Department of Civil Engineering, IIT Guwahati

Preparing the schedule and estimating the cost of a construction project

Project under consideration- 2 Storey residential house

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- **Project Overview**

The project entails the construction of a *2-story residential house* located in Bathinda, Punjab. Bathinda, known for its rich cultural heritage and vibrant community, presents an ideal setting for this residential endeavor. The house is designed to accommodate modern living standards while embracing the architectural essence of the region.

Note- Drive link to Auto CAD and MS Project file

References used

- The cost estimation is done according to the CPWD norms.

https://cpwd.gov.in/Publication/DSR_Book%20Vol_1_2016_(English_Version)_Final.pdf

- IS 7272 was used in order to associate different class of worker and resources required for different works.

https://civilplanets.com/wp-content/uploads/2020/04/7272-1.pdf

❖ Drawings

This drawing provides an overview of the property's layout. Detailed floor plans illustrating the layout of each floor, including room dimensions, spatial arrangement, and circulation areas. Cross-sectional drawings showcase the vertical composition of the structure, highlighting key structura l elements and building systems.

Fig. 1

Design and Dimensions of Ground floor

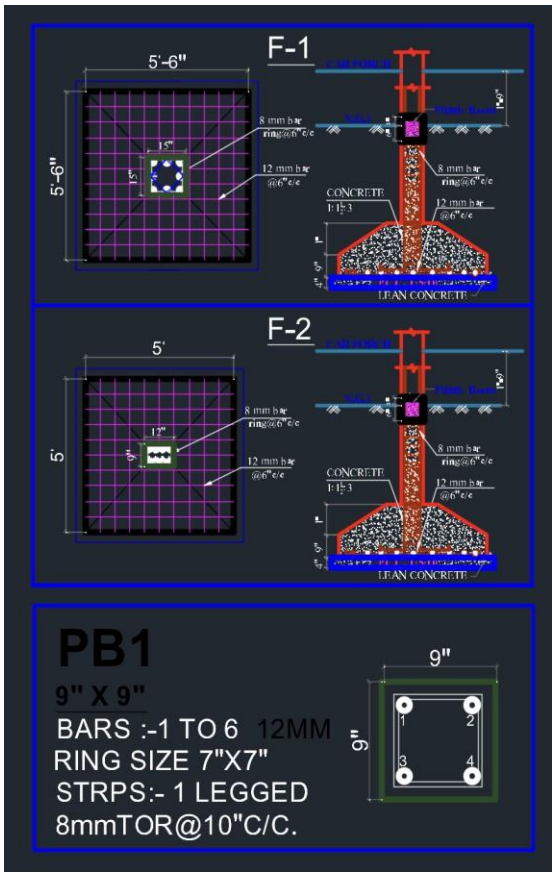

Fig. 2

Foundation and Plinth Beam

Fig. 3

Position of Columns

❖ Excavation

Excavation is the foundational process in construction, involving the careful removal of soil and rock to prepare the site for building. This vital step sets the stage for laying foundations, utilities, and structural support, ensuring stability and longevity for the project.

- Site Clearing
- Trench Excavation

Table 1: Labour required for Trench Excavation

Type of Labour	Recommended constant in days	Rate	Quantity of work (in m^3)	Amount (in Rs)
Mate	0.05	407	49.554	1008.432
Mazdoor	0.5	645	49.554	15981.29
Total				16989.73

Note: This activity take **2 days** to complete with **1 mate** and **13 Mazdoor**

- Layer of crushed stone and sand

Table 2: Labour required for layer of Crushed stone and sand

Type of Labour	Recommended constant in days	Rate	Quantity of work (in m^3)	Amount (in Rs)
Mazdoor	0.7	645	0.5806	262.1607
Total				262.1607

Note: This activity take 1 **days** to complete with **1 Mazdoor**

Table 3: Resource required for Layer of Crushed stone and sand

Material	Quantity (in m^3)	Rate (per m^3)	Amount (in Rs)
Stone	0.1935	1300	251.612
Sand	0.3870	760	294.192
Total			545.79

❖ Foundation

Foundations serve as the bedrock of any structure, providing stability and support against structural loads. They distribute weight evenly, ensuring durability and safeguarding against settlement.

- Laying PCC

Table 4: Labour required for Laying PCC

Type of Labour		Recommended constant in days	Rate	Quantity of work (in m^3)	Amount (in Rs)
Mason		0.07	749	2.3597	123.72
Mazdoor		0.1	645	2.3597	152.20
Bhisti		0.1	714	2.3597	168.485
Total					444.408

Note: This activity take 1 **days** to complete with **1 mason, 1 mazdoor and 1 bhisti**

Table 5: Material required for Laying PCC

Material	Quantity	Rate (per m^3)	Amount (in Rs)
Cement	0.2123 tonne	5700 per tonne	1210.543
Sand	0.7374 m^3	760 per m^3	560.4367
Aggregate (20 mm)	1.4748 m^3	1300 per m^3	1917.283
Total			3688.263

- Foundation reinforcement bar

Table 6: Labour required for Foundation reinforcement bar

Type of Labour	Recommended constant in days	Rate	Quantity of work (quintal)	Amount (in Rs)
Bar Bender	1	714	0.2434	173.8031
Mazdoor	1	645	0.2434	157.007
Total				330.8101

Note: This activity take 1 **days** to complete with **1 bar bender and 1 mazdoor**

Table 7: Material required for Foundation reinforcement bar

Material	Quantity	Rate	Amount (in Rs)
Steel	0.243422 quintal	3625 per quintal	882.4036
Total			882.4036

- Column reinforcement bar

Table 8: Labour required for Column reinforcement bar

Type of Labour	Recommended constant in days	Rate	Quantity of work (quintal)	Amount (in Rs)
Bar Bender	1	714	3.501	2744.798
Mazdoor	1	645	3.501	2258.157
Total				5002.955

Note: This activity take **2 days** to complete with 2 **bar bender and 2 mazdoor**

Table 9: Material required for Column reinforcement bar

Material	Quantity		Rate	Amount (in Rs)
Steel	3.501 quintal		3625 per quintal	12691.19
Total				12691.19

- Formwork of columns

Table 10: Labour required for Formwork of columns

Type of Labour	Recommended constant in days	Rate	Quantity of work (quintal)	Amount (in Rs)
Mazdoor	0.25	645	1.4866 m^3	239.714
Carpenter	0.2	759	1.4866 m^3	225.665
Total				465.379

Note: This activity take 1 **days** to complete with **1 carpenter and 1 mazdoor**

- Concreting of Foundation

Table 11: Labour required for concreting of Foundation

Type of Labour	Recommended constant in days	Rate	Quantity of work (m^3)	Amount (in Rs)
Mason	0.17	749	10.3149	1313.399
Mazdoor	2	645	10.3149	13306.25
Bhisti	0.9	714	10.3149	6628.368
Mixer Operator	0.7	784	10.3149	566.0829
Mixer	0.7	800	10.3149	577.6356
Vibrator	0.7	350	10.3149	252.7156
Total				22644.45

Note: This activity take 1 **days** to complete with **2 mason, 20 mazdoor, 9 bhisti, 1 mixer operator, 1 mixer and 1 vibrator**

Table 12: Material required for concreting of Foundation

Material	Quantity	Rate	Amount (in Rs)
Cement	2.846 tonne	5700 per tonne	16223.42
Sand	2.964 m^3	760 per m^3	2253.253
Aggregate (20 mm)	5.929 m^3	1300 per m^3	7708.468
Total			26185.18

- Concreting of Column

Table 13: Labour required for concreting of column

Type of Labour	Recommended constant in days	Rate	Quantity of work (m^3)	Amount (in Rs)
Mason	0.17	749	1.4866	189.2929
Mazdoor	2	645	1.4866	1917.755
bhisti	0.9	714	1.4866	955.3097
Mixer Operator	0.7	784	1.4866	81.58636
Mixer	0.7	800	1.4866	83.25139
Vibrator	0.7	350	1.4866	36.42248
Total				3263.618

Note: This activity take 1 **days** to complete with **1 mason, 3 mazdoor, 2 bhisti, 1 mixer operator, 1 mixer and 1 vibrator**

Table 14: Material required for concreting of Cloumn

Material	Quantity	Rate	Amount (in Rs)
Cement	0.377 tonne	5700 per tonne	2152.038
Sand	0.393 m^3	760 per m^3	298.8941
Aggregate (20 mm)	0.786 m^3	1300 per m^3	1022.533
Total			3473.464

- Backfilling and compaction

Table 15: Labour required for backfilling and compaction

Type of Labour	Recommended constant in days	Rate	Quantity of work (m3)	Amount (in Rs)
Mate	0.02	407	34.837	283.573
Mazdoor	0.25	645	34.837	5617.478
Bhisti	0.02	714	34.837	497.473
Total				6398.526

Note: This activity take 1 **days** to complete with **1 mate, 9 mazdoor and 1 bhisti**

- Water Curing- Duration(3 days)
- Removal of formwork- Duration(1 day)

❖ Duration Estimation

The construction project entails a comprehensive timeline encompassing various stages and activities essential for the realization of the residential house. The estimation of durations for each phase of the project is imperative for effective planning, resource allocation, and project management.

Table 16

Duration estimation for various activities

Activity	Duration (In Days)
Excavation	5
Foundation	14
Surface Tie Bar	11
Concreting of Slab	7
Ground Floor Work	72
Total	**171**

❖ Quantity of different Materials

Table 17

Cost and Quantity of materials required

Material	Activity	Rate	Quantity	Amount
Excavation	Cement	5700 per tonne	0	0
	Sand	760 per cumec	0.38 cumec	288.80
	Aggregate	1300 per cumec	0.19 cumec	247
	Steel	3625 per quintal	0	0
	Bricks	4590 for 1000 bricks	0	0
Foundation	Cement	5700 per tonne	3.44 tonne	19,608
	Sand	760 per cumec	4.10 cumec	3,116
	Aggregate	1300 per cumec	8.19 cumec	10,647
	Steel	3625 per quintal	3.75 quintal	12,687.50
	Bricks	4590 for 1000 bricks	0	0
Surface Tie Bar	Cement	5700 per tonne	1.45 tonne	8,265
	Sand	760 per cumec	1.51 cumec	1,147.60
	Aggregate	1300 per cumec	3.03 cumec	3,939
	Steel	3625 per quintal	13.48 quintal	48,865
	Bricks	4590 for 1000 bricks	0	0
Concreting of slab	Cement	5700 per tonne	0.93 tonne	5,301
	Sand	760 per cumec	3.22 cumec	2,447.20
	Aggregate	1300 per cumec	6.45 cumec	8,385
	Steel	3625 per quintal	0	0
	Bricks	4590 for 1000 bricks	0	0
Ground floor work	Cement	5700 per tonne	7.40 tonne	42,180
	Sand	760 per cumec	13.20 cumec	10,032
	Aggregate	1300 per cumec	13.94 cumec	18,122
	Steel	3625 per quintal	62.04 tonne	2,24,895
	Bricks	4590 for 1000 bricks	48900	2,24,451

❖ Cost of different works

The successful execution of the construction project relies on the efficient allocation of resources, including labor, materials, and equipment, at competitive rates. The determination of rates for different works is essential for accurate budgeting, cost estimation, and procurement planning, ensuring the optimal utilization of resources while adhering to quality standards.

Table 19

Duration estimation for various activities

Category	Cost
Labor	4,58,873.70
Material	4,37,235.20
Total	**8,G6,108.G0**

The establishment of competitive rates for different works is integral to the overall success and viability of the construction project. Through diligent planning, strategic procurement, and prudent resource management, stakeholders can optimize project costs, enhance project value, and achieve desired project outcomes in a dynamic and competitive construction environment.

- **Total cost of project: 9,15,412.74**
- **After Sundries @2%, GST@18%, CESS@1% and Contractors profit @15% =12,44,961.33**
- **Duration of Project = 171days**