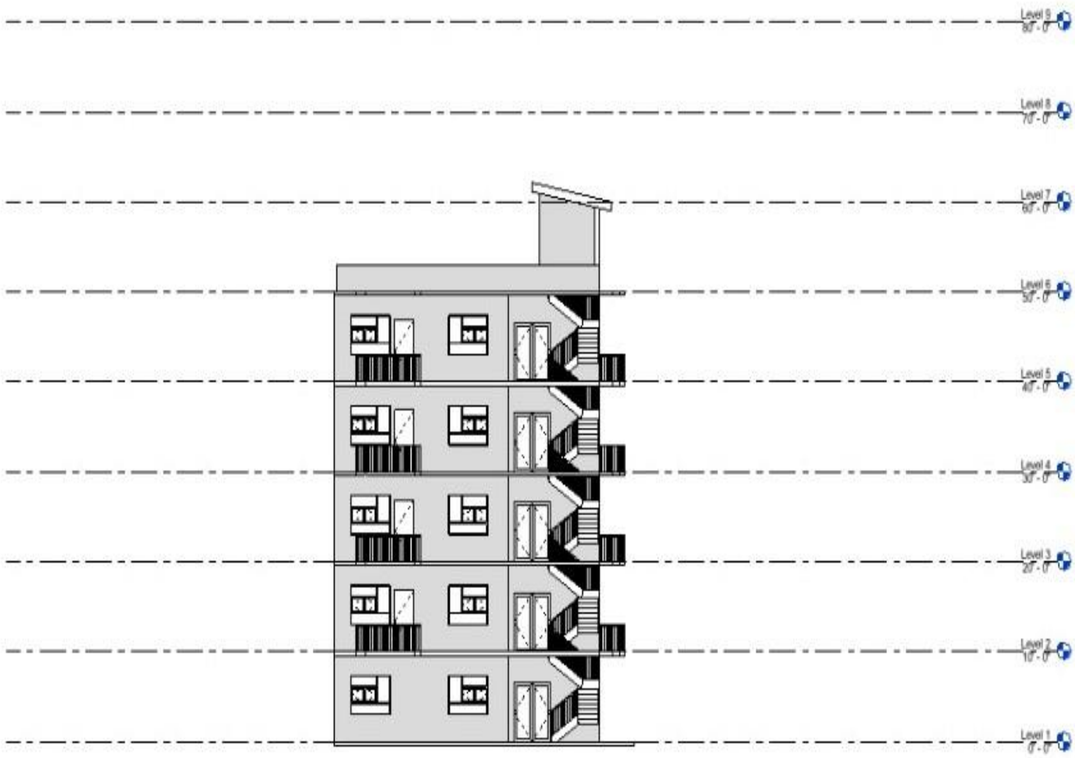


Figure 3.7.1- South elevation of building

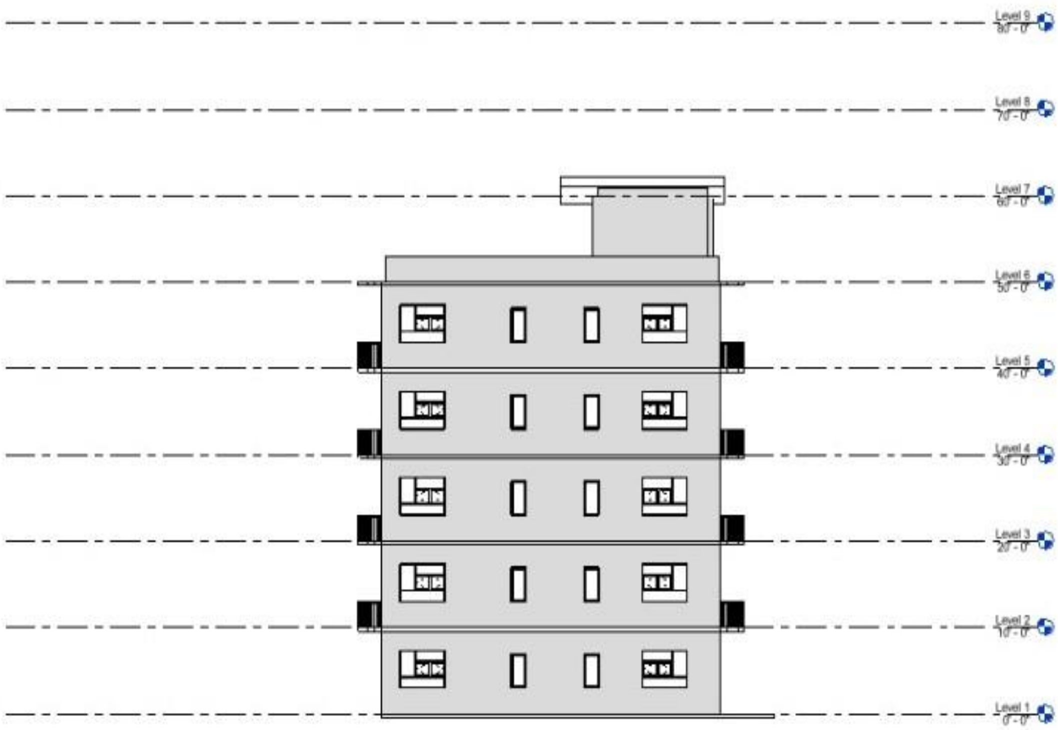


Figure 3.7.2- West elevation of building

Figure 3.7.3 - East elevation of build

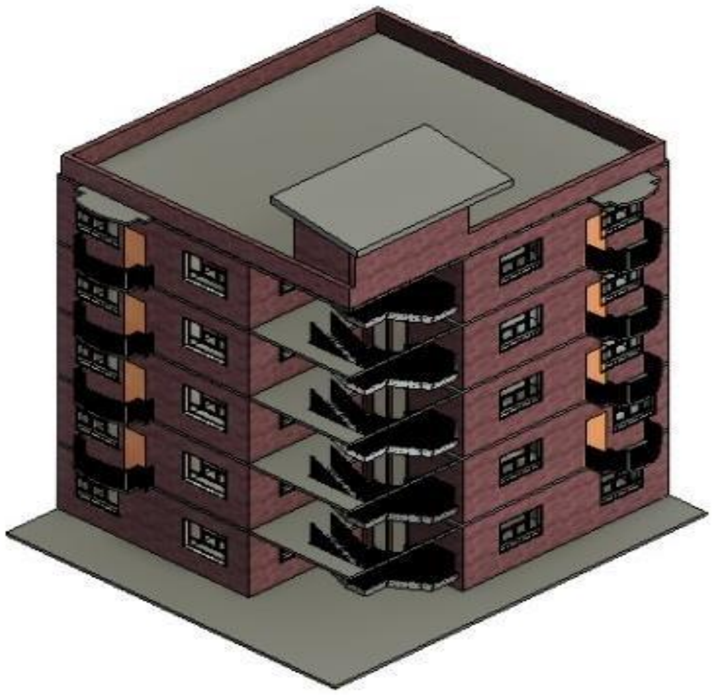


Figure 3.8- 3D view of building

CHAPTER-4

ESTIMATION OF BUILDING

4.1 CALCULATION OF NO. OF BRICKS & COST OF BRICKS

IN MILIMETER (MM**)**

Size of brick = 190mm x 90mm x 90mm (WITHOUT MORTAR**)**

Volume = L x W x H

=190 x 90 x90

=1539000mm^2

PLASTER OF MORTAR USED =10MM

Size of brick = 200mm x 100mm x100mm (WITH MORTAR)

Volume = L x W x H

= 200 x 100 x 100

=2000000mm^3

10MM = 1CM

Size of brick =19cm x 9cm x9cm (WITHOUT MORTAR)

Volume = length x width x height

= 19 x 9 x 9

= 1539cm^2

PLASTER USED = 1 cm

Brick size = 20cm x 10cm x 10cm

Volume = 2000cm^3

1 METER = 100CM

Brick size = 0.19 x 0.09 x 0.09

= 0.001539m^2

PLASTER USED = 0.1 M

Brick size = 0.20m x 0.10m x 0.10m (WITH MORTAR)

Volume = 20 x 10 x 10

= 0.002m^3

Number Of bricks in $1m^3$ = Volume of $1m^3$ / volume of 1 brick with mortar

= 1 / 0.002

= 500 Bricks

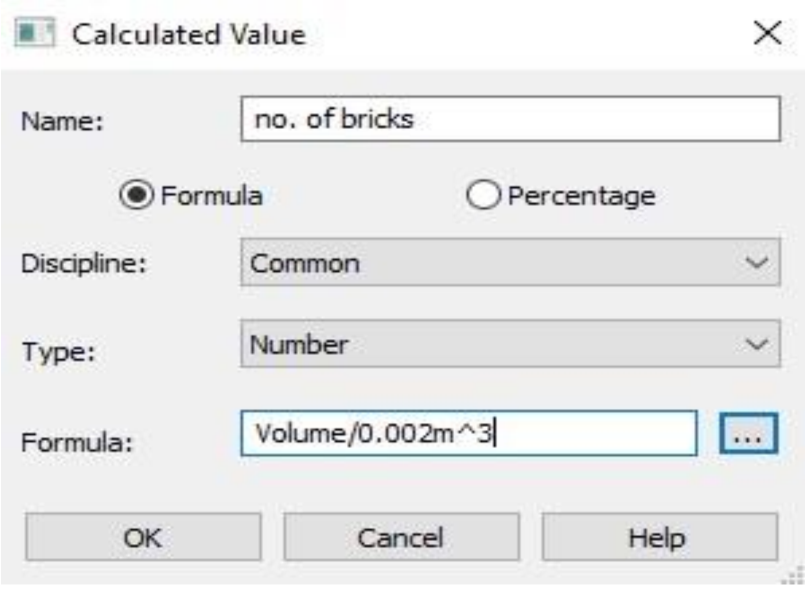


Figure 4.1- Formula for calculation of no. of bricks in Revit

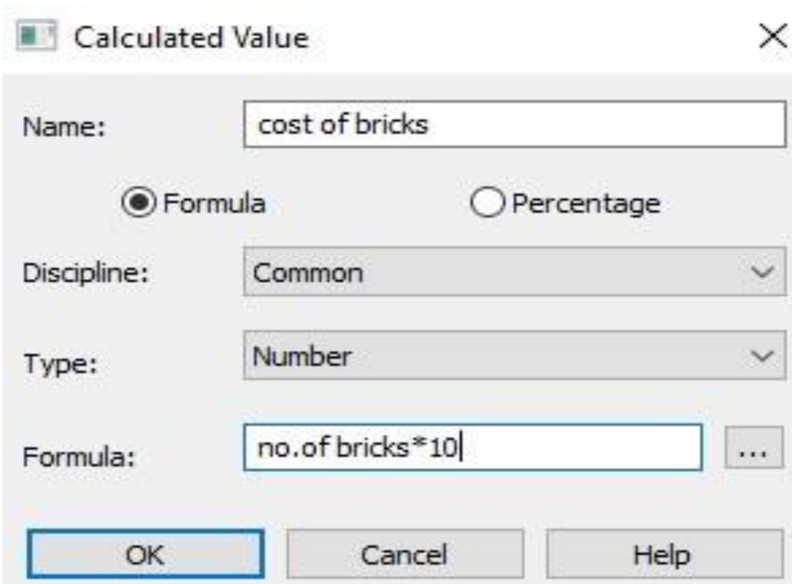


Figure 4.1.1- Formula for calculation of cost of bricks in Revit

A	B	C	D	E
Area	Volume	Width	Length	no.of bricks
30 m^2	6.83 m^3	0' - 9"	12	3414
20 m^2	4.60 m^3	0' - 9"	9	2299
19 m^2	4.32 m^3	0' - 9"	8	2159
32 m^2	7.34 m^3	0' - 9"	13	3669
31 m^2	7.12 m^3	0' - 9"	12	3562
8 m^2	1.76 m^3	0' - 9"	3	878
8 m^2	1.76 m^3	0' - 9"	3	878
10 m^2	2.37 m^3	0' - 9"	4	1183
9 m^2	2.16 m^3	0' - 9"	3	1081
16 m^2	3.66 m^3	0' - 9"	6	1832
13 m^2	2.93 m^3	0' - 9"	4	1463
9 m^2	2.07 m^3	0' - 9"	4	1036
11 m^2	2.52 m^3	0' - 9"	5	1258
7 m^2	1.60 m^3	0' - 9"	3	802
5 m^2	1.15 m^3	0' - 9"	3	573
8 m^2	1.93 m^3	0' - 9"	5	967
28 m^2	6.40 m^3	0' - 9"	12	3198
18 m^2	4.17 m^3	0' - 9"	9	2083
17 m^2	3.89 m^3	0' - 9"	8	1943
32 m^2	7.34 m^3	0' - 9"	13	3669
31 m^2	7.12 m^3	0' - 9"	12	3562
8 m^2	1.76 m^3	0' - 9"	3	878
8 m^2	1.76 m^3	0' - 9"	3	878
10 m^2	2.37 m^3	0' - 9"	4	1183
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 4.1- Table showing calculation of no. of bricks & total bricks

9 m²	2.07 m³	0' - 9"	4	1036	10361
11 m²	2.52 m³	0' - 9"	5	1258	12578
7 m²	1.60 m³	0' - 9"	3	802	8016
5 m²	1.15 m³	0' - 9"	3	573	5726
8 m²	1.93 m³	0' - 9"	5	967	9672
28 m²	6.40 m³	0' - 9"	12	3198	31981
19 m²	4.24 m³	0' - 9"	9	2119	21193
17 m²	3.89 m³	0' - 9"	8	1943	19434
32 m²	7.34 m³	0' - 9"	13	3669	36686
31 m²	7.12 m³	0' - 9"	12	3562	35622
8 m²	1.76 m³	0' - 9"	3	878	8777
8 m²	1.76 m³	0' - 9"	3	878	8777
10 m²	2.37 m³	0' - 9"	4	1183	11830
9 m²	2.16 m³	0' - 9"	3	1081	10812
16 m²	3.66 m³	0' - 9"	6	1832	18320
13 m²	2.93 m³	0' - 9"	4	1463	14629
9 m²	2.07 m³	0' - 9"	4	1036	10361
11 m²	2.52 m³	0' - 9"	5	1258	12578
7 m²	1.60 m³	0' - 9"	3	802	8016
5 m²	1.15 m³	0' - 9"	3	573	5726
8 m²	1.93 m³	0' - 9"	5	967	9672
11 m²	2.56 m³	0' - 9"	12	1282	12822
12 m²	2.77 m³	0' - 9"	13	1386	13858
11 m²	2.52 m³	0' - 9"	12	1258	12583
8 m²	1.73 m³	0' - 9"	8	864	8641
15 m²	3.37 m³	0' - 9"	5	1687	16871
8 m²	1.81 m³	0' - 9"	3	903	9026
15 m²	3.35 m³	0' - 9"	4	1674	16744
7 m²	1.67 m³	0' - 9"	3	833	8333
1248 m²	285.34 m³	66' - 0"	547	142670	1426704

Table 4.1.1- Table showing calculation of no. of bricks & their total

4.2 CEMENT ESTIMATION

Volume of 1 m^3 covering 500 no. of bricks

= Bricks in $1m^3$× 1 brick volume without mortar

= 0.001539 x 500

=$0.7695m^3$

Volume of mortar (in 1 m^3) =1-0.07695

=$0.2305m^3$(wet volume)

For dry volume, 33% is increased as per IS code, dry

volume = (0.2305×33%) +0.2305

=0.2305+0.076065

=$0.306m^3$

Mortar Ratio = (1:6)

= (Cement: Sand)

Quantity of cement in ($1m^3$) = (dry volume of mortar × ratio of cement)/Ratio of (cement+ sand)

= (0.306×1)/ (1+6)

=$0.043m^3$

Density of cement = 1440kg/m^3

Quantity of cement in kg =quantity of cement × density of cement

= 0.043 ×1440

=62 kg

1 cement bag=50 kg

Total no. Of cement bag in m^3=62/50

=1.24 bags

Cost of 1.24 bags = 300 ×1.24=372rs

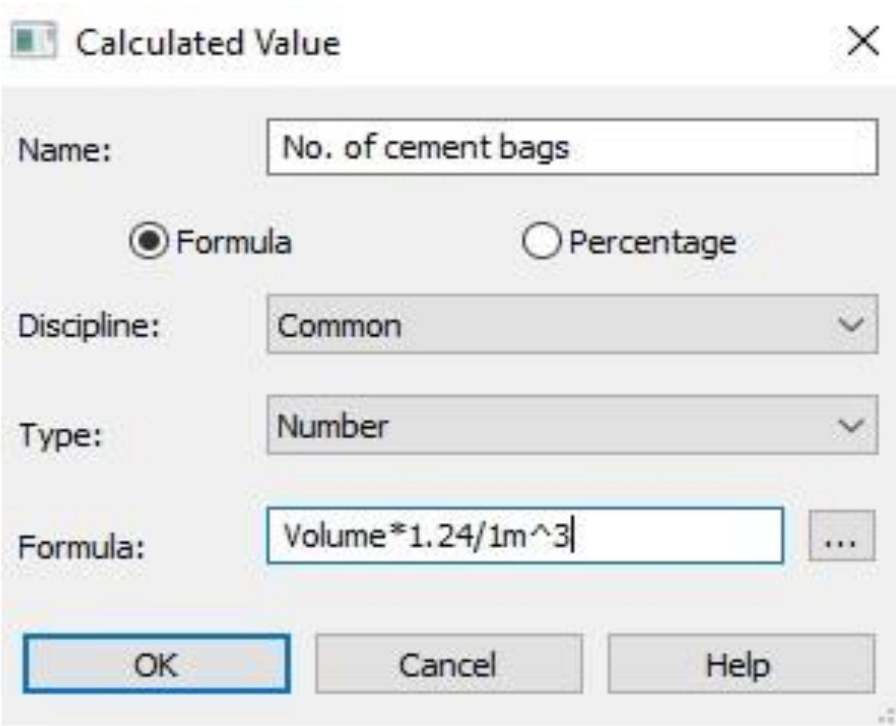


Figure 4.2- Formula for calculation of no. of cement bags in Revit

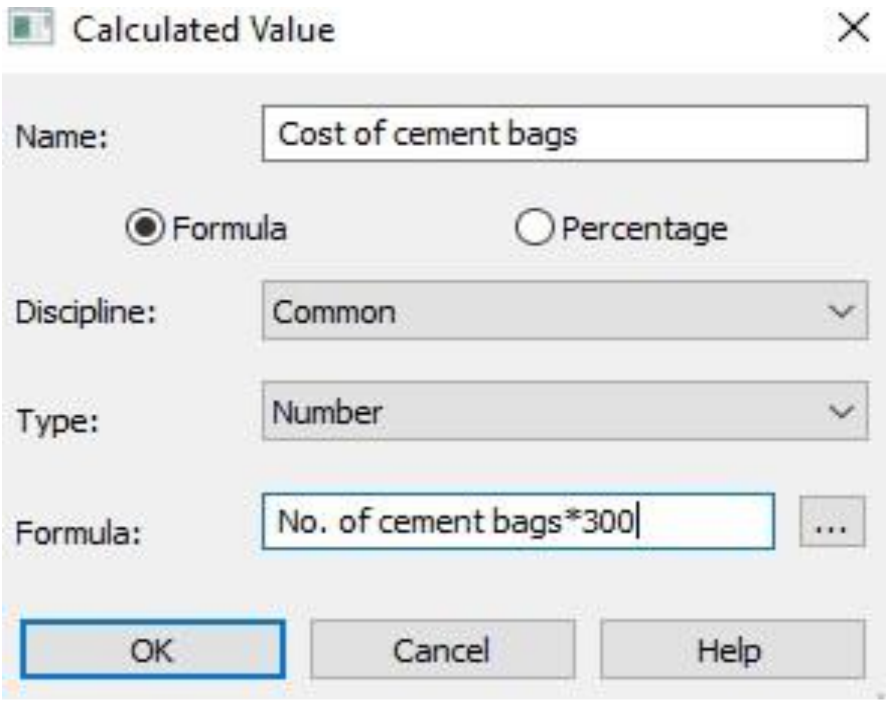


Figure 4.2.1- Formula for calculation of cost of cement bags

F	G
no. of cement bags	cost of cement
8	3386.857674
6	2280.911374
5	2142.105732
9	3639.23157
9	3533.672587
2	870.689939
2	870.689939
3	1173.538613
3	1072.589055
5	1817.311073
4	1451.149898
3	1027.782773
3	1247.714593
2	795.196797
1	568.060291
2	959.458856
8	3172.55889
5	2066.61259
5	1927.806948
9	3639.23157
9	3533.672587
2	870.689939
2	870.689939
3	1173.538613
3	1072.589055
5	1817.311073
4	1451.149898
3	1027.782773

Table 4.2 – Table showing no. of cement bags & cost of cement

3	1072.589055
5	1817.311073
4	1451.149898
3	1027.782773
3	1247.714593
2	795.196797
1	568.060291
2	959.458856
8	3172.55889
5	2102.350797
5	1927.806948
9	3639.23157
9	3533.672587
2	870.689939
2	870.689939

3	1173.538613
3	1072.589055
5	1817.311073
4	1451.149898
3	1027.782773
3	1247.714593
2	795.196797
1	568.060291
2	959.458856
3	1271.964432
3	1374.669635
3	1248.263231
2	857.193422
4	1673.568109
2	895.378689
4	1660.977192
2	826.585396
354	141529.033133

Table 4.2.1- Table showing no. of cement bags & cost of cement & their total

4.3 SAND ESTIMATION

Quantity of sand in $1m^3$ = (dry volume of mortar × sand ratio)/Ratio of (cement and sand)

= (0.306×6)/ (1+6)

=1.836/7

=$0.262m^3$

Density of sand = 1450 to 1500 kg/m^3

We are taking = $1450kg/m^3$

Quantity of sand in kg = 0.262× density of sand

=0.262×1450

=379.9kg

1 Truck sand= 6660kg

379.9 kg = (379.9/6660) truck

=0.0570truck

1 truck sand cost=10500rs

379.9 kg sand cost =0.0570×10500

=598.50rs

1 kg sand=379.9/598.5

=0.63r

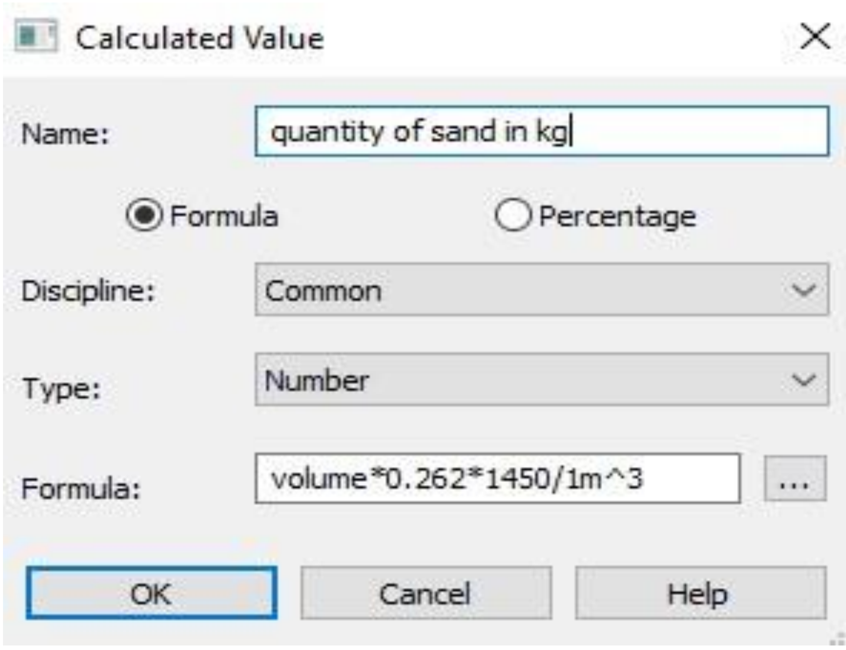


Figure 4.3- Formula for calculation of quantity of sand

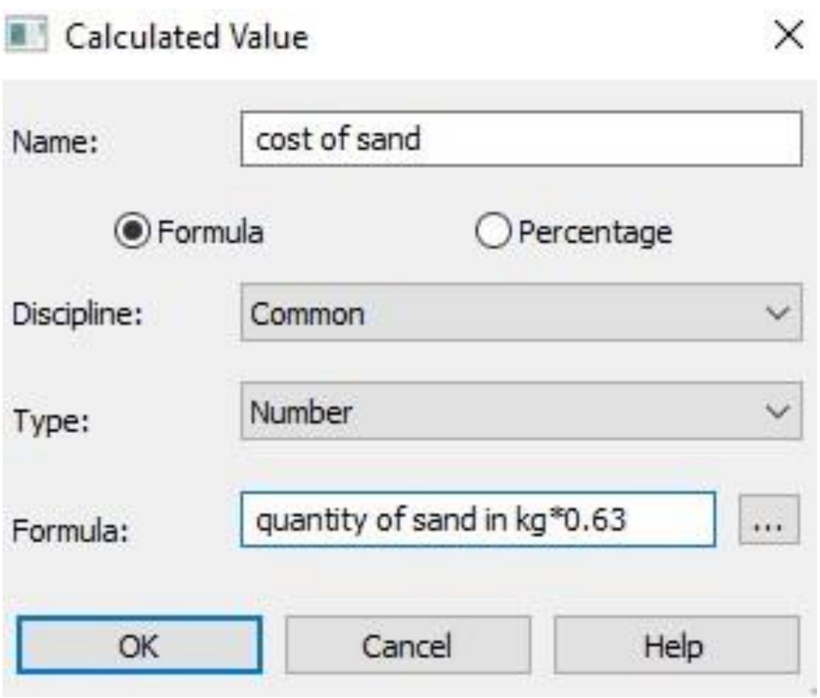


Figure 4.3.1- Formula for calculation cost of sand in Revit

H	I
q.of sand in kg	cost of sand in kg
2594.087158	1297.043579
1747.012563	873.506281
1640.697515	820.348758
2787.387244	1393.693622
2706.536726	1353.268363
666.885298	333.442649
666.885298	333.442649
898.845401	449.422701
821.525367	410.762683
1391.92838	695.96419
1111.475496	555.737748
787.207007	393.603504
955.658818	477.829409
609.063031	304.531515
435.092953	217.546476
734.875845	367.437923
2429.949844	1214.974922
1582.875248	791.437624
1476.560201	738.2801
2787.387244	1393.693622
2706.536726	1353.268363
666.885298	333.442649
666.885298	333.442649
898.845401	449.422701
821.525367	410.762683
1391.92838	695.96419
[illegible]	[illegible]
1111.475496	555.737748
787.207007	393.603504
955.658818	477.829409
609.063031	304.531515
435.092953	217.546476
734.875845	367.437923
2429.949844	1214.974922
1610.248121	805.12406
1476.560201	738.2801
2787.387244	1393.693622
2706.536726	1353.268363
666.885298	333.442649
666.885298	333.442649
898.845401	449.422701
821.525367	410.762683
1391.92838	695.96419
1111.475496	555.737748
787.207007	393.603504
955.658818	477.829409
609.063031	304.531515
435.092953	217.546476
734.875845	367.437923
974.232435	487.116217
1052.897166	526.448583
956.079036	478.039518
656.547945	328.273973
1281.831703	640.915851
685.795089	342.897544
1272.187974	636.093987
633.104419	316.55221
108400.967111	54200.483555

Table 4.3- Table showing calculation of quantity and cost of sand in kg & their total

Level 1 | Wall Schedule

<Wall Schedule>

A	B	C	D	E	F	G	H	I
Volume	Width	Length	no of bricks	cost of bricks	no. of cement bags	cost of cement	q.of sand in kg	cost of sand in kg
241.14 CF	0' - 9"	40' - 0"	3414.171043	27313	8	3386.857674	2594.087158	1297.043579
162.40 CF	0' - 9"	28' - 1 1/2"	2299.305821	18394	6	2280.911374	1747.012563	873.506281
152.52 CF	0' - 9"	26' - 0"	2159.380778	17275	5	2142.105732	1640.697515	820.348758
259.11 CF	0' - 9"	44' - 0"	3668.580211	29349	9	3639.23157	2787.387244	1393.693622
251.59 CF	0' - 9"	40' - 0"	3562.169947	28497	9	3533.672587	2706.536726	1353.268363
61.99 CF	0' - 9"	9' - 0"	877.711632	7022	2	870.689939	666.885298	333.442649
61.99 CF	0' - 9"	9' - 0"	877.711632	7022	2	870.689939	666.885298	333.442649
83.55 CF	0' - 9"	12' - 4 1/2"	1183.002634	9464	3	1173.538613	898.845401	449.422701
76.37 CF	0' - 9"	11' - 0"	1081.238967	8650	3	1072.589055	821.525367	410.762683
129.39 CF	0' - 9"	20' - 10 1/2"	1831.966807	14656	5	1817.311073	1391.92838	695.96419
103.32 CF	0' - 9"	14' - 4 1/2"	1462.852719	11703	4	1451.149898	1111.475496	555.737748
73.18 CF	0' - 9"	14' - 0"	1036.071344	8289	3	1027.782773	787.207007	393.603504
88.84 CF	0' - 9"	15' - 10 1/2"	1257.776807	10062	3	1247.714593	955.658818	477.829409
56.62 CF	0' - 9"	10' - 9"	801.609674	6413	2	795.196797	609.063031	304.531515
40.45 CF	0' - 9"	8' - 6"	572.641423	4581	1	568.060291	435.092953	217.546476
68.31 CF	0' - 9"	15' - 3"	967.196427	7738	2	959.458856	734.875845	367.437923
225.88 CF	0' - 9"	40' - 0"	3198.144043	25585	8	3172.55889	2429.949844	1214.974922
147.14 CF	0' - 9"	28' - 1 1/2"	2083.278821	16666	5	2066.61259	1582.875248	791.437624
137.26 CF	0' - 9"	26' - 0"	1943.353778	15547	5	1927.806948	1476.560201	738.2801
259.11 CF	0' - 9"	44' - 0"	3668.580211	29349	9	3639.23157	2787.387244	1393.693622
251.59 CF	0' - 9"	40' - 0"	3562.169947	28497	9	3533.672587	2706.536726	1353.268363
61.99 CF	0' - 9"	9' - 0"	877.711632	7022	2	870.689939	666.885298	333.442649
61.99 CF	0' - 9"	9' - 0"	877.711632	7022	2	870.689939	666.885298	333.442649
83.55 CF	0' - 9"	12' - 4 1/2"	1183.002634	9464	3	1173.538613	898.845401	449.422701
76.37 CF	0' - 9"	11' - 0"	1081.238967	8650	3	1072.589055	821.525367	410.762683
129.39 CF	0' - 9"	20' - 10 1/2"	1831.966807	14656	5	1817.311073	1391.92838	695.96419

Table 4.3.1- Table showing wall schedule

103.32 CF	0' - 9"	14' - 4 1/2"	1462.852719	11703	4	1451.149898	1111.475496	555.737748
73.18 CF	0' - 9"	14' - 0"	1036.071344	8289	3	1027.782773	787.207007	393.603504
88.84 CF	0' - 9"	15' - 10 1/2"	1257.776807	10062	3	1247.714593	955.658818	477.829409
56.62 CF	0' - 9"	10' - 9"	801.609674	6413	2	795.196797	609.063031	304.531515
40.45 CF	0' - 9"	8' - 6"	572.641423	4581	1	568.060291	435.092953	217.546476
68.31 CF	0' - 9"	15' - 3"	967.196427	7738	2	959.458856	734.875845	367.437923
225.88 CF	0' - 9"	40' - 0"	3198.144043	25585	8	3172.55889	2429.949844	1214.974922
149.69 CF	0' - 9"	28' - 1 1/2"	2119.305239	16954	5	2102.350797	1610.248121	805.12406
137.26 CF	0' - 9"	26' - 0"	1943.353778	15547	5	1927.806948	1476.560201	738.2801
259.11 CF	0' - 9"	44' - 0"	3668.580211	29349	9	3639.23157	2787.387244	1393.693622
251.59 CF	0' - 9"	40' - 0"	3562.169947	28497	9	3533.672587	2706.536726	1353.268363
61.99 CF	0' - 9"	9' - 0"	877.711632	7022	2	870.689939	666.885298	333.442649
61.99 CF	0' - 9"	9' - 0"	877.711632	7022	2	870.689939	666.885298	333.442649
83.55 CF	0' - 9"	12' - 4 1/2"	1183.002634	9464	3	1173.538613	898.845401	449.422701
76.37 CF	0' - 9"	11' - 0"	1081.238967	8650	3	1072.589055	821.525367	410.762683
129.39 CF	0' - 9"	20' - 10 1/2"	1831.966807	14656	5	1817.311073	1391.92838	695.96419
103.32 CF	0' - 9"	14' - 4 1/2"	1462.852719	11703	4	1451.149898	1111.475496	555.737748
73.18 CF	0' - 9"	14' - 0"	1036.071344	8289	3	1027.782773	787.207007	393.603504
88.84 CF	0' - 9"	15' - 10 1/2"	1257.776807	10062	3	1247.714593	955.658818	477.829409
56.62 CF	0' - 9"	10' - 9"	801.609674	6413	2	795.196797	609.063031	304.531515
40.45 CF	0' - 9"	8' - 6"	572.641423	4581	1	568.060291	435.092953	217.546476
68.31 CF	0' - 9"	15' - 3"	967.196427	7738	2	959.458856	734.875845	367.437923
90.56 CF	0' - 9"	39' - 6"	1282.22221	10258	3	1271.964432	974.232435	487.116217
97.88 CF	0' - 9"	43' - 6"	1385.75568	11086	3	1374.669635	1052.897166	526.448583
88.88 CF	0' - 9"	39' - 6"	1258.32987	10067	3	1248.263231	956.079036	478.039518
61.03 CF	0' - 9"	27' - 6"	864.106272	6913	2	857.193422	656.547945	328.273973
119.16 CF	0' - 9"	16' - 0"	1687.064626	13497	4	1673.568109	1281.831703	640.915851
63.75 CF	0' - 9"	8' - 6"	902.599485	7221	2	895.378689	685.795089	342.897544
118.26 CF	0' - 9"	14' - 6"	1674.37217	13395	4	1660.977192	1272.187974	636.093987
58.85 CF	0' - 9"	8' - 6"	833.251407	6666	2	826.585396	633.104419	316.55221
10076.71 CF	66' - 0"	1793' - 1 1/2"	142670.396303	1141363	354	141529.033133	108400.967111	54200.483555

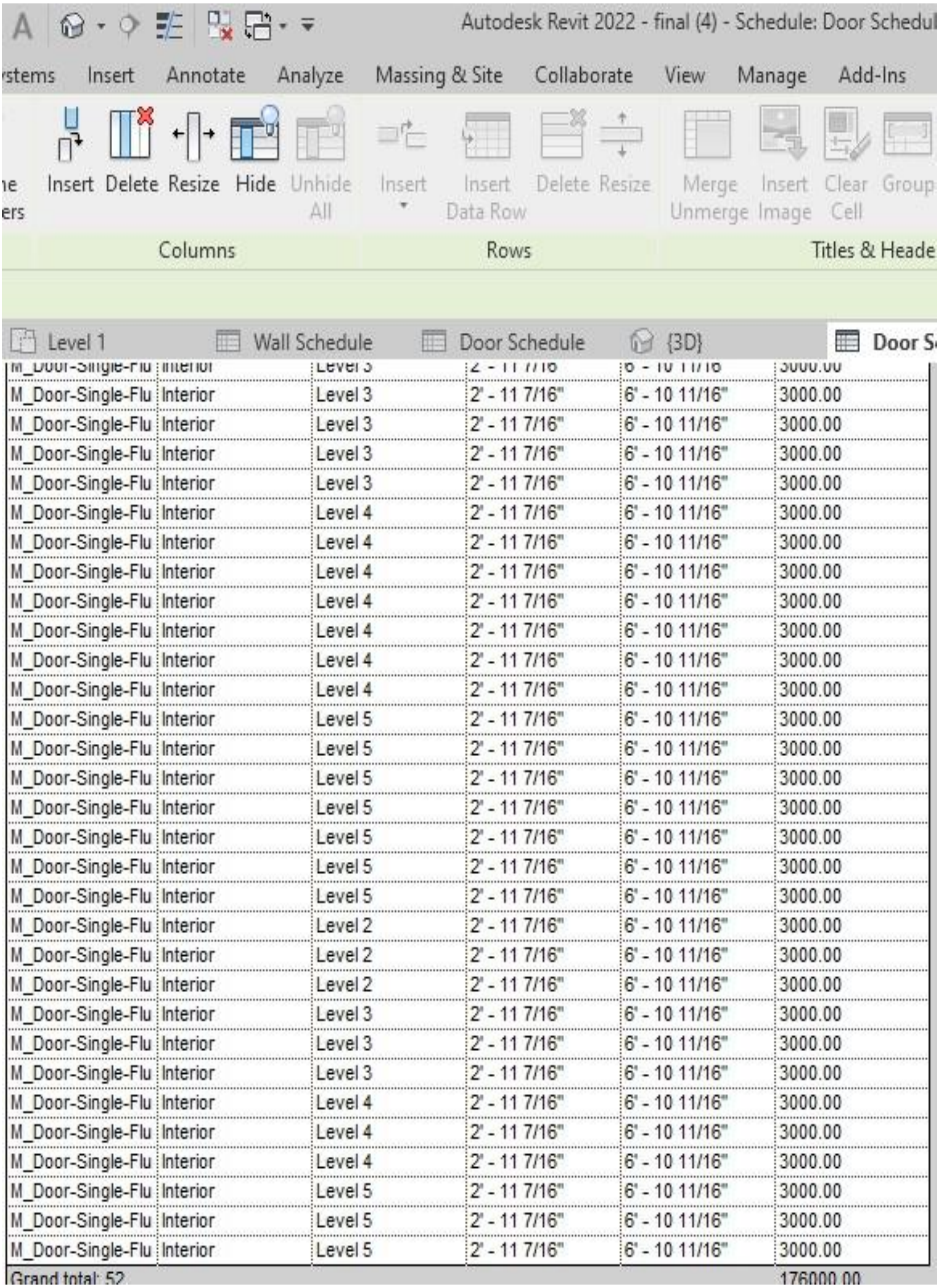
Table 4.3.2- Table showing wall schedule & total

4.4 DOOR SCHEDULE

<Door Schedule 2>

A	B	C	D	E	F
Family and Type	Function	Level	Width	Height	Cost
M_Door-Double-Gl	Interior	Level 1	5' - 6 15/16"	6' - 6 3/4"	7000.00
M_Door-Double-Gl	Interior	Level 2	5' - 6 15/16"	6' - 6 3/4"	7000.00
M_Door-Double-Gl	Interior	Level 3	5' - 6 15/16"	6' - 6 3/4"	7000.00
M_Door-Double-Gl	Interior	Level 4	5' - 6 15/16"	6' - 6 3/4"	7000.00
M_Door-Double-Gl	Interior	Level 5	5' - 6 15/16"	6' - 6 3/4"	7000.00
M_Door-Single-Flu	Interior	Level 1	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 1	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 1	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 1	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 1	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 1	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 1	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00

Table 4.4 – Table showing door schedule



M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 2	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 3	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 4	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
M_Door-Single-Flu	Interior	Level 5	2' - 11 7/16"	6' - 10 11/16"	3000.00
Grand total: 52					176000.00

Table 4.4.1 – Table showing door schedule & total

4.5 WINDOW SCHEDULE

<Window Schedule>

A	B
Family and Type	Cost
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Fixed: 24" x 48"	2000.00
Fixed: 24" x 48"	2000.00
Fixed: 24" x 48"	2000.00
Fixed: 24" x 48"	2000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Fixed: 24" x 48"	2000.00
Fixed: 24" x 48"	2000.00
Fixed: 24" x 48"	2000.00
Fixed: 24" x 48"	2000.00
Window-Casement	9000.00
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Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00

Table 4.5- Table showing window schedule

Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
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Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
Window-Casement	9000.00
65	445000.00

Table 4.5.1- Table showing window schedule with total cost

4.6 FLOOR SCHEDULE

<Floor Schedule>			
A	B	C	D
Area	Family and Type	Volume	Cost
2392 SF	Floor: Generic - 12	996.67 CF	1500.00
1795 SF	Floor: Generic - 12	747.82 CF	1500.00
1795 SF	Floor: Generic - 12	747.82 CF	1500.00
1795 SF	Floor: Generic - 12	747.82 CF	1500.00
1795 SF	Floor: Generic - 12	747.82 CF	1500.00
1795 SF	Floor: Generic - 12	747.82 CF	1500.00
11366 SF		4735.76 CF	9000.00

Table 4.6 – Table showing floor schedule with total cost

4.7 RAILING SCHEDULE

<Railing Schedule>			
A	B	C	D
Railing Height	Family and Type	Length	Cost
3' - 0"	Railing: Handrail - Rectangular	18' - 1 13/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	29' - 7 3/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	18' - 1 13/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	29' - 7 3/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	18' - 1 13/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	29' - 7 3/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	18' - 1 13/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	29' - 7 3/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	18' - 1 13/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	29' - 7 3/32"	600.00
3' - 0"	Railing: Handrail - Rectangular	15' - 0 13/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	14' - 3 5/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	12' - 0 1/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	15' - 0 13/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	14' - 3 5/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	12' - 0 1/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	15' - 0 13/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	14' - 3 5/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	12' - 0 1/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	15' - 0 13/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	14' - 3 5/16"	600.00
3' - 0"	Railing: Handrail - Rectangular	12' - 0 1/16"	600.00
Grand total: 22			13200.00

Table 4.7- Table showing railing schedule with total cost

4.8 FOUNDATION

It is a lower portion of building structure that transfers its gravity loads to the earth.

Types of Foundation and their uses

Following are different types of foundations used in construction:

1. Shallow foundation

- Individual footing or isolated footing
- Combined footing
- Strip foundation
- Raft or mat foundation

2. Deep Foundation

- Pile foundation
- Drilled Shafts or caissons

Types of Shallow Foundation

1. Individual Footing or Isolated Footing

It is the most common type of foundation used for building construction. This foundation, also called as a pad foundation and it is designed for a single column.

They are square or rectangular in shape and are used when the structure's loads are carried by the columns. The volume is defined by the weight on the column and the soil's safe bearing capacity.

2. Combined Footing

When two or more columns are near enough together for their separate footings to meet, a combined footing is created. It's a group of separate footings with different structural designs.

When weights from the structure are carried by the columns, this footing is rectangular in form.

3. Spread footings or Strip footings and Wall footings

   The base of such a spread footing is wider than that of a typical load-bearing wall foundation. This foundation type's broader base spreads the weight of the building structure over a larger area, improving stability.

   Individual columns, walls, and bridge piers with the bearing soil layer within 3m (10 ft) of the ground surface are supported by spread footings and wall footings. The soil carrying capacity must be sufficient to support the structure's weight throughout its whole base area.

   These should not be used on soils where there is a chance of a groundwater flow above the bearing layer, which might create scour or liquefaction.

4. Raft or Mat Foundations

These are foundations which span the whole footprint of a structure to carry significant structural loads from columns and walls. Mat foundations are used for column and wall foundations where the structure's loads on columns and walls are extremely high. This is designed as a single mat (or integrated footing) of all the load-bearing elements of the structure to prevent differential settling of individual footings. Types of Deep Foundation

5. Pile Foundations

A pile foundation is a type of deep foundation that transfers high loads from the structure to a hard rock stratum well below ground level. Pile foundations are used to transport large loads from structures to hard soil layers below ground level, where shallow foundations like spread footings and mat footings are ineffective. This is also used to avoid structural rise caused by lateral loads like earthquakes and wind.

Quantity analysis of isolated footing:

I. Excavation for foundation: length = centre line -width/2 × No. of T junctions

= 89.9 -1.2 ×12

= 75.5m

Breadth =0.15+0.9+0.15

=1.2m

Height =0.20+0.3+0.3+0.3

=1.1m

II. For PCC (1:4:8)

Length = centre line -width/2 × No. of T junction

= 89.9 – 0.9/2 ×12

= 84.5m

Breadth = 0.90m

Height = 0.20m

III. Brickwork in foundation:

1st step (0.60m)

Length = 89.9 -0.60/2×12

=86.3m

Breadth = 0.60m

Height = 0.30m

2nd step (0.50m)

Length = 89.9-0.50/2×12

= 86.9m

Breadth = 0.50m

Height = 0.30m

3rd step (0.4m)

Up to plinth level, length= 89.0 – 0.4/2×12

= 87.5m

Breadth = 0.40m

Height = 0.3+(0.6 – DPC)

=0.3+(0.6-0.05)

=0.85m

IV. Earth filling work in plinth:

For Bedroom(3.7m×1m)

Length =3.7

Breadth= 1m

Height = 0.60-0.05

= 0.55m

Therefore quantity = 3.7× 1 ×0.55

= 2.035m^2

For three bedrooms of same size, the quantity =6.1m^2

Bathroom(2.2m×1m):

Length = 2.2m

Breadth=1m

Height= 0.55m

Therefore quantity =1.21m^2 For three

bathrooms, the quantity=3.63m^2

Kitchen(3.5m×1m):

Length= 3.5m

Breadth=1m Height=0.55m

Quantity=1.925m^2

Store room(2.5m×1m):

Length=2.5m

Breadth=1m Height=0.55m

Quantity =1.375m^2

Hence total quantity of earth filling work in plint h =6.1+3.63+1.925+1.375

= 13.025m^2

V. DPC at plinth level (0.05m):

Length = centre line – width /2 ×12

= 89.9 – 0.4/2 × 12

87.5m

Breadth = 0.4m

Quantity= 35m^2

Item No.	Description of items	No's	Length(m)	Breadth(m)	Height(m)	Quantity(m^2)
1	Excavation for foundation	1	75.5	1.2	1.1	99.6
2	PCC (1:4:8)	1	84.5	0.9	0.20	15.21
3	Brickwork in foundation: 1st step (0.60m): 2nd step (0.50m): 3rd step (up to plinth):		 86.3 86.9 87.5	 0.60 0.50 0.40	 0.30 0.30 0.85	 15.5 13.03 29.75
4	Earth filling work in plinth: Bedroom(3.7m×1m) Bathroom(2.2m×1m) Kitchen(3.5m×1m) Store room(2.5m×1m)	 3 3 1 1	 3.7 2.2 3.5 2.5	 1 1 1 1	 0.55 0.55 0.55 0.55	 6.1 3.63 1.925 1.375 Total=13.025m^2
5	DPC at plinth level (0.05m)	1	87.5	0.4	-	35m^2

Table 4.8- Table showing Quantity analysis of footing

CHAPTER-5

CONCLUSION

One of the most significant parts of the construction industry is estimating and costing. Accurate estimating is critical to the success and quality of any building or project. At each stage of the investment process, a building cost analysis is frequently prepared. The success or failure of a construction or project is determined on accurate estimating and costing. Slight changes in constructing expenses might impair a real estate firm's overall success as well as the developer's financial stability. An estimate is a projection of a project's cost that is generally made before work begins.

Before beginning any operation or project, it is vital to determine the likely cost, which is determined by estimating. The estimating is done by computing or calculating the required quantities and then calculating the cost at appropriate rates to determine the expected expenditures in the construction of the work or project.

From the completion of this project, we learnt about:

- Types of estimate and duties of an estimator.
- Rate analysis of civil engineering works.
- Determines the rates of various items of civil works.
- Calculate estimated cost of construction work using Revit software.

This project includes the layout of G+4 residential building using REVIT software

The layout of the proposed G+4 residential building is design using REVIT software. The Area of building is $1760ft^2$.The building has four floor with ground floor and each floor is of 3BHK configuration. All the drafting was done using Revit and AutoCAD.

The result includes various schedule of building component. The foundation has been designed as an isolated footing. The quantity analysis of foundation has been calculated. The scheduling include: bricks, cement bags, sand, doors, windows, floor, railing

The cost of bricks for $10076.71ft^3$ is Rs 1141363.

The cost of sand for 108400 kg^2 is Rs 54200.

The cost of 52 doors is Rs 176000.

The cost of windows is Rs 445000.

The scope of the project as well as the related costs are detailed in construction estimates. Estimates assist in determining how much something will cost and planning appropriately so that can complete the job swiftly. Because costs might occasionally exceed budgets, a cost estimate must be established before the process begins. It helps to make the estimates realistic and complete. A cost estimator looks at the whole cost of a building project. Construction cost estimators analyse labour, materials, location, duration, unique machinery, building codes, site soil conditions, and many other factors. With accurate estimates, the builder can order the right number of supplies while keeping on budget.

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