

Estimation and Quality Control of Residential G+3 Building

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ABSTRACT

An estimate is a computation of the quantities required and expenditure likely to be incurred the construction of a work. In any construction project, the probable cost of construction which is known beforehand is known as the estimated cost. And hence it is quite essential for the arrangement of financial resources for the completion of any construction project. In this project, the main aim was to find out the detailed estimate of quantities of all the structural aspect of G+3 building. The Sunway Opus Grand Neville is a result of a joint venture between Sunway City of Malaysia and Opus of Hyderabad, India. It also aims in finding out the probable cost, or the estimated cost of the project based on the computation of these quantities. The structural aspects considered for the estimation of quantities are earthwork in excavation and backfilling, concrete work in foundation and in R.C.C structures such as beams, columns, slabs, staircases etc., steel reinforcement in beams, columns and other R.C.C structures and brickwork in superstructure. The computation of quantities was carried out based on the drawings of various structural elements, such as the each floor plan, footings and columns layout, beams layout, staircases layout, footing specifications and column specifications, which have also been provided in this document. These details provide an idea for requirement of quantities for a project and also the likely expenditure which would be needed to be arranged. This documentation also provides the abstract of the estimated cost for the structural aspects.

Keywords: NBC, ETABS, Multi-storied Building, Isolated Footing, Open Newel Quarter Turn Staircase, Estimation.

1. INTRODUCTION

Sunway Opus Grand Neville is a result of a joint venture between Sunway City of Malaysia and Opus of Hyderabad, India. Sunway City is one of Malaysia's best-known and well-diversified conglomerates, with interests in property development, leisure, entertainment, hospitality, conventions, and healthcare. Opus is a leading consortium of builder's property developers in Hyderabad, India. With a collective experience of over 100 years, Opus is a name that stands for solid expertise. The Grand Neville-Phase 2 is a one-of-a-kind project. A refreshingly new residential township spread across 9.4 acres of lush landscape and the first to introduce a concept into every construction. Giving you absolute choice to live in either single, duplex or three storey villas- all of which are

„corner“ villas, with sizeable space outside your front door. Estimation is defined as we can estimate the cost before we construct quantities of finished items of work and its expenses (cost) likely to be incurred for its construction. The main object of estimate is to know the required quantity of material, labour and cost before actual execution. It helps an engineer to plan the construction work, for quick and proper construction with required quality. It is a accurate estimation in which, each item of work (Earth work, cement concrete etc..) is worked out separately. The dimensions such as length, width, depth/height are accurately taken from the concerned drawings (plans, sections, elevations) of the proposed project. All the similar items of works are grouped at one place to sum the total contents. As an intern with GIPPL at the Sunway Opus Grand-Neville project, I was trained in the duties of a site engineer encompassing site supervision and quality control of which the major time was spent on site supervision. Part of my assignment was to take out quantities of shuttering, concreting and reinforcement to prepare the bills. I was majorly stationed at, but not limited to, E-Block, which was at the foundation-stage initially as I joined and thus a logical place to start.

Scope

Cover the activity of quarry dust filling, earth filling in the trenches of foundations, plint, under floors in all towers, we can estimate the total cost of the building, labours, materials. in further days we cannot estimate the cost of materials weather it may be increased or decreased, it depends on the quality

2. METHODOLOGY

Earthwork Excavation

Soils are the most complex of all engineering materials, and the excavation of soil is the most hazardous of all construction occupations. Soil type is used by construction workers to properly excavate the ground for utility and other purposes. Different methods of construction are permitted that include sloping, shoring, shielding, and benching of the soil for protection. We employed sloping for soil excavation here on site.

Scope: Covers the activity of Earthwork Excavation for foundations under floors.

Manpower:

Engineer –As required

Surveyor –As required

Supervisor –As required

Labour –As required

Equipment:

Total Station

Levelling instrument

Proclaim

Tippers

Compactor

Methodology:

1. The boundary lines will be marked with the help of total station as per co-ordinates mentioned in drawings. Pre levels will be taken at 5 to 15m interval (or) as directed by Engineer in charges in both direction (x-axis & y-axis).
2. The levels will be plotted on plan and the same may be recorded in field books. It will be signed by both contractor and engineer.
3. Excavation will be done by mechanical means (i.e. proclain and tippers) Excavated earth will be disposed in location as directed by engineer in charge.
4. The location of blocks will be once again verified with the help of total station after completion of excavation to start the next activity
5. If there is any minor variation, it will be dressed by manual means.

Formwork:

Scope: Covers the activity of formwork for foundations, plinth beam, columns, and slab.

Manpower:

1. Engineer –As required
2. Surveyor –As required
3. Supervisor –As required
4. Labour –As required

Equipment:

1. Shuttering Plates
2. Adjustable Props

Methodology:

1. Formwork for footings, plinth beam, columns, beams and slabs for shuttering will be M.S. Plates (Fabricated with M.S. Sheet and M.S. Angles)
2. The shutters shall be made free from dirt and dead mortar.
3. Appropriate shutter releasing oil shall be applied all over the shutter.
4. All the joints of the shutters are pasted with 3mm foam to avoid slurry leakage.
5. Adequate support is provided to formwork to maintain the alignment, verticality at the time of concrete.
6. Alignment, verticality of formwork shall be checked.
7. All dimensions and levels of the formwork shall be as per the drawings.
8. For facilitating concreting and for inspection, a staging with working platform shall be provided.
9. To check the verticality, a plumb bob weighing 1kg tied to a binding wire shall be made to fall from top.
10. To avoid slurry leakage, 3mm foam shall be pasted on the face of the shutters as well

Reinforcement:

Scope: Covers the activity of reinforcement for foundations, columns, plinth beams and slabs.

Manpower:

1. Engineer –As required
2. Surveyor –As required
3. Supervisor –As required
4. Labour –As required

Equipment:

1. Rod cutting machine
2. Rod bending machine

Methodology:

1. After receiving G.F.C (Good for Construction) drawings from the client, B.B.S may be prepared as per drawings and it should be submitted to client.
2. After getting required approval from the client, cutting, bending, and tying of reinforcement steel will be done as per approved B.B.S & drawings.
3. Bar bending and cutting machines shall be used for bending and cutting of steel.
4. All laps in reinforcement shall be in accordance with the drawings and shall be provided in as the indicated “Lap in the drawings Zone”.
5. Bars shall be rigidly fixed using 18 gauges annealed steel binding wire.
6. Binding wires shall be bent inwards and loose ends out, so that they do not protrude out of concrete.
7. Clear cover of 15mm to 50mm to all outer reinforcement shall be maintained or as shown in drawings.

Preparation of Bbs and Reord of Consumption:

- Prepare bar bending schedule from approved, latest revised drawings and check for error/inconsistencies and take approval from consultant/client.
- Plan and check for fix ability and sequence of fixing.
- Plan intelligent cutting from full length bars by preparing cutting length.
- Cutting length shall be worked out after considering bend effect.
- Check the bent shapes for dimensional accuracy against full scale template and get approval from client.
- Keep painted specimen bars for comparison with production.
- Use cut pieces for ancillary works and record consumption.

A. Plan of the Building

Structure Specifications:

Frame ---- R.CC Frame

Internal and external walls --- clay bricks/r.c.c. walls.

Villa types:

3 BHK Typical floor plans:



Fig. 2: Plan of the building

Project Brief

Contract Details:

Contract Sum: Rs. 27, 90, 95,400 Date of site possession: 17th Sep 2018 Expected date of completion (As per Contract): 16th June, 2020.

Site Details:

TOTAL AREA OF PROJECT SITE - 5.5 acres –22, 258 sqm

SEISMIC ZONE –ZONE 2

SAFE BEARING CAPACITY OF SOIL –300 N/mm²

Work

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Block Details:

Plinth area of E-block = 1728 sq.m.

Control Benchmark Reduced Level = 567.85 m

Total Footings –89

Raft (lift) Footings –4 Shorter span length = 2.425 m E-block levels as per drawing:
Basement level = 566.5 Landscape level = 567.5 Ground floor level = 569.7

1st floor level = 573.0

2nd floor level = 576.3 Roof terrace level = 579.6

Listed below are details of various stages of construction works, as followed on site, which I supervised along with the site engineers.

B. Quality Control

Following the compaction, in-situ density test (core-cutter test), moisture content, the MDD test & OMC test are carried out at the site laboratory as per testing frequency plan. Density-moisture relationship as per IS 2720 (Part8) shall be carried out at the site laboratory as per testing frequency plan. Each 100sqm. area compacted in layers shall be tested {as per IS2720 (Part29) and records for the same shall be maintained} for each layer in plinth filling before starting placing soil for the next layer.

The structure of the building is constructed by casting of foundation, columns, beams and slabs with concrete and reinforced with steel reinforcing bars. In RC construction, the following materials are used:

- Steel reinforcing bars.
- Cement.
- Aggregate
- Brick

To ensure construction of building which will be safe and durable, the construction materials should be of good quality.

Steel Reinforcing Bars

It should be of good quality and manufactured as per BSTI standard. From strength consideration, there are three grades of steel reinforcing bars available in our market e.g. 40 grade, 60 grade and 75 grade. Quality of steel reinforcing bars should be tested regularly from a standard testing laboratory.

Cement

Routine tests to check the quality of cement should be done regularly from a standard testing laboratory having testing facilities as per BSTI standard.

Aggregate

The aggregate gives volume, stability, resistance to wear or erosion, and other desired physical properties to the finished product. Fine aggregate usually consists of sand, crushed stone, or crushed slag screenings; coarse aggregate consists of gravel (pebbles), fragments of broken stone, slag, and other coarse substances. Fine aggregate is used in

making thin concrete slabs or other structural members and where a smooth surface is desired; coarse aggregate is used for more massive members.

Burnt clay brick

It used for construction purpose this bricks are generally moulds in which clay is filled and dried and then baked or fired in the kiln burnt bricks are usually not visually appealing, they need on application of plaster they can withstand extreme heat and therefore use in construction projects involving thermal, chemical, and mechanical stress

Rolling Margin for steel

Other Routine Inspections By Quality Dept. Common Checks For Reinforcement.



Fig. 3: Correct Spacing Of Slab Reinforcement



The main object of estimate is to know the required quantity of material, labour and cost before actual execution.

VI. ESTIMATION DETAILS

1. Land acquisition, including assembly, holding and improvement.
2. Planning and feasibility studies.
3. Architectural and engineering design.
4. Construction, including materials, equipment and labour.
5. Field supervision of construction. Construction financing.
6. Insurance and taxes during construction.
7. Owner's general office overhead.

8. Equipment and furnishings not included in construction. Inspection and testing

Item	Description	Block E	Total
			Amount (Rs)
Bill 1	Sub Structure (Basement)	10,519,198.66	10,519,198.66
Bill 2	Super Structure	10,525,334.44	10,525,334.44
Bill 3	Masonry	2,964,503.19	2,964,503.19
Bill 4	Plastering	2,930,971.37	2,930,971.37
Bill 5	Door Frame, Shutter & Lockset	1,327,970.24	1,327,970.24
Bill 6	Aluminium Windows & Sliding Doors	3,745,982.72	3,745,982.72
Bill 7	Roof Structure & Finishes	345,943.20	345,943.20
Bill 8	Floor & Wall Finishes	6,062,928.05	33,734,072.00
Bill 9	Railing	724,000.00	724,000.00
Bill 10	Water proofing Works	659,778.20	659,778.20
Bill 11	Sanitary Fitting, Internal water supply and sanitary piping	1,360,931.32	1,360,931.32
Bill 12	Internal MEP	2,193,050.20	2,193,050.20
Bill 13	External MEP	N/A	19,558,671.00
Bill 14	Infra Works	N/A	9,092,952.49
Bill 15	Affiliate Building Works	N/A	
Bill 16	Provisional Sum	N/A	11,400,000.00
TOTAL CONSTRUCTION COST (Rs)		43,360,591.59	279,095,400.00

VII. CONCLUSION

It was an absolute privilege to undergo my training at Galacon Infra & Projects (P) Ltd for Sunway Opus Flexi Villas Project, Hyderabad, A.P. It was indeed a learning experience and went a long way in increasing my knowledge and skill. It was wonderful to work alongside a highly skilled and experienced workforce at one of the major construction sites in the country. It gave me an opportunity to learn about various aspects of civil engineering. I learnt about the implementation of various techniques and methods being used for construction. I also learnt how the entire work site is managed and how the various activities are planned. I feel proud to have worked at this project and I am thankful to GALCON infrastructure pvt ltd for having given me the opportunity. In the process of carrying out this project, we learnt to apply the theoretical aspects of estimation on a live project. We have learnt the process of Estimation and Costing and we understood that it is an essential aspect in a project for the arrangement of financial resources necessary for the completion of the job. Our calculation is based on precise measurements which gave us approximate and accurate values. The structural estimate had been prepared in detail such that the values can be used in the actual project being carried out. Also, the abstract of the estimated cost was prepared such that the current on-going rate per unit of each item of work were considered. Hence the estimated costs of the structural requirements of the project are accurate too.

Therefore, this project is not a rough, but fairly accurate in its results of both the estimated quantities as well as the estimated cost and is quite useful for the ongoing project on which it is made.

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