Team ID - 322894

INTERNSHIP AT M/S. WAGAD BUILDCON

AN INTERNSHIP REPORT

Submitted by

Mr. Kunal Gupta

190390106001

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Civil Engineering

S.P.B. Patel Engineering College, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at M/s. Wagad Buildcon** has been carried out by **Kunal Rakeshbhai Gupta** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Civil Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Sign

Prof. Meet Jani

Internal Guide

Sign

Prof. Avani Dedhia

Head of Department

Team ID - 322894

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 14 May 2023 (15:14:33)

This is to certify that, *Gupta Kunal Rakeshbhai* (Enrolment Number - 190390106001) working on project entitled with *Internship at Wagad Buildcon* from *Civil Engineering* department of *S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA* had submitted following details at online project portal.

Internship Project Report	Completed

Name of Student : Gupta Kunal Rakeshbhai **Name of Guide :** Mr. Meet Jani

Signature of Student : _____ ***Signature of Guide :** _____

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

Company Certificate

WAGAD

Date: 24/04/2023

TO WHOM IT MAY CONCERN

This is to certify that **Mr. Kunal Gupta**, having enrollment no. 190390106001, a student of S.P.B. Patel Engineering College has successfully completed his Internship of Final Year in the field of "Construction of Diaphragm Wall" as a Project Co-Ordinator from 23/01/2023 to 24/04/2023 (Total number of Weeks: 13) under the guidance of General Manager of Diaphragm Wall Department **Mr. Amit Sagare.**

His internship activities include: Coordination with the staff engineers and team, Preparing Daily Progress Report, Tendering, Estimating BoQ, Preparing quotations, Preparing work orders for hiring equipment, Preparing Quality Assurance Plan (QAP) and Method Statements, Planning & Scheduling of a project, Evaluating on-site metrics, Preparing BBS & Concrete Reports, Preparing RA bills, Reconciliation reports, Preparing and processing subcontractor bills, Preparing POs (Purchase Orders), and other activities related to Project Co-Ordination.

During the period of his internship program with us, he had been exposed to different processes and was found diligent, hardworking and inquisitive.

We wish him every success in his life and career.

For M/s. Wagad Buildcon,

Authorized Signature

WAGAD BUILDCON
413, TIME SQUARE ARCADE, NEAR BAGHBAN PARTY PLOT, THALTEJ-SHILAJ ROAD, AHMEDABAD-380 059
dwall@wagadinfra.com www.wagadinfra.com T: 079 - 3521 2802

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship / Project report submitted along with the Internship / Project entitled **Internship at Company/Industry Name** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Mechanical Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Prof. FirstName LastName** & **FirstName LastName (External Guide)** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the Student — Sign of Student

1. **Kunal Rakeshbhai Gupta** _____

ACKNOWLEDGMENT

I would like to earnestly acknowledge the sincere efforts and valuable time given by my Mr. Amit Sagare. His valuable guidance and feedback has helped me in completing this internship with full dedication.

I am dearly obliged to Prof. Meet Jani & Prof. Avani Dedhia for giving me an opportunity to work on this project which has made me learn new skills and gain good amount of knowledge.

My sincere thanks to all office colleagues who have made me believe on myself and guided me in every task.

Abstract

Wagad Buildcon is a company specializing in the field of construction of Diaphragm Wall. The company has been established since 2020 under the umbrella of Wagad Infraprojects Pvt. Ltd., delivering Diaphragm Wall construction services on Pan India level. Diaphragm Wall is a trending technology substituting traditional method of the construction of retaining walls. My role being a Project Coordinator was:

- Coordination with the staff engineers and team
- Preparing Daily Progress Reports (DPR)
- Tendering
- Estimation & Preparing BoQ
- Preparing quotations
- Planning & Scheduling
- Preparing BBS & Concrete Reports
- Creating RA Bills
- Reconciliation Reports
- Creating Subcontractor Bills

During my tenure I explored working procedures of Diaphragm Wall from commencement of the project to closeout.

List of Figure

List of Table

List of Abbreviations

GFC – Good For Construction

BBS – Bar Binding Schedule

NHAI – National Highway Authority of India

DPR – Daily Progress Report

DPR – Daily Panel Report

BoQ – Bill of Quantities

RA – Running Account

Table of Contents

Chapter – 1 Background of the Company

We Wagad, an ISO 9001:2015 certified are based at Ahmedabad, Gujarat. We are pleased to introduce ourselves as a premier Engineering and Construction company in India. We have been successfully delivering complex and challenging projects in Highways Bridges, Diaphragm Wall, Industrial development projects, High Rise Buildings & Real Estate Development in PAN India since 2011 and we are also into Ready Mix Concrete Supply Business at various places in Gujarat.

Wagad Infraprojects Pvt. Ltd. currently having approx. Rs. 2000 crore projects for Highways & Bridges at different locations from all over in India like at Rajasthan, Gujarat, Madhya Pradesh, and Kerala under NHAI.

Wagad Buildcon is built up under the umbrella of Wagad Infraprojects Pvt. Ltd. specializing in Diaphragm wall construction. Having a dominant presence in Diaphragm wall construction segment in Gujarat as well as in Bengaluru and Delhi. We're one of the leading players in the diaphragm wall construction segment sector focused on commercial building/high-rise structures and housing projects, et cetera.

We at Wagad, are more than competent to meet the immediate expectation of clients for achieving project completion in a timely manner with utmost safety norms and topmost quality of the execution of the work, as we are well equipped with the required machineries and man power with a commitment to:

- Execute work as per standard HSE (Health, Safety, & Environment) norms.
- Create detailed schedules & resources to meet the clients project expectations and objectives.
- Communicate clearly with all Project's stakeholders.
- Track project's timely progress and take corrective actions where required.
- Timely completion and commissioning of the projects in a positive attitude.

Currently our ongoing diaphragm wall projects are in New Delhi and Bengaluru with very reputed clients like Galaxy Group – Delhi (2 Projects), County Courtyard – Delhi (2 Projects) and Embassy Group – Bengaluru.

Chapter – 2 Introduction to Diaphragm Wall

2.1 Introduction to Diaphragm Wall & Its Methodology

Diaphragm wall is a modern technology which is recently in demand for several commercial, residential sites. Diaphragm walls are underground structural components frequently utilized as permanent foundation walls and retention systems. They can also serve as barriers for groundwater. Diaphragm walls can be constructed quickly for building projects having 1 or more basements. The construction of diaphragm walls includes several components such as:

We M/S Wagad Buildcon ensure quality work for each and every components of the diaphragm wall. Following are the detailed description of the quality assurance for each and every component:

2.1.1 Fixing of Alignment for Diaphragm Wall

Before the excavation of panel marking of diaphragm wall is done with the help of 'Total Station Survey Method'. The marking of the diaphragm wall is done with accordance to the shared GFC drawings. With the help of total station survey method, a bed is prepared for further processes. The bed made should be aligned properly and equally levelled. To check the bed preparation and levelling total station is used.

Figure 1: Chuna Line Marking for Construction of Guide Wall

During the survey, both the posts are turned in opposite directions then bubble tube present in the centre is being levelled. This will ensure proper making of the bed for further action. In addition, a properly levelled bed boosts the working procedure of guide walls and excavation of panels as minimal or no further alignment will be required. Therefore, work can be carried out flawlessly without or minimal delays. This will also ensure quality working procedures.

2.1.2 Construction of Guide Wall

The construction of two temporary parallel concrete beams to guide the excavation tool and stabilise the upper is required before diaphragm wall excavation. Cast-in-place or precast light reinforced concrete parts are guide walls. A guide wall preserves a diaphragm wall's horizontal alignment and wall continuity while being used to prevent superficial soil collapse, indicate the position of the panels, and support the steel cages as the concrete matures.

This temporary support is crucial since the wall is prone to instability and the slurry levels change throughout construction. Guide walls are also crucial since they aid in situating the finished building and assist in vertically guiding the diaphragm wall grabs.

Figure 2: Shuttering Work of Guide Wall

Depending on the makeup of the topsoil, the guide walls' size and shape may fluctuate. The bentonite slurry inside the excavation hole must always be kept a few metres above the height of the water table, as is the case in bored piles. The guide walls may be constructed at a higher height than the ground plane in some unique situations where the water table is extremely close to the surface and the soil has weak mechanical qualities in order to maintain the previously indicated height difference.

As per the GFC Drawing, a guide wall with a depth of **1.2 metres** usually or as per GFC drawings must be constructed out of reinforced cement concrete. The interior sides of the guide wall must have spacing of some ‘mms’ as per GFC drawings. The guide wall's dimensions must match those in the above-mentioned GFC design, whether they are in a filled area or an excavation. Only once the filled area has been sufficiently compacted, excavation work for the guide wall can begin. After the excavation is done, reinforcement takes place. The shuttering is carried out properly with perfect alignment along with the required effective covers placement. During the concreting of the guide walls – cube tests are done. Finally, de-shuttering takes place. Henceforth, making the conditions suitable for boring/trenching of the diaphragm wall.

2.1.3 Boring/Trenching

Hydraulic grabs are used to dig the single panel down till it reaches the necessary level. The cycle of excavation labour begins with the open grab resting on the ground; the weight and speed of the tool allow the teeth to quickly pierce the earth. The grab excavates the dirt and holds some of it inside the jaws by engaging the closing mechanism. To guarantee correct shutting, the jaws' tooth

arrangements often have an odd number of teeth on one jaw and an even number on the other. Because the asymmetrical shape of the jaws tends to veer away from straightness, the grab is rotated 180 degrees each time it is lowered into the excavation rather than continually being employed in one direction.

Figure 3: Boring with Casagrande B125 XP Machine

With the jaws closed, the grab is raised, and earth is ejected into a predetermined location. The process is repeated several times until the excavation is finished. The secondary diaphragm wall panels are erected between the primary panels, which are dug initially. For excavation processes, we at Wagad Buildcon has the latest modern equipment i.e. Casagrande B125 XP & Casagrande B200 XP. This equipment is designed especially for the proper excavation of the panels of diaphragm wall till the desired depth as per the GFC drawings.

2.1.4 Polymer or Bentonite Slurry

As the trenching proceeds further, chances of collapsing increases. Therefore, it becomes crucial to maintain the trenches until the desired depth is reached. For the same, a polymer bentonite aided slurry is used that maintains the lateral forces of the excavated soil and allows the trenching process until the desired depth is reached. Polymer or bentonite slurry is used for boring, after the dry boring is completed. Usually dry boring can be continued until the depth of 5-6 meters. Although, the length of a single panel is round about 5 meters. Therefore, the process of grabbing can be accomplished in three cuts as per the grab size.

Panel width may change depending on site constraints or as permitted by GFC. The bore must be kept vertical during the trenching operation to the degree necessary for it to comply with the technical specification's allowable limitations. The following actions must be taken to maintain the trench's verticality: The machine must be set up on reasonably level and sturdy ground, and the crane's track chain's level must be verified using a spirit level. The boring equipment must be moved to a different site after the necessary depth has been reached. After the completion of the boring up to specified depth, polymer slurry needs to be added. Polymer or bentonite slurry will stabilize the trenches, if heavy collapse chances are observed the density of the polymer or bentonite is increased, in order to achieve the required stabilization.

Following tests are carried out on freshly prepared polymer or bentonite slurry to be used in diaphragm wall:

Type of Test	Method of Test	Permissible Value at 20°C
Density	Mud balance or hydrometer	1.04 to 1.10 g/ml
pH	pH indicator strips	9.5 to 12
Viscosity	Marsh cone method	80 to 110 seconds

Table 1: Test as per IS: 9556-1980

Where polymer or bentonite slurry gets heavily polluted with fine sand during its first usage, testing frequency shall be on a panel to panel basis, and may be on a daily basis where contamination may be modest. The frequency of slurry testing in situations where a mechanical method is used to remove contaminated materials from the slurry shall depend on the equipment used. Fresh polymer or bentonite slurry must be added to the polluted slurry at the bottom of the trench using suitable slurry pumps, submersible pumps, or air lift. For further details regarding the polymer or bentonite slurry, you may refer to IS : 9556-1980.

Figure 4: Viscosity Test

2.1.5 Reinforcement Cage: Making, Placing, & Resting

Reinforcement shall comply with the requirements of the drawings. High strength deformed steel bars and wires for concrete reinforcement conforming to IS: 1786-1985 and structural steel sections conforming to IS: 800 shall be used. Structural steel sections shall be inserted into the cage where openings shall be made at subsequent stages. All reinforcement bars and other structural steel section used shall be clean and free from loose mill scales, dust, rust, oil, grease, paint or other coatings which may reduce the bond with concrete.

Figure 5: Making of Cage for Panel of Size – 5m

Front and rear of cages shall be marked on Site to identify them during placement, and lifting points and design of lifting lugs shall not cause distortion of the cage. Distance spacers shall be of an approved type, capable of resisting displacement during cage placement within the trench and shall not entrap slurry during cage placement or concreting.

The reinforcement shall be adequately fixed to avoid displacement and to maintain the minimum specified cover during concreting. Welding of cold worked high tensile reinforcement bars shall normally not be permitted as a method of splicing cages. If permitted the requirements of IS: 9417-1989 shall be adhered to. Welding of hot rolled high tensile steel bars will be permitted provided that a method is used which will not adversely affect the properties of the bars. Reinforcement cage is lifted & placed with the help of crane.

Figure 6: Cage Lifting

2.1.6 Installing Stop Ends with PVC Water Stopper

Stop ends, inserted before placement of concrete in panel, shall be clean and have a smooth regular surface. Any shutter release agent shall have no detrimental effect on the finished works. Where stop ends are inserted in sections, adequate joint connections must be provided to ensure verticality of the complete tube. Two stop end tubes are used at the ends of the primary panels to support concrete and form suitable joints with the secondary panels. While, for the secondary panel, a stop end tube with a smooth surface, or a structural section shall be inserted in the trench at the end of the panel to support concrete and to form a suitable joint with the next panels.

Figure 7: Stop End Lifting & Resting

During, the installation of the stop ends in the panels excavated – a PVC water stopper of size depending on depth of the panel, thickness varies from 8-10mm of 250mm width, is installed by means of glass putty and grease. During the concreting process, stop end is shake after every one hour so that it doesn't get stuck in the panel and damage the panel. The stop end is being removed without damaging the placed concrete as well as without damaging the nearby structure while the PVC water stopper remains the placed concrete itself. This water stopper also serves as a bonding connection between primary and secondary panels. These connections are referred to as 'Male-Female' connection. The open end of the PVC water stopper placed in the primary panel is referred to as 'Male' while the other stop ends and concrete placed in the secondary panel i.e. the receiving end is referred to as 'Female'. After the successful installation of the stop ends, panel is set ready for concreting procedure. Stop ends are placed and extracted using crane.

2.1.7 Concrete Pouring

For concreting of the panel tremie pipes are installed. Tremie pipes shall be clean, watertight and with a minimum internal diameter of 250mm. The tremie tube shall extend that all polymer slurry is expelled from the pipe during the initial charging operation. The tremie pipe shall be maintained with a minimum embedment of 2.0 m into the concrete to prevent the re-entry of slurry in the pipe. The contractor shall ensure that an adequate supply of concrete to tremie is available all the times so that placement is continuous until completion of the panel. The number of tremie pipes per panel shall be in accordance with the method statement. Where more than one tremie pipe is employed during concrete pouring to any one panel, the charging of concrete into the pipes shall be arranged so that it is evenly distributed between the pipes and so that no differential head exists at the concrete/slurry interface over the length of the panel. This level shall be confirmed by sounding taken during the concrete pour. During, the concreting of the panel, continuous supply of the concrete shall be ensured for achieving the desired finishing of the work.

Concrete shall comply with the general requirements as per the drawings. It shall have a minimum cementious content of 400 kg/m^3 , in accordance with BS 8004 (or as per CI. 5.2 of IS: 456-2000). Minimum slump of the concrete shall be 150mm and the mix shall flow easily within the tremie pipe and be designed to produce a dense impervious concrete. While pouring concrete excess polymer water coming out will be recycled, there is no chance of the polymer being getting wasted. The received polymer can be reused for further work. Although, integral water proofing admixture Vandex Am 10 (integral crystalline admixture) is used to interact with concrete capillary pore structure to provide waterproofing system that is a permanent part of the concrete mix.

Test cubes shall be made and tested in accordance with the specification. Test cubes shall be taken for each panel constructed. Cubes shall be marked with the wall panel numbers and shall be sub-marked within each panel set to indicate a location within the panel. Cube test will be done as per the standard procedures i.e. every 7 days and 28 days after the concreting is done. Plus, slump test will be done before the placing of the concrete.

Figure 8: Pouring Panel Using Tremie Pipe

After the concreting is done. The site is cleaned for the further processes, also the muck extracted is disposed of with necessary actions.

i) Spoil removed from the excavation shall be separated from the slurry employed in the excavation process. It shall be disposed of as quickly as possible to locations as directed by the Engineer and in such a manner that spillage and annoyance be minimized.

ii) Contaminated slurry, not suitable for re-use, shall be removed from the Site and disposed of as per specification.

2.2 Tolerances

Construction shall be carried out in accordance with the following normal tolerances, unless otherwise defined by the Contractor's drawings or procedures.

i) For straight or other specified prone panels. the minimum clear distance between the faces of the guide walls shall be the specified diaphragm wall thickness plus 25mm, and the maximum distance Shall be the specified diaphragm wall thickness plus 50mm. The guide walls shall be propped as necessary, to maintain these tolerances, and the inner guide wall shall be constructed to the line as shown on the drawings. Finished faces of guide walls towards the trench shall be vertical and shall have no ridges or abrupt changes. Variations from straight line or profile shall not exceed 25 mm in 3 m. The trench face of the guide wall on the side of the trench nearest to the subsequent main excavation shall vertical to within 1:200. The top edge of this wall face shall not vary from a straight line or the specified profile by more than +15mm in 3m and shall be without ridges or abrupt irregularities.

ii) The plane of the wall face to be exposed shall be vertical to within a tolerance of 1:200, relative to a vertical line projected from the base of the guide wall. In addition to this tolerance, 75mm shall be allowed for protuberances resulting from irregularities in the ground excavated beyond the general face of the wall.

iii) The ends of panels shall be vertical to within a tolerance of 1 :200.

iv) Where recesses are to be formed by inserts in the wall, they shall be positioned within a vertical tolerance of ±75mm, a horizontal tolerance measured along the face of the wall of ±75mm, and a horizontal tolerance at right angles to the face of the wall as constructed of ±75mm.

v) The tolerance in positioning reinforcement shall be as follows:

- Longitudinal tolerance of cage head at the top of the guide wall and measured along the trench: ±75mm.
- Vertical tolerance at cage head in relation to the top of the guide wall: ±5mm.
- Lateral tolerance of reinforcement in the direction across the width of the wan shall be ±50mm.

vi) The tolerance in positioning couplers and starter bars for subsequent structural connections shall be as follows:

- Longitudinal tolerance measured along the trench: ±75mm.
- Vertical tolerance: ±50mm.
- Lateral tolerance in the direction across the width of panel shall be ±50mm.

vii) A minimum cover to main reinforcement of 75mm shall be maintained. Minimum clear distance between reinforcement bars Shall be 100 mm.

viii) Notwithstanding the requirements of this Subsection the tolerances may be aggregated only to the extent that they do not exceed 250mm. If, during the general excavation, it is detected that the above stated tolerances have been exceeded, the Contractor shall draw up proposals for remedying or compensating for the defects. The Contractor should review his method statement for all subsequent diaphragm wall construction.

2.3 Method Statement

The Contractor shall submit a statement giving the full details of materials, plant and operations involved in the construction of diaphragm walls. It shall include details of:

a) dimension of walls and lengths of panels;
b) dimensions and details of guide walls;
c) the formation of the joints between panels, including sealing the joints and installation of water stop;
d) the sequence of excavation and concreting of panels;
e) the methods of monitoring and checking the stability of neighboring highways, services and other underground structures;
f) the methods of monitoring and checking the tolerances associated with the diaphragm wall panels;
g) the methods of monitoring and checking the stability of the diaphragm wall trench;
h) the mixing, transporting and placing equipment for the polymer or bentonite slurry;
i) the cleaning and re-use of polymer or bentonite slurry;
j) the method of disposal of contaminated polymer or bentonite slurry;
k) the type, source, chemical and physical properties of the polymer to used;
l) calculations to show that the density of the polymer and lowest head of slurry are sufficient to maintain the stability of the trench, in the ground conditions envisaged, to its entire length.
m) Methods of protection of any adjacent structure and utilities existing close to the trench. Construction of diaphragm walls shall not commence until the Contractor's proposals have received a 'Notice of No Objection' from the Engineer. Unless otherwise directed by the Engineer, the construction of panels shall be continuous once excavation has commenced. Excavated panels or part panels shall not be left open at night or during weekends.

2.4 Records

The following records shall be maintained and kept for each wall panel and such records shall be available for inspection by the Engineer.

1. Name of work
2. Panel No and reference drawing no
3. Date and time of start and finish of panel excavation;
4. Details of any obstructions time spent and construction method adopted in overcoming such obstructions.
5. Date and time of completion of cage placement;
6. Date and time of start and completion of panel concreting
7. Length of panel and width and depth of panel from top of guide wall
8. Top of guide wall level and densities;
9. Top level of wall as cast, in relation to top of guide wall at the edges and at the centre.
10. A log of soil type encountered from start to finish of excavation, and of slurry levels and densities;
11. Volume of concrete used and time of any interruptions in concrete supply where exceed 15 minutes. Volumes of normal and lean mix concrete;
12. Cut-off level of concrete below top of guide wall level;
13. Date, place and time of slurry tests and results recorded;
14. Concrete test cubes, w/c ratio, slump markings, date and results obtained on testing;
15. Details of reinforcement and cage type;
16. Quantity of slurry removed from Site and spoil removed from Site recorded by date;
17. A graph of theoretical and placed concrete volumes with depth.

Chapter – 3 Introduction to Internship

3.1 Preparing Daily Progress Reports (DPR)

For a successful construction project, it is crucial to evaluate the resources used and activities that has been accomplished so far! DPR represents the currently achieved activities and the activities that has been planned further. This helps in evaluating the work done amount and daily expenses of the project. Also, DPR helps in better planning and scheduling of the project for timely and on-budget completion.

DPR										
Date	05-04-2023									
Site: Sector - 113										
Staff	**Engg**	**Admin**		**Foreman**	**Welder**	**Operator**	**Electrician**	**Store Incharge**	**Casa Helper**	**Incharge**
	1	1		1	1	2	2	1	2	2
Labour	**Fitter**	**Helper**		**Concrete Laboour**						
	2	3		5	Today's Work Plan					
Guide Wall	**Total (m)**	**Casted (m)**		**Balance**	1. Complete 1 cage					
	81	66		15	2. Grabbing of Panel No. 12					
Diaphragm Wall	**Total**	**Casted**		**Balance**	3. Crane Maintenance					
	14	11		3						
Machinery	**Casa B 125 Xp**	**Crane 440**		**JCB 3DX**	Tomorrow's Work Plan					
	1	1		1	1. Casting Panel No. 12					
Cage Progress	**Cage Ready**	**In Progress**			2. Making one more cage					
	2	1								

Figure 9: DPR (Daily Progress Report) Format

In addition, DPR is also referred to as Daily Panel Report in Diaphragm Wall Sector. This DPR includes information like Panel No., Completed Date, Length (m), Width (m), Depth (m), Excavation (sq. m.), Concrete Qty (cu. m.), and Steel (MT).

Manyata Tech Park									
Sr. No.	Panel No.	Date	Length (m)	Width (m)	Depth (m)	Excavation Qty (sq. mt.)	Concrete Qty. (cu m)	Steel BBS (mt)	Remark
1	51	12/01/22	6.2	0.8	14	86.8	75	5.269	
2	33	12/02/22	5	0.8	15	75	54	5.507	
3	43	12/02/22	5	0.8	15	75	54	6.16	
4	58	12/03/22	6.2	0.8	15	93	72	5.269	
5	32	12/04/22	5	0.8	15	75	58	5.507	
6	43A	12/05/22	5	0.8	15	75	57	6.16	
7	49	12/07/22	6.2	0.8	14	86.8	72	5.269	
8	59	12/07/22	6.2	0.8	15	93	72	5.269	
9	31	12/08/22	5	0.8	15	75	60	5.502	
10	2	12/08/22	5	0.8	14.5	72.5	50	6.173	
11	50	12/10/22	4.5	0.8	14	63	48	4.853	
12	60	12/11/22	4.3	0.8	15	64.5	48	4.731	
13	44	12/11/22	5	0.8	15	75	67	6.341	
14	3	12/12/22	5	0.8	14.7	73.5	53	6.173	
15	8	12/13/22	5	0.8	14.7	73.5	54	6.173	
16	4	12/14/22	5	0.8	14.7	73.5	54	5.491	
17	9	12/14/22	5	0.8	14.7	73.5	54	5.491	
18	7	12/15/22	5	0.8	14.7	73.5	54	5.491	
19	5	12/16/22	5	0.8	14.6	73	54	5.491	
20	1	12/17/22	4.6	0.8	14.6	67.16	43	2.84	
21	61	12/17/22	3	0.8	15	45	31	3.428	
22	10	12/18/22	5	0.8	14.6	73	54	5.491	
23	6	12/19/22	5	0.8	14.6	73	59	5.491	
24	62	12/20/22	6.2	0.8	15.1	93.62	65	5.011	
25	68	12/21/22	5	0.8	14	70	51	5.603	
26	84	12/21/22	5	0.8	14	70	49	4.908	
27	75	12/22/22	5	0.8	12	60	46	4.908	
28	67	12/22/22	5	0.8	14	70	53	5.603	
29	69	12/23/22	4.6	0.8	14	64.4	47	5.177	
Total			147			2136.28	1608	154.78	

Figure 10: DPR (Daily Panel Report) Format

3.2 Tendering

A tender is an offer or invitation to bid for a project or to accept a formal offer. There are various types of tender like open tender, selective tender, negotiated tender, etc. Particularly, for diaphragm wall sector, the most preferred type of tender is 'Selective Tender'. Selective tendering is a bidding process where only certain vendors can bid for the project.

For selective tendering, the vendors have to provide with some essential documents, this includes:

- Registration Certificate
- ISO Certification
- Balance Sheets (minimum 2 years or more as required)
- Machinery & Plant Details
- Partnership Deed (if company type is Partnership)
- BOCW & ESI Documents
- List of completed and ongoing projects
- Organization structure (if asked)
- Company profile (if asked)
- Available manpower (if asked)
- Quality Assurance Plan (if asked)
- Price Bid in BoQ form or as mentioned in tender

After successful tendering, if the vendor is selected a contract is duly signed by both the parties. In case of diaphragm wall construction works, a Unit Price Contract is preferred. This contract includes several variables either individual or in combination, such as materials, labor, and overhead.

BOQ FOR THE PROPOSED DIAPHRAGM WALL CONSTRUCTION

Sr. No.	Work Description	Approx. Quantity	Unit	Rate	Cost
1	**Construction of Guide Wall** in RCC made from lightly reinforced concrete including earthwork in excavation, RMC, reinforcement in guide wall, etc.	197.00	Rmt		₹ -
2	**Boring/ Trenching in soil for 450 mm th. Diaphragm Wall** From top of Guide Wall to the tip of Diaphragm wall including mud fluid [polymer/ bentonite solution] for all types of soil/ sand/ gravel, with mechanical grabbing method.	2000.00	sqm		₹ -
3	**Concreting of 600 mm th. Diaphragm Wall** **M25 Grade** with tremie arrangements including cost of RMC, stop-ends, cover blocks, labour, tools, and equipments, etc. complete	847.00	cum		₹ -
4	Providing and fixing of **PVC Water Stopper** of approved make.	344.00	Rmt		₹ -
5	**Reinforcement Cage for Diaphragm Wall & Capping Beam** Fabricating, tieing using 18-gauge GI binding wire, erecting, placing, and lowering in position by suitable lifting method, including laps, chairs, lifting hooks, spacers, etc. complete				
	Diaphragm Wall	72.00	Ton		₹ -
	Capping Beam	4.51	Ton		₹ -
6	**Capping Beam** Construction of Capping Beam in M25 Grade concrete, including labour, concrete, cover blocks, shuttering, placing, curing, etc. complete.	53.00	cum		₹ -
	TOTAL COST				₹ -

Figure 11: BoQ Format

3.3 Estimation & Preparing BoQ

3.3.1 Drawing Interpretation

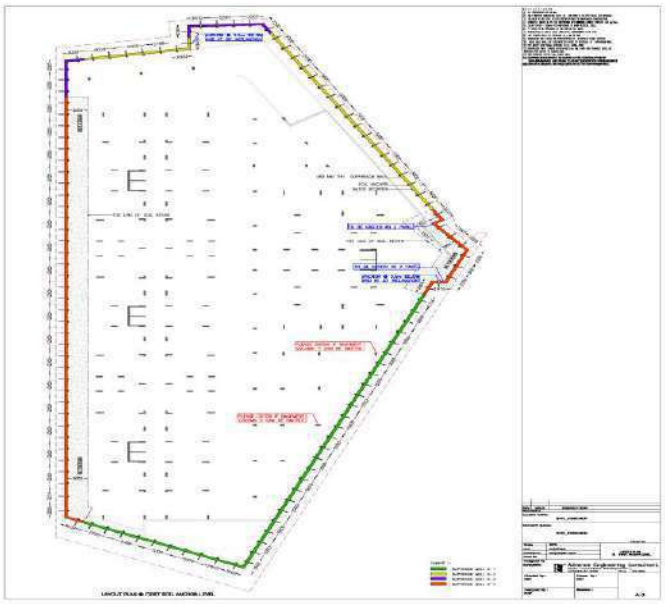


Figure 12: Layout of Diaphragm Wall

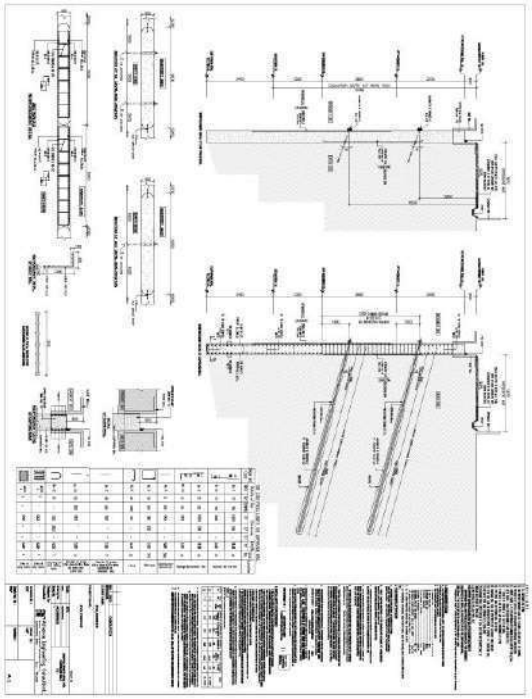


Figure 13: Cross Section of Diaphragm Wall

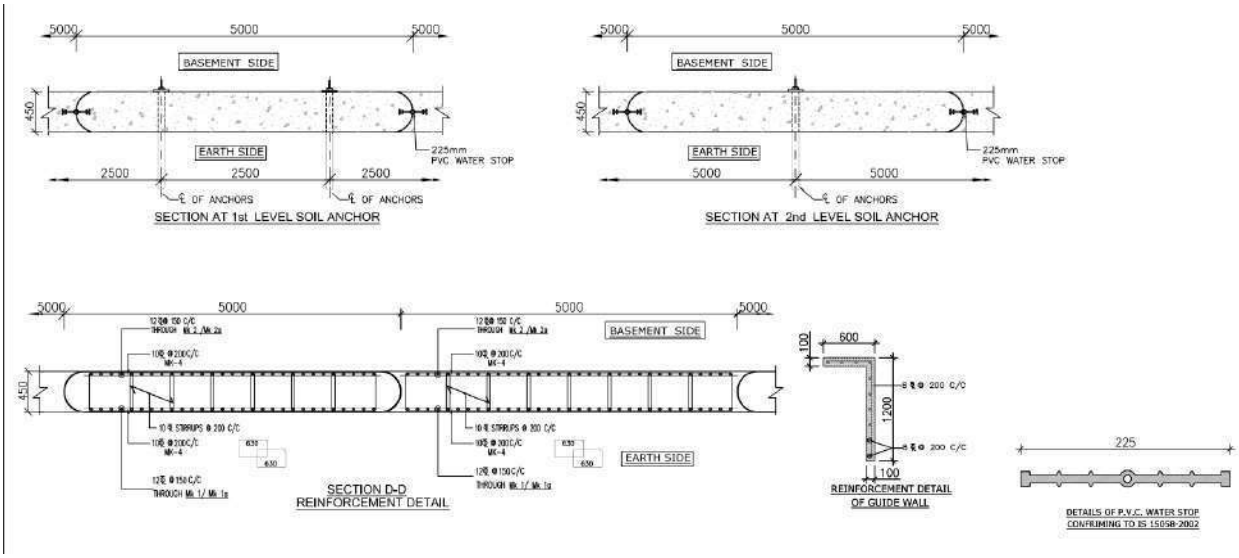


Figure 14: Detailed Section of Diaphragm Wall

For estimation and billing, it is crucial to interpret the GFC drawings with utmost accuracy. The better the interpretation will be, the better will be the estimation. With the help of GFC drawings one can even carry out detailed estimate of the project.

3.3.2 Estimation

Estimation is the process of calculating the quantities and costs of the various aspects of a particular work. For the estimation of Diaphragm Wall Work, at first, we have to determine the Total Running Length (L) i.e. the perimeter of the layout of Diaphragm Wall. Now, we've to evaluate the Depth of the Diaphragm Wall (D) based on GFC drawings. Once, we've evaluated the Length (L), Depth (D), & Thickness (W) of the diaphragm wall. We'll then determine Excavation (sq. m.) quantity, Concrete (cu. m.), and Steel (MT).

For example:

Total Running Length of the Diaphragm Wall in the above shared plan is 301 RMT.
Total Depth of the Diaphragm Wall in the above shared plan is 13.8 m.
Thickness of the Diaphragm Wall is 0.45 m or 450 mm.

Excavation Qty (€) (sq. m.) = L*D = 301 * 13.8 = 4153.8 sq. m.
Concrete Qty (cu. m.) = € * 0.45 = 1869.21 cu. m.
PVC Water Stopper Qty (m) = (Total Number of Panels – 1) * D {for closed loop}
PVC Water Stopper Qty (m) = Total Number of Panels – 1 * D {for open loop}
For deriving Steel Qty (MT), a BBS is prepared:

BBS																			D1 & D2
Sr. No.	Size of Panel (m)	Mark Designation	Side	Bar Size (mm)	Spacing (mm)	No. of Set	Bar per Set	Total Nos.	Length (m)	Total Length (m)	Weight	Total Weight (kg)	8mm	10mm	12mm	16mm	20mm	25mm	32mm
1	5	Vertical Bar	Earth	12	150	1	34	34	14.6	496.4	0.889	441.244	-		441.244				
2		Vertical Bar	Basement	12	150	1	34	34	14.6	496.4	0.889	441.244	-		441.244				
													-						
3		Distribution Bar	Earth	10	200	1	38	38	4.9	186.2	0.617	114.938	-	114.938					
4		Distribution Bar	Basement	10	150	1	38	38	4.9	186.2	0.617	114.938	-	114.938					
													-						
5		Stirrups		10	200	1	272	272	2.17	590.24	0.617	364.346	-	364.346					
6		Link		10	1000	1	10	10	0.72	7.2	0.617	4.444	-	4.444					
													-						
7		Extra Bar	Earth	20	300	1	17	17	7	119	2.469	293.827	-				293.827		
8		Extra Bar	Basement	20	300	1	17	17	5	85	2.469	209.877	-				209.877		
													-						
14		Roller		10	-	2	25	50	0.2	10	0.617	6.173	-	6.173					
15		Mesh Jaali		8	-	2	9	18	6	108	0.395	42.667	42.667						
16		Lifting Hook		20	-	1	3	3	4	12	2.469	29.630	-				29.630		
17		U - Bar		12	-	2	3	6	3	18	0.889	16.000	-		16.000				
18		Cage Resting Bar		20	-	1	3	3	1.5	4.5	2.469	11.111	-				11.111		
19		Soil Anchor Support		20	-	2	4	8	0.6	4.8	2.469	11.852	-				11.852		
											Total (kg)	2102.29	42.667	604.840	898.489	0.000	556.296	0.000	0.000

Figure 15: BBS of Panel Length 5 m & Depth 13.8 m

***Calculation of Vertical Bar**:

Cutting Length = Total Depth + Lap (50 d) + L-Bent at both sides

Cutting Length = (13.8 - 0.05 - 0.05) + 0.6 + 2 (0.15) {here; 0.05 is the cover used}

Cutting Length = 14.6 m

Length of Panel = 5m (spacing of Vertical bars 150 mm c/c)

Total No. of Bars = Length of Panel/Spacing = ((5000-50-50)/150) + 1 = 33.66 = 34

Total Length of Bars = Cutting Length * Total No. of Bars = 14.6 * 34 = 496.4 m

Unit Weight of 12 mm dia. Steel = $d^2/162 = 12^2/162 = 0.889$

Total Weight = Total Length of Bars * Unit Weight = 496.4 * 0.889 = 441.244 kgs.

***Calculation of Distribution Bar**:

Cutting Length = Total Length of Panel – 2 * Cover (50 mm)

Cutting Length = 5 – 2*0.05 {here; 0.05 is the cover used}

Cutting Length = 4.9 m

Depth of Panel = 7.6 m (that requires distribution bars)

Total No. of Bars = Length of Panel/Spacing = (7600/200) = 38

Total Length of Bars = Cutting Length * Total No. of Bars = 4.9 * 38 = 186.2 m

Unit Weight of 10 mm dia. Steel = $d^2/162 = 10^2/162 = 0.617$

Total Weight = Total Length of Bars * Unit Weight = 186.2 * 0.889 = 114.938 kgs.

After we've determined the steel required for one panel of length of 5 m.

Now, steel required per meter is determined = Steel Required for 5 m Panel/5

Finally, the steel required per meter is multiplied by the total length of the project.

Now, Anchoring Work is estimated (if mentioned in the plan)

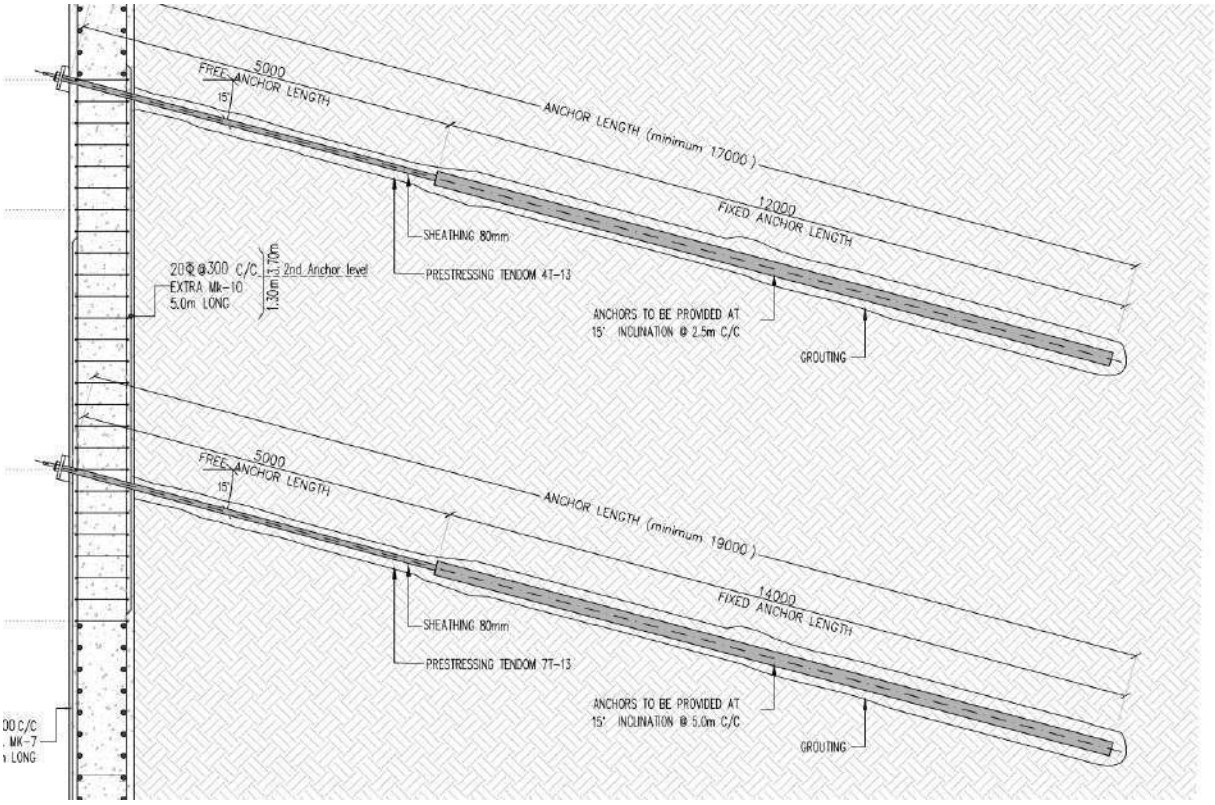


Figure 16: Anchoring Details

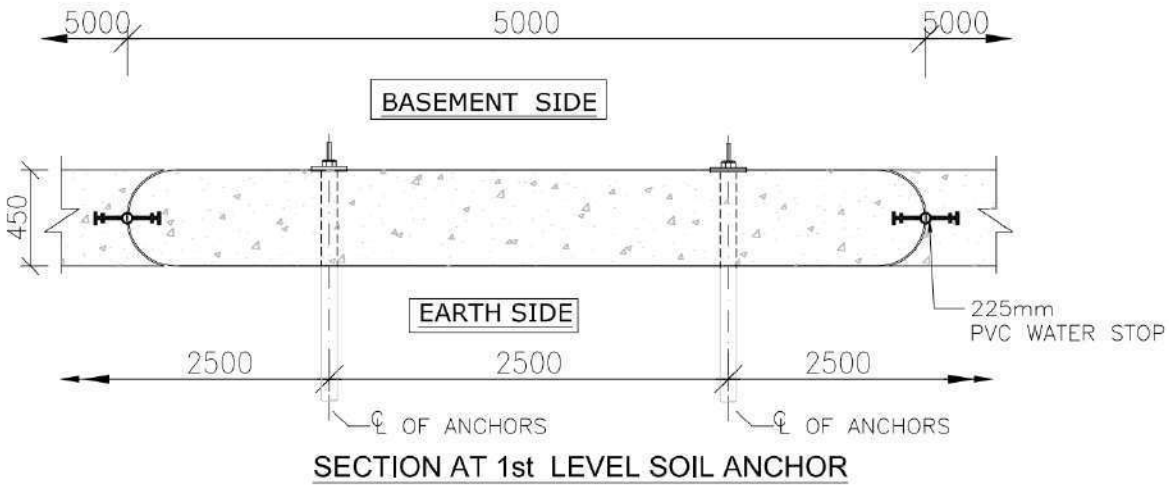


Figure 17: Cross Section of 1st Layer Anchor

*Calculating Anchors:

Spacing of Anchor = 2500 mm

Length of 1st Layer Anchor = 12 m (fixed) + 5 m (free) = 17 m

Anchor Required for One Panel of 5 m = 5/2.5 (spacing) = 2 No.s Anchor

Length of 2 No.s Anchor = 2 * 17 = 34 m (total no. of anchors depends on the no. of panels and their sizes)

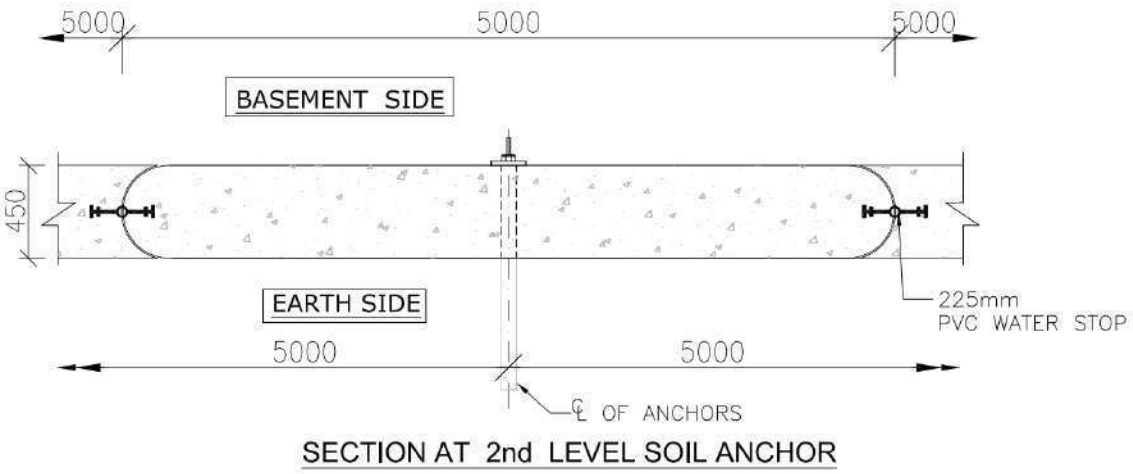


Figure 18: Cross Section of 2nd Layer Anchor

Spacing of Anchor = 5000 mm
Length of 1st Layer Anchor = 14 m (fixed) + 5 m (free) = 19 m
Anchor Required for One Panel of 5 m = 5/5 (spacing) = 1 No.s Anchor
Length of 1 No.s Anchor = 1 * 19 = 19 m

3.3.3 Preparing BoQ

Bill of Quantities (BoQ) is one of the systemic ways applied in the construction industry in which its primary function is to record items of works for tendering purposes and to create a fair agreement among the parties involved for contracting purposes.

After estimation of the project, a Quantity sheet is prepared which cross verifies the quantities mentioned in BoQ. Based on the comparison, final derived quantities are entered in BoQ and rates are filled for further procedures.

Finally, an approximate estimate of the project is determined that is further attached with the tender. Also, based on the quantity sheet a Quotation is prepared for the same.

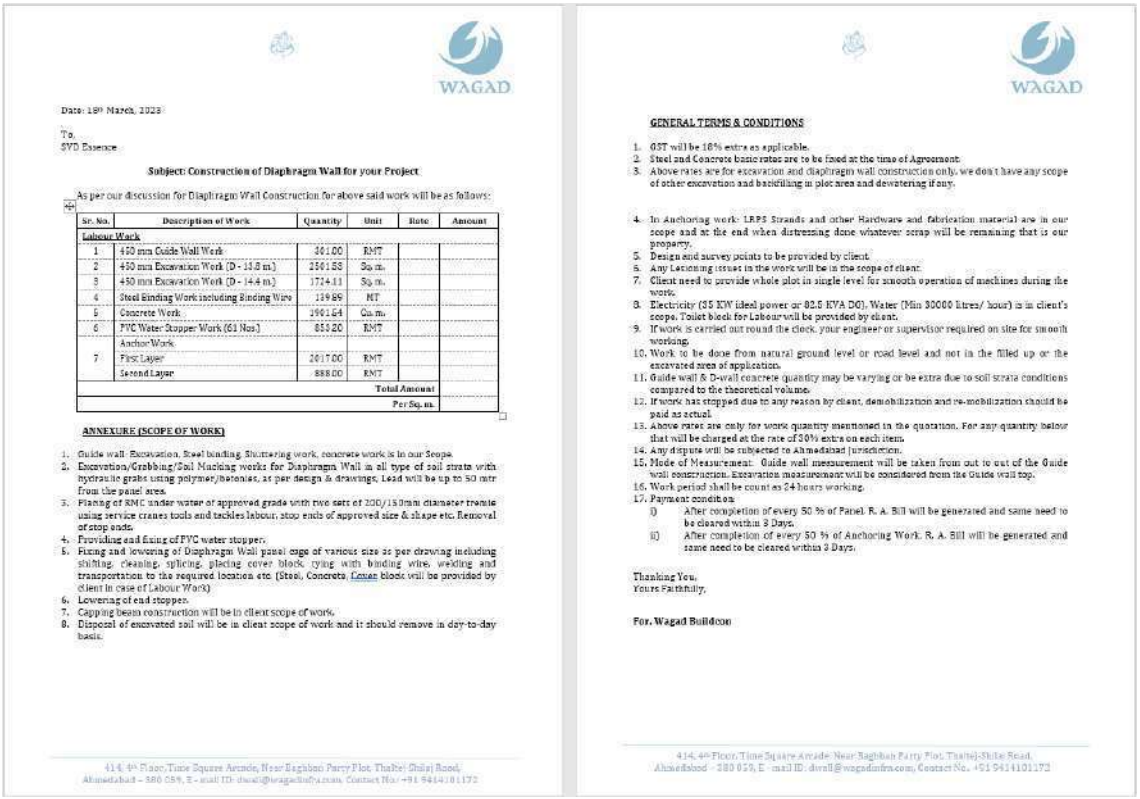
Sr. No.	Description of Work	Quantity	Unit	Rate	Amount
Labour Work					
1	450 mm Guide Wall Work	301.00	RMT		0
2	450 mm Excavation Work (D - 13.8 m.)	2501.53	Sq. m.		0
3	450 mm Excavation Work (D - 14.4 m.)	1724.11	Sq. m.		0
4	Steel Binding Work including Binding Wire	139.89	MT		0
5	Concrete Work	1901.54	Cu. m.		0
6	PVC Water Stopper Work (61 Nos.)	853.20	RMT		0
7	Anchor Work				
	First Layer	2017.00	RMT		0
	Second Layer	888.00	RMT		0
				Total Amount	**0**
				Per Sq. m.	**0**

Figure 19: Quantity Sheet

3.4 Preparing Quotation

A quotation refers to a general contractor's figure from a supplier for the price of labor and materials required for a job. The quotation for the Construction of Diaphragm Wall Work is shared in two form:

1. Only Labor Job (material will be in client's scope)
2. Labor + Material Job (material will be in vendor's scope)



WAGAD

Date: 18th March, 2023

To,
SVD Essence

Subject: Construction of Diaphragm Wall for your Project

As per our discussion for Diaphragm Wall Construction for above said work will be as follows:

Sr. No.	Description of Work	Quantity	Unit	Rate	Amount
Labour Work					
1	450 mm Guide Wall Work	301.00	RMT		
2	450 mm Excavation Work (D - 13.8 m.)	2501.53	Sq. m.		
3	450 mm Excavation Work (D - 14.4 m.)	1724.11	Sq. m.		
4	Steel Binding Work including Binding Wire	139.89	MT		
5	Concrete Work	1901.54	Cu. m.		
6	PVC Water Stopper Work (61 Nos.)	853.20	RMT		
7	Anchor Work				
	First Layer	2017.00	RMT		
	Second Layer	888.00	RMT		
				Total Amount	
				Per Sq. m.	

ANNEXURE (SCOPE OF WORK)

1. Guide wall Excavation, Steel binding, Shuttering work, concrete work is in our Scope.
2. Excavation/Grabbing/Soil Mucking works for Diaphragm Wall in all type of soil strata with hydraulic grabs using polymer/bentonite, as per design & drawings. Lead will be up to 50 mtr from the panel area.
3. Placing of RMC under water of approved grade with two nos of 200/150mm diameter tremie using service cranes tools and tackles labour, stop ends of approved size & shape etc. Removal of stop ends.
4. Providing and fixing of PVC water stopper.
5. Fixing and lowering of Diaphragm Wall panel cage of various size as per drawing including shifting, cleaning, splicing, placing cover block, tying with binding wire, welding and transportation to the required location etc. (Steel, Concrete, Cover block will be provided by client in case of Labour Work)
6. Lowering of end stopper.
7. Capping beam construction will be in client scope of work.
8. Disposal of excavated soil will be in client scope of work and it should remove in day-to-day basis.

414, 4th Floor, Time Square Arcade, Near Raghuvir Party Plot, Thaltej-Shilaj Road, Ahmedabad - 380 059, E - mail ID: dwall@wagadinfra.com, Contact No.: +91 9414101172

WAGAD

GENERAL TERMS & CONDITIONS

1. GST will be 18% extra as applicable.
2. Steel and Concrete basic rates are to be fixed at the time of Agreement.
3. Above rates are for excavation and diaphragm wall construction only, we don't have any scope of other excavation and backfilling in plot area and dewatering if any.
4. In Anchoring work: LRPS Strands and other Hardware and fabrication material are in our scope and at the end when distressing done whatever scrap will be remaining that is our property.
5. Design and survey points to be provided by client.
6. Any Leakening issues in the work will be in the scope of client.
7. Client need to provide whole plot in single level for smooth operation of machines during the work.
8. Electricity (35 KW ideal power or 62.5 KVA DG), Water (Min 30000 litres/ hour) is in client's scope, Toilet block for Labour will be provided by client.
9. If work is carried out round the clock, your engineer or supervisor required on site for smooth working.
10. Work to be done from natural ground level or road level and not in the filled up or the excavated area of application.
11. Guide wall & D-wall concrete quantity may be varying or be extra due to soil strata conditions compared to the theoretical volume.
12. If work has stopped due to any reason by client, demobilization and re-mobilization should be paid as actual.
13. Above rates are only for work quantity mentioned in the quotation. For any quantity below that will be charged at the rate of 30% extra on each item.
14. Any dispute will be subjected to Ahmedabad Jurisdiction.
15. Mode of Measurement: Guide wall measurement will be taken from out to out of the Guide wall construction. Excavation measurement will be considered from the Guide wall top.
16. Work period shall be count as 24 hours working.
17. Payment condition:
    i) After completion of every 50 % of Panel, R. A. Bill will be generated and same need to be cleared within 3 Days.
    ii) After completion of every 50 % of Anchoring Work, R. A. Bill will be generated and same need to be cleared within 3 Days.

Thanking You,
Yours Faithfully,

For, Wagad Buildcon

414, 4th Floor, Time Square Arcade, Near Raghuvir Party Plot, Thaltej-Shilaj Road, Ahmedabad - 380 059, E - mail ID: dwall@wagadinfra.com, Contact No.: +91 9414101172

Figure 20: Quotation Format

3.5 Preparing BBS & Concrete Reports

3.5.1 BBS

The Bar Bending Scheduling (BBS) essentially shows how to bend bars and how long they should be cut according to the plans. The BBS is created using GFC drawings. Bars are bent in a variety of forms based on the curvature of the member, hence unique BBS are created for each panel size of diaphragm wall.

BBS M3M Sector - 113 Site — Size -

6X14.45 m — Cage Top 1300 mm from Guide Wall-Closing Panel

Sr. No.	Bar Mark	Bar Shape	Mark Designation	Side	Bar Size (mm)	Spacing (mm)	No. of Set	Bar per Set	Total Nos.	Bend Deduction (2d)	Length (m)	Total length (m)	Weight	Total Weight (kg)	8mm	10mm	12mm	16mm	20mm	25mm
1	MK1	3.35	Main Bar	Earth	16	200	1	30	30		3.350	100.500	1.580	158.81				158.815		
2	MK1	0.3 / 11.7	Main Bar	Earth	16	200	1	30	30	0.032	11.968	359.040	1.580	567.37				567.372		
3	MK1	12	Main Bar	Basement	16	125	1	49	49		12.000	588.000	1.580	929.19				929.185		
4	MK1	0.3 / 1.05	Main Bar	Basement	16	125	1	49	49	0.032	3.318	162.582	1.580	256.92				256.920		
5	MK 2	5.85 / 0.6 / 0.1 / 0.3	Distribution	Bottom	12	150	1	97	97	0.048	6.390	619.830	0.888	550.41			550.409			
6	MK 2	0.1 / 0.3 / 5.85	Distribution	Earth	12	150	1	97	97	0.048	6.390	619.830	0.888	550.41			550.409			
6	MK 3	1.05 / 0.6 / 135° / 45	Stirrups	Stirrups	10	450	1	165	165	0.100	3.060	504.900	0.620	313.04		313.038				
7	MK 3	0.6 / 45	Stirrups	Stirrups	10	450	1	33	33	0.100	2.210	72.930	0.620	45.22		45.217				
8			Z Bar		20		1	18	18	0.200	1.025	18.450	2.469	45.56					45.556	
9			U Bar		20		1	6	6	0.080	4.200	25.200	2.469	62.22					62.222	
10			Lifting Hook		20		1	6	6	0.120	3.000	18.000	2.469	44.44					44.444	
11			Mess Jali		8		1	16	16	0.320	6.000	96.000	0.400	38.40	38.400					
12			Anchor Support Bar		16		1	6	6		0.650	0.650	1.580	1.03				1.027		
													Total (kg)	3563.01	38.40	358.25	1100.02	1913.32	152.22	0.00

Figure 21: BBS of Panel Size 6 X 14.45 m

Here,

Z Bars are used for maintaining the distance between Earth side and Basement side cage.

U Bars are used for hanging the panel on Guide Wall for support so that the cage doesn't fall in totally.

Lifting Hooks are used for lifting the cage with the help of crane.

Mess Jali & Anchor Support are used for anchoring purposes.

3.5.2 Concrete Reports

Once the cage is rested in the panel as mentioned in 2.1.5. Casting of the panel is carried out as per 2.1.7. During the casting, the site engineer has to fill up the Concrete Report that represents theoretical & actual concrete, slump value, cubes taken, number of TMs required for casting, capacity of 1 TM, etc.

WAGAD BUILDCON

414, 4th Floor, Time Square Arcade, Near Baghban Party Plot,
Thaltej-Shilaj Road, Ahmedabad - 380059

Email ID: dwall@wagadinfra.com **Contact No**: +91 6358022340

CONCRETE POUR CARD

Project Name: M3M

Date	**02-02-2023**
Panel No.	**1**
Length	**5 m**
Width	**0.5 m**
Depth	**14.3 m**

Sr. No.	Description				Observations	Remarks
1	Location				: M3M Sector 57	
2	Panel Reference				: Primary Panel	
3	Grade of concrete				: M30	
4	Formwork				: N/A	
5	Reinforcement				:	
	i) As per Drawing				: Yes	
	ii) Cover blocks				: Yes	
6	Grabbing Start time				: 01/02/2023 11:40 AM	
7	Grabbing End time				: 01/02/2023 8:45 PM	
8	Viscosity of Polymer				: 85-110 Sec	
9	Concreting				:	
	a) Source of Concrete				:	
	Vehicle No.	Time In		Time Out	:	
	1	1:39 AM	to	2:10 AM	: 7 cum	HRSSAF0160
	2	2:25 AM	to	2:34 AM	: 14 cum	HRSSAF0264
	3	2:45 AM	to	3:27 AM	: 27 cum	HRSSAJ3631
	4	5:00 AM	to	5:20 AM	: 28 cum	HRSSAF0160
	5	5:20 AM	to	5:40 AM	: 31 cum	HRSSAJ3631
	6				:	
	7				:	
	8				:	
	9				:	
	10				:	
	11				:	
10	Theoretical Volume of Concrete				: 31 cum (m3)	
11	Actual Volume of Concrete				: 31 cum (m3)	
12	Slump at Batching Plant (in mm)				: 155 mm	
13	Slump at Site (in mm)				: 140 mm	
14	No. of cubes taken				: 6	

For Wagad Buildcon **Client's Signature**

Name: **Name:**

Figure 22: Concrete Report

3.6 Creating RA Bills

Running Account (RA) Bills means a Bill for payment of 'on account' moneys against the Work Done. At first, the total work done is represented in a Summary Sheet that is certified from the Site. Based on the data derived RA bill is generated for E-Invoicing.

M3M Sector 25 - Gurgaon

Sr. No.	Panel No.	Date	Length(m)	Width (m)	Depth(m)	Excavation (Sq. m.)	Concrete	Steel	Water Stopper	Remark
1	12	31-03-2023	3.65	0.6	15.00	54.75	33.00	2.692	15.000	
2	7	02-04-2023	4.80	0.6	15.00	72.00	44.00	3.620	15.000	
3	11	07-04-2023	6.00	0.6	15.00	90.00	54.00	14.337	15.000	
4	8	11-04-2023	6.00	0.6	15.00	90.00	54.00	14.346	15.000	
5	3	14-04-2023	4.25	0.6	15.00	63.75	40.00	2.111	15.000	
6	9	15-04-2023	6.00	0.6	15.00	90.00	54.00	14.341	15.000	
7	5	16-04-2023	2.50	0.6	15.00	37.50	23.00	1.919	15.000	
8	4	18-04-2023	2.20	0.6	15.00	33.00	21.00	1.753	15.000	
9	6	19-04-2023	5.00	0.6	15.00	75.00	45.00	13.580	15.000	
10	2	20-04-2023	2.20	0.6	15.00	33.00	20.00	1.753	15.000	
11	13	26-04-2023	6.00	0.6	15.00	90.00	54.00	20.704	15.000	
12	14	26-04-2023	4.60	0.6	15.00	69.00	41.00	3.434	15.000	
13	1	27-04-2023	4.65	0.6	15.00	69.68	32.50	2.807	15.000	

Figure 23: Summary Sheet

Abstract Sheet

Sr. No.	Description of Items	Unit	Rate in Rs	Quantity (Sq. m.)			Amount			Remarks
				Upto Date	Upto Prevoius	This Bill	Upto Date	Upto Prevoius	This Bill	
Diaphragm Wall Work										
1	600 mm Thick Guide Wall Work	Sq. m.	1	1,421.850	-	1,421.850	1,422	-	1,422	
2	600 mm Excavation Work									
3	Steel Binding Work									
4	Concrete Work									
5	PVC Water Stopper Work									
6	Anchor Work - Excluded									
	4T - 12.7 mm									
	4T - 12.7 mm									
Total							1,422	-	1,422	

Figure 24: Abstract Sheet

The amount on the 'Abstract Sheet' is further sent for accounting purposes and for raising 'E-Invoice'.

3.7 Reconciliation Reports

In case of Labor Job, the material is provided by client that has to be reconciled before closeout. Hence, based on the BBS reports and the steel received a reconciliation report is created.

Wagad Buildcon									
Project Name: M3M Jewel, Commercial Area-Situated at Sector - 25, Gurugram, Haryana									
Work Order Ref. No. - Lekh/M3M Jewel/Commercial Area/Diaphragm Wall Work/LOA/2023/17									
Steel Used At Site As Per BBS									
Panel No.	**Date**	**8mm**	**10mm**	**12mm**	**16mm**	**20mm**	**25mm**	**32mm**	**Total**
1	27-04-2023	37.93	209.92	818.56	563.66	1177.43	0.00	0.00	**2807.50**
2	20-04-2023	18.96	0.00	717.53	311.01	704.99	0.00	0.00	**1752.49**
3	14-04-2023	37.93	235.25	862.74	629.34	1346.32	0.00	0.00	**3111.58**
4	18-04-2023	18.96	0.00	717.53	311.01	704.99	0.00	0.00	**1752.49**
5	16-04-2023	18.96	0.00	777.26	345.63	777.04	0.00	0.00	**1918.89**
6	19-04-2023	37.93	2458.50	1231.11	376.47	854.32	0.00	8621.95	**13580.28**
7	02-04-2023	37.93	306.29	1042.72	716.38	1516.99	0.00	0.00	**3620.30**
8	11-04-2023	37.93	2512.52	1437.52	539.82	1196.35	0.00	8621.95	**14346.09**
9	15-04-2023	37.93	2508.32	1437.52	539.82	1196.35	0.00	8621.95	**14341.89**
10	03-05-2023	18.96	0.00	995.02	370.34	825.43	0.00	0.00	**2209.75**
11	07-04-2023	37.93	2504.12	1437.52	539.82	1196.35	0.00	8621.95	**14337.69**
12	31-03-2023	28.44	193.51	802.87	532.04	1135.26	0.00	0.00	**2692.13**
13	26-04-2023	18.96	3749.10	591.94	269.91	599.70	0.00	15475.37	**20704.98**
14	26-04-2023	37.93	271.81	1000.13	680.86	1444.05	0.00	0.00	**3434.78**
15	06-05-2023	37.93	1533.89	1039.56	599.65	1078.07	1795.00	1423.36	**7507.46**
16	07-05-2023	18.96	1685.25	1623.34	820.49	1718.91	0.00	3648.63	**9515.57**
17	29-04-2023	37.93	299.53	1060.14	893.96	1881.68	0.00	0.00	**4173.25**
18	28-04-2023	18.96	0.00	777.26	345.63	777.04	0.00	0.00	**1918.89**
19	02-05-2023	0.00	4385.23	115.20	0.00	11.06	0.00	11309.06	**15820.55**
20	04-05-2023	37.93	310.99	1123.79	965.00	2027.56	0.00	0.00	**4465.27**
21	05-05-2023	37.93	220.79	1478.18	838.19	1791.85	0.00	35.50	**4402.45**
	Total	**616.30**	**23385.03**	**21087.46**	**11189.03**	**23961.73**	**1795.00**	**66379.73**	

Figure 25: Reconciliation Format

3.8 Planning & Scheduling

Construction planning is defining all actions that must be taken to create a project, breaking them down into distinct activities, rationally organising these stages, and figuring out the required supplies, labour, and tools.

There are various technological platforms and solutions available today that may be used to simplify the scheduling of construction projects without the need to start from scratch. Software has several advantages, including:

- Lowered danger and error risk
- Better synthesis of conflicts
- Tracking of important metrics and milestones
- Increased effectiveness
- Streamlined procedures and workflows
- More tolerant to changes when they do arise
- More accountability and transparency

M/s Wagad Buildcon
413, 4th Floor, Times Square - 1, Near Baghban Party Plot, Thaltej, Ahmedabad - 380059
Ph: +91 6358022340
Email: dwall@wagadinfra.com, Web: www.wagadinfraprojects.com

Project: Diaphragm Wall works at M3M MUL, Sect 94, Noida
Date: 14th April, 2023

Construction Programme For Diaphragm Wall Works & Excavation Work					
SN	**Decription**	**No of Days**	**Start Date**	**End Date**	**Remarks**
	Dwall Work Complete Work With Anchoring	167	20-04-2023	04-10-2023	
A	Start of work & Setup				
1	Work order issued	0	17-04-2023	17-04-2023	
2	App approved GFC drawings, Survey dwgs issued.	5	18-04-2023	23-04-2023	
3	Submission of Method Statement, ITP etc	5	19-04-2023	24-04-2023	
4	Approval of MST and all process to start work	2	24-04-2023	26-04-2023	
5	Detailed Design submission and approval from IIT	9	21-04-2023	30-04-2023	
6	Mobilization Design & Approval, Setup	10	18-04-2023	28-04-2023	
B	Guide Wall Work - 450 Rmt (approx)				
1	Fabrication of steel cage for guide wall - 10 mtr in advance - Steel supplied by client in advance	7	26-04-2023	03-05-2023	
2	Excavation, Dressing & Shuttering Works	30	27-04-2023	27-05-2023	
C	Diaphragm Wall Work - 450 Rmt (approx)				
1	Providing Dwall stell by clients and RMC Tie ups	4	18-04-2023	22-04-2023	
2	Fabrication of steel cage starting	0	23-04-2023	23-04-2023	
3	Diaphragm wall grabbing & concreting including cage lowering work	60	02-05-2023	01-07-2023	
D	Capping Beam Work				
	Capping Beam Work - 50%	20	02-06-2023	22-06-2023	
	Capping Beam Work - 50%	20	02-07-2023	22-07-2023	
E	Anchoring Work On Dwall				
1	Excavation for anchoring upto 1st layer anchoring	5	22-06-2023	26-06-2023	
2	Anchoring with Stressing 1st Layer 50% of Panel	21	27-06-2023	17-07-2023	
3	Excavation for anchoring upto 1st layer anchoring balance excavation	5	23-07-2023	24-07-2023	
4	Anchoring with Stressing 1st Layer 50% of Panel balance anchoring	21	25-07-2023	18-08-2023	
5	Excavation for anchoring upto 2nd layer anchoring	2	18-07-2023	19-07-2023	
6	Anchoring with Stressing 2nd Layer 50% of Panel	21	20-07-2023	09-08-2023	
7	Excavation for anchoring upto 2nd layer anchoring balance excavation	2	19-08-2023	20-08-2023	
8	Anchoring with Stressing 2nd Layer 50% of Panel balance anchoring	21	21-08-2023	10-09-2023	
9	Excavation for anchoring upto 3rd layer anchoring	2	10-08-2023	11-08-2023	
10	Anchoring with Stressing 3rd Layer 50% of Panel	21	12-08-2023	02-09-2023	
11	Excavation for anchoring upto 3rd layer anchoring balance excavation	2	11-09-2023	12-09-2023	
12	Anchoring with Stressing 3rd Layer 50% of Panel balance anchoring	21	13-09-2023	04-10-2023	

for & on behalf of
M/s. Wagad Buildcon

Table 2: Planning & Scheduling Using Excel Sheet

3.9 Sub-Contractor Bills

It takes a team to complete a project. Professionals with a wide range of abilities are needed, and the more complicated the project, the more talents are needed. Due to this, owners employ contractors to oversee the project, and contractors in turn recruit subcontractors to complete specialised tasks.

Complexity characterises construction undertakings. They need labour-intensive planning, manual labour, and a variety of specialisations. Realistically, none of the team members have all of these specialised abilities, and even if they did, it would be difficult for them to handle everything on their own. Due to this, construction subcontractors are now required for the majority of new building projects.

CONSTRUCTION WORK OF DIAPHGRAM WALL WORK

Name of Contractor :
Address :
PAN :
Bill No. & Date :

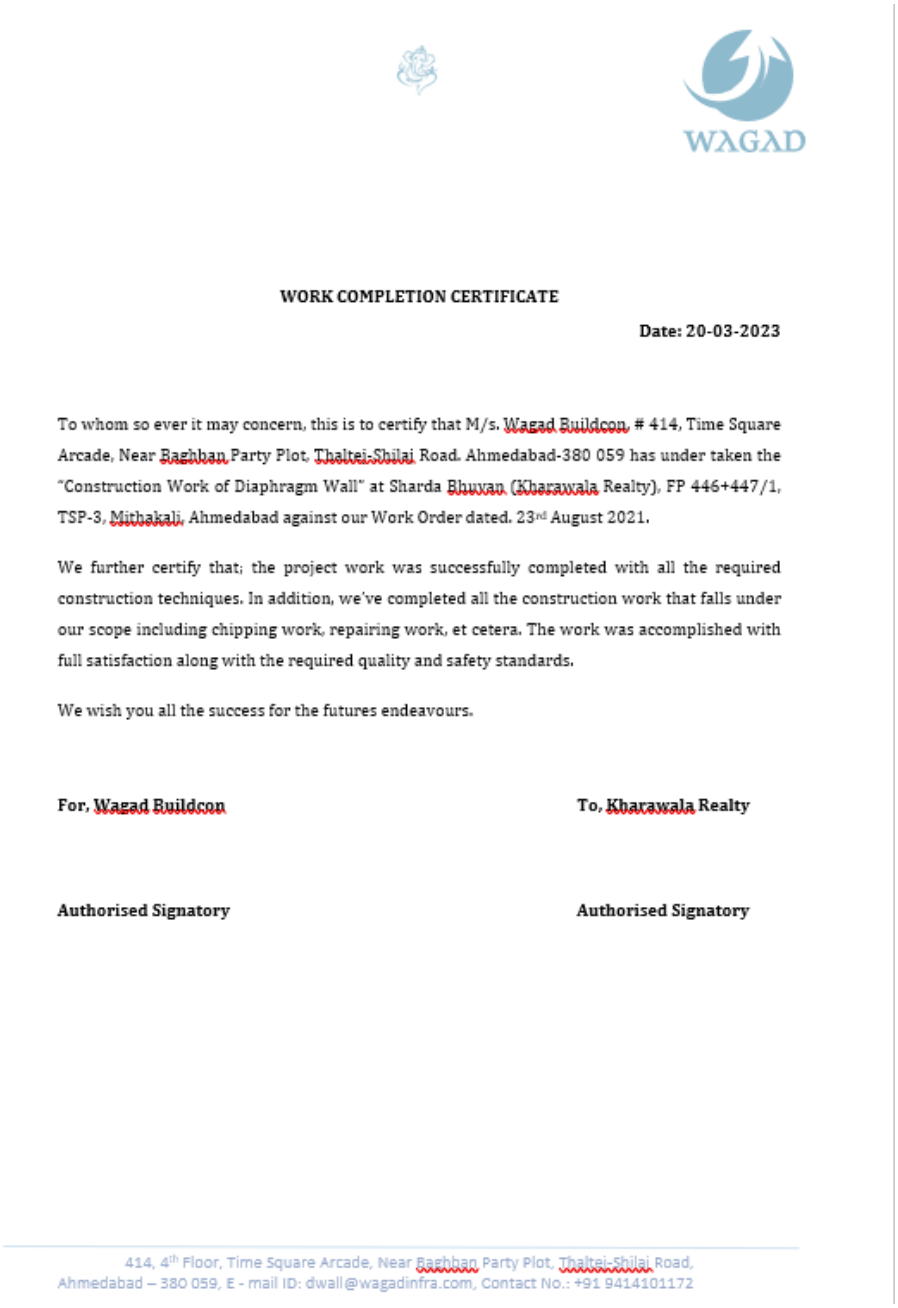
To, Wagad Buildcon
414, Time Square, Opp. Bagban Party Plot,
Ahmedabad - 380059

Sr. No.	Description of Work	Quantity	Unit	Rate	Amount
A	**Sector - 25 Site**				
1	Steel Work	54.27	Cu.m.		-
2	Labour Supply	59	No.s		-
	A) Sub Total				**-**
B	**Debit**				
1	Advance				
2	Advance				
3	Advance				
4	Advance				
	B) Sub Total				**-**
C	**Recoveries**				
1	Retention Money				-
2	Income Tax TDS 1%				-
3	Other				-
4	Material				-
	C) Sub Total				**-**
D	**Net Payable Amount In INR (A-B-C)**				**-**

Table 3: Sub-Contractor Bill Format

3.10 Closeout

After successful completion of the project it is essential to get feedback as well as completion certificate from the client. This completion certificate includes the total amount of work done and the quantum metrics that has been executed at the site to that of the time of taking the Work Order from the client. Once the client agreed upon the work quoted and work done quantities a Completion Certificate in the following format is issued by the client.



WAGAD

WORK COMPLETION CERTIFICATE

Date: 20-03-2023

To whom so ever it may concern, this is to certify that M/s. Wagad Buildcon, # 414, Time Square Arcade, Near Baghban Party Plot, Thaltej-Shilaj Road. Ahmedabad-380 059 has under taken the "Construction Work of Diaphragm Wall" at Sharda Bhuvan (Kharawala Realty), FP 446+447/1, TSP-3, Mithakali, Ahmedabad against our Work Order dated. 23rd August 2021.

We further certify that; the project work was successfully completed with all the required construction techniques. In addition, we've completed all the construction work that falls under our scope including chipping work, repairing work, et cetera. The work was accomplished with full satisfaction along with the required quality and safety standards.

We wish you all the success for the futures endeavours.

For, Wagad Buildcon **To, Kharawala Realty**

Authorised Signatory **Authorised Signatory**

414, 4th Floor, Time Square Arcade, Near Baghban Party Plot, Thaltej-Shilaj Road,
Ahmedabad – 380 059, E - mail ID: dwall@wagadinfra.com, Contact No.: +91 9414101172

Figure 26: Completion Certificate Format

Chapter – 4 Conclusion

These 14 weeks have been very informative and gave me new opportunities to explore the construction field. During this tenure, I explore a lot about a new technology regarded as ‘Diaphragm Wall’. Being a Project Co-Ordinator during my internship I explored several aspects of Diaphragm Wall Projects from tendering to quotation, execution to collecting DPRs, preparing RA bills to closeout, and more. Also, during this tenure I explored several theoretical concepts and practical knowledge. In addition, there were may scenarios where I have implemented my theoretical knowledge to make the job happen. There were many challenges and new things that has troubled at some point but somehow the practical knowledge and with the help of theoretical practices I was able to carry out the tasks efficiently and accurately.

ANNEXURE – (i)

ANNEXURE – (ii)

INTERNSHIP AT NAME K.S.F. buildcon LLP

AN INTERNSHIP REPORT

Submitted by

Prince P. Kalavadiya

190390106002

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Civil Engineering

S.P.B. Patel Engineering College, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at KSF buildcon LLP** has been carried out by **Prince P. Kalavadiya** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Civil Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Internal Guide	Head of Department
Prof. Meet Jani	Prof. Avani Dedhiya
Sign	Sign.

Company Certificate

Buildcon LLP

Date:- 02/05/2023

Internship Certificate

This is to certify that **Prince P. Kalavadiya** a student of **S.P.B. Patel engineering college** has sincerely completed his internship in the field of "**Shakti exalt**" under **KSF Buildcon LLP**, From 04/02/2023 to 02/05/2023.

His activities during internship are – Site Management, Supervision.

We wish him great success in his life and bright future.

For, KSF Buildcon LLP

Designated Partner

For **KSF Buildcon LLP**,
Authorized person signature.

PMMS CERTIFICATE

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 14 May 2023 (14:52:04)

This is to certify that, ***Kalavadiya Prince PareshBhai*** (Enrolment Number - 190390106002) working on project entitled with ***Internship at KSF buildcon llp.*** from ***Civil Engineering*** department of ***S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Kalavadiya Prince PareshBhai

Name of Guide : Mr. Meet Jani

Signature of Student : _____

*Signature of Guide : _____

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship report submitted along with the Internship entitled **Internship at KSF Buildcon LLP** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Civil Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Prof. Meet Jani** & **Janak Patel (External Guide)** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
1. **Prince P. Kalavadiya**	_____

ACKNOWLEDGMENT

The journey of internship in corporate world as an intern is possible with the guidance of this mentors,

I am deeply grateful to **External guide**, **Er. Janak patel** for their invaluable guidance and support throughout my civil engineering internship. From the moment I started **Janak Patel** and two more persons **Er. Aashish Patel** and **Er. Umang raval** who are the builder's project manager and senior engineer respectively, they also took the time to get to know me and understand my goals for the internship. They provided me with clear direction and expectations and were always available to answer my questions and provide valuable feedback.

Throughout the internship, they provided me with invaluable insights and advice that helped me to grow as a professional. Their extensive knowledge of the field and their mentorship helped me to understand the intricacies of civil engineering and allowed me to gain valuable hands-on experience. During my all difficulties such as managing schedule, managing labors, calculation of quantity they were always there to help me, I am deeply thankful for there's time, effort and behavior with me, it's such unforgettable.

I am deeply thankful to **Internal guide, Prof. Meet Jani** and our **H.O.D. Prof. Avani Dedhiya** for Expert suggestion, supervision, support & encouragement, which helped me a lot throughout this internship period.

Abstract

KSF buildcon LLP is a construction company that makes residential, commercial, industrial projects and they also construct private bungalows, their current project is running near D.P.S. school bopal, a residential building of 14floors with 4blocks on each floor and provides 3bhk facilities. The owner is working for more than 10 years in his main company KSF construction and this is a second company with a partner, my role as a site engineer to Check reinforcement work, check shuttering and centering work, calculate concrete quantity, manage men-power, follow the schedule, ordered concrete quantity for casting, data entry of bills and give all update to higher authority.

List of Figures

List of Table

ABBREVIATIONS

PCC	Plain Cement Concrete
RCC	Reinforcement Cement Concrete
TS	Total Station
CMT	Cubic Meter
TM	Transit Mixer.

Table of Contents

CHAPTER 1. OVERVIEW OF COMPANY

1.1 Company profile

KSF Buildcon LLP is a Limited Liability Partnership firm incorporated on 07 May 2021. It is registered at Registrar of Companies, Ahmedabad. Its total obligation of contribution is rupe. 1,00,000

Designated Partners of KSF Buildcon LLP are Sapan Parikh and Pulin Anilbhai Shah.

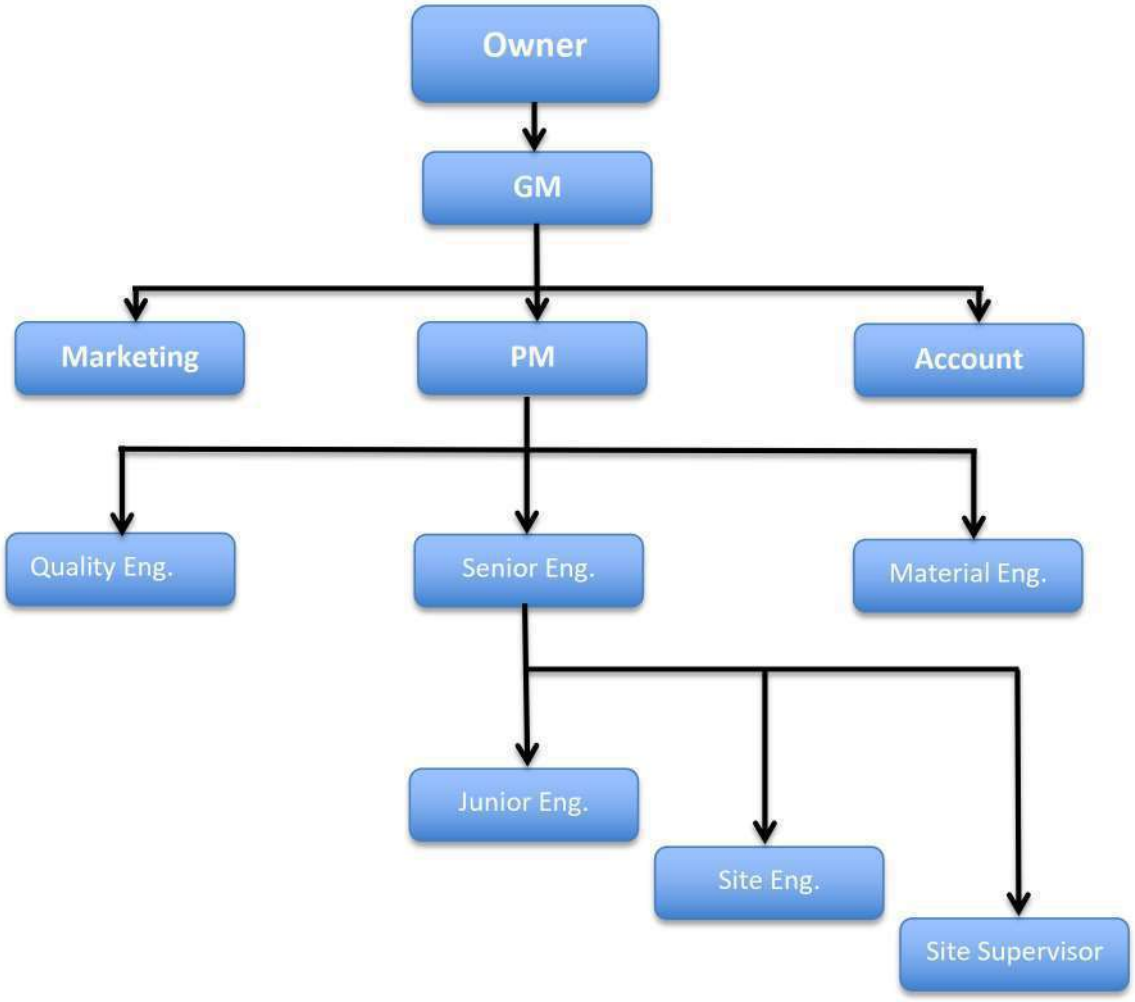
KSF Buildcon LLP's last financial year end date for which Statement of Accounts and Solvency were filed is N/A and as per records from Ministry of Corporate Affairs (MCA), date of last financial year end date for which Annual Return were filed is N/A.

KSF Buildcon LLP's LLP Identification Number is (LLPIN)AAW-9637. Its Email address is info@ksfconstructions.com and its registered address is 412, ISCON EMPORIO, B/S. STAR INDIA BAZAR NR. JODHPUR CROSS ROAD, SATELLITE AHMEDABAD Gujarat 380015.

Table 1.1 company details

Company Details	
LLP Identification Number	AAW-9637
Company Name	KSF BUILDCON LLP
Company Status	Active
RoC	RoC-Ahmedabad
Main division of business activity to be carried out in India	Construction
Description of main division	Construction
Number Of Partners	0
Number of Designated Partners	2
Date of Incorporation	07 May 2021
Age of Company	1 years, 11 month, 28 days

1.2 Organization chart



1.3 Current status

"Shakti Exalt" is the debut project of KSF Buildcon LLP under Shakti Infrastructure. The company has recently started its second project at Adalaj, and several new projects are in the pipeline. KSF Buildcon LLP specializes in constructing residential sites, but it is also equipped to take on commercial and industrial projects. KSF Construction is the core branch of KSF Buildcon LLP, responsible for the construction and participation in numerous commercial and industrial sites.

CHAPTER 2. INTRODUCTION

2.1 General Role & Responsiblity

2.1.1 Roles & Responsibility as site engineer

- Organizing materials and ensuring sites are safe and clean.
- Preparing cost estimates and ensuring appropriate materials and tools are available.
- Providing technical advice and suggestions for improvement on particular projects.
- Diagnosing and troubleshooting equipment as required.
- Negotiating with suppliers and vendors to ensure the best contracts.
- Authorizing technical drawings and engineering plans.
- Drawing up work schedules and communicating any adjustments to crew members and clients.
- Gathering data, compiling reports and delivering presentations to relevant stakeholders.
- Delegating tasks and scheduling meetings and training sessions where required.
- Ompleting quality assurance and providing feedback to the team.

2.2 Site introduction

The construction project for "Shakti Exalt," a residential building with one basement for four-wheel parking, has been given to KSF Buildcon LLP by Shakti Infrastructure. The project involves two blocks, A and B, each comprising 14 floors with four blocks per floor, except for the 14th floor which only has two blocks. The building will provide 3BHK facilities.

Table 2.1 Site Details

Floor	Built-up area (In Sq. mtr)	Total residential unit (In num.)
Ground floor	453.06	0
1st floor	465.00	4
2nd floor	465.00	4
3rd floor	465.00	4
4th floor	465.00	4
5th floor	465.00	4
6th floor	465.00	4
7th floor	465.00	4
8th floor	465.00	4
12th floor	465.00	4
13th floor	465.00	4
14th floor	254.34	2
Stair cabin	61.60	0
Lift room	39.75	0
Total	6853.75	54

CHAPTER 3. EXCAVATION

The site is divided into two blocks, A and B. The total excavation area is 3100 m². Excavation is being carried out using an excavator and labor. The depth of excavation is 14ft from the road level. Due to the high groundwater level, the groundwater has risen to the surface.

The excavation work started from the block B raft, retaining wall, and half portion of the COP area for PCC work. Then the excavation of block A's raft, retaining wall, and remaining COP area began. The soil excavated from block A is being used for soil filling in block B. An area is left to excavate, which is being done using manual labor. The excavated soil is being used for soil filling in the COP area. The work of excavation was took 4 to 5 days using the excavator.

As an intern, my task is to supervise the excavation work.

Fig: 3.1 Excavation

Fig: 3.2 Excavation

CHAPTER 4. FOUNDATION

4.1 Rubble soiling

After excavation, direct casting of PCC was not possible due to the high groundwater level, which would disrupt the concrete mix design. To address this issue, the team used a 230mm rubble layer to provide adequate bearing capacity. The rubble layer was spread over the muddy soil and water pond until it was fully covered. Once the rubble layer was in place, the voids were filled with a cement-sand mix to provide added strength and stability.

Fig. 4.1 Rubble Soiling

Fig. 4.2 Rubble Soiling

4.2 PCC work

PCC :- It is important component of building which is laid on the soil surface to avoid direct contact of reinforcement of concrete with soil.

For the PCC work, PCC level is surveyed by dumpy level, Dumpy level is commonly used leveling instrument to locate the points in same horizontal plane. It is also called as automatic level or builder's level. Elevations of different points and distance between the points of same elevation can be determined by dumpy level. The telescope is fixed to its supports in dumpy level and hence it cannot be rotated in vertical axis. It is invented by William Gravatt in 1832.

The PCC work has begun for block A and the COP area. A volume of 100CMT has been cast only in areas where the rubble soil layer has been completed. The remaining areas will be cast in the next scheduled casting, as per the project plan. The purpose of the PCC is to provide a level surface for the structure to be built upon.

PCC Details:-

- Layer 1 – rubble soiling.
- Layer 2 – Cement-sand mix.
- Layer 3 – PCC
- Depth - 150mm
- Grade of concrete – M15 (1:2:4)

Fig. 4.3 PCC

Fig. 4.4 PCC

4.3 Mark points on the PCC

Total station is an electronic/optical instrument used for surveying and building construction. It is an electronic transit theodolite integrated with electronic distance measurement (EDM) to measure both vertical and horizontal angles and the slope distance from the instrument to a particular point.

Points are marked using a total station (TS), which is placed on a leveled surface to enable the operator to set up the TS easily using a bubble tube, marking the first points at the beginning of the site work, the TS operator takes a fix point in a location that is visible from anywhere on the site. If, after some time, the fix point becomes obstructed by an object, the operator takes another fix point and marks it as a reference point that can be used later.

The points represent the size and dimensions of the structure and are useful to laborers during steelwork and shuttering work.

4.4 Footing & Raft

The **Raft** foundation is also called mat footing. It is a combined footing that covers the entire area under a structure and supports all the columns. A Raft foundation is a large slab made of concrete which can support a number of columns and walls.

In foundation there are **2** raft and **42** footings, **Raft – 1** is for 'block-B' and **Raft -2** is for 'block-A', There is one more layer of 230mm RCC bed on PCC, Reinforcement work of this RCC bed is not connected with any raft or footing structure, it works same as PCC.

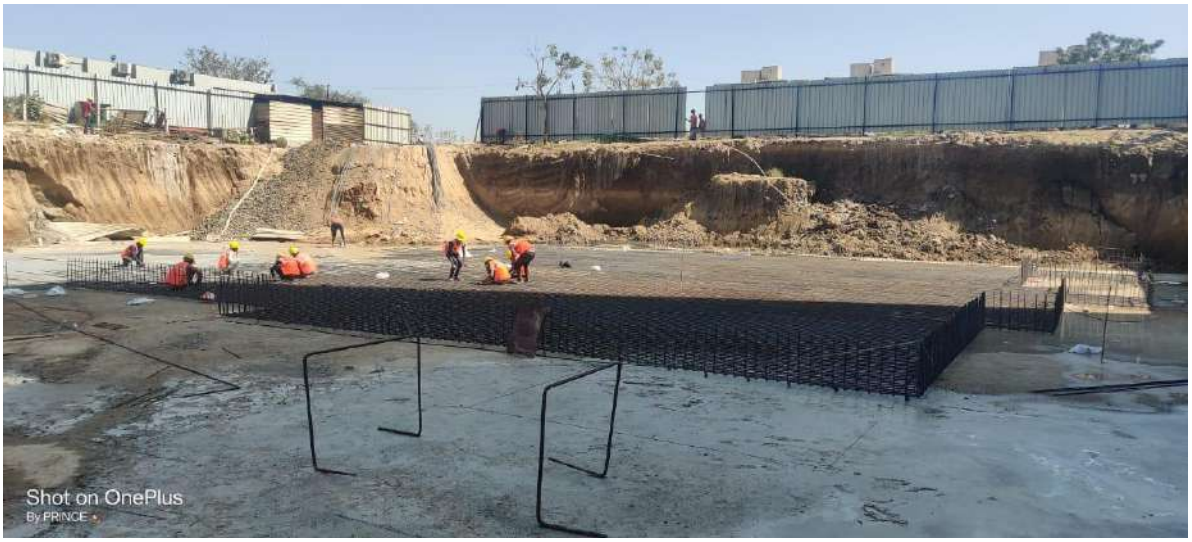


Fig. 4.5 Raft

Fig. 4.6 Raft

Fig. 4.7 Footing

Fig. 4.8 Footing

4.4.1 Reinforcement work

- Cutting steel for a structure size.
- Place cutted steel bar on PCC.
- Tie a bottom mesh and placed 50mm cover below the bottom mesh, Cause there are footing or a raft we use 50mm cover.
- Tie a column with bottom mesh of the raft.
- Check a plum-bob test of column.
- Place chair between top and bottom mesh, It is placed to support steel mesh and a spacing between both mesh should be constant.
- Laborers tie or bind a top mesh.

4.4.2 Shuttering

- Bind a side cover of 50mm.
- Make sheets(Wooden/Steel) as per footing and raft size.
- Apply oil on sheets face with brush.
- Use binding wire and bind sheets with footing steel.
- Provide support to sheets through props.
- Use yoke, batten and arm for extra support.

4.4.3 Casting

- For footing M25 grade of concrete is used, for a concrete we have to give order on batching plant and they provide a concrete through transit mixer(TM).
- Vibrator of 60mm needle is use for good compaction of concrete.
- Concreting is done by piping method.
- Finishing work with wooden float and finishing trowel.

Table.4.1 Raft Details

RAFT	**RAFT-1(Block-B)**	**RAFT -2(Block-A)**
Steel (In mm)	Bottom mesh : 16Ø 135C/C Top mesh : 16Ø 150C/C	Bottom mesh : 16Ø 135C/C Top mesh : 16Ø 150C/C
Grade of concrete	M25	M25
Concrete quantity	666.21 CMT	679.85 CMT
Column unit	32	35
Depth(In mm)	1050	1050

Table 4.2 Raft(230mm) Details

Raft	**Raft of (230mm)**
Steel	Top & bottom mesh : 10Ø 150C/C

Table 4.3 Footing Details

COLUMN NO.	BC1	BC2	BC3	BC4	BC4A	BC5
Size	2750 X 2950	2400 X 2600	2700 X 3000	3200 X 3500	3800 X 2900	2400 X 2100
Depth	650	600	650	850	850	600
Steel/B	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C	16Ø 150C/C	12Ø 150C/C
Steel/L	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C
Grade of concrete	M25	M25	M25	M25	M25	M25
Units	3	3	1	2	3	10

Table 4.4 Footing Details

COLUMN NO.	GC2,GC3	GC4	BC3A	GC1A
Size	3200 x 3500	3150 x 3550	2800 x 2900	2750 x 2950
Depth	850	850	650	650
Steel/B	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C
Steel/L	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C	12Ø 150C/C
Grade of concrete	M25	M25	M25	M25
Units	5,7	1	6	1

CHAPTER 5. COLUMN

5.1 Basic information of column

Column is vertical structural members that carry loads mainly in compression. It might transfer loads from a ceiling, floor slab, roof slab, or from a beam, to a floor or foundations. Commonly, columns also carry bending moments about one or both of the cross-section axes.

Column is a main member of structural member and collapse of column create a problem, therefor process of constructing a column should be more important to follow during construction.

5.2 Steel work of column

A columns extended from the raft and reinforcement work is started, Steel rings and links are bonded with steel bars use of binding wires as showed in a plan.

Based on the plan, the spacing of rings is indicated, and according to the design specification, these rings are to be placed at a distance of H/4 from the bottom of the column and the bottom of the beam. The rings are intended to be closely spaced and bonded at a **75mm** spaced through H/4 distance to ensure proper reinforcement of the structure.

In column, rings are placed from the top, master ring are bonded after every 5 to 6 rings, there links are also bonded with steel bars and rings, ring and link are bonded for column positioning and it support the column during transferring a load from beam to footing or foundation, This column is for basement, which is extended for ground floor column.

Only raft column and COP area columns are bonded, the height of basement column is **4020mm** from raft top to beam bottom.

- Cutting steel of **8mm** for a ring lenth.
- Put ring on column from the top.
- Tie a ring with column and spacing should be maintain as per plan.
- Tie link with rings and steel bar.
- Check a plum-bob test of column.

Table 5.1 Column Details

COLUMN NO.	**C1**	**C1A**	**C2**	**C2A**	**C3**
Size.	300 X 1050	300 X 1050	380 X 900	380 X 900	300 X 900
Steel.	21 - 25Ø	21 - 25Ø	22 - 25Ø	21 - 25Ø	13 - 25Ø+4-20 Ø
Ring.	8Ø115C/C - 8Ø75C/C 2-RING + 5-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 5-LINK	8Ø115C/C - 8Ø75C/C 3-RING + 4-LINK	8Ø115C/C - 8Ø75C/C 3-RING + 4-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 3-LINK
Grade of concrete.	M35	M35	M35	M35	M35
Refer section	1:1	1:1	2:2	2:2	3:3
Units	2	2	2	2	2

Table 5.2 Column Details

COLUMN NO.	**C4**	**C4A**	**C5**	**C6**	**C7**
Size.	300 X 1200	300 X 1200	300 X 1050	380 X 900	300 X 1200
Steel.	23 - 25Ø	23 - 25Ø	21 - 25Ø	9 - 25Ø+12-20Ø	24 - 25Ø
Ring.	8Ø115C/C - 8Ø75C/C 3-RING + 4-LINK	8Ø115C/C - 8Ø75C/C 3-RING + 4-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 5-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 5-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 6-LINK
Grade of concrete.	M35	M35	M35	M35	M35
Refer section	4:4	4:4	5:5	6:6	7:7
Units	2	2	2	2	2

Table 5.3 Column Details

COLUMN NO.	**C8**	**C9**	**C10**	**C10A**	**BC5**
Size.	300 X 1200	300 X 900	380 X 750	380 X 750	300 X 600
Steel.	9 - 25Ø+14-20Ø	18 - 25Ø	16 - 25Ø	16 - 25Ø	12 - 25Ø
Ring.	8Ø115C/C - 8Ø75C/C 3-RING + 4-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 4-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 3-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 3-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 1-LINK
Grade of concrete.	M35	M35	M35	M35	M35
Refer section	8:8	11:11	10:10	10:10	45:45
Units	2	2	2	2	10

Table 5.4 Column Details

COLUMN NO.	**GC1,GC1A**	**BC1**	**BC3,BC3A**	**BC2**
Size.	300 X 600	380 X 600	300 X 600	380 X 600
Steel.	12 - 16Ø	12 - 16Ø	12 - 16Ø	10 - 16Ø
Ring.	8Ø115C/C - 8Ø75C/C 2-RING + 1-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 1-LINK	8Ø115C/C - 8Ø75C/C 2-RING + 1-LINK	8Ø115C/C - 8Ø75C/C 2-RING
Grade of concrete.	M35	M35	M35	M35
Refer section	45:45	45:45	45:45	46:46
Units	3,1	3	1,6	3

Table 5.5 Column Details

COLUMN NO.	BC4,BC4A	GC2	GC3	GC4
Size.	300 X 600	380 X 600	300 X 600	300 X 680
Steel.	12 - 20Ø	12 - 20Ø	12 - 20Ø	12 - 20Ø
Ring.	8Ø115C/C - 8Ø75C/C 2-RING+1-LINK	8Ø115C/C - 8Ø75C/C 2-RING+1-LINK	8Ø115C/C - 8Ø75C/C 2-RING+1-LINK	8Ø115C/C - 8Ø75C/C 2-RING+1-LINK
Grade of concrete.	M35	M35	M35	M35
Refer section	45:45	47:47	45:45	50:50
Units	2,3	5	7	2

5.3 Shuttering of the column

5.3.1 Starter of column

After reinforcement work, starter are casted cause on the basis of starter we shuttering the column, starter is very important part for column casting.

- Shuttering a column starter.
- Bind a thread for starter alignment.
- Check starter alignment, thread and wooden plate should be in one line.
- Check starter measurement from centerline drawing.
- Casting of starter.

Fig. 5.1 Starter

Fig. 5.2 Starter

5.3.2 Shuttering of column

- Bind a side cover of **40mm.**
- Apply oil on sheets face with brush.
- Place sheet on starter sides.
- Sheet height is standardized **2440mm**.
- Use binding wire and bind sheets with opposite side sheet.
- Provide support to sheets through props.
- Use yoke, batten and arm for tie a sheet.

5.4 Casting of column

- For column M35 grade of concrete is used, for a concrete we have to give order on batching plant and they provide a concrete through transit mixer(TM).
- Vibrator of 40mm needle is use for good compaction of concrete and it is easily enter in a column.
- For concrete labor make a small base known as “chatto”.
- Concrete pipe put on the base and concrete is falling through pipe on base.
- Column is casted manually.
- Check the plum-bob test, to know a column position is change or not.
- If column not in position correct it with use props, yoke, batten and arm.

Fig. 5.3 Column

Fig. 5.4 Column

Table 5.6 Column quantity

Column	**C1,C1A**	**C2,C2A**	**C3**	**C4,C4A**	**C5**	**C6**	**TOTAL**
Size	300 X 1050X 3945X2	380 X 900 X 3945	300 X 900 X 3945	300 X 1200X 3945X2	300 X 1050X 3945X2	380 X 900 X 3945X2	
Quantity	2.4854	2.6982	1.0651	2.8404	2.4854	2.6982	14.2727
Column	**C7**	**C8**	**C9**	**C10,C10A**	**ST**		
	300 X 1200 X 3945	300 X 1200 X 3945	300 X 900 X 3945	380 X 750 X 3945X2	230 X 450 X 2440		
Quantity	1.4202	1.4202	1.0515	2.2487	0.2525		6.40
Total						**20.67 CMT**	

CHAPTER 6. LIFT

A lift is also known as elevator, it is a vertical transportation device use to move people and goods between different floors of building, lifts are typically situated within a fully enclosed vertical shaft in buildings, which is usually square or rectangular in shape.

These shafts run from the ground floor to the uppermost level of the building and may also extend below the ground to accommodate basement levels. Additionally, lift shafts frequently terminate above the roof level of the building.

In this block, there is a single lift unit installed, and there are a total of two lifts servicing the building.

Fig. 6.1 Lift steel

6.1 Reinforcement work

The elevator shafts are suspended from the rafters by means of X, Y, Z, and A beams. The curtain wall is then attached to the primary and secondary steel members. Here are some additional details regarding the steelwork:

Main steel: this refers to the primary structural steel members that support the building, including columns, beams, and trusses.

Distribution steel: this term typically refers to the secondary steel members that support the cladding or facade of the building, such as curtain walls, window frames, and sunshades.

It is important to ensure that the steelwork is fabricated and installed according to the appropriate standards and codes to ensure the safety and structural integrity of the building.

Table 6.1 Beams details

BEAM	**X**	**Y**	**Z**	**A**
Size	1100 X 5430	600 X 5430	600 X 5430	600 X 5960
Ring	8Ø125C/C ALL4-LEGGED	8Ø125C/C ALL4-LEGGED	8Ø150C/C ALL4-LEGGED	8Ø125C/C ALL4-LEGGED
Spacer bar	12Ø 4NOS.	12Ø 4NOS	12Ø 4NOS	12Ø 4NOS
Main steel	20Ø 16NOS.	25Ø 6NOS & 20Ø 5NOS	20Ø 12NOS	20Ø 16NOS.

Table 6.2 Lift dimensions

SIZE (IN MM)	**UNIT**	**STEEL**
125 X 2200	2	Main steel : 10Ø150C/C Distribution steel : 8ØC/C
150 X 4230	1	Main steel : 10Ø150C/C Distribution steel : 8ØC/C
150 X 2800	1	Main steel : 10Ø150C/C Distribution steel : 8ØC/C

6.1.1 Centerline work

Based on the centerline drawing provided by the structural engineer, the lift points will need to be marked on both sides of the boundary line. This process will be repeated horizontally along the boundary until all lift points have been identified.

Once all the lift points have been established, the starter will need to be applied. The starter refers to the initial section of the elevator shaft that is installed at the bottom of the lift pit.

It is important to ensure that the starter is installed correctly and meets the necessary structural requirements to support the weight and movement of the elevator. Proper installation and reinforcement of the starter will help to ensure the safety and longevity of the elevator system.

6.2 Shuttering work

The shuttering work involves the use of manual labor to construct formwork for concrete pouring. This formwork is made of plywood plates and supported by scaffolding props.

In the superstructure, a frame of the specified size is constructed, and this same frame is utilized for the shuttering work. The plywood plates are then secured to the frame using clamps or screws to create a mold for the concrete.

It is important to ensure that the shuttering work is properly constructed to prevent any leaks or seepage of the concrete, as this can compromise the strength and integrity of the structure. Proper alignment and bracing of the shuttering plates is also crucial to ensure that the concrete is poured accurately and evenly.

After the concrete has been poured and cured, the shuttering plates can be removed and reused for subsequent pours, as long as they remain in good condition and are free from defects or damage.

Before beginning the shuttering work, it is important to ensure that all steelwork is in place and that appropriate covers have been applied. A thin layer of oil should then be applied to the plates to facilitate their removal after the shuttering work is completed.

However, the amount of oil applied must be sufficient, as excess oil may remain on the surface of the curtain wall or column after the deshuttering work, creating issues during the curing process by reducing the amount of water remaining on the surface.

Once the oil has been applied, the plates are secured by bolts if readymade plates are used, or by clamps and shuttering clamps if centering plywood frames are utilized. Before filling, the vertical level must be checked using a plumb bob.

6.3 Casting of lift

For the lift casting, M35 grade of concrete is utilized, which is a high-strength concrete mix commonly used in construction projects that require a durable and resilient concrete structure.

The casting process is done manually, and it involves pouring the concrete into the prepared formwork or mold. To ensure that the concrete is evenly distributed and compacted, a vibrator is used during the casting process. The vibrator helps to remove any air pockets or voids that may be present in the concrete, resulting in a denser and stronger finished product.

Once the concrete has been poured and compacted, it is allowed to cure and harden over time. This process can take several days or even weeks, depending on the environmental conditions and the specific properties of the concrete mix used.

During the curing process, it is important to ensure that the concrete is kept moist and protected from extreme temperature fluctuations, as this can affect the strength and durability of the final product. Proper curing techniques help to ensure that the concrete achieves its maximum strength and longevity, making it suitable for use in the lift shafts and other critical structural components of thebuilding.

Fig. 6.3 Lift casting

CHAPTER 7. STAIRCASE

A staircase is a series of steps or flights of steps that connect different levels within a building. It is an essential component of multi-level structures and provides a safe and convenient means of vertical transportation for occupants.

Staircases are constructed using various materials, such as concrete, steel, wood, or a combination of these materials. The design of a staircase depends on the specific requirements of the building, such as the number of levels, the amount of traffic, the available space, and the architectural style.

A well-designed staircase should be easy to navigate, with steps of uniform height and width, appropriate lighting, and sturdy handrails for support. It should also be visually appealing, blending in with the overall design of the building while also serving as a focal point. Proper maintenance of staircase are also essential to ensure the continued safety and longevity of the staircase.

Fig. 7.1 staircase centering

Fig. 7.2 staircase centering & steel

Fig. 7.3 staircase steel & shuttring completed

Fig. 7.4 staircase casted

7.1 Centering work of staircase

When it comes to centering work for a staircase, there are several important steps that need to be followed to ensure that the finished structure is safe and stable.

The first step in centering work for a staircase is to prepare the base of the centering plates on the support of scaffolding props. This involves ensuring that the base is level and stable, and that the plates are securely attached to the scaffolding to prevent any movement or shifting during the construction process.

Once the base is prepared, side supports are added on both sides of the staircase. These supports need to be perfectly jointed and supported , as they will be responsible for holding up the risers once they are installed.

After the side supports are in place, riser plates are connected to the supports. These plates are equal in height to the risers and are kept at a distance above the base that is equal to the thickness of the slab. This helps to ensure that the risers are properly supported and aligned during the concrete pouring process.

To prevent any movement of the riser plates due to the high pressure of the concrete while filling, a wooden shaft may be added at the center of the staircase. This helps to ensure that the structure remains stable and aligned throughout the construction process.

Finally, the centering plates and riser plates are oiled to make it easier to remove them once the concrete has cured. With proper centering work, a staircase can be constructed safely and efficiently, providing a stable and durable structure for years to come.

7.2 Reinforcement work of staircase

- Before starting the reinforcement work for a staircase, it is important to first provide a strong and stable base. This typically involves preparing the area where the staircase will be located and ensuring that it is level and free from any debris or obstructions.
- Once the base is prepared, the reinforcement work can begin. This involves placing steel bars or mesh in a specific configuration to provide maximum support to the staircase. The reinforcement is typically placed in a pattern that evenly distributes the

load and provides support to the entire structure.

- Dowels are typically provided earlier from the stair curtain wall to help connect the reinforcement to the surrounding structure. A lapping length of 50D is often used to ensure a secure and stable connection.
- In addition to the reinforcement bars or mesh, a cover of 20mm is typically applied below the stair mesh to provide additional protection and support. This cover helps to prevent the reinforcement from coming into direct contact with the concrete, which can lead to corrosion or other damage over time.
- Once the reinforcement work is complete, the concrete can be poured and allowed to cure. Proper maintenance and upkeep of the reinforcement is important to ensure its continued effectiveness and longevity, including regular inspections and repairs as needed.

7.3 Casting of staircase

The centering work has been completed for the staircase, the concrete is filled in and casted along with the slab. A vibrator is used to ensure proper compaction of the concrete, and the concrete is filled up to the top of the riser plate. After the concrete has been poured and leveled, the surface is smoothened with a wooden float to give a smooth finish.

How to find riser height:

Total rise height / Number of riser = Riser height.

Table 7.1 Staircase detail

STRUCTURE	STAIRCASE
Thickness stair slab	150mm
Riser	162mm
Grade of concrete	M25

CHAPTER 8. RETAINING WALL

A retaining wall is designed to hold in place a mass of earth or the like, such as the edge of a terrace or excavation. The structure is constructed to resist the lateral pressure of soil when there is a desired change in ground elevation that exceeds the angle of repose of the soil.

8.1 Reinforcement work of retaining wall

To reinforce a retaining wall, a footing mesh is bound to the main steel of the retaining wall, which is bent at a 90-degree angle to join with the footing mesh.

The distribution steel is then bound to the main steel to provide additional reinforcement to the wall. This helps to ensure that the retaining wall is strong enough to withstand the pressure from the soil or other material it is retaining.

Between a both mesh put a spacer-ring for maintain their distance, Bind double wire node at lapping and every 75mm distance, after this 25mm cover are bounded and steel is checked then shuttering work is started.

Here there are two type of retaining wall B-type & C-type wall, B- type is regular and C-type is for eccentric footing.

Eccentric footing - a footing is called eccentric when the centre of gravity (CG) of the column is NOT in alignment with the centre of gravity (CG) of the footing and the load from the column is not transferred uniformly to the soil. The foundation provided here is called eccentric foundation.

Fig. 8.1 RCC wall steel

Fig. 8.2 RCC wall steel

Table. 8.1 steel detail

STRUCTURE	ECCENTRIC BEAM OR FOOTING
Size	1500 X 450
Main steel	TOP: 16Ø-4Nos. + 12Ø-2Nos. BOTTOM: 16Ø-4Nos. + 12Ø-2Nos.
Ring	10Ø 125C/C.
Retaining wall footing L size	600mm

Table. 8.2 steel detail

STRUCTURE	RETAINING WALL
Main steel Inner/Outer	8Ø150C/C / 10Ø150C/C
Distribution steel	8Ø200C/C
Height	5690
Footing length from both side of retaining wall accept retaining wall	450mm
Lapping length	50D

8.2 Shuttering work of retaining wall

First starter for retaining are casted, after centerline checking and after starter settled shuttering plates are ready for shuttering and the process are same.

- Bind a side cover of **25mm.**
- Apply oil on plywood sheets with brush.
- Place sheet on starter sides for shuttering.
- Sheet height is standardized **2440mm**.
- Plywood sheet was bonded with another side sheet, use of binding wire.
- Provide support to sheets through **props**.
- Used **yoke, batten, tie-road** and **arm** to tie a sheet.
- Check **plum-bob** after shuttering is completed for, verticality of structure.

Fig. 8.3 RCC wall shuttering

8.3 Casting of retaining wall

- Here we use M25 grade of concrete for casting
- Casted retaining wall through pumping.
- For compaction use vibrator but it should use in proper manner neither more nor less, cause it effects the concrete quality.
- Wooden hammer is used to prevent honey-combing effect, hammer striked at bottom of wooden sheet during casting to setal down the concrete.

Table. 8.3 casting detail

STRUCTURE	**RETAINING WALL**
Size of retaing wall	230mm
Grade of concrete	M25

Fig. 8.4 RCC wall casting

CHAPTER 9. BEAM & SLAB

9.1 Beam & Slab

Beam : A beam is a **horizontal structural member** in a building to resist the lateral loads applied to the beam's axis. The structural member which resists the forces laterally or transversely applied to the (beam) axis is called a **beam**.

The loads act transversely to the longitudinal axis, which produces the **shear forces** and **bending moment**. The lateral load acting on beams is the main cause of the bending of the beam. They are responsible for transferring a load from the slab to the column.

Concrete is strong in compression and very weak in tension. Therefor Steel reinforcement counter act tensile stresses in reinforced concrete beams, For beam main steel, mild steel bars or Deformed or High yield strength deformed bars (HYSD) used but **HYSD** bars have ribs on the surface and this increases the bond strength at least by **40%** for it is used.

Slab : A slab is a flat, horizontal structural element used in construction to provide a solid, level surface for buildings and other structures. Slabs are typically made of concrete, but they can also be made of other materials such as wood or steel. Slabs are used in a variety of construction applications, including floors, roofs, and bridge decks.

In concrete construction, a slab is typically made by pouring concrete into a formwork, which is a temporary mold that defines the shape and size of the slab. The concrete is then left to cure and harden, after which the formwork is removed, leaving behind a solid, flat surface.

Overall, slabs are an important component of many construction projects, providing a durable and reliable surface that can support a wide range of structures and activities.

Types of slab:

1. One-way slab:

One way slab is a slab which is supported by beams on the two opposite sides to carrythe load along one direction. The ratio of longer span (L) to shorter span (B) is equal or greater than 2.

$$\frac{LongerSpan}{ShortSpan} \geq 2$$

Due to the large difference in lengths, load is not transferred to the shorter beams, Main reinforcement is provided in shorter span and distribution reinforcement in longer span.

Example: Chajja and verandasare one way slab

2. Two-way slab:

Two way slab is a slab supported by beams on all the four sides and the loads are carried by the supports along both directions, it is known as two way slab. In two way slab,the ratio of longer span (L) to shorter span (B) is less than 2.

$$\frac{LongerSpan}{ShorterSpan} = \frac{l}{b} < 2$$

In two way slabs, load will be carried in both the directions. So, main reinforcement is provided in both the direction for two way slabs.

9.1.1 Beam Centering work

Beam bottom placed at one fix height, there always beam bottom are placed and through centerline drawing measurement and alignment are checked.

Once beam bottom are checked then beam sides shuttering work is started, also the same process beam sides alignment and measurement are checked through centerline drawing and threading.

The centering sheets are used was oiled with brush, Used flat and smooth sheets for centering work so that after deshuttering structure member shape remains the same.

After this labors start centering work for slab.

9.1.2 Slab Centering work

After beam side shuttering, slab centering work is started for all slab, sheets are placed at same level then oiled all sheets.

At small place where sheet cannot placed, at that place use small wooden plates for centering work, tight all sheets or plates with the help of props.

Fig. 9.3 Slab centering

9.1.3 Beam & slab Reinforcement work

- Cutting a steel bars for different beam as per there length,
- Place steel bars on beam box not in the box
- Put rings as per structure plane.
- Bound the rings with main steel of the beam.
- Spacing was followed as per structure drawing.
- After rings are bound then bound the junction of the beams.
- The lapping length was 50D.
- Beam L length is depends on beam depth.

- Bind a cover of 25mm at beam bottom, after beam downed bound cover at sides of the beam.
- After covering, slab reinforcement work is started.
- Maintained slab steel spacing as per drawing
- Check bent-up and top extra length was as per drawing.
- Chair placed between slab bottom mesh and bent-up.
- Cover of 25mm placed below the slab mesh.
- Check the level of slab with the use of threading.

Fig. 9.4 Beam reinforcement

Fig. 9.4 Slab reinforcement

9.2 Beam and Slab casting

For a casting of slab and beam, here we use M25 grade of concrete, concreting is done by pumping method.

Apply vibrator with pouring of concrete, needle of vibrator was always at 90degree during use of vibrator, pipe is change after concreting one portion.

Finishing work was completed with use of wooden float, and after that checked a slab thickness with one steel-road, where thickness is marked on that steel-road.

CHAPTER 10. EQUIPMENTS

10.1 Crane

A crane is a type of machine, generally equipped with a hoist rope, wire ropes or chains, and sheaves, that can be used both to lift and lower materials and to move them horizontally. It is mainly used for lifting heavy objects and transporting them to other places. The device uses one or more simple machines to create mechanical advantage and thus move loads beyond the normal capability of a human.

A main crane assembled by mobile crane.

Fig. 10.1 crane

Fig. 10.2 crane

10.2 Vibrator

Use for compaction of concrete, there are different type of needle use for different work there are 3 type of needle 40mm, 50mm and 60mm.

40mm & 50mm – Needle use for retaining wall, lift, column, staircase, beam and slab.

60mm – Needle use for footing, raft, beam and slab.

10.3 Breaker

Use for breaking extra concreting work, chipping to provide rough surface.

10.4 Grinder

Use for cutting all type wooden work, cutting of steel bars and pipes etc.

10.5 Total Station (TS)

For marking points of structure member on PCC, for the reference.

10.6 Dumpy Level

Use for level checking of PCC, ground level and road level etc., it shows the height difference.

10.7 Transit Mixer™

Use to provide concrete at site, mixer is mixing the concrete and prevent a concrete setting.

Capacity of TM: 2CMT, 4CMT, 5CMT, 6CMT and 8CMT, but 6CMT is enough for TM, cause TM can mix material properly at this capacity.

Fig. 10.3 TM

CHAPTER 11. WATER PROOFING

Waterproofing buildings is the method of forming a barrier over surfaces of foundations, roofs, walls and other structural members of buildings to prevent water penetrations through these surfaces.

Need: To protect the building from damage and give it an extended life, right waterproofing solution is necessary. Because water leakage and moisture cannot only lead to building damage and collapse, but also can create threat for human lives too

Types of waterproofing:

- Cementitious Waterproofing
- Bituminous Coating waterproofing
- Bituminous Membrane Waterproofing Method
- Polyurethane Membrane Waterproofing
- Liquid Waterproofing Membrane Method

11.1 Method of waterproofing

Step 1: Surface Preparation

Clean the surface thoroughly free from loose materials, dust, and oil. Surface cleaning plays a very important role in all membrane based waterproofing coating systems.

Step 2: Application of Primary Coat

Apply a primary coat to prime the surface of the structure, at concrete joint and then at all surface. Check a surface by applying water, if water fell smoothly the coat is perfect.

Step 3 : Application of secondary coat

After first coating is completed and perfected secondary coating is started. It is only for if any portions are left in primary coating, it will coated in second coating.

11.2 Site status

At here we use force rope chemical for waterproofing, where two chemical are mixed and apply it on the surface, one is base –A and second is hardener –B and first coating is completed on retaining wall.

Fig. 11.1 waterproofing

CHAPTER 12. ROLE AND RESPONSIBILITY

My role as intern to, First read all details of the drawing, Analyze all work and progress of site and according to this check work on site, monitoring and supervision it.

Role and Responsibility

- Check steel work.
- Check shuttering work.
- Check deshuttering work
- Quality check of concrete.
- Manage activity and manpower.
- Data entry of bills.

Steel work: In a steel work of any structural member ex. Column, beam, slab, footing, raft etc.,

Check its,

- main steel
- spacing of main steel
- Spacing of distribution
- spacing of rings
- ring hook
- link hook
- L – size
- Lapping length
- Node of binding wire
- Bent up length
- Extra top length
- Chair for maintain spacing

Shuttering work:

- Sheet or plat should be flat and smooth
- Oiled work
- Fitted work
- Plum bob

Deshuttering work:

- Concrete quality
- Any concrete effect (Ex.: honey combing etc.)

Quality check of concrete:

- Cleaning
- Slump
- Color
- Setting time
- Cube test

Manage manpower and activity:

- Excavation
- Cleaning
- Curing
- Loading – Unloading of material.
- Casting schedule.

Data entry of bills:

- Rubble
- Soil
- Bricks
- Steel
- Concrete
- Coupler
- Cover
- Equipment

Calculate concrete and steel quantity:

Formula for concrete quantity:

$$L \times B \times H = \_\_\_ (m^3)$$

L – Length

B – Breadth

H – Height

Formula for steel quantity:

Weight -> $(D^2 \times L) / 162 =$ w (Kg.)

Weight -> w x No. of bars (same dia.) = W (Kg.)

D – Diameter of steel bar

L – Length of steel bar

w – Weight of one bar

W – Total weight of steel

And all update about site and office work is given to higher authority.

CONCLUSION

In conclusion, my internship experience as a junior civil engineer has been an invaluable opportunity for me to gain practical knowledge, skills, and hands-on experience in the field. During the course of the internship, I had the chance to work on several projects, which allowed me to understand the complexities of civil engineering and apply the theories learned in the classroom.

Working closely with senior engineers and other professionals has given me the guidance and mentorship needed to develop my knowledge and understanding of the field. Their knowledge and expertise have been instrumental in shaping my perspective on civil engineering.

In addition, my internship experience has taught me the importance of effective communication, teamwork, and time management skills in the workplace. Collaborating with colleagues and stakeholders has helped me to understand the importance of effective communication in achieving project success.

Overall, my internship experience has been both challenging and rewarding. I am confident that the skills and knowledge I have gained during this period will be valuable in my future career as a civil engineer. I express my sincere gratitude to my supervisors and colleagues for their support and guidance throughout my internship period.

INTERNSHIP AT KSF BUILDCON LLP

AN INTERNSHIP REPORT

Submitted by

Ravindrakumar Bharatbhai Taviya

190390106003

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Civil Engineering

S.P.B. Patel Engineering College, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY.

S.P.B. Patel Engineering College

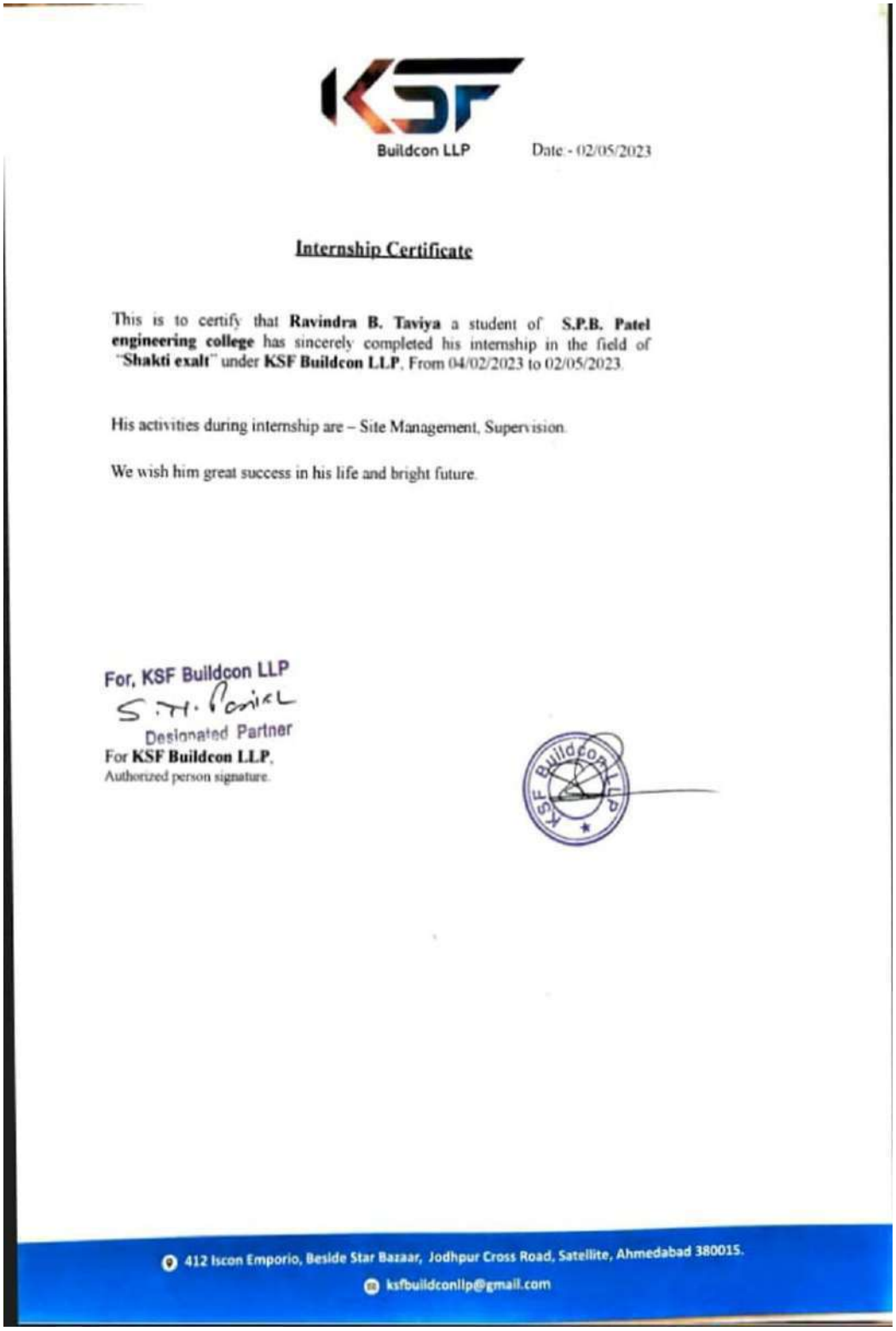
Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled Internship at **KSF BUILDCON LLP** has been carried out by **Ravindrakumar Bharatbhai Taviya** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Civil Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Sign:.	Sign:
Prof. Meet Jani	Prof. Avani Dedhiya
Internal Guide	Head of Department

COMPANY CERTIFICATE



Buildcon LLP

Date - 02/05/2023

Internship Certificate

This is to certify that **Ravindra B. Taviya** a student of **S.P.B. Patel engineering college** has sincerely completed his internship in the field of "**Shakti exalt**" under **KSF Buildcon LLP**. From 04/02/2023 to 02/05/2023.

His activities during internship are – Site Management, Supervision.

We wish him great success in his life and bright future.

For, KSF Buildcon LLP

Designated Partner

For **KSF Buildcon LLP**,
Authorized person signature.

412 Iscon Emporio, Beside Star Bazaar, Jodhpur Cross Road, Satellite, Ahmedabad 380015.

ksfbuildconllp@gmail.com

PMMS CERTIFICATE

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 14 May 2023 (14:47:26)

This is to certify that, ***Taviya Ravindrakumar Bharatbhai*** (Enrolment Number - 190390106003) working on project entitled with ***Internship at KSF buildcon llp.*** from ***Civil Engineering*** department of ***S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Taviya Ravindrakumar Bharatbhai

Name of Guide : Mr. Meet Jani

Signature of Student : _____

*Signature of Guide : _____

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY.

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship report submitted along with the Internship entitled **KSF BUILDCON LLP** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Civil Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Prof. Meet Jani & Mr.Janakbhai Patel (External Guide)** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the student. Sign of student

Ravindrakumar Bharatbhai Taviya .

_____

ACKNOWLEDGMENT

I wish to express my appreciation to Prof. Avani Dedhiya, Prof. Meet Jani, Prof. Joseph Sebastian, Dr. Shailesh Patel and Dr. Pooja Mehta for the knowledge imparted during my academic tenure at Saffrony Institute of Technology. A special thanks goes to Prof. Meet Jani for making sure I gained sufficient knowledge during my graduate studies and for their encouragement.

I am grateful to KSF BUILDCON's Mr.Janakbhai Patel for this internship opportunity. I also want to thank Mr.Sapan Parikh, Mr. Pulin Shah, Mr. Aashish Patel and Mr.Umang Raval who have provided encouragement and the type of Knowledge they share with me which is helpful for onsite job and guide me for my task and taught me technical skills for construction work and make my internship worthy, Mr. Jankbhai Patel who is my external Guide on site ,Mr. Sapn Parikh and Mr. Pulin Shah are owner of the Company, KSF BUILDCON LLP is a contractor company, Mr. Aashish Patel and Mr. Umang Raval are Engineers from Builder Shakti Infrastructure. Most importantly, I wish to thank my parents for their encouragement and support , so that I could pursue this internship.

I perceive this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement, to attain desired career objectives. I am also grateful for them to offer me with this internship opportunity and work with these wonderful people at their esteemed organization after the internship opportunity.

ABSTRACT

This report contains the work done by the author during his internship at KSF BUILDCON LLP, on construction site Shakti Exalt,near DPS school, Shilaj , Ahmedabad. Shakti Exalt is a 3 BHK multistorey residential building. Having 2 blocks.In this report author shows the process of learning in construction work, Excavation work, their process work of RCC work and casting of building elements. In the report, the author discusses the process of steel placing,steel cutting, Excavation work dor building structure, shuttering work, centering work, casting process, material used on site, his role and responsibilities, day to day task. How the process of making building elements, form start to end , marking of points, then placing of steel, pcc work , excavation wherever it is needed. Then shuttering work, and checking of steel and then casting of structure, concrete mixer, and grade of concrete, some calculation and estimation for material, material testing, quality of work etc, are discussed in this report.

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

1. PCC = Plain cement concrete

2. RCC = Reinforced cement concrete

3. TS = Total station

4. Sqm= Square metre, Sqft=Square feet

5. CMT= Cubic metre

6.CFT = Column footing

7.BHK = Bedroom Hall Kitchen

8.Dia=Diameter

9.c/c = Centre to centre

10. Fig = Figure

11.Nos = Numbers

12. BBS = Bar Bending Schedule

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

1.1 Company Profile

KSF Buildcon LLP is a Limited Liability Partnership firm incorporated on 07 May 2021. It is registered at Registrar of Companies, Ahmedabad. Its total obligation of contribution is Rs. 100,000.Designated Partners of KSF Buildcon LLP are Pulin Anilbhai Shah and Sapan Parikh.And its registered address is 412, ISCON EMPORIO, B/S. STAR INDIA BAZAR NR. JODHPUR CROSS ROAD, SATELLITE AHMEDABAD Gujarat 380015.Company is providing construction services,for residential, commercial building, RCC work, Brick work, plastering work, Flooring,site supervison, execution on contract basis.Project manager is Mr. Janakbhai Patel Site Engineer is Mitulbhai RCC contract is of Uma construction Mr.Chetan Patel and Mr.Navin Patel.

1.2 Introduction To Project

Project name is "Shakti Exalt", location of site is near Zion Sky field, DPS Bopal road ,Shilaj Ahmedabad. It is a residential type building, 2 Blocks are there Block A and Block B, it has Ground floor,1 basement parking, 14 floors of 3 BHK flat. In one building each floor has 4 number of houses. Each flat has built up area around 465 square metre. Each building has 1 lift and staircase. Building height is of 44.99m, and plot area is of 3553.66 Sqm. Common plot area is having Ramp for basement parking, Having 3 underground water tanks , a domestic use water tank 66000litres capacity, fire safety water tank 72000litres capacity and one small tank near retaining wall Block B of 5000litres capacity. Builder of this project is Shakti Infrastructure their project manager Mr. Aashish Patel , Senior engineer Mr. Umang Raval. Developers are KSF BUILDCON LLP, Mr.Sapan Parikh, Mr.Pulin Shah, Project manager Mr.Janakbhai Patel , Site Engineer Mr. Mitul Vadaliya. Sub contractor company Uma construction for RCC work. Their engineers are Mr. Chetan Patel and Mr. Naveen Patel fro

1.3 DETAILS OF PROJECT

Project is in under construction stage. Basement parking and foundation level RCC work in progress. Here Foundation plan was provided. Two Raft foundation are shown in plan , Raft q and Raft 2, here rafts are shown as typical column footing. And in cop area typical isolated footing are provided. It has 28 numbers of isolated footing.

Project is having 2 blocks , Block A and Block B , 14 storey building and lift in each block, 1 basement parking, 3BHk falts. And Shoping complex in Block A front side. In basement foundation is rested on pcc of 150mm and RCC bed of 230mm depth,then it will be covered by soil filling and pcc and trimix layer then floor level of basement was completed. Columns having different sizes are provided. Retaining wall in both blocks all around. In COP area ramp fro driving is provided, in basement drainage channel ,fire safety water tank, domestic water tank are there.

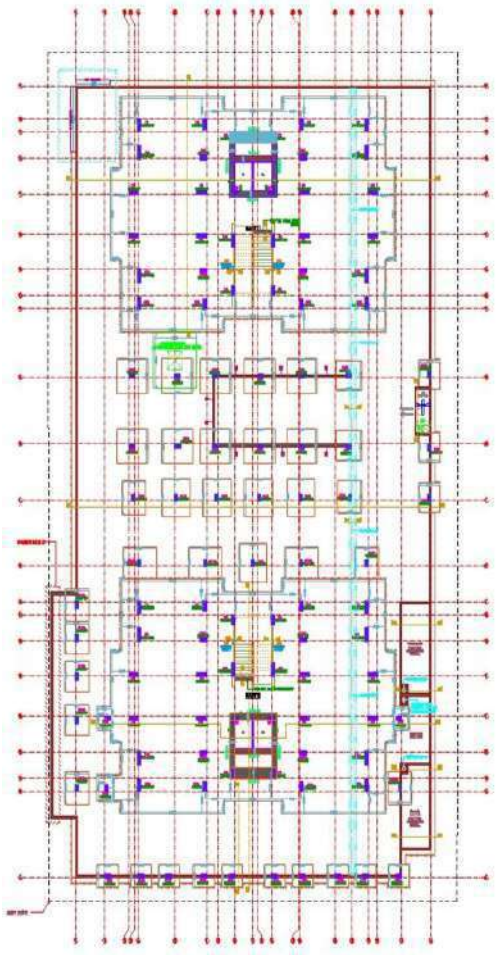


Fig 1.1. Basement foundation drawing.

CHAPTER 2: INTRODUCTION TO BULIDING STRUCTURAL ELEMENTS

2.1 Foundation Footing

Footings are of many types Wall footing/Strip footing ,Spread Footings, Isolated footings,Stepped footings, Combined footings,Sloped footings,Mat or Raft foundation, Strapped footings, Pile foundation. But here we used Raft and isolated footing. Because raft foundation are useful where soil is soft and marhsy and when you construct heavy structures on aoft soil these type of foundation is useful.

Use of footing: it is needed to transfer load of building to aoil strata.

Foundation selection is is depend upon soil type, bearing capacity of soil and type of superstructure.

Fig.2.1 Isolated Rectangular footing

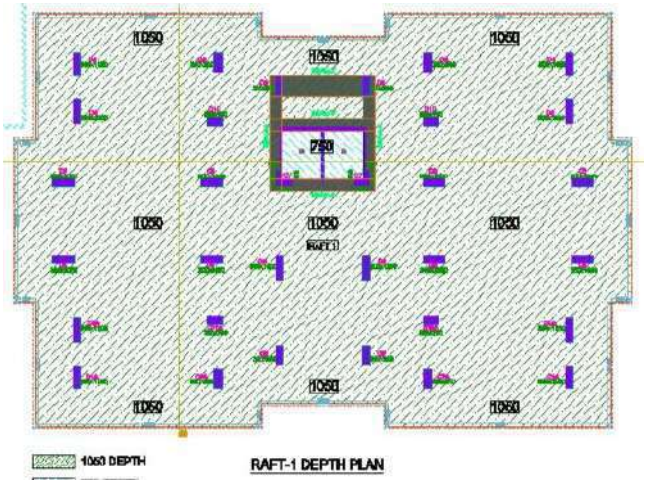


Fig.2.2 Raft foundation Depthplan

2.2 Column

Columns are important structural member of a building. Int take load from slab and beam and transfer to foundation. It is a mediator for slab beam to foundation. It take compression load and weight of building structure is laying on it. It is a compression memeber. Vertical alignment in building architecture and structure. It has steel bars for make concrete compressive. Columns are of different types and shape like Circular, square and Rectangular, octagonal, hexagonal etc. Here we use square and Rectangular type columns.

Fig: 2.3 Rectangular Column

2.3 Retaining Wall

Retaining wall is the wall structure which is constructed to hold, or retain or prevent the sliding of nearby soil.Construction of the retaining wall can be done by both cast-in-situ and pre-cast method, Depending upon the location or function, different types of retaining wall can be used. Types of Retaining wall are cantilever ,gravity retaining wall, semi gravity, counterfort retaining wall, buttress retaining wall etc. Applications are For the prevention of the soil erosion,To retain the soil nearby, Culvert,Underpass,Bridge, etc.To provide the stability in sloped soil,Landscaping, Building basement,Embankments (Gabion wall), Various structure where soil retention is required.

Fig: 2.4 Retaining wall

2.4 Beam

The beam is defined as the structural member which is used to bear different loads. It resists the vertical loads, shear forces and bending moments, different types of beams depends on support, geometry, material, based on profile, and based on indeterminacy.

Based on material : steel, concrete,Timber.

Based on support : Hinged, cantilever, overhanging, simply supported ,fixed, double overhanging, trussed, continuous.

Based on geometry : Straight, Curved, tapered.

Based on Profile : Rectangular, C-Beam,I- Beam,T-Beam,other cross sections.

Based on Indeterminacy : Statically determinate, Statically indeterminate.

On our site concrete, continuous, simply supported and Rectangular type beam are used.

Fig: 2.5 Rectangular beam (Before casting)

2.5 Slab

A reinforced concrete slab is a crucial structural element and is used to provide flat surfaces(floors and ceilings) in buildings. On the basis of reinforcement provided, beam support, and the ratio of the spans, slabs are generally classified into one-way slab and two-way slab. The former is supported on two sides and the ratio of long to short span is greater than two. However, the latter is supported on four sides and the ratio of long to short span is smaller than two.Varying conditions and stipulations ask for the selection of appropriate and cost-effective concrete slab, keeping in view, the type of building, architectural layout, aesthetic features, and the span length. Concrete slabs, therefore, are further classified into one-way joist slab, flat slab, flat plate, waffle slab, hollow core slab, precast slab, slabs on grade, hardy slab, and composite slab. On our site One way slab and two way slab both are provided as per requirement.

Fig: 2.6 Slab steel structure

2.6 Staircase

A stair is a set of steps leading from one floor of a building to another, typically inside the building. The room or enclosure of the building, in which the stair is located is known as staircase. The opening or space occupied by the stair is known as a stairway. Types are of straight staircase, turning staircase, half turn, quarter turn, geometrical quarter turn, doglegged, spiral, continuous stair etc. On site we used Dog legged type staircase used.

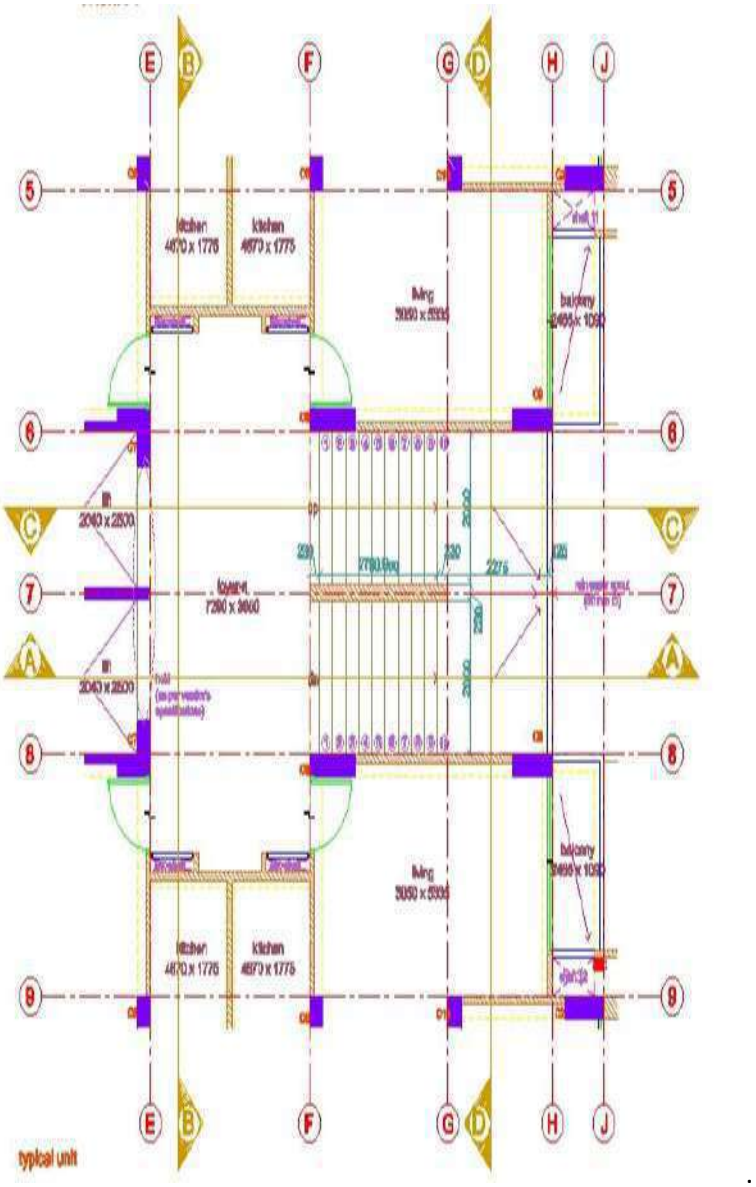


Fig: 2.7 Staircase plan view

CHAPTER 3: EXCAVATION AND SOIL FILLING

3.1 Need Of Excavation

Excavation is the process of moving earth, rock, or other materials with tools, equipment, or explosives. It includes earthwork, trenching, wall shafts, tunneling, and underground. Excavation has a number of important applications including exploration, environmental restoration, mining, and construction. Among these, construction is one of the most common applications for excavation. Excavation is used in construction to create building foundations, reservoirs, and roads.

Some of the different processes used in excavation include trenching, digging, dredging, and site development. Each of these processes requires unique techniques, tools, and machinery to get the job done right. The processes used will depend upon the structure that will result from the construction process. On our site excavation was done by backhoe up to depth of and then manually excavation done for retaining wall and pcc at corners.

The entire excavation process includes:

- setting out corner benchmarks
- surveying ground and top levels
- excavation to the approved depth
- dressing the loose soil
- making up to cut off level
- the construction of dewatering wells and interconnecting trenches
- making boundaries of the building
- the construction of protection bunds and drains.

3.2 Types Of Excavation

Fig.3.1 Excavation by Back hoe.

Fig.3.2 Manual excavation

3.3 Need Of Back Filling

Back-filling is the process of filling in the excavated area around a foundation or structure. The backfill material can be anything from soil to gravel and is usually compacted to provide support and stability. Backfill can also be used to insulate foundations or improve drainage. Back filling is essential in the construction process.

Depending on the project, back filling can be a simple or complex operation requiring special equipment. It is vital to ensure that the backfill material is compacted correctly to provide a stable foundation.

Fig.3.3 Soil filling

CHAPTER 4: PCC WORK

4.1 Need of PCC

The term PCC stands for plain cement concrete. The mixture of cement, fine aggregate (sand) and coarse aggregate are generally called plain cement concrete (PCC).

Before starting any R.C.C or masonry work directly on the excavated soil, PCC is done to form a levelled surface and to avoid laying concrete on soil directly so as to avoid mixing/ with soil and also to prevent soil extracting water from PCC thereby weakening it.

4.2 Rubble laying

Soil having water level high ,there is need of hard surface for PCC work and it is achieved by laying of Rubble for layer of 230mm , Rubble size is of 90 to 300mm. Rubble soiling was done manually. First level marking was done by dumpy level test and then Rubble laying process was started.

Fig: 4.1 Rubble laying

4.3 Material Details

4.3.1 Coarse Aggregate

Any foreign granite or elements similar to stone, including hard grit, dirt, and other foreign materials, should not be present in the coarse aggregates used in PCC. The size of the stone ballast will be 20 mm and smaller. Every piece of coarse material needs to be kept in a 5 mm square mesh and graded properly so that voids don't transcend 42%.

4.3.2 Fine Aggregate

The fine set must be composed of coarse sand with hard, pointed, and angular grains and must pass through a mesh screen with a 5 mm square opening. The sand must be clean, of standard specifications, and free of organic debris, dust, and grime.

4.3.3 Cement

Plain cement concrete is frequently made with Portland Pozzolana Cement (PPC). It should meet the requirements in terms of fineness, have the necessary tensile and compressive stresses, and conformance to the specifications.

4.3.4 Water

The water will be crystal clear and largely free of impurities, including oil, chemicals, oxidising agents, minerals, and plant growth. In general, water needs to be at least 6 on the pH scale.

4.4 Concrete mixing and Casting of PCC

4.4.1 Concrete mixing

The following three concrete mixing techniques are used to produce concrete that is efficient and of high quality.
Concrete mixing by hand (mixing concrete manually without a mixer machine)
Automatic concrete mixing (mixing concrete with a mixer machine)

Pre-mixed concrete (mixing in an automatic or semi-automatic batching plant)
On our site premixed concrete method was applied for concrete mixing. For PCC M10 1:3:6 was used. RMC truck and pump is used for concrete supply to PCC work area.

4.4.2 Casting of PCC

- Make sure the PCC is at the ideal brick soling/sand bed level.
- Build the PCC formwork using wooden boards to the required dimensions.
- The area where concrete is being poured shouldn't include any dust or unwanted foreign objects.
- From one side, gently place the concrete. The mixed concrete must be applied within 45 minutes.
- The PCC should be compacted and finished with wooden rammers.
- To facilitate future work before the concrete solidifies, the PCC surface should be rough.
- PCC must be applied to the concrete surface and left there for 24 hours before it may begin to cure. Alternatively, the surface can be covered for at least seven days using damp gunny bags**.**

Fig: 4.2 Casting of PCC

CHAPTER 5: FOUNDATION FOOTINGS

5.1 Steel Fitting Of Footing

Footings are of two types , 2 numbers of Raft and 31 numbers of Isolated Rectangular footings. Steel of Footings are cutted by steel cutting machine and bending machine. And placed and fitted manually by steel fitters.

Fig:5.1 Steel Cutting

Fig:5.2 Bending of Steel

Footing	Size (mm×mm)	Main steel(dia in mm, Spacing in mm)	Distribution steel (dia in mm, Spacing in mm)	Depth of Footing(mm)	Size of Pedestal (mm×mm)
BC1	2750×2950	12,150	12,150	650	450×680
BC3	2700×300	12,150	12,150	650	380×680
BC2	2400×2600	12,150	12,150	600	450×680
BC4	3200×3500	12,150	12,150	850	380×680
BC4A	3800×2900	16,150	16,150	850	380×680
GC2,GC3	3200×3500	12,150	12,150	850	380×680
GC4	3150×3550	12,150	12,150	850	380×750
BC3A	2800×2900	12,150	12,150	650	380×680
GC1	2750×2950	12,150	12,150	650	380×680
Raft1	30300×21160	16,135(Bottom) 16,150(Top)	16,135(Bottom) 16,150(Top)	1050	_
Raft2	30300×21300	16,135(Bottom) 16,150(Top)	16,135(Bottom) 16,150(Top)	1050	_

Table:5.1 Steel detailing of Footings

5.2 Shuttering Of Footing

Shuttering of Footings done vy Shuttering carpenter using plywood sheets and iron sheets ,wooden batten, wooden blocks , shuttering clamps, nails etc. Size of shuttering was kept as per schedule of Footing. And in Footing 50mm cover blocks are used to set steel and shuttering position. At the end of shuttering work done Plumb bob check was done and measurement taken by measuring tape to check size and footing to footing distance.

Fig:5.3 Shuttering of Footing

Fig:5.4 Checking of Center of Footing

5.3 casting of footing

Casting of Footing was done with M25 grade concrete having ratio of 1:1:2, RMC truck and RMC pump are used for concrete mixing and placing. Then casting was done by casting labour, they use shovel for taking concrete and placing in any corner, pan , wooden rammer for finishing, trowel, and needle vibrator. Some time when number of Footings are more or size is big then casting is done in night also. Concrete quantity was calculated by formula.

VOLUME OF CONCRETE= Length × Width × Height

Length of structure in m

Width of structure in m

Height of structure in m

Concrete quantity denoted as CMT.

Fig: 5.5 Casting of Footing

Fig: 5.6 Finishing of Raft footing

CHAPTER 6: COLUMNS OF BUILDING

6.1 Steel Fitting Of Columns

Steel of columns are cutted and placed according to schedule of columns. Cutting length of steel 20mm dia and 25mm dia is kept 3 m and 4 meet ,and lapped alternatively by steel coupler. Size of columns are different for main building and for cop area. Some of the columns are not continued after 1st floor. Steel of columns placed and fitting work was done by steel fitters. Before starting of columns points of columns are marked on pcc by total station equipment.

Fig: 6.1 Steel fitting of Column

Fig: 6.2 over lapping of column

Column	Column size(mm×mm)	Column Pedestal size(mm×mm)	Column steel(nos - dia in mm)	Stirrup steel(dia in mm, Spacing in mm)	Stirrup ring set(Ring+link)
C1,C1A	300×1050	380×1130	21-25	8,115 8,75	2 Ring+5link
C2,C2A	380×900	450×980	22-25	8,115 8,75	3 Ring+ 4 link
C3	300×900	380×980	13-25,4-20	8,115 8,75	2 Ring + 3link
C4,C4A	300×1200	380×1280	23-25	8,115 8,75	3 Ring +4 link
C5	300×1050	380×1130	21-25	8,115 8,75	2 Ring +5 link
C6	300×1050	380×1130	9-25,12-20	8,115 8,75	2 Ring+5 link
C7	300×750×750	_	24-25	8,115,75	2 Ring+6 link
C8	300×1200	380×1280	9-25,14-20	8,115 8,75	3 Ring+6 link
C9	300×900	380×989	18-25	8,115 8,75	2 Ring+4 link
C10,C10A	380×750	450×830	16-25	8,115 8,75	2 Ring+ 3 link
BC5	300×600	380×680	12-16	8,115 8,75	2 Ring+1 link
GC1,GC1A	300×600	380×680	12-16	8,115	2 Ring+1 link

				8,75	
BC1A	380×600	450×680	12-16	8,115 8,75	2 Ring+1 link
BC3,BC3A	300×600	380×680	12-16	8,115 8,75	2 Ring+1 link
BC2	380×600	450×680	10-16	8,115 8,75	2 Ring
BC4,BC4A	300×600	380×680	12-20	8,115 8,75	2 Ring+1 link
GC2	300×600	380×680	12-20	8,115 8, 75	2 Ring+1link
GC3	300×600	380×680	12-20	8, 115 8, 75	2 Ring+1 link
GC4	300×680	380×750	12-20	8,115 8,75	2 Ring+1 link

Table: 6.1 Steel details of Columns

6.2 Shuttering Of Columns

Shuttering of columns are done by plywood sheet, before that column starter are fitted by wooden block and casting of starter done before starting casting of column. Then Column shuttering work was placed as per size of Column and point of columns marked . Height of one plywood sheet is up to 8foot. So maximum Column casting height for 1st casting is set as 8 foot. Then cap of Column fitted after first casting then cap of columns will cast. And Column junction with beam is casted within slab casting.After shuttering work was completed its size , height, line dori ,and plumb bob check was done.

Fig: 6.3 Shuttering of column.

Fig: 6.4 Starter shuttering,line dori

6.3 Casting of Column

First Column starter are casted before 8 to 10 hours. Casting was done by M35 grade concrete. RMC pump , pipe ,iron sheet open platform was used . First concrete was pumped till open pan of iron sheet then manually placed by labours head pan and vibrator was used to make concrete free from air void and make dense compacted structure.

Fig: 6.5 Casting of columns

Fig: 6.6 Concrete pumped on platform

CHAPTER 7: RETAINING WALL

7.1 Steel Fitting

Steel cutting was done as per requirement of retaining wall steel. Lapping of main steel was done as per IS 456: 2000 , 50D. Height of Retaining wall was kept till beam bottom of slab. 4300mm from raft Footing surface.

Steel details: in Outer mesh main steel which is provided vertical alignment is of 10mm diameter bars and with 150mm c/c , Distribution steel Horizontal alignment Having 8mm diameter bars 200mm c/c . Inner mesh main steel 8mm diameter bars,150mm c/c, Distribution steel 8mm diameter bars 200mm c/c.

Two types of Retaining wall are used C type and B type , C type retaining wall is having eccentric Footing, and B type is for ramp wall.

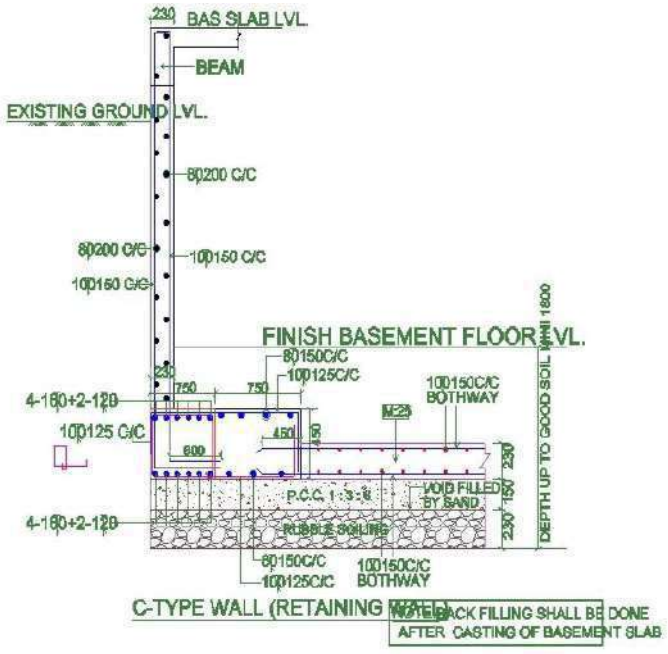


Fig:7.1 C type retaining wall

Fig:7.2 Retaining wall steel structure

7.2 Shuttering of Retaining wall

After steel work is completed, and starter was casted, then shuttering of Retaining wall started. By plywood sheet, wooden blocks, shuttering clamps, both site of steel structure shuttering work was fitted. Then plumb bob check and level was checked by line dori check. Inner surface of plywood sheet was oiled properly so it can not stick with concrete. Then bottom surface was cleaned with water spray before casting started. In one eccentric Footing retaining wall one side shuttering was used cause it is exactly near to neighbouring building's retaining wall.

Fig:7.3 Single side shuttering

Fig:7.4 Double side shuttering

7.3 Casting Of Retaining Wall

Casting of Retaining wall was done by M25 grade 1:1:2 Concrete. First casting of 2.44m was done because plywood sheet height is of 2.44 m then second flight was shuttering work was done then casting of Retaining wall was done then cap of Retaining wall was casted with slab casting. Casting was done by RMC truck, Pump ,pipe was set up to height of Retaining wall. Casting labour are for vibrator and finishing of surface.

Fig: 7.5 casting of Retaining wall

Fig: 7.6 One sided shuttering Retaining wall

CHAPTER 8: BEAMS, STAIRCASE AND SLAB

8.1 Centering And Shuttering Of Beam

Beam bottoms are placed after marking of level of bottom on columns. Then from level of bottom plywood sheet are fitted on wooden blocks rested on column. Size of plywood is make of beam size. Bottom are supported by staging,props. After bottom are placed then bottom to bottom distance was checked by line dori and tape measurements with Slab layout drawing. After beam bottom was placed and checking is done then sides of beam are placed. Beam bottom Placing is called centering work cause beam is a horizontal member, and its side is vertical so it is called shuttering work for beam side.

Fig:8.1 Beam Bottom placing

Fig: 8.2 Beam Bottom Checking

Fig:8.3 Beam Side shuttering

8.2 Centering Of Staircase And Slab

8.2.1 Slab Centering

Centring of slab was started after beam sides are placed properly, then with help of 3×4 foot iron sheet ,wooden batten, props,nails slab centering was done. In one slab minimum 10 to 12 props are used to support iron sheets, in gap between two iron sheet plywood or wooden blocks are used to fill the gap. Then tap is applied to corners and joints of sheets.

Fig:8.4 Slab Centering

Fig:8.5 Props supporting slab

Fig:8.6 Tap in sheet joint

8.2.2 Centring of Staircase

First west slab of staircase was placed. Two levels are marked first on bottom case floor of basement is at 1000mm. Then landing level is marked. Staircase was casted in two stages first till landing, in second stage landing to Ground floor slab. Steps are marked, riser of 162 mm, tread of 230mm. First flight 10 steps and landing,in second 11 steps . 150mm thick landing slab and west slab. 230mm thickness of Staircase wall.

Fig: 8.7 Centring of Staircase

Fig: 8.8 Second stage staircase centering

8.3 Steel Details Of Staircase

In Staircase wall 230mm thickness, main steel 12mm dia,100mm c/c Distribution steel 8mm dia, 175mm c/c .

West slab Bent up from staircase wall 1200mm lenth of main steel, slab main steel of 12mm ,100mm c/c , distribution steel 8mm,175mm c/c.

Landing size is of 4m×2.275m , and having main steel 12mm 100mm c/c, distribution of 8mm 175mm c/c.

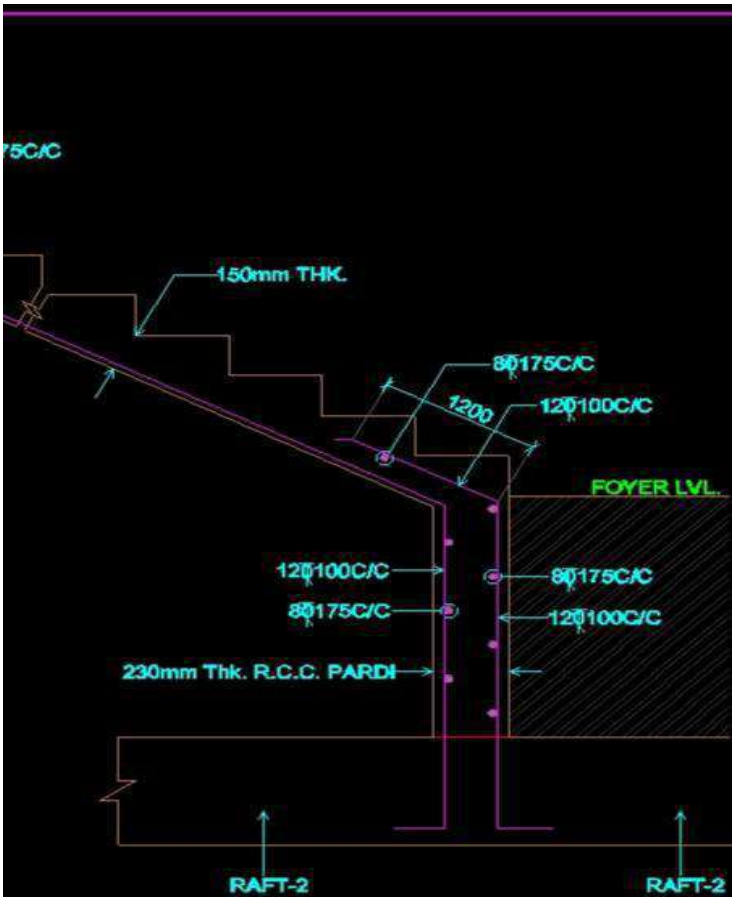


Fig: 8.9 Staircase wall and West Slab

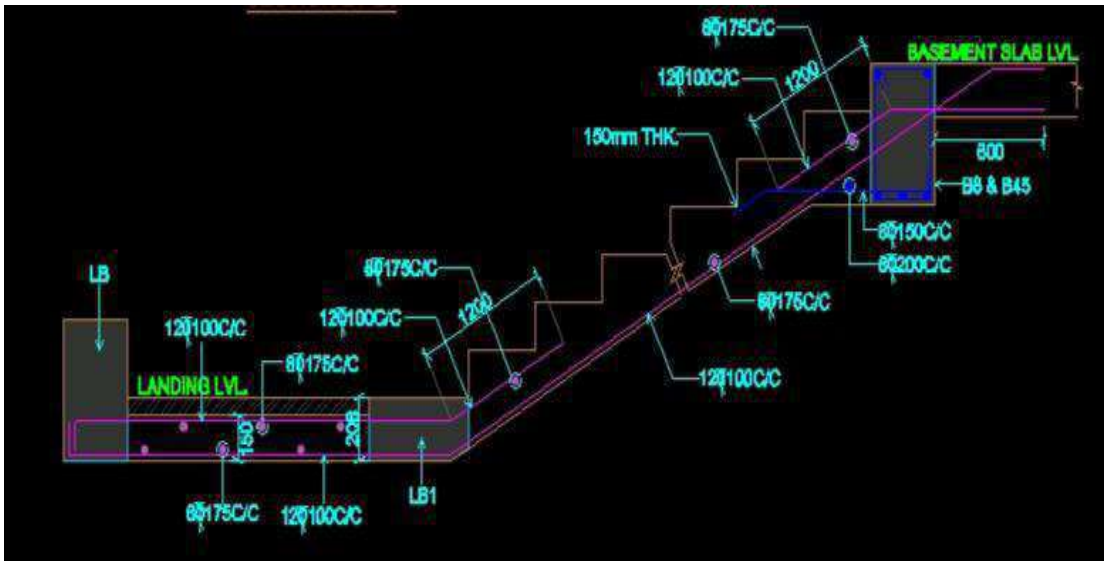


Fig: 8.10 Staircase Steel detail

8.4 Beam Steel Fitting

Beam steel fitting is done as per schedule of beams. Beams having different sizes.

During steel fitting number of steel bars ,its diameter, spacing, extra bars length, laping length, stirrup position and size all are followed as per schedule of beams.

Here i will share one of beams steel details.

Beam : B84 Here it has size of 300×625, 30×725.

Top steel: 2-20mm dia +1-25mm dia bars

Top extra steel: 2-16mm diameter bar

Bottom steel: 4-25mm diameter bar

Bottom extra: 2-25 mm diameter bar

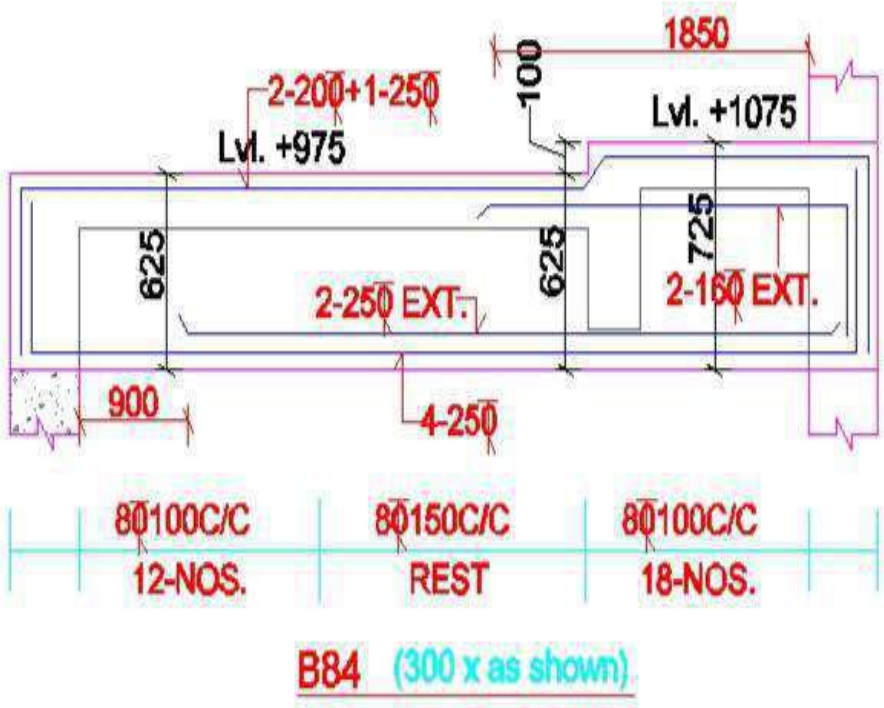


Fig:8.11 Beam Steel

8.5 Steel Fitting Of Slab

Slab steel having different types of slab Portion with different size steel. But most of portion is of 10mm diameter bars with 100mm c/c bothway. Slabs are of one way and two way category. Bent up of length was provided L/7 At end of slab and slab level difference joint. In continuous slab bent up of length L/5 are provided. Here L is length of slab in one direction. Etra top bars are provide in slab of length L/4 8mm dia bars with spacing of 200mmc/c or 300mmc/c . In slab steel cover are provided odmf 25mm. Retaining wall steel was bent and bind with slab steel at joints. At corner corner steel are provided as per drawing.

Fig: 8.12 Steel fitting of slab

Fig: 8.13 Steel binding

8.6 Casting Of Slab,Beam And Staircase

After completion of steel work covers are fitted in beam side , in bottom they fitted Before placing of beam and slab covers are also fitted before casting.Then,level of beam and slab was checked by dubba level check. Water level pipe was filled with water and its one end was placed in bucket filled with water then level was marked on pipe and with one steel rod pipe is tied with thread and then level of slab was checked in between 2-3 points. Cleaning was done by water spray and removing all dust ,paper, plastic garbage etc. Then casting was started , concrete of M25 was used for beam slab and staircase. Vibrator is used for making concrete dense and free from air voids, then surface was finished by wooden rammer.

Fig:8.14 Concrete placing

Fig:8.15 Level check

Fig:8.16 Finishing

CHAPTER 9: LIFT

9.1 Steel Fitting Of Lift

Steel details of lift is as follow:

Main steel : 10mm dia, 150mm c/c

Distribution steel: 8mm dia,150mm c/c

3 curtain walls ,150mm thickness, at corner 4 nos 16mm dia bars are provided vertically.

Steel work is done by steel fitters.

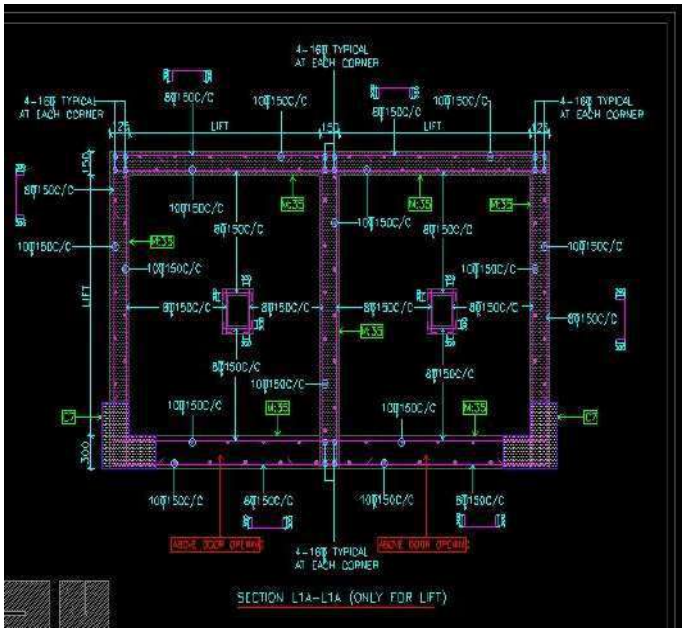


Fig: 9.1 Steel details of lift

9.2 Shuttering Of Lift

Shuttering of lift is done in 2 stages first till height of foyer level 1000mm, then 2.44 m plywood sheet shuttering then cape of remaining 1500mm and joint is casted with slab for around 600mm Depth casting in lift. Double aide Shuttering was needed, plywood sheet are fitted with clamps, tie rod ,prop, wooden blocks,nails etc. Before starting of shuttering work ,steel check was done and all shutters are oiled properly.

Fig: 9.2 Shuttering of lift

9.3 Casting Of Lift

Casting of lift was done by M25 Grade concrete, Casting was done by pipe of RMC pump direct set to the casting of lift curtain walls. Then vibrator is used manually,and corners are compacted properly. After concrete filling surface is smooth-en by messon.

Fig: 9.3 Casting of lift curtain walls

CHAPTER 10: COP RAMP

10.1 Ramp Steel Fitting

Cop Ramp having 3 RCC walls. Steel details are as follow

Main steel : 10mm dia,100mm c/c(outer mesh) , 8mm dia,150mm c/c (inner mesh)

Distribution steel : 8mm dia, 200mmc/c.

Ramp is having decreasing steel level for rcc wall in inclined direction. So steel work is done in decreasing height at column. After steel fitting is done steel check was done before starting shuttering work.

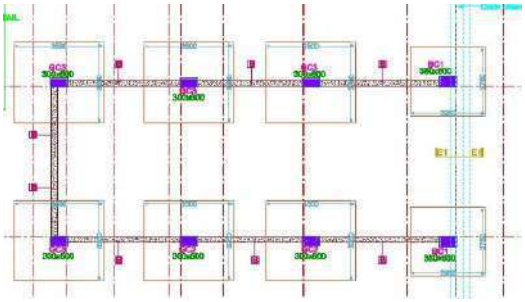


Fig:10.1 Plan view of rampwall

Fig:10.2 Steel fitting of rampwall

10.2 Shuttering Of Ramp Wall

Shuttering of ramp wall was done in 3 stages as shown in figure,with plywood sheet, wooden blocks, tie rod and clamps, then plumb bob check and alignment was check before casting. Its starter was casted before shuttering was started. Starter are checked before casting by measuring tape, center line drawing,and line dori.

Fig:10.3 Shuttering of ramp wall

Fig: 10.4 Starter checking

10.3. Casting Of Rampwall

Casting of rampwall was done by M25 Grade concrete. Manually casting was done. During casting concrete was pumped to iron sheet platform then carried by labours in head pans. Then placed in rampwall shuttering. Compacted and smoothen by messon. Vibrating process was done by handy vibrator.

Fig: 10.5 Casting of Rampwall

CHAPTER 11: WATERPROOFING

11.1 Need Of Waterproofing

Waterproofing is basically a process designed to prevent water from penetrating into a structure. Typically waterproofing is done in various layers and stages to create multiple barriers so that water cannot penetrate the structure. A structure is waterproofed by the use of membranes and coatings to protect contents underneath or within as well as protecting structural integrity. protection from weather, seepages from ground and vertical travel of water in a structure can be well protected by the correct application of waterproofing , Modern waterproofing systems deal with sustainable architecture by a dual course of action on its application to the source. Various and specific coats with certain proportions of chemicals allows the process to multitask, with ease. The parallel effect of energy conservation occurs because of the use of materials involved in the process. This largely includes the coats on the external walls and floors, which cuts down the heat flow into the building thereby reducing the load on improving the indoor air quality and air conditioning of a space.

Types of waterproofing:

1) Cementation waterproofing

2) Bituminous membranes

3) Bituminous Coating

4) Liquid membrane

11.2 Process Of Waterproofing

Step 1: Clean the surface thoroughly free from loose materials, dust, and oil. Surface cleaning plays a very important role in all membrane based waterproofing coating systems.

Step 2 : Apply forst coat of waterproofing chemical at joints of casting, and then on whole surface.

Step 3 : Checking of surface coated with chemical its alignment and ,patches, then 2nd and 3rd coat was applied.

On our site first waterproofing of Retaining wall was started, cleaning was done by wire-brush Grinder , shovel and cleaning brush, then water sprayed with pressure. Then chemical is applied. Before applying Waterproofing chemical tie rod holes in rcc wall was filled with micro-concrete. Waterproofing chemical is from "FOSROC constructive solutions" company work for chemical supply and waterproofing and structure chemical solutions like pressure grout, micro concrete,SBR etc.

11.3 Chemicals Used

Part A: Base

Contains : Xylene, Slate powder,Creosote, wash oil , Coal Tar.

Part B : Hardener

Contains : Xylene, 2-Ethoxyethanol, Nonylphenol.

For 1litre of Part A , 500ml of part B was used and Chemical composition was 2:1.

Fig: 11.1 Part A : Base.

Fig: 11.2 Part B : Hardener

Fig:11.3 Chemical mixing

Fig:11.4 Chemical Applying

CHAPTER 12: CONCRETE MIXING AND PLACING

12.1 Type of Concrete mixing

Concrete Mixing : Concrete mixing is the process of properly mixing the materials needed to form concrete, such as cement, sand, aggregate, water, and admixtures.The primary goal of concrete mixing is to make the concrete mass homogeneous and uniform in colour while maintaining the required consistency.All of the aggregate particles should be coated with cement paste, and all of the concrete's constituents should blend together into a homogeneous mass.This process is so crucial that if the concrete-making ingredients aren't mixed properly, it can lead to weak concrete sections, which can lead to concrete failure under compression load.

Types Are:

1) Hand mixing : Small construction or maintenance works typically require hand mixing of concrete. Because the concrete need for small construction works is minimal and employing a machine mixing method is not cost effective, so the hand mixing method of concrete is used.

2) Machine mixing: The process of mixing concrete materials in a concrete mixer is known as machine mixing. This sort of concrete mixing technique is commonly used for medium- large construction projects where a huge amount of concrete is required and hand mixing is ineffective.

i) Batch mixing: The concrete is mixed in a batch mixer at predetermined intervals. Batch mixers are commonly used in small to medium-sized construction projects. Batch mixers are further divided into two types: 1.Drum Type mixer ,2.Pan type mixer.

12.2 Types Of Concrete Placing

The deposition, distribution, and consolidation of freshly mixed concrete in the place where it is to harden often inappropriately referred to as pouring or placing of concrete.To provide durable concrete, it should be free of segregation and the mortar should be in close contact with the coarse aggregate, reinforcement, and any adjacent faces to which it

is to be bonded. Concrete should be deposited, as nearly as practicable, in its final position.

Types of Concrete placing:

1) Bucket

2) Hopper

3) Manually

4) pump

5) Conveyor belts

6) Chutes and drop pipes

On our site pump, hopper, Bucket, and manual pouring was used.

Fig: 12.1 Bucket Concreting

Fig: 12.2 Hopper and RMC truck.

12.3 Cube Casting Of Concrete

Cube mould size is of 150mm×150mm×150mm, casting of cube was done by messon in concrete was filled in mould in 3 layers after each layer it is compacted by steel rod 35 strokes are applied. Then after 3 layer compacted its surface is smoothen by trowel. Then after 24 hours cube mould was opern and cubes are cured for 7 days in each 2 hours gap repeated whole day. Then its strength is tested in cube testing machine.

Fig: 12.3 Cube casting

Fig:12.4 Compacting of Concrete

CHAPTER 13: EQUIPMENTS USED

13.1 Total Station

A total station is an electronic theodolite that measures angles and distances between points. It's the most advanced surveying instrument today, capable of measuring horizontal and vertical angles to ±3 seconds.A total station has two associated devices used during surveying: a digital distance meter which measures distance, and an angle sensor or right-angle optical prism, which measures the horizontal or vertical angle.

Total Station is a telescope mounted on wheels or a tripod. It can measure distances and angles between lines, heights of points on an object, area and volume of an object from its sides, slope angle between two directions on the ground, etc.

Types :1)Scanning Total Stations 2) Robotic Total Stations 3) Auto-lock Total Stations 4)prism total station and 4)Total Mechanical Stationary total stations.

Fig: 13.1 Total station

13.2 Dumpy Level

Dumpy level is commonly used leveling instrument to locate the points in same horizontal plane. It is also called as automatic level or builder's level. Elevations of different points and distance between the points of same elevation can be determined by dumpy level.The telescope is fixed to its supports in dumpy level and hence it cannot be rotated in vertical axis. It is invented by William Gravatt in 1832.

Components: Telescope,Bubble tubes,Compass,Vertical spindle, Tribrach screws,Foot screws,Leveling head,Tripod.

Procedure:

1)Setting up of Dumpy Level :The instrument is fixed to the tripod stand using clamp screws. Spread the tripod legs and position the instrument at convenient height. Firstly fix the two legs in the ground at a point and centering of bubble in the bubble tubes is done by adjusting third leg.

2)Leveling up: The leveling up of an instrument is done using foot screws or leveling screws. In this case, the telescope is arranged parallel to the any two leveling screws and the bubble in the tube is centered by turning both the screws either inwards or outwards.When it is centered, then the telescope is turned 90o and the third screw is turned until the bubble come to center. Repeat the process until the bubble in the tube always stays at the middle in any position of telescope.

3)Focusing: Focusing is done by adjusting eye piece and focusing screw. Eye piece is adjusted until the cross hairs of diaphragm are clearly visible. To eliminate the parallax error, a white paper is used to obtain sharp vision of cross hairs.Focusing screw is adjusted to view the clear image of the objective or staff. Focusing is said to be done when the cross hairs bisect the objective or staff with clear vision.

Fig:13.2 Dumpy level check

13.3 Vibrator

Immersion or Needle Vibrators are most commonly used vibrator for concrete. It consists of a steel tube (with one end closed and rounded) having an eccentric vibrating element inside it. This steel tube called poker is connected to an electric motor or a diesel engine through a flexible tube. They are available in size varying from 40 to 100 mm diameter. The diameter of the poker is decided from the consideration of the spacing between the reinforcing bars in the form-work.

The frequency of vibration varies up to 15000 rpm. However a range between 3000 to 6000 rpm is suggested as a desirable minimum with an acceleration of 4g to 10g.

The normal radius of action of an immersion vibrator is 0.50 to 1.0m. However, it would be preferable to immerse the vibrator into concrete at intervals of not more than 600mm or 8 to 10 times the diameter of the poker.

The period of vibration required may be of the order of 30 seconds to 2 minute. The concrete should be placed in layers not more than 600mm high.

Fig: 13.3 Needle vibrator

13.4 RMC Truck

RMC truck is used for concrete mixing and traveling from batching plant to construction site. I has hydraulic system, mixing drum, water tank, support wheels, joystick control, opening ,discharging system, sub-frame, electrical system.

Fig: 13.4 RMC truck components

13.5 Crane

A crane is a type of machine commonly used in construction, generally equipped with an elevator, ropes or chains and sheaves that can be used both to move and to lift and lower materials horizontally. It is mainly used for heavy lifting and transport to other locations.

Fig: 13.5 Towered Crane

13.6 Centering Tools

Centring tools are Hammer, nails, plywood sheets, clamps ,studs,props, wood cutter, grinder machine, drilling machine, tape, level pipe, wooden blocks etc.

Fig: 13.6 Shuttering Clamp

Fig: 13.7 Wooden blocks

Fig: 13.8 Props

13.7 Cube Testing Machine

Cube testing of cube is done in material testing laboratory, i have visited the laboratory to see the procedure of cube testing. In this test cube is placed in Cube testing machine, then load pressure is applied on cube until any cracks are not found in cube. Capacity of machine is up to 1000KN. Result is shown on screen of machine.

Fig: 13.9 Cube testing Fig: 13.10 Screen of machine

13.8 Saftey Precautions

1) wearing helmet is necessary for Engineers and workers, for Engineers White colour helmet and for workers yellow colour helmet.

2) Saftey shoes are compulsory.

3) Use of Saftey cable for workers when height of structure is up to 3 metres.

4) Danger tap use for restrictions of area by making barrier of danger tap and steel rods.

5) Use of Saftey jacket is necessary.

6) Electric equipment are used with taped joints.

CHAPTER 14: IMPORTANT ACTIVITIES

14.1 Hacking Of Surface

Hacking refers striking of surfaces such as RCC walls, columns, beams, slabs etc., with a chisel to dent the surface in order to create a proper mechanical bond between structure and plaster. The term Hacking is used at various instances during construction. It is advisable to have 300 to 350 dents on an average per square meter and 28 to 32 per square foot 3 mm deep and 25 mm c/c. , It is recommended to have hacking always for plaster surfaces although you use chemical bonding materials. Although bonding chemical helps in bonding between surfaces, mechanical keys will always enhance the plaster bonding with substrate.Hacking should be done atleast after 3 days from date of casting the concrete. Proper curing should be ensured before hacking is done to avoid any hairline cracks. Hacking is done by Hacking hammer.

Fig:14.1 Hacking hammer

Fig:14.2 Hacked Column

14.2 De-Shuttering Work

Definition: Removal of formwork of Column, retaining wall,Beam, slab etc is called as De-Shuttering, Different materials are used to make the formwork such as plywood board, steel. Modern times plastic frameworks are also in use. However, the deshuttering period will be the same regardless of the material used.

Type of form work	Formwork removal time after casting
Vertical formwork of columns,beam and retaining wall	16 hours to 24 hours
Forms removal for Slab (Props has to be fixed immediately after removal of forms)	3 days
Forms removal for Beams (Props has to be fixed immediately after removal of forms)	7 days
Props removal for slab	
Span length up to 4.5m	7 days
Span length beyond 4.5m	14 days
Props removal for beams and arches	
Span length up to 6m	14 days
Span length beyond 6m	21 days

Table: 14.1 Duration of De-Shuttering

14.3 Curing Work

Curing plays an important role on strength development and durability of concrete. Curing takes place immediately after concrete placing and finishing, and involves maintenance of desired moisture and temperature conditions, both at depth and near the surface, for extended periods of time. Properly cured concrete has an adequate amount of moisture for continued hydration and development of strength, volume stability, resistance to freezing and thawing, and abrasion and scaling resistance.

In this method material can be saved for certain part shapes. In this case, blanks are twice passed through the die by making the strip up-side down. 10% to 15% higher labour cost will occur in double-run layouts. During feeding greater care to be taken by operator. Extra labor cost is offset by the saving in material when blanks are large and waste is considerable.

Types of Curing :

1) Surface pounding

2) Water sprinkler method

3) Wet Covers

4) Membrane curing

Curing period:

Column - 7to 14days

Beam - 7 to 14 days

Slab - 7 to 28 days

Wall - 7 to 14 days

Footing - 7 to 14 days.

Fig: 14.3 Curing of Slab

Fig: 14.4 Wet covers

14.4 Cover Placing

Covers are necessary to make steel work and Shuttering in position of their required size. To make concrete work effective. Covers are placed after steel work is completed.

Cover size are various. for different types of rcc structure.

Column - 40mm, Beam - 25mm, Slab - 20mm, Footing - 50mm.

Fig: 14.5 50mm Cover

14.5 Steel Lapping By Coupler

Steel of columns are lapped by coupler. On our site steel of Column is of size 16mm, 20mm, 25mm. coupler of 16mm, 20mm, 25mm are used. For making it easy threading of steel bar was done on site ,then with help of wrenches steel was fitted tightly.

Fig: 14.6 Couplers.

Fig: 14.7 Coupler placing

CHAPTER 15: MY TASKS AND RESPONSIBILITIES

15.1 Supervision And Execution

Day to day task is to supervise work on site. Making day to day manpower report, updating casting sheet, taking record of material used on site, helping in arranging bills.

- Doing Concrete quantity calculation
- Steel checking
- Shuttering work checking
- Point marking for Column and Footing
- Level marking for beam and slab
- Casting supervision

Steel Check: During steel check of structure, main steel and distribution steel details was checked as per drawing, spacing and lapping was checked. Then alignment of steel was checked. Chairs position,cover position was checked.

During Shuttering check: plumb bob testbwas done with help of tap,plumb, and thread. On top of column distance of thread and at bottom distance are match to adjust the alignment. Line dori check for horizontal alignment of shuttering. Oiled surface of sheets, size of Shuttering work check by measuring tape. For centering work level was check by water level. For slab level was checked by dubba level.

During casting: Cleaning of surface, Vibrator used properly or not, Concrete quantity and quality is good or not these all care should be taken while supervision of casting.

15.2 CONCRETE QUANTITY CALCULATION

Here some concrete quantity estimation was shown for columns of basement floor.Both Block A and Block B is having same size and same number of columns in basement. Beam and slab quantity was also calculated with same method.

Volume of concrete= Volume of Structure(Length × Breadth ×Height) - volume of steel

Here Length,breadth,and height are in metre.

No.	Column	Size (mm×mm)	Height (mm)	Total volume (CMT)
1.	C1,C1A	300×1050	3900	1.228
2.	C2,C2A	380×900	3900	1.333
3.	C3,C3	300×900	3900	1.053
4.	C4,C4A	300×1200	3900	1.404
5.	C5,C5	300×1050	3900	1.228
6.	C6,C6	300×1050	3900	1.228
7.	C7,C7	300×(450+750)	3900	1.404
8.	C8,C8	300×1200	3900	1.404
9.	C9,C9	300×900	3900	1.053
10.	C10,C10A	380×750	3900	1.111
			Total	12.446

Table: 15.1: Concrete quantity of columns

15.2 BBS Of Beams

Here BBS of few beams of basement slab are provided by me.

.

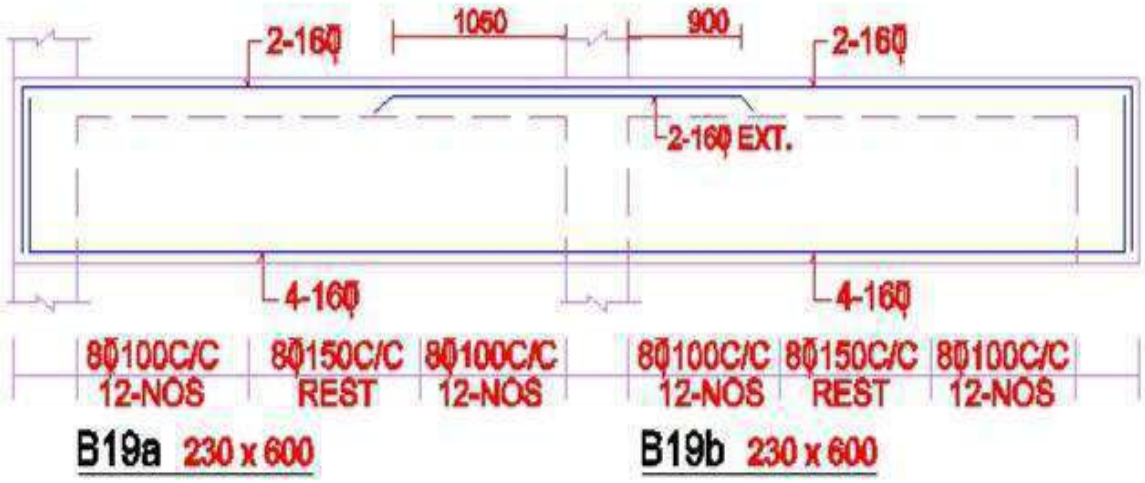


Fig: 15.1 Beam steel details

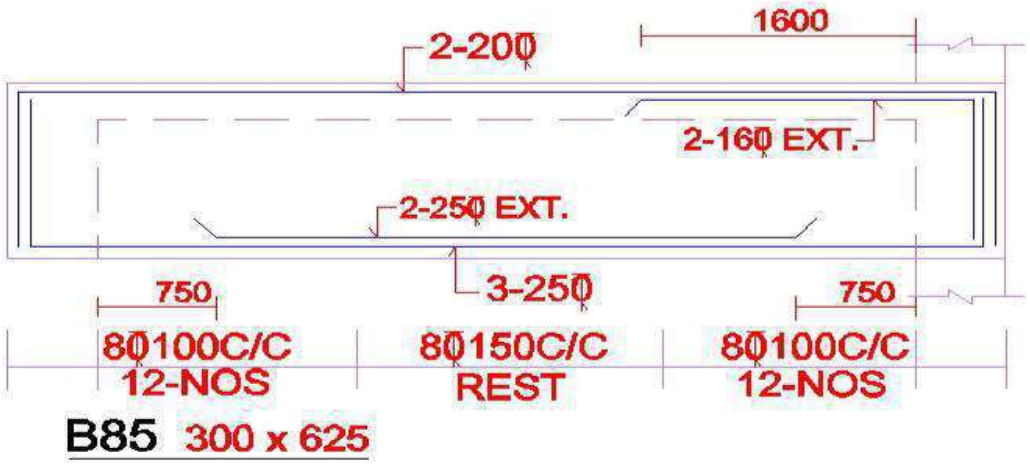


Fig: 15.2 Beam steel details

Beam	Type of steel	No of bars and dia(mm)	Length (mm)+Development length	Total length (m)	Total weight (kg)
B85,B86	Top	2-20	5890+1600	7.940	36.738
	Top extra	2-16	2400+0	2.400	7.584
	Bottom	3-25	7440+0	7.400	86.110
	Bottom extra	2-25	4500+0	4.540	35.030
	Stirrup	47-8	1800+0	1.800	33.417
B19a,B19b	Top	2-16	6825+1250	8.140	25.722
	Top extra	2-16	2250+0	2.250	7.110
	Bottom	4-16	8140+0	8.140	51.444
	Stirrup	60-8	1410+0	1.410	33.417

Table: 15.2. BBS of Beams

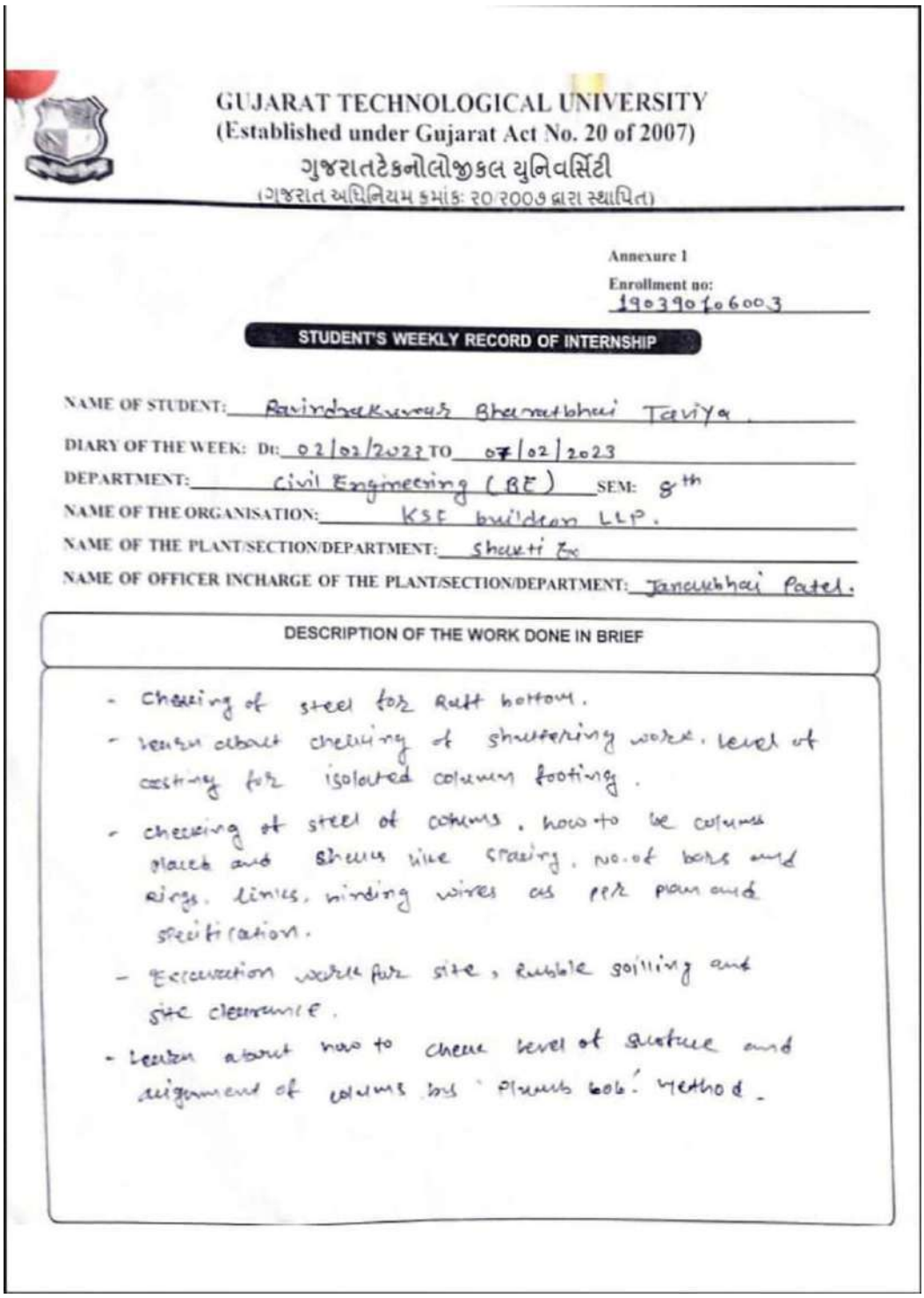
.

CONCLUSION

Internship at KSF BUILDCON LLP.from this internship I experience the real corporate world. Here I learnt how to deal with situation which are arrived during work. How to behave with your colleague and your seniors on site. You should have time punctual and work according to planned schedule. I learnt about quantity estimation and some basic technical skills like taking measurement, marking of structure on ground with Centre line and checking of steel and leveling**.** From this opportunity i have learnt a lot from my senior engineer. From them i have learnt about technical skills like how to check level of structure,what are the points that you have to keep in mind while making any structure, how to check steel and what are care should be taken for steel work, knowing about shuttering work and centering work difference, Footing casting, method of level marking by water level and total station. What are the cares should be taken before and after casting of structure. Learn about Bar Bending Schedule and Estimation of soil, concrete and steel. From this internship i have get to know how the quality of work maintain and what the test are to be performed on site. Their are many differences in on site and book knowledge. Construction industry has huge scope in terms of jobs and opportunities.

APPENDIX-1

Annexure-1(Weekly Dairy)



GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure I

Enrollment no: 190390106003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Ravindrakumar Bhanubhai Taviya.

DIARY OF THE WEEK: Dt: 02/02/2023 TO 07/02/2023

DEPARTMENT: Civil Engineering (BE) SEM: 8th

NAME OF THE ORGANISATION: KSE builders LLP.

NAME OF THE PLANT/SECTION/DEPARTMENT: Shakti Ex

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Janeshbhai Patel.

DESCRIPTION OF THE WORK DONE IN BRIEF

- Checking of steel for Raft bottom.
- Learn about checking of shuttering work. Level of casting for isolated column footing.
- checking of steel of column. how to be columns placed and checks like spacing, no. of bars and rings, links, binding wires as per plan and specification.
- Excavation work for site, Rubble soiling and site clearance.
- Learn about how to check level of surface and alignment of columns by Plumb bob method.

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 48 hours

R.B. Tanjara
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

SUPPLEMENTRY NOTES
(add additional sheets if required)

- checking of R.C.C. bed for col. areas, 230 mm thickness steel was provided as per drawing requirement.
- footings are of size as below :
  - GC_2 - column - 300 x 600 mm^2
    footing - 3500 x 3200 mm^2
  - GC_4 - column 300 x 850 mm^2
    footing - 3550 x 3150 mm^2
  - BC_1 = column 360 x 600 mm^2
    footing 2950 x 2750 mm^2.
- during excavation by base hoe checking marking of excavation point. and soil dumping for ramp making.
- after steel checking of column and R.C.C bed shuttering was checked.
- some calculation for concrete quantity was done for Columns. using formula L x B x H. L = length
  B = Breadth
  H = Height.
- point marking for shutter, pedestal on col ramp footing by total station equipment.

APPENDIX-2

Annexure-2

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 2

Feedback Form by Industry expert

Student Name: Ravindra B. Taviya Date: 02/05/2023

Work Supervisor: Janak Patel Title: Project Manager.

Company/Organization: K.S.F. buildcon LLP

Enrollment No: 190390106003

Internship Address: Near zion skyfield, behind D.P.S. school - Bopal.

Dates of Internship: From 02/02/2023 to 02/05/2023

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives			✓	
Produces high quality work and accepts responsibility			✓	
Uses technical knowledge and expertise			✓	
Analyzes problems effectively			✓	
Communicates well and writes effectively				✓

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent): ✓

Additional comments, if any:

Signature of Industry person with name and Stamp:

Signature of the Faculty Mentor

INTERNSHIP AT WAGAD INFRAPROJECTS PVT LTD

AN INTERNSHIP REPORT

Submitted by

Mr. Mihir Modha

200390106501

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Civil Engineering

S.P.B. Patel Engineering College, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at Wagad Infraprojects Pvt. Ltd.** has been carried out by **Mihir Kamlesh Modha** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Civil Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Sign	Sign
Prof. Meet Jani	Prof. Avani Dedhia
Internal Guide	Head of Department

COMPANY CERTIFICATE

WAGAD

Date: 03/05/2023

TO WHOM IT MAY CONCERN

This is to certify that Mr. Mihir Modha, having enrollment no. 200390106501, a student of S. P. B. Patel Engineering College has successfully completed his Internship of Final Year in the field of Planning and Billing Department under the project **"Construction of Four Lane Divided Carriageway with Paved Shoulder from Patan (Near Rajpur) at km 52+000 (design) to Gojariya at km 128+940 (design), A length of 76.940 Km (Package-II) of NH-68 in the State of Gujarat under NH(O) on EPC mode".** from 01.02.2023 to 30.04.2023 (Total number of Weeks: 13) under the guidance of Asst. Manager of Planning and Billing Department Mr. Atif Khan.

His internship activities include: - Preparing Daily Progress Report, Request For Inspection, Strip charts for Structures, Drawing Submissions to the Client and other activities related to Planning and Billing.

During the period of his internship program with us, he had been exposed to different processes and was found diligent, hardworking and inquisitive.

We wish him every success in his life and career.

For Wagad Infraprojects Pvt. Ltd.

Authorised Signature with Industry Stamp

WAGAD INFRAPROJECTS PVT. LTD.

414, TIME SQUARE ARCADE, NEAR BAGHBAN PARTY PLOT, THALTEJ-SHILAJ ROAD, AHMEDABAD-380 059

admin@wagadinfra.com www.wagadinfra.com T: 079 - 3521 2802 CIN-U70200GJ2011PTC117129

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship report submitted along with the Internship entitled **Internship at Wagad Infraprojects Pvt. Ltd.** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Civil Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Mr. Atif Khan & Mr. Niglesh Patel** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
1. **Mihir Kamlesh Modha**	_____

ACKNOWLEDGEMENT

This report is done during a Final Year internship, with the title **"Internship at Wagad Infraprojects Pvt. Ltd.".** I would like to show my gratitude to external instructors, **Assit. Project Manager Mr. Atif Khan**, **Senior Computer Operator Mr. Niglesh Patel** and **HR Mr. Vipul Patel,** whose constant inspiration, guidance, and cooperation from the preliminary to the concluding level enabled me to develop my practical knowledge and skills of office work. Their perfectionism has made me strong on my decision and able to fulfill my duty as an intern in office work.

I am obliged to the internal instructor **Prof. Meet Jani**, Assistant Lecturer in the Civil Department, at Saffrony Institute of Technology, who helped me in maintaining quality work in professional means and I would like to show my gratitude to other staff members of Saffrony Institute ofTechnology, Linch- Mehsana, for the valuable information provided by them in their respective fields. I am grateful for their cooperation during the period of my final year internship. **Prof. Avani Dedhia**, Head of Department, Civil Engineering, Saffrony Institute of Technology, Linch- Mehsana, was abundantly helpful and offered invaluable assistance, support, and guidance.

My thanks and appreciation also goes to my colleagues in developing the practical skills and people who have willingly helped me with their creative abilities.

ABSTRACT

Wagad Infraprojects is a well-established company specializing in and collaborating with government road infrastructure to accomplish major projects like the construction of bridges, roads, and highways, commercial projects, diaphragm walls, and infrastructure development. Being an intern, I have learned and accomplished various activities and tasks involved in planning and billing for the construction of a national highway, i.e., preparing the scope of the project, preparing a strip chart for each structure, preparing a daily progress report, preparing a request for inspection, submitting drawings to NHAI via email, preparing Excels for the plan and profile of the highway, and much more. This has enhanced my skills in construction project management, helped me understand the defined flow of a construction project, and taught me various office tasks of a planning and billing department.

List of Figures

List of Tables

List of Abbreviations

MCW	Main Carriageway
SR	Service Road
NHAI	National Highway Authority of India
IS	Indian Standard
IRC SP	Indian Road Congress Specifications
EC	Elevated Corridor
BC	Box Culvert
MJB	Major Bridge
MNB	Minor Bridge
FO	Flyover
VUP	Vehicular Underpass
LVUP	Light Vehicular Underpass
ROB	Road Over Bridge
VOP	Vehicular Overpass
RE	Retaining Wall
NCR	Non Conforming Report
TCS	Typical Cross Section
BBS	Bar Bending Schedule
Pvt.	Private
Ltd.	Limited

Table of Contents

Chapter 1: Introduction to Company

1.1 Founder of Wagad Infraprojects Pvt. Ltd.

A visionary talented foresighted businessmen Sh. Ashok Jain the founder of WIPL born in Banswara District, Rajasthan in 1959. He started construction activities as contractor of the Irrigation Department of Rajasthan Government in 1981 from Banswara. Since then he established landmarks and completed number of Challenging and prestigious construction projects. To, contribute significantly in construction sector to build the new India and to become national class construction entrepreneur beyond expectation, always.[1]

1.2 How we Started Wagad

Initially "WAGAD CONSTRUCTION COMPANY" was formed and registered under companies Act 1932 on 25.10.1999 with the Registrar of Companies, Banswara in Rajasthan. The company was founded by Mr. Ashok Jain. [1]

The company was renamed as "WAGAD INFRAPROJECTS PRIVATE LIMITED" in 2011 to symbolize the activities of infrastructure development. The Company was promoted by Mr. Ashok Jain, Mr. Vinod Jain, Mr. Andesh Jain, and Mr. Ankush Jain. [1]

In 2018 – We become the leading company. The company has implemented number of roads, highways and infrastructures projects and striving to implement more. Company is technologically driven, entrepreneurially managed and socially committed, contributing towards advancement of the nation by undertaking, implementing and commissioning the infrastructure projects in India. [1]

In 2021 – Becoming the leader in industry with reshaping brand image. With pandemic effect around the world and slow down effect in 2020, "WAGAD INFRAPROJECTS PRIVATE LIMITED" continued to thrive new heights and implemented challenging projects. In 2021, company decided to reshape the brand image of company and showcased full strength with aggressive operational capabilities and effective marketing campaign. [1]

1.3 Our Services

We provide numerous services in construction field and that are as follow:

1.3.1 Infrastructure Development

All other type of Infrastructure Development needs can be managed and served under umbrella of Wagad Infraprojects Pvt. Ltd. [1]

This infrastructure development includes various government and private sector projects, government backed residential projects, public parks and other facilities for citizens. Private sector infrastructure includes different types of hostels, commercial property, land development etc. [1]

1.3.2 Roads / Highways

Wagad Infraprojects have constructed many state highways and road construction projects using modern road construction machineries

1.3.3 Ready Mix Concrete

Ready-Mix Concrete is concrete that is manufactured in a batch plant, according to computer operated engineered requirement. [1]

The process of manufacturing Ready Mixed Concrete (RMC) divided in two stages. First is the barrel truck which delivers concrete in a row state to the site. Second is the silo type plant or volumetric concrete mixer which delivers the ready mix in a dry state and then mixes the concrete on site. Ready-mix concrete is widely used as a replacement of other materials considering the cost and multiple applications in building, particularly in large scale projects like multi-storey buildings and bridge construction. [1]

Ready-mixed concrete is used in construction projects where the construction site is not willing, or unable, to mix concrete on site. Using ready-mixed concrete means product is delivered finished, on demand, in the specific quantity required, in the specific mix design required. For a small to medium project, the cost and time of hiring mixing equipment, labour, plus purchase and storage for the ingredients of concrete, added to environmental concerns (cement dust is an airborne health hazard) may simply be not worthwhile when compared to the cost of ready-mixed concrete, where the customer pays for what they use, and allows others do the work up to that point. For a large project, outsourcing concrete production to ready-mixed concrete suppliers means delegating the quality control and testing, material logistics and supply chain issues and mix design, to specialists who are already established for those tasks, trading off against introducing another contracted external supplier who needs to make a profit, and losing the control and immediacy of on-site mixing. [1]

Also have numerous benefits as follow:

- Uniform, consistent and assured quality of concrete
- Flexibility in concrete design mixes
- Easier addition of admixtures
- Faster and speedier construction
- Reduced inventories, material handling and storage of raw materials at sites
- Savings in labour requirements, labour costs and supervision of labour
- Reduced wastage of materials

1.3.4 Bridge construction

Building a bridge is a complex undertaking requiring knowledge and expertise. Several variables, including engineering constraints, costs, and environmental impacts come into play when deciding which construction method to use and bridge type to build. [1]

Incremental launching of bridges can save time, money, space and disruption while easing access and delivering a high quality finish. [1]

The incremental launching method is particularly suited to the construction of continuous post-tensioned multi-span bridges. It involves casting 15-30m long sections of the bridge superstructure in a stationary formwork behind an abutment and pushing a completed section forward with jacks or friction launching system along the bridge axis. The sections are cast contiguously and then stressed together. The superstructure is launched over temporary sliding bearings on the piers. To keep the bending moment low in the superstructure during construction, a launching nose is attached to the front of the bridge deck.

High-strength steel, high-performance concrete, and fiber-reinforced polymer composite materials has resulted in structures that are, in many cases, easier to build, more durable, and more economical. Optimization of structural shapes, details, components, and construction procedures was considered to take full advantages of these materials and their properties.

Our key achievement in constructing of 47 meter spans Bridge on Hiran Rivan on Jabalpur National Highway # 12. [1]

Also have numerous benefits as follow:

- Minimal disturbance to environmentally sensitive areas
- Smaller assembly zone required
- Greater safety during construction which is mainly carried out at ground level
- Economy of transportation and general reduction in construction elements
- Higher quality finish and performance derived from easier working conditions and repeatability of tasks

1.3.5 Diaphragm Wall

Wagad Buildcon is buildup under umbrella of Wagad Infraprojects Pvt Ltd specializing in diaphragm wall construction. [1]

Wagad Buildcon’s Diaphragm wall technology have state of the art specialized equipment for excavating slurry trenches to construct diaphragm walls. [1]

Wagad Buildcon’s maintain the inventory of our own specialized trenching equipment like hydraulic clamshells, fraise and hydro mills which are manufactured by mainly Casagrande. [1]

Diaphragm walls are rectangular-section excavations with a complete ground asportation that is made in situ. The result is an underground concrete wall. They are essentially retention walls, which are constructed for instance at wharfs. A rectangular-section tool is generally used to remove the soil, thus creating a rectangular excavation. Furthermore the rectangles making up the wall must be interlocked to ensure structural endurance and water tightness. The diaphragm wall panel construction entails three steps: the construction of

guide wall, the panel excavation (demolition – removal – stabilization), and the construction phase (reinforcing cage – casting – curing). To build a continuous diaphragm wall the primary panels are firstly constructed and spaced at a distance slightly larger than the panel width. The secondary panels are built in the empty spaces between the primary ones. [1]

Also have numerous benefits as follow:

- Earth retention walls for deep excavations, basements, and tunnels.
- High capacity vertical foundation elements.
- Retaining wall-foundations
- Retaining wall-water control
- Used in top-down construction method as permanent basement walls

1.3.6 Commercial Projects

We have managed and successfully completed many commercial projects in around the country including parking facility, hostel and buildings. [1]

When constructing a new commercial project, the multitude of tasks can often overwhelm new contractor company. Companies assume the responsibilities for planning, coordinating, and supervising the project from start to finish. [1]

Ultimately, project management companies must ensure the project stays on budget by completing on schedule, negotiating contracts and supplies, and securing building permits and licenses. [1]

Ideally there are six significant steps of the commercial construction process: development and planning, pre-design, design, pre-construction, construction, and post-construction. [1]

As a company we play major role in step 5 which is construction phase. This process includes site preparation, implement drainage to building code, excavate site, lay utilities, arrange power, water and sanitation, remove vegetation, and construct temporary storage facility, foundation and framing. [1]

Constructing a commercial building requires many steps and good communication and collaboration between numerous professionals to ensure the project stays on budget. Select building products that enhance the efficiency of the building process. [1]

Upon completion of the project, the contractor and client will walk through the structure and create a punch list. The punch list identifies unsatisfactory components of the construction that need further attention before officially completing the project. After completing the punch list, the building may obtain a Substantial Completion certificate, and a building official can perform the final inspection. [1]

1.4 Achievements and Company Mission

In total 84 Completed Projects, 22 Professional Contractors, 17 Industries Served, 88 Happy Customers. [1]

Our Mission is to become the best Infrastructure Company in the Industry. [1]

1.5 Key Projects

Details of completed projects and ongoing projects of the Wagad Infraprojects Pvt. Ltd. including its location, nature of work, project cost, staring date of the projects and name of authority as shown in Table 1.1.

Sr No.	Name of Authority	Name, Location and Nature of Work	Project Cost (In Crore)	Date of Start
		Ongoing Projects		
1	National Highways Authority of India G-5&6, Sector-10, Dwarka, New Delhi-110075	Construction of four lane divided carriageway with paved shoulder from Patan to Gojariya of NH-68 in the State of Gujarat under NH(O) on EPC Mode.	INR 741	23-Jan
2	Azhiyur Vengalam Road Private Limited (AVRPL)(Concessionaire), NHAI(Client), New Delhi	Execution of civil & associated works of six laning of Azhiyur to Vengalam section of NH-17 (New NH-66) in the State of Kerala under Bharatmala Pariyojna.	INR 971	21-Oct
3	National Highway Authority of India (NHAI), Regional Officer, Gandhinagar-382007 (Gujarat)	Construction of six lane flyover / VUP including RE wall, service road and drain, near Umbhel village on Bharuch-Surat section of NH-48	INR 26	23-Jan
		Completed Projects		
1	MADHYA PRADESH ROAD DEVELOPMENT CORPORATION	Widening and reconstruction of Pachawali -Rannod, Basula-chaipur-vijyapur and Ashoknagar-Thubon under MPDCSP, Package-M ADB Funded	INR 148.19	17-Aug
2	Madhya Pradesh Public work Department	Widening of road to two lane with paved shoulder incl. construction of shoulder and bridge on NH-26A Sagar Bina Road in MP	INR 48.7	18-Aug
3	MADHYA PRADESH ROAD DEVELOPMENT CORPORATION	Development of Guna- Ashok Nagar- Isagarh Road (BOT) Km. 0.00 to 78+150	INR 110	16-Mar
4	K 10 Developer	Shop plaza complex opp. Vadodara central Vadodara.	INR 120	14-Mar
5	MADHYA PRADESH ROAD DEVELOPMENT CORPORATION	Sehore-Icchawar-Koshmi Tollway Project	INR 56.64	13-Nov
6	JNNURAM Vadodara	Rehabilitation of Gotri Pond Bhayli Khans	INR 14.08	12-May
7	Adani Power	Construction of Raw Water Reservoir for 1320 MW thermal Power Projects Kawai.	INR 70.23	12-Apr
8	Mundra International Airport Kawai	Construction of Air Strip	INR 6.9	11-Jan

Fig 1.1 Key Projects [1]

Chapter 2: Scope of the Project

2.1 Prepare Excel Sheet of Structure List

Create an excel sheet for each structure included in Technical Schedule B, including the structure's specifications such as the existing chainage, the design chainage, the type of construction, the type of opening, the span/size/opening, the TCS, the proposed width, the proposed width, etc.

2.1.1 Excel Sheet for Culvert

An excel file with details on the culvert, such as the existing chainage, design chainage, type of structure, type of construction etc. as indicated in Table 2.1.

Sr No.	Existing Chainage	Design Chainage	Type of Stucture	Size/span/opening	Type of construction	Remark	TCS	Type of Road

Fig 2.1 Culvert Detail Sheet

2.1.2 Excel Sheet for MJB, MNB, ROB and Girder.

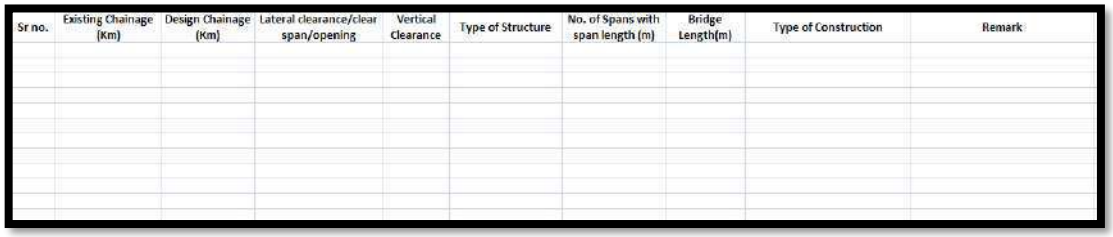
An excel file with details on the MJB, MNB, ROB and Girder such as the existing chainage, design chainage, type of structure, type of construction, proposed deck width, total width etc. as indicated in Table 2.2.

Sr No.	Existing Bridge Location	Design Bridge Location	Type of Structure/Proposed type	Existing width (m)	Extent of Wideni	Type of Crossi	Existing Span Arrangement	Proposed Span Arrangement	Proposed Deck Width		Proposed Deck Width	Type of Construction	Total Width of the	Adequacy or otherwise of the existing	Remark
									LHS	RHS					

Fig 2.2 MJB, MNB, ROB, and Girder Detail Sheet [2]

2.1.3 Excel Sheet for LVUP, VUP, EC and FO.

An excel file with details on the LVUP, VUP, EC and FO such as existing chainage, design chainage, type of structure, type of construction, No. of span, Bridge Length, vertical clearance etc. as shown in Table 2.3.



Sr no.	Existing Chainage (Km)	Design Chainage (Km)	Lateral clearance/clear span/opening	Vertical Clearance	Type of Structure	No. of Spans with span length (m)	Bridge Length(m)	Type of Construction	Remark

Fig 2.3 LVUP, VUP, EC and FO Detail Sheet [2]

2.2 Summary Sheet of Structure

A summary of all the structures, which includes information on the number of each structure as shown in Table 2.3

Sr No.	Type of the Structure	Nos of the Stucture
1	Box culvert	101
2	Pipe culvert	20
3	Major Bridges	4
4	Minor Briges	15
5	ROB	4
6	VUP	7
7	LVUP	2
8	Flyover	5
9	Elevated Corridor	1

Fig 2.4 Summary Sheet

Chapter 3: Planning and Billing

3.1 Prepare Strip chart for each structure

A strip chart is used to keep track of the actual work done on site. It is an Excel sheet format that includes the sequential stages of the actual site work of the structure, i.e., box culvert, pipe culvert, flyover, EC, LVUP, VUP, MJB, MNB, VOP, highway.

3.1.1 Strip chart for Box Culvert

The construction stages of the box culvert on actual side is shown in the Figure 3.1

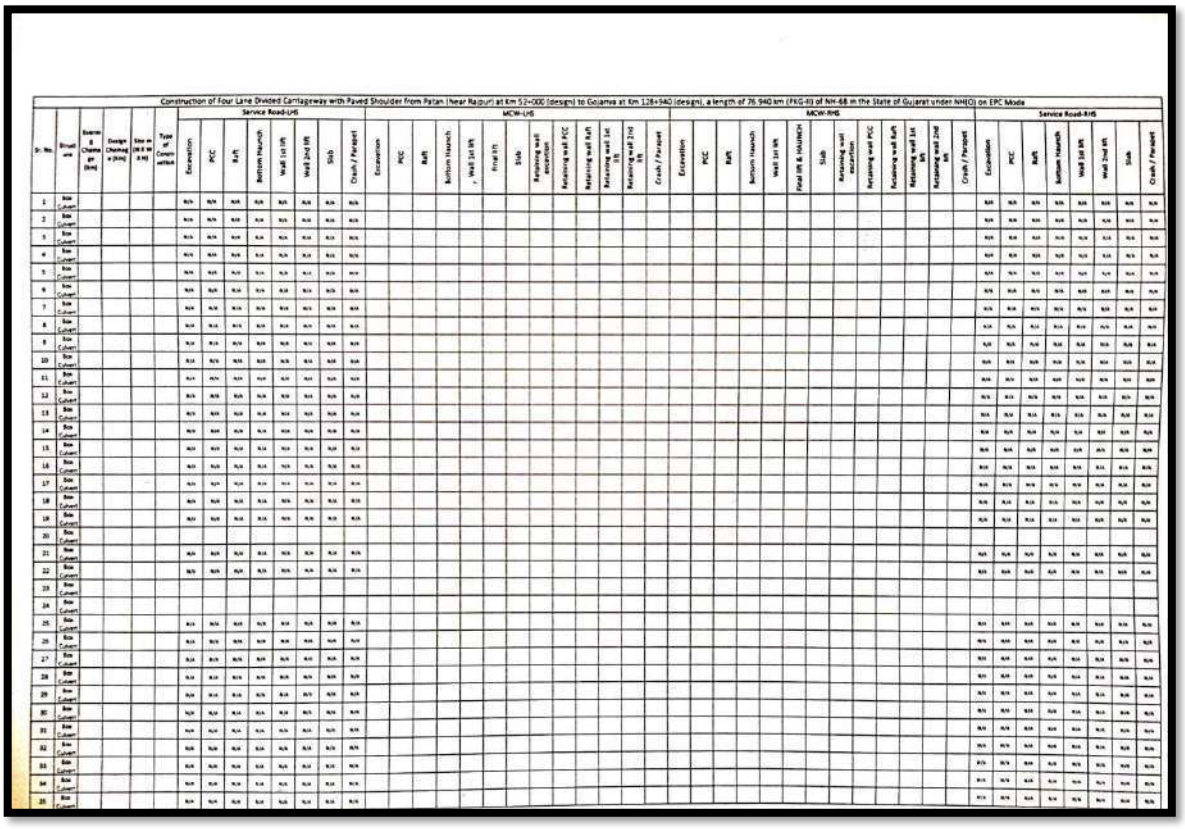


Fig 3.1 Box Culvert Strip chart

3.1.2 Strip chart for MNB

The construction stages of the MNB on actual side is shown in the Figure 3.2

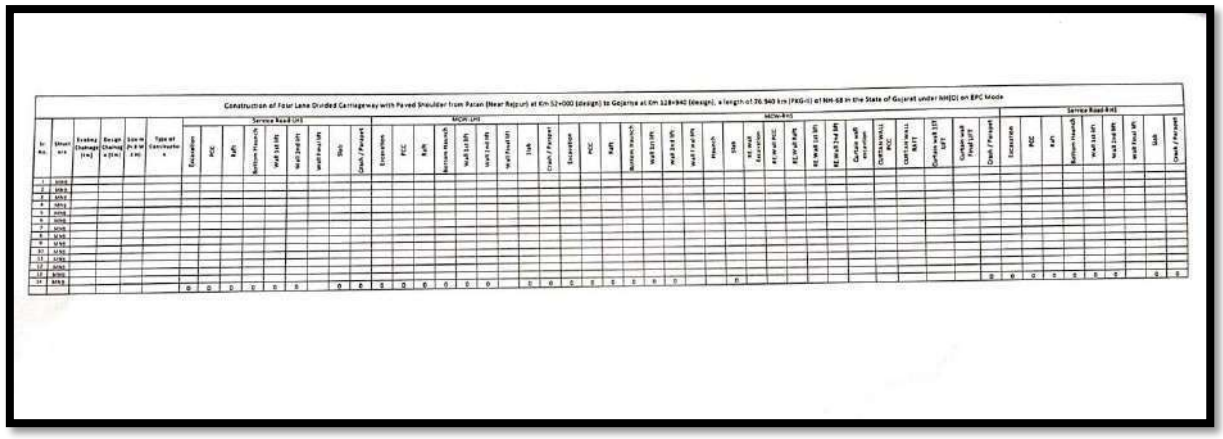
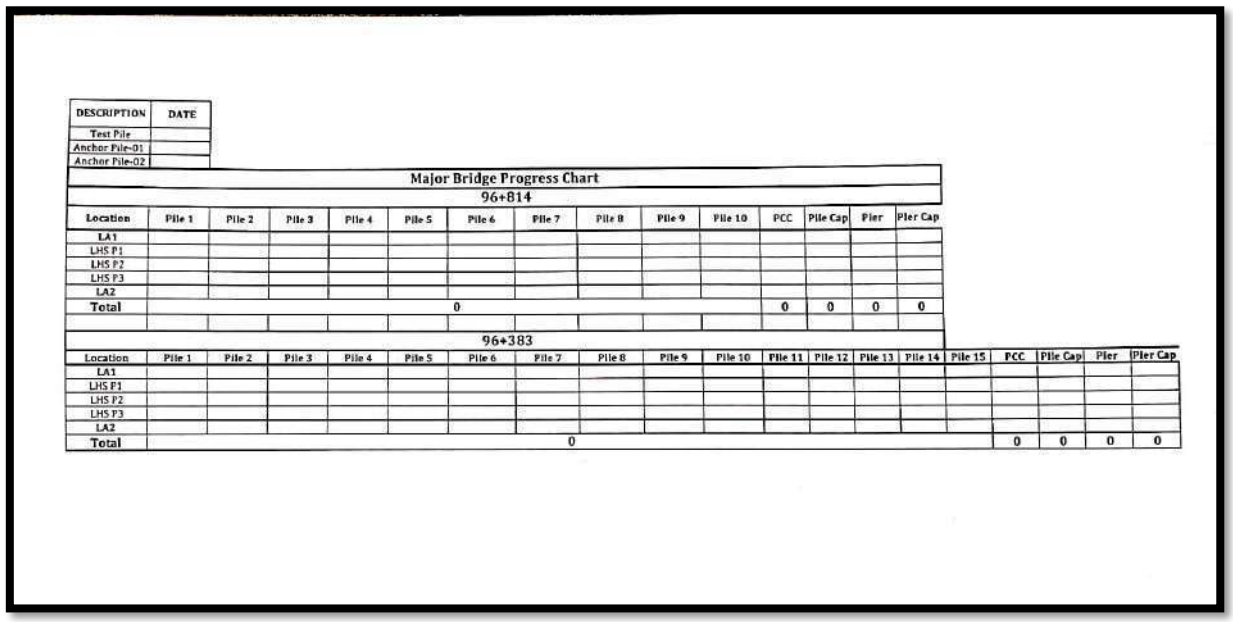


Fig 3.2 MNB Strip chart

3.1.3 Strip chart for MJB

The construction stages of the MJB on actual side is shown in the Figure 3.3



DESCRIPTION	DATE
Test Pile	
Anchor Pile-01	
Anchor Pile-02	

Major Bridge Progress Chart

96+814

Location	Pile 1	Pile 2	Pile 3	Pile 4	Pile 5	Pile 6	Pile 7	Pile 8	Pile 9	Pile 10	PCC	Pile Cap	Pier	Pier Cap
LA1														
LHS P1														
LHS P2														
LHS P3														
LA2														
Total						0					0	0	0	0

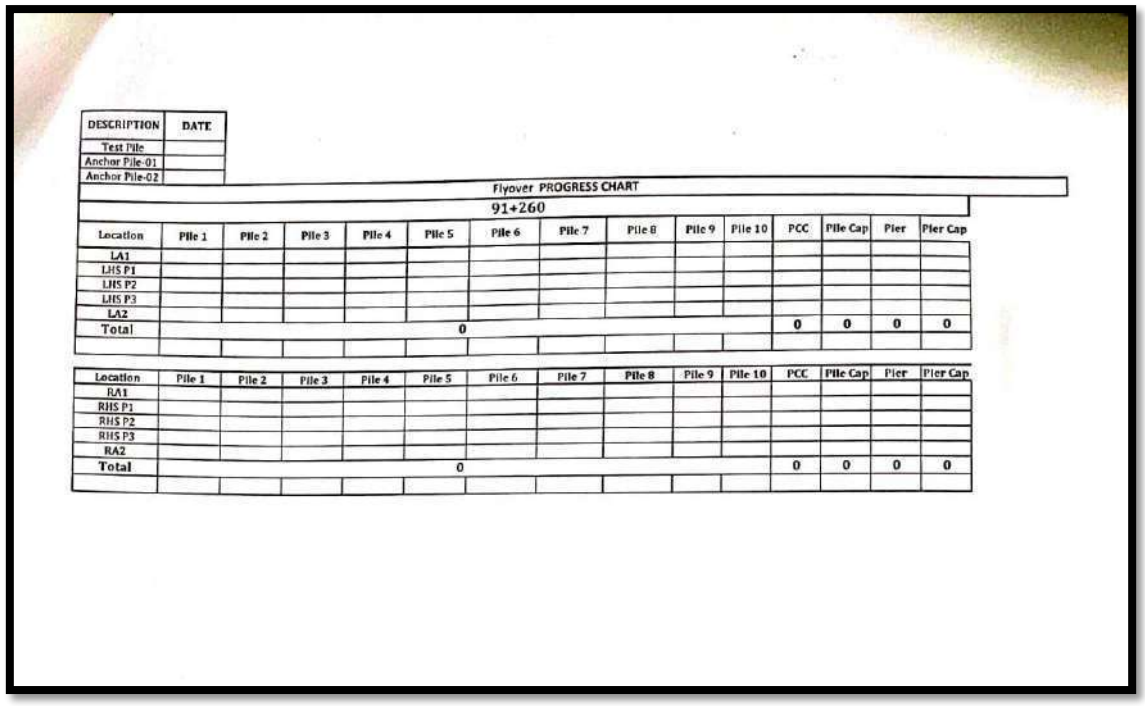
96+383

Location	Pile 1	Pile 2	Pile 3	Pile 4	Pile 5	Pile 6	Pile 7	Pile 8	Pile 9	Pile 10	Pile 11	Pile 12	Pile 13	Pile 14	Pile 15	PCC	Pile Cap	Pier	Pier Cap
LA1																			
LHS P1																			
LHS P2																			
LHS P3																			
LA2																			
Total							0									0	0	0	0

Fig 3.3 MJB Strip chart

3.1.4 Strip chart for Flyover

The construction stages of the Flyover on actual side is shown in the Figure 3.4



DESCRIPTION	DATE
Test Pile	
Anchor Pile-01	
Anchor Pile-02	

Flyover PROGRESS CHART

91+260

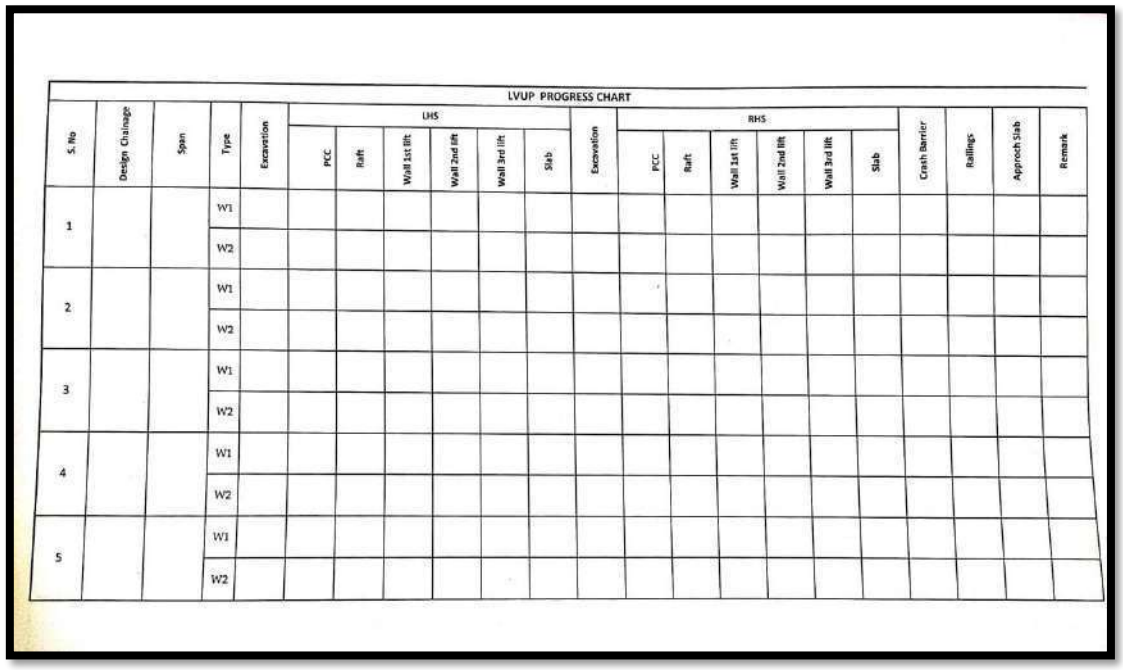
Location	Pile 1	Pile 2	Pile 3	Pile 4	Pile 5	Pile 6	Pile 7	Pile 8	Pile 9	Pile 10	PCC	Pile Cap	Pier	Pier Cap
LA1														
LHS P1														
LHS P2														
LHS P3														
LA2														
Total					0						0	0	0	0

Location	Pile 1	Pile 2	Pile 3	Pile 4	Pile 5	Pile 6	Pile 7	Pile 8	Pile 9	Pile 10	PCC	Pile Cap	Pier	Pier Cap
RA1														
RHS P1														
RHS P2														
RHS P3														
RA2														
Total					0						0	0	0	0

Fig 3.4 Flyover Strip chart

3.1.5 Strip chart for LVUP

The construction stages of the LVUP on actual side is shown in the Figure 3.5



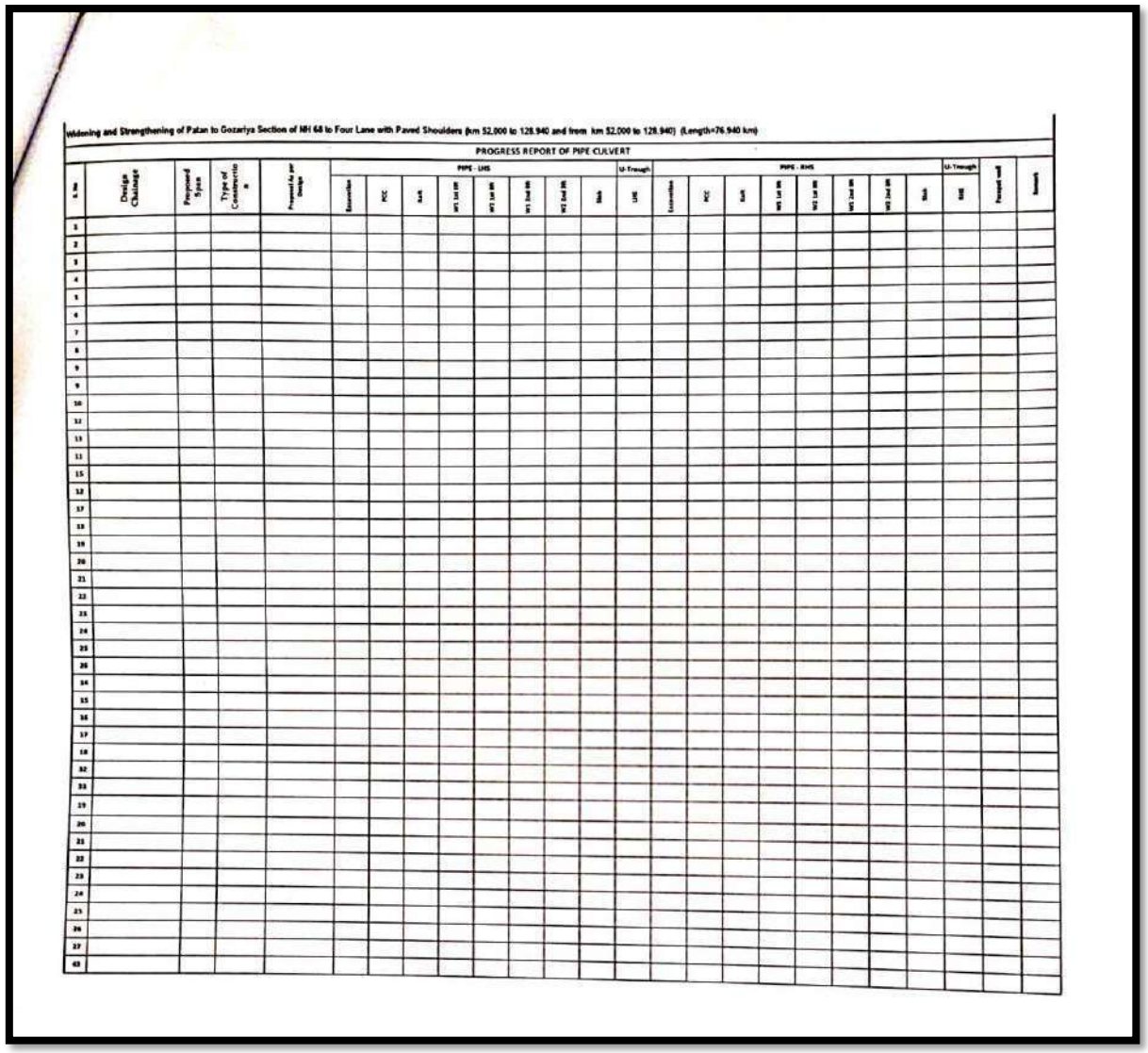
LVUP PROGRESS CHART

S. No	Design Chainage	Span	Type	Excavation	LHS PCC	LHS Raft	LHS Wall 1st lift	LHS Wall 2nd lift	LHS Wall 3rd lift	LHS Slab	Excavation	RHS PCC	RHS Raft	RHS Wall 1st lift	RHS Wall 2nd lift	RHS Wall 3rd lift	RHS Slab	Crash Barrier	Railings	Approch Slab	Remark
1			W1																		
			W2																		
2			W1																		
			W2																		
3			W1																		
			W2																		
4			W1																		
			W2																		
5			W1																		
			W2																		

Fig 3.5 LVUP Strip chart

3.1.6 Strip chart for Pipe Culvert

The construction stages of the Pipe Culvert on actual side is shown in the Figure 3.6


Widening and Strengthening of Patan to Gozariya Section of NH 68 to Four Lane with Paved Shoulders (km 52.000 to 128.940 and from km 52.000 to 128.940) (Length=76.940 km)

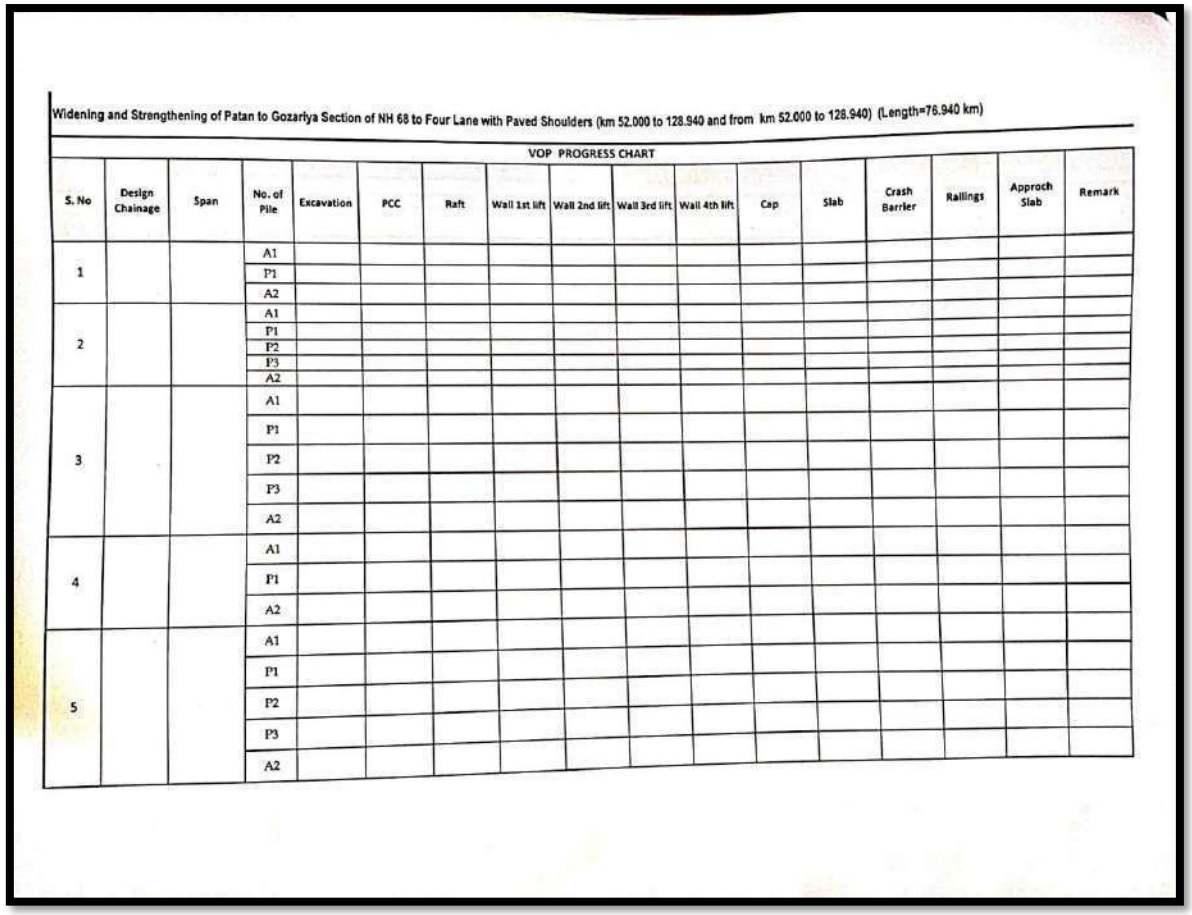
PROGRESS REPORT OF PIPE CULVERT

Sr. No.	Design Chainage	Proposed Span	Type of Construction	Proposed As per Design	PIPE - LHS								U-Trough	PIPE - RHS							U-Trough	Present Work	Remark
					Excavation	PCC	R.R.	W.S. 1st RR	W.S. 1st RR	W.S. 2nd RR	W.S. 2nd RR	Slab	LHS	Excavation	PCC	R.R.	W.S. 1st RR	W.S. 1st RR	W.S. 2nd RR	W.S. 2nd RR	Slab	RHS		
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
9																							
10																							
12																							
13																							
11																							
15																							
12																							
17																							
18																							
19																							
20																							
21																							
22																							
23																							
24																							
25																							
26																							
14																							
15																							
16																							
17																							
18																							
32																							
33																							
19																							
20																							
21																							
22																							
23																							
24																							
25																							
26																							
27																							
43																							

Fig 3.6 Pipe Culvert Strip chart

3.1.7 Strip chart for VOP

The construction stages of the VOP on actual side is shown in the FIgure 3.7



Widening and Strengthening of Patan to Gozariya Section of NH 68 to Four Lane with Paved Shoulders (km 52.000 to 128.940 and from km 52.000 to 128.940) (Length=76.940 km)

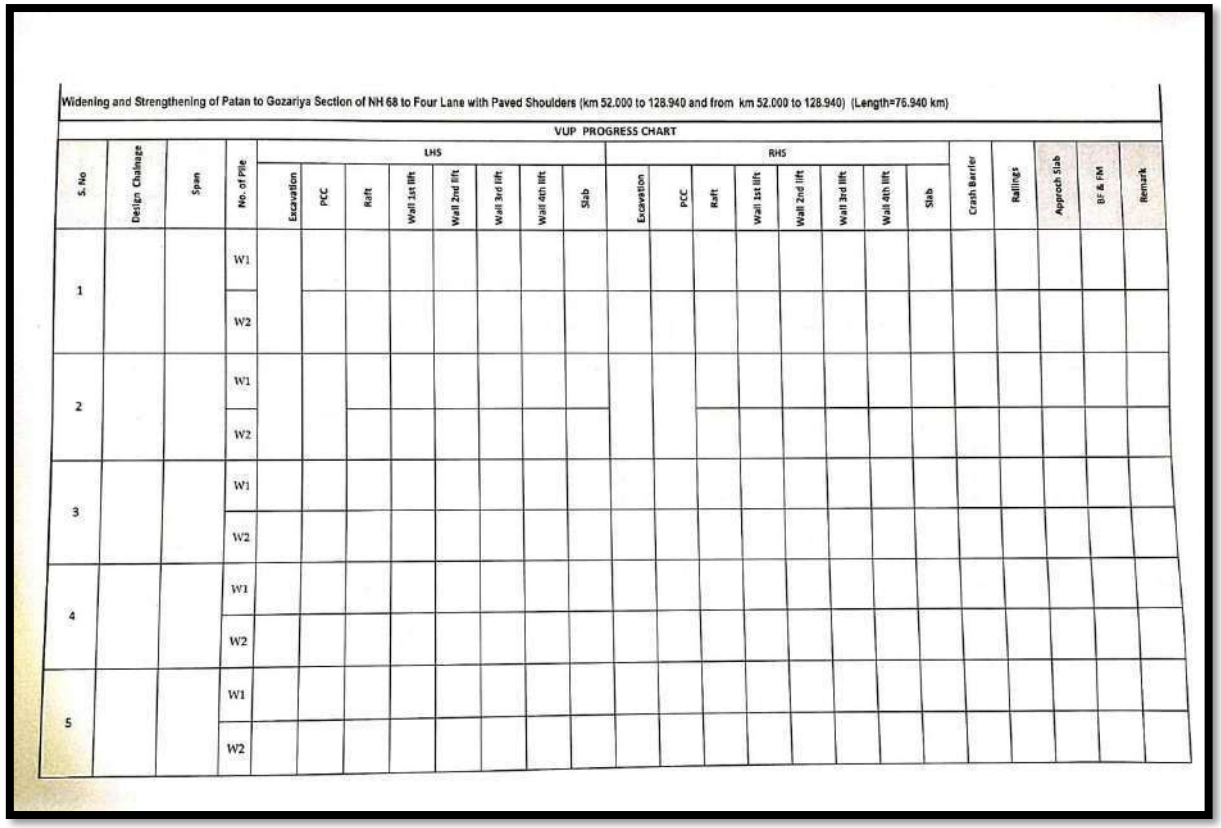
VOP PROGRESS CHART

S. No	Design Chainage	Span	No. of Pile	Excavation	PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Wall 4th lift	Cap	Slab	Crash Barrier	Railings	Approch Slab	Remark
1			A1													
			P1													
			A2													
2			A1													
			P1													
			P2													
			P3													
			A2													
3			A1													
			P1													
			P2													
			P3													
			A2													
4			A1													
			P1													
			A2													
5			A1													
			P1													
			P2													
			P3													
			A2													

Fig 3.7 VOP Strip chart

3.1.8 Strip chart for VUP

The construction stages of the VUP on actual side is shown in the Table 3.8



Widening and Strengthening of Patan to Gozariya Section of NH 68 to Four Lane with Paved Shoulders (km 52.000 to 128.940 and from km 52.000 to 128.940) (Length=76.940 km)

VUP PROGRESS CHART

S. No	Design Chainage	Span	No. of Pile	LHS								RHS								Crash Barrier	Railings	Approch Slab	BF & FM	Remark
				Excavation	PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Wall 4th lift	Slab	Excavation	PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Wall 4th lift	Slab					
1			W1																					
			W2																					
2			W1																					
			W2																					
3			W1																					
			W2																					
4			W1																					
			W2																					
5			W1																					
			W2																					

Fig 3.8 VUP Strip chart

3.1.9 Strip chart for EC

The construction stages of the EC on actual side is shown in the Figure 3.9

DESCRIPTION	DATE
Anchor Pile-01	
Anchor Pile-02	

Elevated Corridor Progress Chart

Location	Pile 1	Pile 2	Pile 3	Pile 4	Excavation	PCC	Pile Cap	Pier	Pier Cap
TEST PILE									
LA1									
LP1									
LP2									
LP3									
LP4									
LP5									
LP6									
LP7									
LP8									
LP9									
LP10									
LP11									
LP12									
LP13									
LP14									
LP15									
LP16									
LP17									
LA2									
Total	0				0	0	0	0	0
RA1									
RP1									
RP2									
RP3									
RP4									
RP5									
RP6									
RP7									
RP8									
RP9									
RP10									
RP11									
RP12									
RP13									
RP14									
RP15									
RP16									
RP17									
RA2									
Total	0					0	0	0	0

Table 3.9 EC Strip chart

3.1.10 Strip chart for Highway

The construction stages of the Highway on actual side is shown in the Figure 3.10

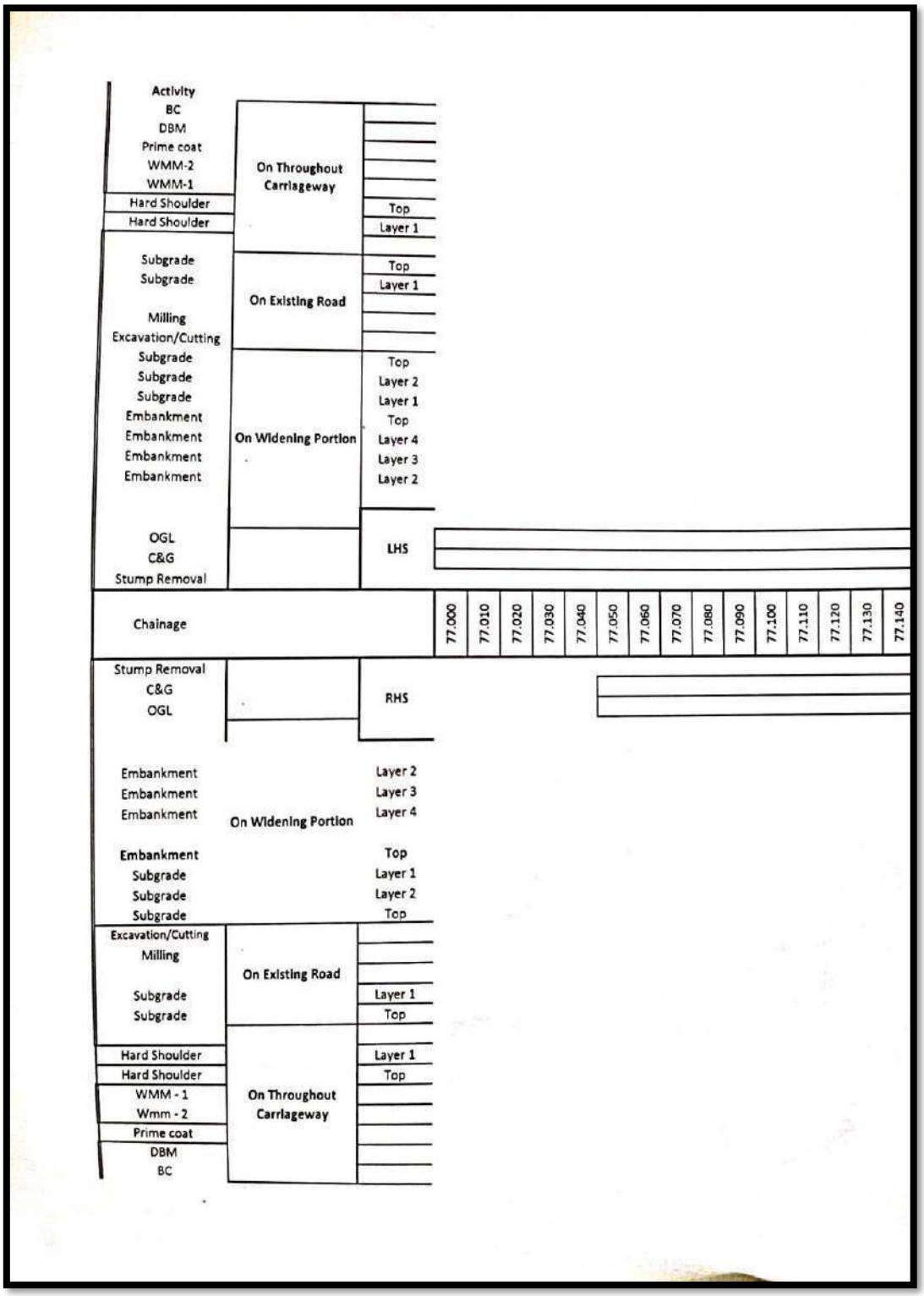


Fig 3.10 Highway Strip chart

3.2 I.S. Codes

I have referred to the following I.S. codes for a better knowledge of technical aspects and the design of the various constructions of highways:

3.2.1 IRC SP: 90 2010

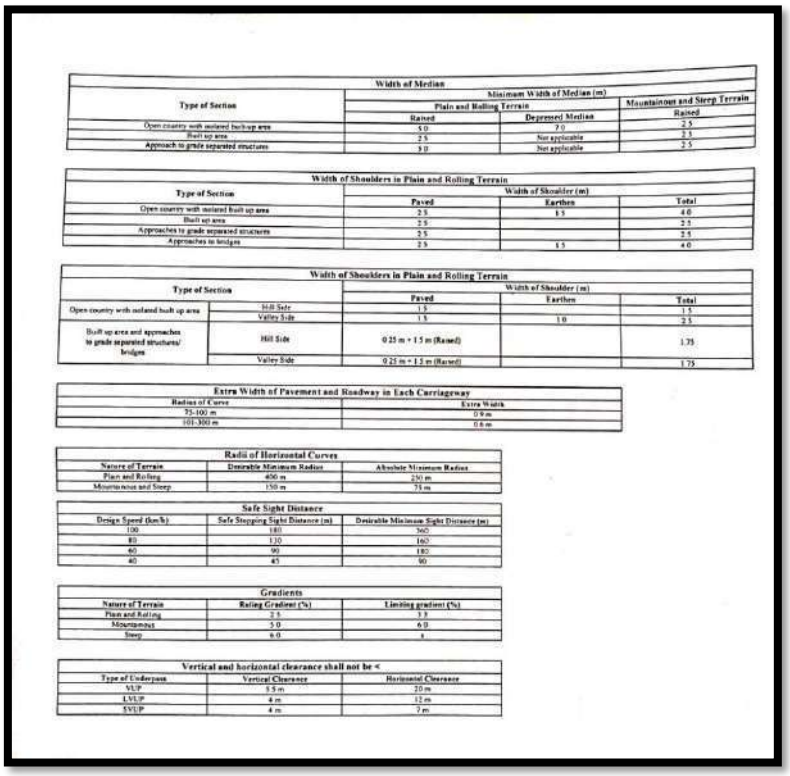
This code is a guide for grade separators and elevated structures, and it is referenced to when implementing technical terms.

3.2.2 IRC SP: 013 2004

This code is used to design small bridges and culverts, as well as to comprehend and put into practice general aspects.

3.2.3 IRC SP: 084 2019 (Second Revision)

To comprehend and put into practice the requirements and standards for the Four Lanings of Highways, reference is made to this code. Developed an excel file with a few key highway standard dimensions, as indicated in Figure 3.11.



Width of Median

Type of Section	Minimum Width of Median (m)		
	Plain and Rolling Terrain		Mountainous and Steep Terrain
	Raised	Depressed Median	Raised
Open country with isolated built-up area	5.0	7.0	2.5
Built up area	2.5	Not applicable	2.5
Approach to grade separated structures	3.0	Not applicable	2.5

Width of Shoulders in Plain and Rolling Terrain

Type of Section	Width of Shoulder (m)		
	Paved	Earthen	Total
Open country with isolated built up area	2.5	1.5	4.0
Built up area	2.5		2.5
Approaches to grade separated structures	2.5		2.5
Approaches to bridges	2.5	1.5	4.0

Width of Shoulders in Plain and Rolling Terrain

Type of Section		Width of Shoulder (m)		
		Paved	Earthen	Total
Open country with isolated built up area	Hill Side	1.5		1.5
	Valley Side	1.5	1.0	2.5
Built up area and approaches to grade separated structures/ bridges	Hill Side	0.25 m + 1.5 m (Raised)		1.75
	Valley Side	0.25 m + 1.5 m (Raised)		1.75

Extra Width of Pavement and Roadway in Each Carriageway

Radius of Curve	Extra Width
75-100 m	0.9 m
101-300 m	0.6 m

Radii of Horizontal Curves

Nature of Terrain	Desirable Minimum Radius	Absolute Minimum Radius
Plain and Rolling	400 m	250 m
Mountainous and Steep	150 m	75 m

Safe Sight Distance

Design Speed (km/h)	Safe Stopping Sight Distance (m)	Desirable Minimum Sight Distance (m)
100	180	360
80	120	160
60	90	180
40	45	90

Gradients

Nature of Terrain	Ruling Gradient (%)	Limiting gradient (%)
Plain and Rolling	3.3	5.0
Mountainous	5.0	6.0
Steep	6.0	7

Vertical and horizontal clearance shall not be <

Type of Underpass	Vertical Clearance	Horizontal Clearance
VUP	5.5 m	20 m
LVUP	4 m	12 m
SVUP	4 m	7 m

Fig 3.11 Standard Dimensions of the highway [3]

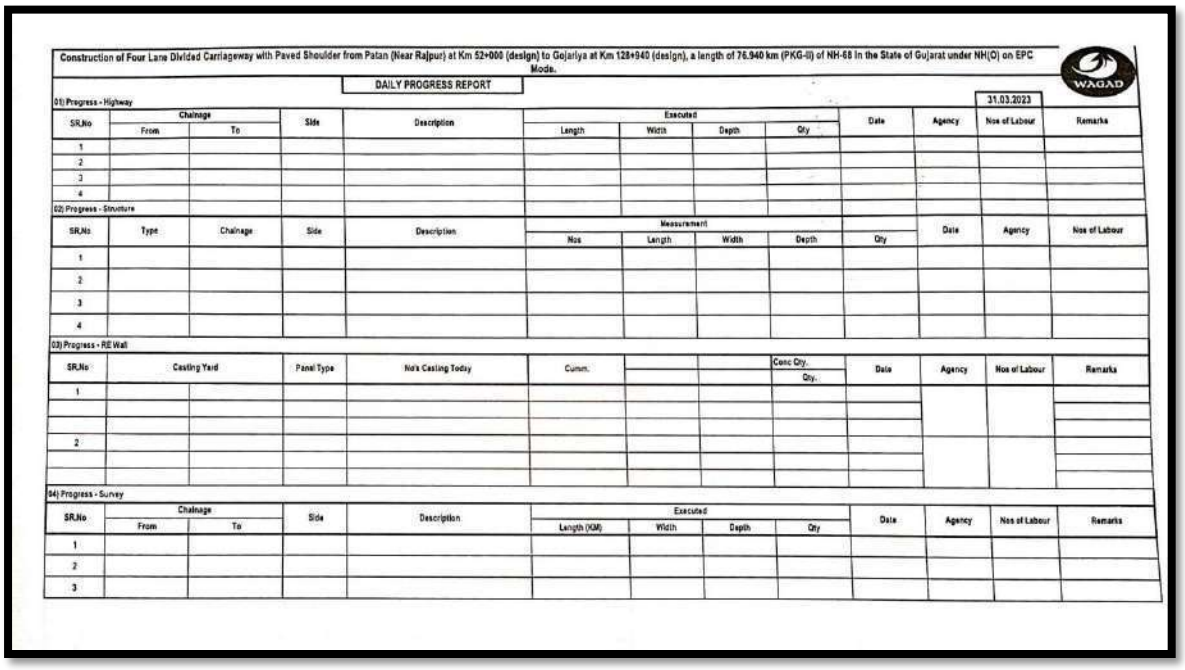
3.2.4 IRC SP: 087 2013

To comprehend and put into practice the requirements and criteria for the Six Lanings of Highways, reference is made to this code.

3.3 Daily Progress Report

It is a report that is created each day at the end of the day detailing the actual work completed at the site to determine how well projects are progressing in relation to the time and schedules that were originally set for them.

The report includes information on the structure's chainage (location), survey details for the highway, the layer of the highway that has been built, concrete consumption information, material consumption information, labour information, and much more as indicated in Figures 3.12, 3.13, and 3.14



Construction of Four Lane Divided Carriageway with Paved Shoulder from Patan (Near Rajpur) at Km 52+000 (design) to Gojariya at Km 128+940 (design), a length of 76.940 km (PKG-II) of NH-68 in the State of Gujarat under NH(O) on EPC Mode.

DAILY PROGRESS REPORT

31.03.2023

01) Progress - Highway

SR.No	Chainage From	Chainage To	Side	Description	Executed Length	Width	Depth	Qty	Date	Agency	Nos of Labour	Remarks
1												
2												
3												
4												

02) Progress - Structure

SR.No	Type	Chainage	Side	Description	Measurement Nos	Length	Width	Depth	Qty	Date	Agency	Nos of Labour
1												
2												
3												
4												

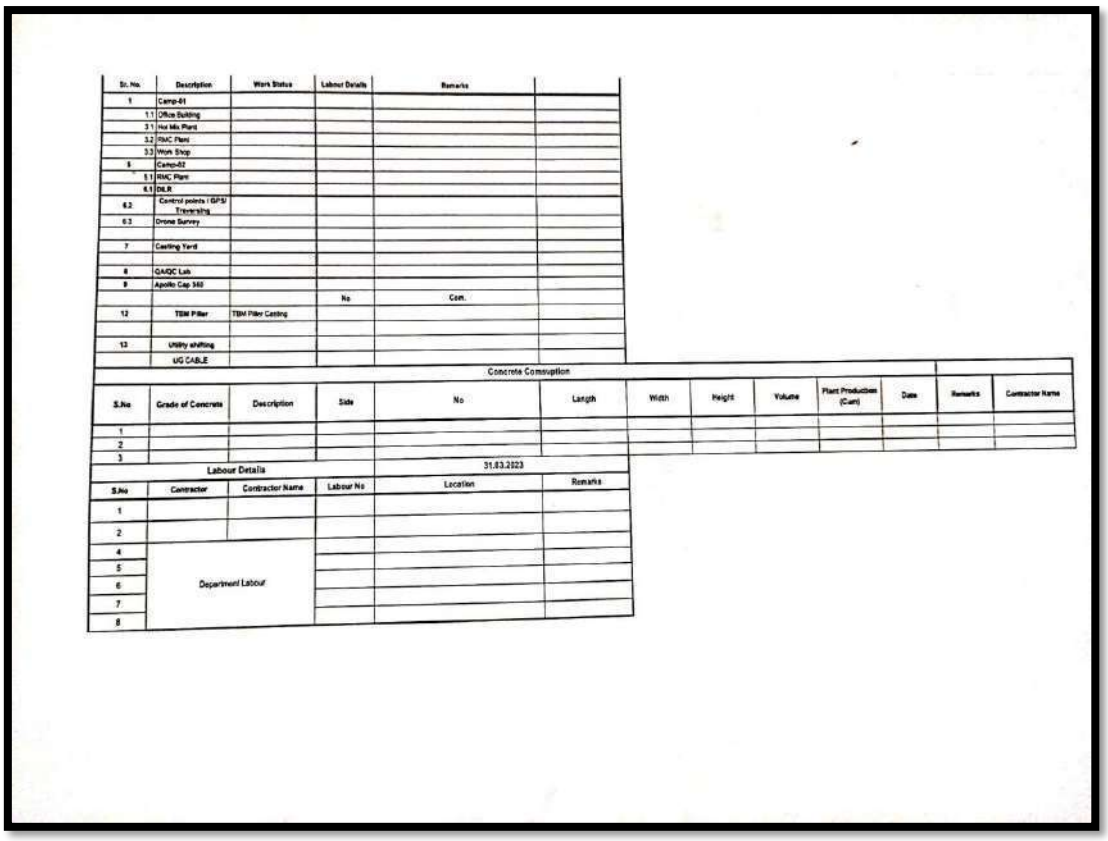
03) Progress - RE Wall

SR.No	Casting Yard		Panel Type	No's Casting Today	Cumm.			Conc Qty. Qty.	Date	Agency	Nos of Labour	Remarks
1												
2												

04) Progress - Survey

SR.No	Chainage From	Chainage To	Side	Description	Executed Length (KM)	Width	Depth	Qty	Date	Agency	Nos of Labour	Remarks
1												
2												
3												

Fig 3.12 DPR of Highway, Survey, Structure, RE wall



Sr. No.	Description	Work Status	Labour Details	Remarks	
1	Camp-01				
1.1	Office Building				
3.1	Hot Mix Plant				
3.2	RMC Plant				
3.3	Work Shop				
5	Camp-02				
5.1	RMC Plant				
6.1	DLR				
6.2	Control points / GPS/ Traversing				
6.3	Drone Survey				
7	Casting Yard				
8	QA/QC Lab				
9	Apollo Cap 360				
			No	Con.	
12	TBM Pillar	TBM Piller Casting			
13	Utility shifting				
	UG CABLE				

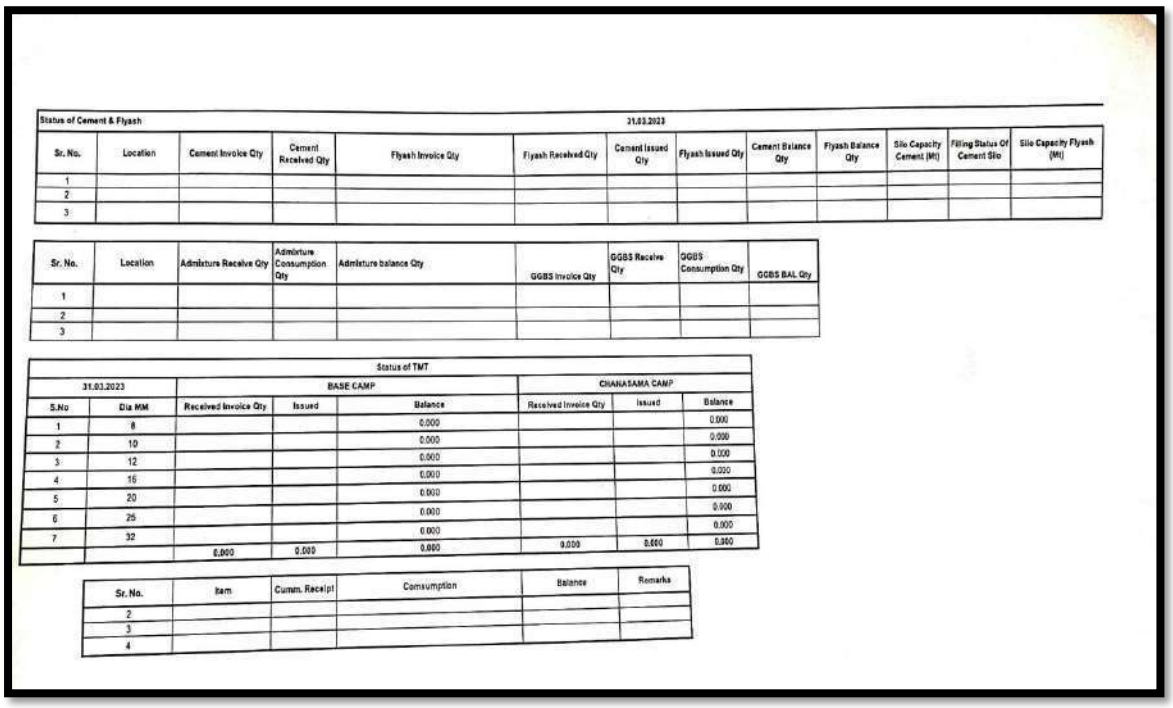
Concrete Consuption

S.No	Grade of Concrete	Description	Side	No	Length	Width	Height	Volume	Plant Production (Cum)	Date	Remarks	Contractor Name
1												
2												
3												

Labour Details — 31.03.2023

S.No	Contractor	Contractor Name	Labour No	Location	Remarks
1					
2					
4	Department Labour				
5					
6					
7					
8					

Fig 3.13 DPR of Utility Work, Concrete Consumption and Labour Report



Status of Cement & Flyash — 31.03.2023

Sr. No.	Location	Cement Invoice Qty	Cement Received Qty	Flyash Invoice Qty	Flyash Received Qty	Cement Issued Qty	Flyash Issued Qty	Cement Balance Qty	Flyash Balance Qty	Silo Capacity Cement (Mt)	Filling Status Of Cement Silo	Silo Capacity Flyash (Mt)
1												
2												
3												

Sr. No.	Location	Admixture Receive Qty	Admixture Consumption Qty	Admixture balance Qty	GGBS Invoice Qty	GGBS Receive Qty	GGBS Consumption Qty	GGBS BAL Qty
1								
2								
3								

Status of TMT

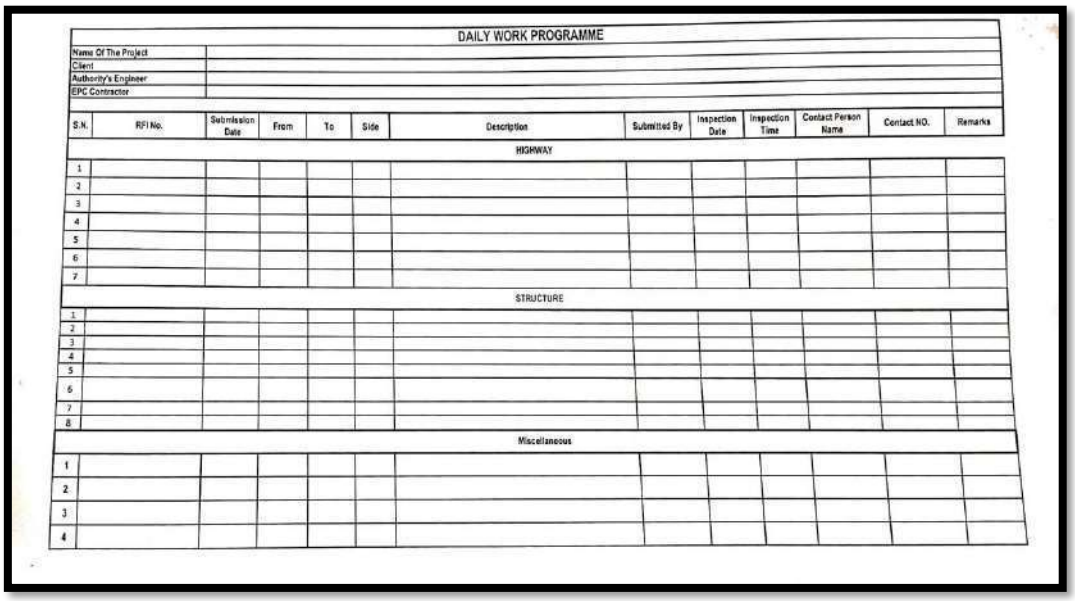
31.03.2023		BASE CAMP			CHANASAMA CAMP		
S.No	Dia MM	Received Invoice Qty	Issued	Balance	Received Invoice Qty	Issued	Balance
1	8			0.000			0.000
2	10			0.000			0.000
3	12			0.000			0.000
4	16			0.000			0.000
5	20			0.000			0.000
6	25			0.000			0.000
7	32			0.000			0.000
		0.000	0.000	0.000	0.000	0.000	0.000

Sr. No.	Item	Cumm. Receipt	Consumption	Balance	Remarks
2					
3					
4					

Fig 3.14 DPR of Cement, flyash and TMT

3.4 Request For Inspection

For the client to check the quality of the work the following day, a brief informational excel sheet of the work completed at the site is sent via email, as shown in Table 3.15. Request for Inspection is also prepared on paper for the client's approval of the work completed and signature, as shown in Table 3.16.

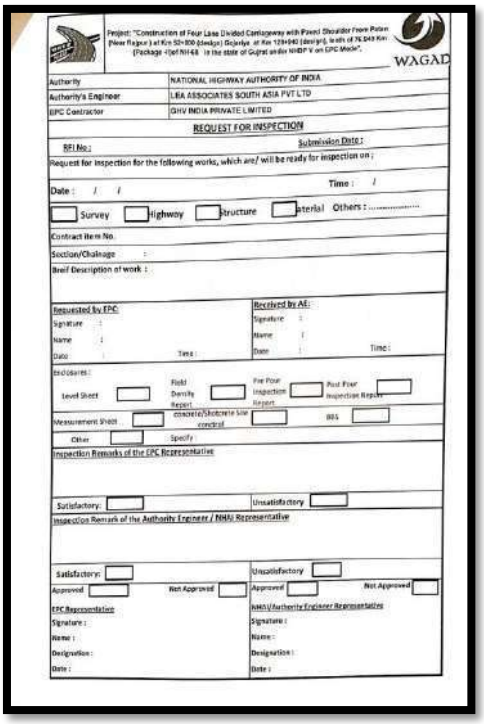


DAILY WORK PROGRAMME

Name Of The Project	
Client	
Authority's Engineer	
EPC Contractor	

S.N.	RFI No.	Submission Date	From	To	Side	Description	Submitted By	Inspection Date	Inspection Time	Contact Person Name	Contact NO.	Remarks
						HIGHWAY						
1												
2												
3												
4												
5												
6												
7												
						STRUCTURE						
1												
2												
3												
4												
5												
6												
7												
8												
						Miscellaneous						
1												
2												
3												
4												

FIg 3.15 Request For Inspection Digital Format



WAGAD

Authority	NATIONAL HIGHWAY AUTHORITY OF INDIA
Authority's Engineer	LEA ASSOCIATES SOUTH ASIA PVT LTD
EPC Contractor	GHV INDIA PRIVATE LIMITED

REQUEST FOR INSPECTION

RFI No.: Submission Date:

Request for inspection for the following works, which are/ will be ready for inspection on ;

Date : / / Time : /

Survey Highway Structure Material Others : .....

Contract Item No.

Section/Chainage :

Brief Description of work :

Requested by EPC	Received by AE:
Signature :	Signature :
Name :	Name :
Date : Time :	Date : Time :

Enclosures :

Level Sheet Field Density Report Pre Pour Inspection Report Post Pour Inspection Report

Measurement Sheet Concrete/Shotcrete Low control BBS

Other Specify :

Inspection Remarks of the EPC Representative

Satisfactory: Unsatisfactory

Inspection Remark of the Authority Engineer / NHAI Representative

Satisfactory:	Unsatisfactory
Approved Not Approved	Approved Not Approved
EPC Representative	NHAI/Authority Engineer Representative
Signature :	Signature :
Name :	Name :
Designation :	Designation :
Date :	Date :

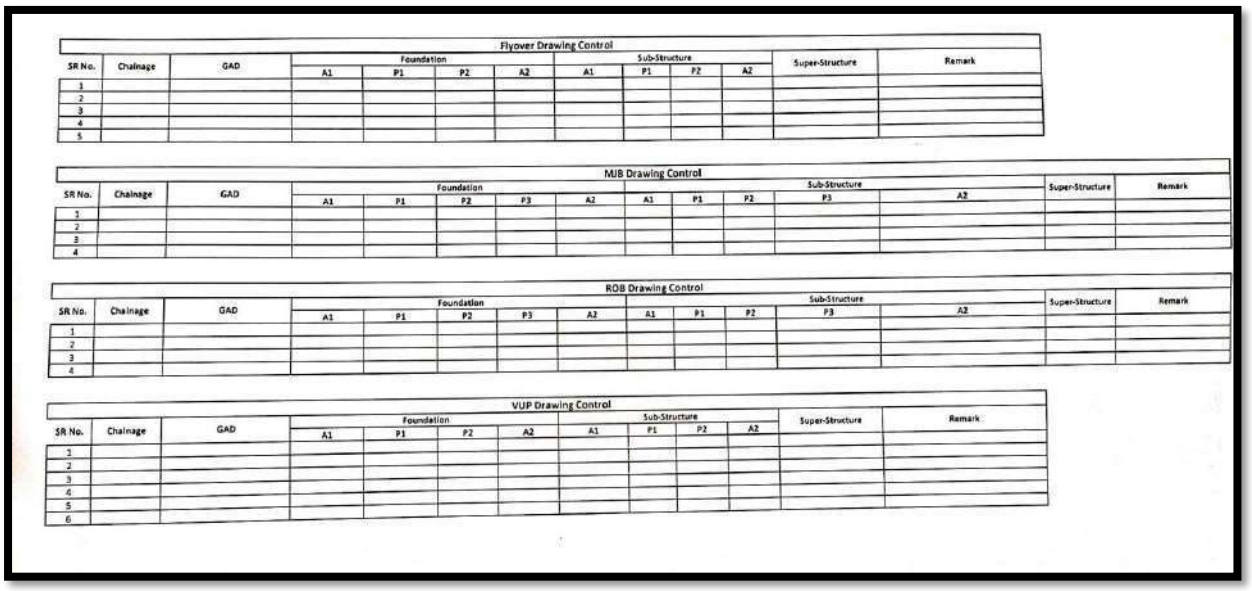
Fig 3.16 Request For Inspection Hardcopy Format

3.5 Drawing (Letter) Submission

Drawings of the constructions, obtained from the designer and verified by my engineer, are then sent to NHAI for approval in hardcopy and by email. There are two kinds: inward letters, which are sent to the client (NHAI) via email and contain information such as the drawing's approval, the work's NCR, changes to the drawing or coordinates, etc.; and outward letters, which include submissions of all drawings, survey coordinates, drone survey videos, reports, and much more.

3.6 Drawing Control Sheet

Drawing Control Sheet's main purpose is to keep a record of each drawing submitted to the client of each structure mentioned, along with the letter no., structure name, and chainage, as shown in Figures 3.17 and 3.18.



Flyover Drawing Control

SR No.	Chainage	GAD	Foundation				Sub-Structure				Super-Structure	Remark
			A1	P1	P2	A2	A1	P1	P2	A2		
1												
2												
3												
4												
5												

MJB Drawing Control

SR No.	Chainage	GAD	Foundation					Sub-Structure					Super-Structure	Remark
			A1	P1	P2	P3	A2	A1	P1	P2	P3	A2		
1														
2														
3														
4														

ROB Drawing Control

SR No.	Chainage	GAD	Foundation					Sub-Structure					Super-Structure	Remark
			A1	P1	P2	P3	A2	A1	P1	P2	P3	A2		
1														
2														
3														
4														

VUP Drawing Control

SR No.	Chainage	GAD	Foundation				Sub-Structure				Super-Structure	Remark
			A1	P1	P2	A2	A1	P1	P2	A2		
1												
2												
3												
4												
5												
6												

Fig 3.17 Drawing Control Sheet for Flyover, MJB, ROB and VUP

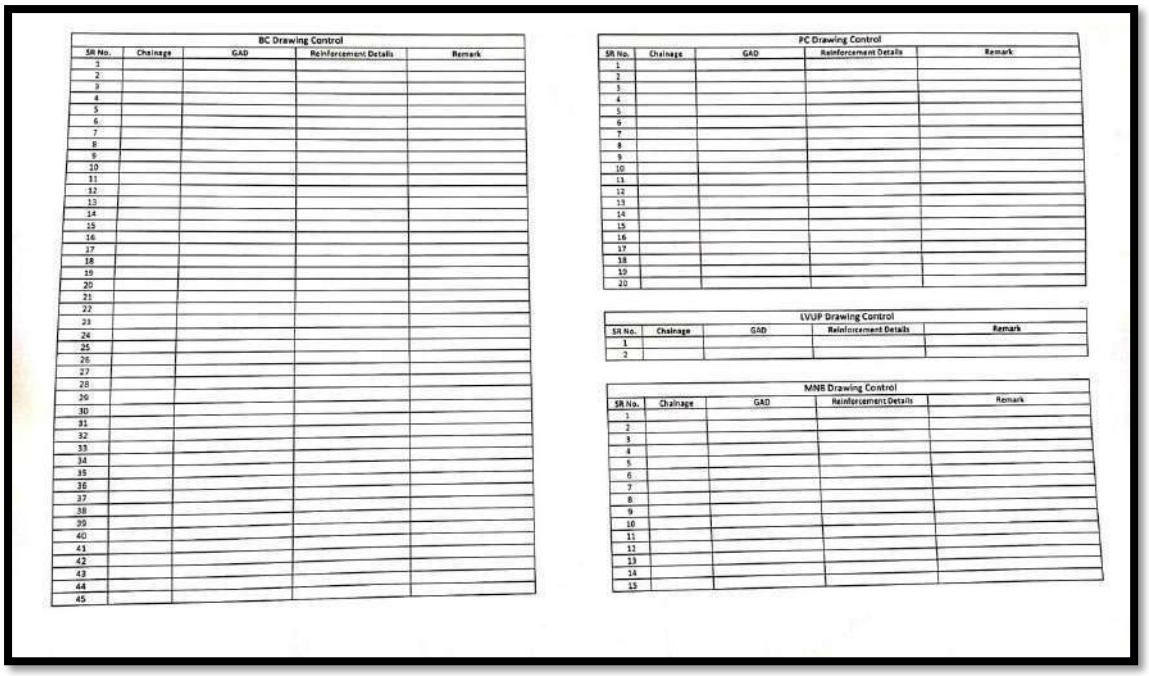


Fig 3.18 Drawing Control Sheet for BC, Pipe Culvert, MNB and LVUP

3.7 Plan and Profile for EC and Flyover

An excel sheet with the plan and profile of the road for the EC and Flyover. This sheet contains information on the road, such as the design chainage, the planned FRL of the LME and RME, the existing chainage, other ground level, the FRL + SR and much more, as indicated in Figures 3.19, 3.20, 3.21 and 3.22.

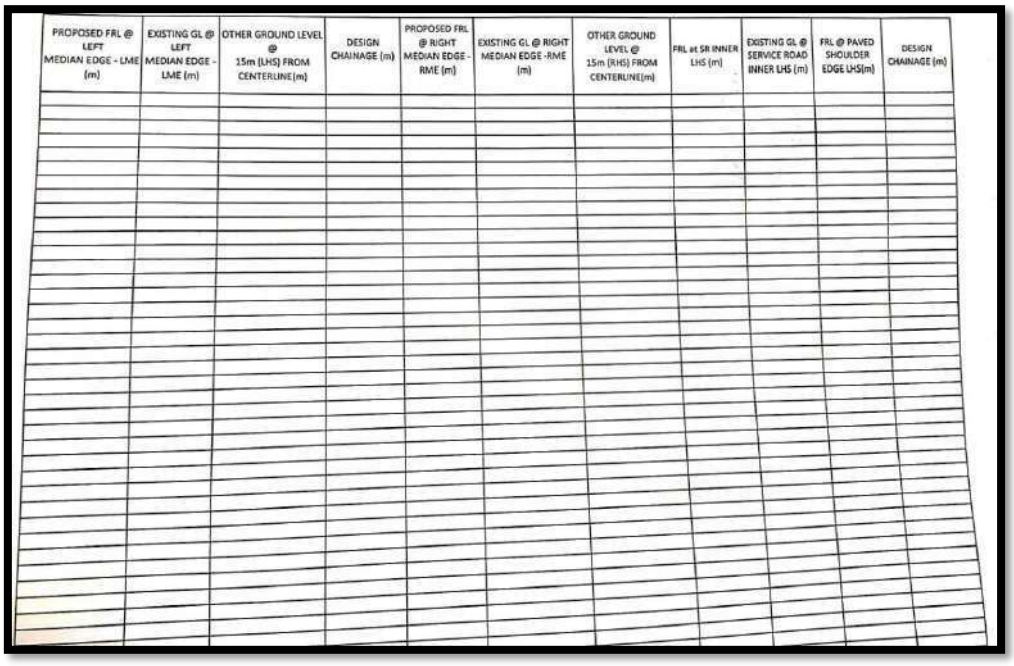
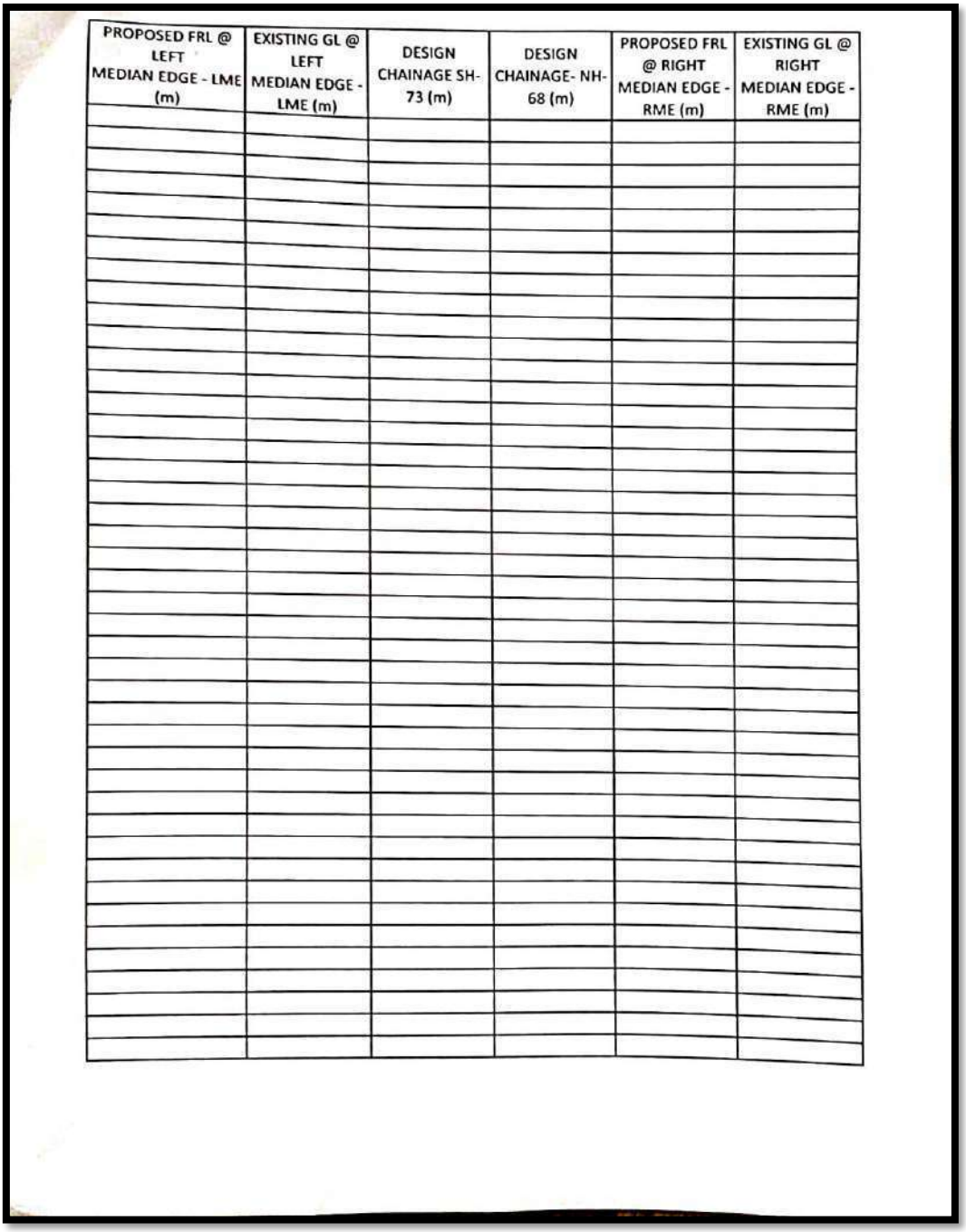


Fig 3.19 Plan and Profile for EC



PROPOSED FRL @ LEFT MEDIAN EDGE - LME (m)	EXISTING GL @ LEFT MEDIAN EDGE - LME (m)	DESIGN CHAINAGE SH-73 (m)	DESIGN CHAINAGE- NH-68 (m)	PROPOSED FRL @ RIGHT MEDIAN EDGE - RME (m)	EXISTING GL @ RIGHT MEDIAN EDGE - RME (m)

Fig 3.20 Plan and Profile for Flyover

SR NO	PROPOSED FRL @ LEFT MEDIAN EDGE - LME (m)	EXISTING GL @ SERVICE EXISTING GL @ LEFT MEDIAN EDGE -LME	DESIGN CHAINAGE (m) SHOULDER EDGE LHS(m)	PROPOSED FRL @ RIGHT MEDIAN EDGE - RME (m) MEDIAN EDGE -RME	EXISTING GL @ RIGHT MEDIAN EDGE -RME (m)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					

Fig 3.21 Plan and Profile for Flyover MCW

SR NO	FRL at SR INNER - LHS (m)	EXISTING GL @ SERVICE ROAD INNER LHS (m)	FRL @ PAVED SHOULDER EDGE LHS(m)	DESIGN CHAINAGE SH-73 (m) MEDIAN EDGE -RME (m)	EXISTING GL @ RIGHTDESIGN CHAINAGE-NH-68 (m)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					

Fig 3.22 Plan and Profile for Flyover MCW + SR

3.8 Steel Quantity

Excel calculation of the steel amount for MJB from the drawing One 12 m reinforcement bar's weight is determined using the D^2/162 formula, and the total weight is determined by multiplying the result by the quantity of bars used for the same purpose, as indicated in Figure 3.23.

Sr.no	Description	Dia	Nos	weight	Total
1	Pier Cap P1 , P2 &P3	32	3	3313	9939
		12	3	269	807
		16	3	994	2982
		16	3	1388	4164
		20	3	652	1956
		12	3	369	1107
2	Pier P1 & P2 & P3	25	3	12721	38163
		10	3	502	1506
		10	3	670	2010
		10	3	796	2388
		10	3	530	1590
		12	3	323	969
3	pier p1 Foundation P1 & P2 & P3	32	3	2061	6183
		16	3	515	1545
		12	3	410	1230
		20	3	1139	3417
		10	3	1458	4374
		12	3	114	342
		12	3	69	207
		20	3	839	2517
		20	3	341	1023
		10	3	91	273
		10	3	65	195
		10	3	65	195
4	Pier A1 (Per Foundation)	32	1	76490	76490
		10	1	1256	1256
		10	1	1675	1675
		10	1	1396	1396
		10	1	2582	2582
		12	1	909	909
5	A1 (Per Foundation) Dirt wall	16	1	596	596
		10	1	455	455
		10	1	215	215
		10	1	283	283
		10	1	121	121
		10	1	51	51
6	A1 (Per Foundation) Return wall	12	1	192	192
		12	1	151	151
		10	1	112	112
		10	1	100	100
		20	1	671	671
		20	1	430	430
		12	1	465	465
		10	1	141	141
		25	1	3147	3147
		12	1	725	725

Fig 3.23 Steel Quantities for MJB

3.9 Pot holes Measurements Sheet

Created an excel spreadsheet for package 3's potholes, as shown in Figure 3.24. Calculate the volume using a variety of lengths, breaths, and heights, where necessary assuming an average height

Pot Hole Measurement of Pkg -3

Pot Hole Measurement of Pkg -3

SR No	Length	Breadth	Area	Remarks (Depth)
1	1.500	1.200	1.800	0.023
2	1.500	0.500	0.750	0.020
3	1.600	0.350	0.560	
4	1.100	0.850	0.935	0.022
5	1.060	1.500	1.590	
6	1.150	0.900	1.035	
7	0.780	0.300	0.234	
8	0.990	0.366	0.362	
9	1.550	0.900	1.395	
10	2.150	1.550	3.333	0.250
11	0.680	0.800	0.544	
12	0.850	0.600	0.510	
13	1.550	1.250	1.938	0.220
14	2.000	2.800	5.600	
15	1.000	0.250	0.250	
16	0.650	0.900	0.585	
17	2.400	1.600	3.840	0.220
18	0.900	0.100	0.090	0.100
19	0.570	0.380	0.217	
20	0.800	0.100	0.080	0.010
21	0.650	0.520	0.338	0.015
22	0.700	0.180	0.126	
23	0.500	0.330	0.165	
24	0.370	0.150	0.056	0.010
25	0.550	0.600	0.330	0.120
26	1.800	1.500	2.700	0.023
27	0.750	0.600	0.450	
28	0.500	0.400	0.200	0.015
29	0.450	0.350	0.158	
30	0.800	0.900	0.720	0.020
31	0.700	0.710	0.497	

Fig 3.24 Pot holes Measurements sheet

3.10 Prepared Structure Component Details

Created an excel document with the details of the EC, Flyover, VUP, ROB, and MJB structures. This document contains information such the type of structure, chainage, span number, pile number, pile cap number, pier number, pier cap number, and slab number, as shown in Figure 3.25.

Structrue Components Details								
Sr No.	Type of Structure	CH	Span No.	Pile No.	Pile Cap No.	Pier No.	Pier Cap No.	Slab No.
1	EC							
2	Flyover							
3	VUP							
4	ROB							
5	MJB							

Fig 3.25 Structure Components Details for EC, Flyover, VUP, ROB and MJB

3.11 Report Formatting

A few reports, including the Methodology of Construction Work, the Wagad Infraprojects Pvt. Ltd. Quality Assurance Plan, and the Wagad Infraprojects Pvt. Ltd. Health, Safety, Traffic, and Environment Management Plan, must be prepared before initiating the project and submitted to the client (NHAI). My responsibility for formatting these reports includes heading and footer spacing, justified writing, proofreading, and other required changes.

Chapter 4: Bar Bending Schedule

4.1 Introduction

Bar Bending Schedule is termed as "Calculation of the total Steel required for the construction of a building" We use steel to make concrete to be reinforced and for tension requirements.[4]

In Bar bending schedule, the bars are organized for each structural units (Beams or columns or slabs or footings etc.) and detailed list is prepared which specifies the Bar location (Bar in footings, slabs, beams or columns), Bar Marking (to identify the bar in accordance with the drawing), Bar Size (length of the bar used), Quantity (No. of Bars used), Cutting length, Type of Bend and Shape of the bar in reinforcement drawings.[4]

Table 4.1 Percentage of steel in different members

Bar bending member	**Percentage**
Slab	1% of total volume of concrete
Beam	2% of total volume of concrete
Column	2.5% of total volume of concrete
Footings	0.8% of total volume of concrete

4.2 Bar Bending Schedule

Table 4.2 Calculation of Weight of Steel

Sr.no.	**Particulars**	**Result**
1	Standard Length of the Steel Bar (Bars are sold at standard Length)	12m or 40inch.
2	Weight of Bar for length = 1m	$D^2/162$ (Where D = Dia. of Bar)
Ex	If length of bar is 12m with 10mm Dia then, Weight of bar = $D^2/162$ Therefore, for length 1m = 1m x ($D^2/162$) = 1 x ($10^2/162$) = 0.61 Kgs For length 12m = 12 x ($10^2/162$) = 7.40Kgs	7.40Kgs
3	Density of Steel	7850Kg/m^3

4.2.1 Hook Length or Cutting length of Stirrups

The hook length is commonly provided for stirrups in beams and ties in columns. In general, Hooks are added at the two ends of the rebar in stirrups or ties.[4]

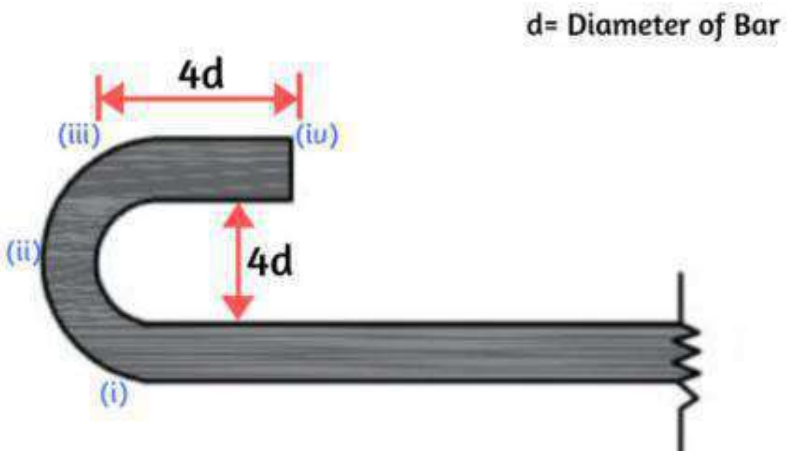


Fig 4.1 Hook Length in Stirrups

Total length of hook = (i) to (ii) + (ii) to (iii) + (iii) to (iv)

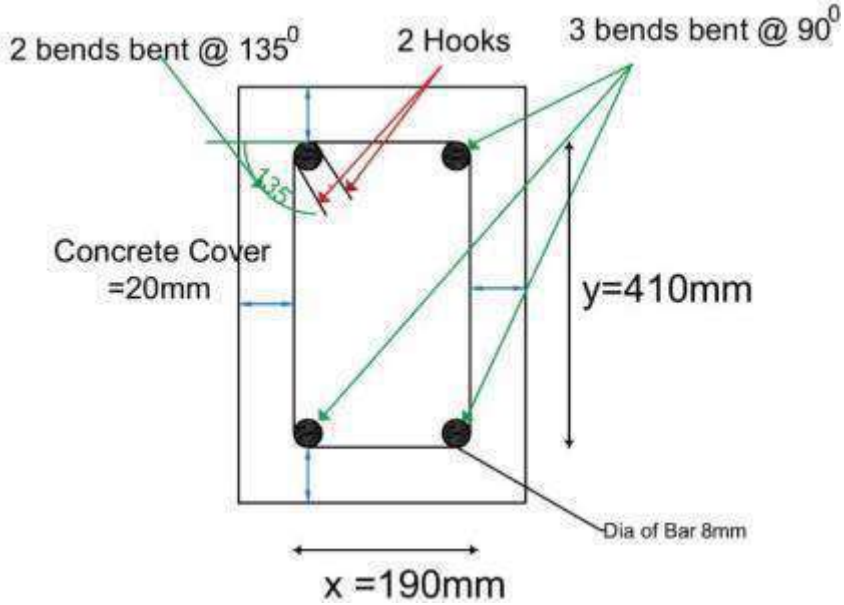
= 4d + d + 4d

= **9d**

4.2.2 Calculation of Bend Length

The important standards used while calculating the bend length at corners [4]

1. 45° Bend length = 1d
2. 90° Bend length = 2d
3. 135° Bend length = 3d



Total bend length = 3 x 900 Bend length + 2 x 1350 Bend length

= 3 x 2d + 2 x 3d = 12d = 12 x 8

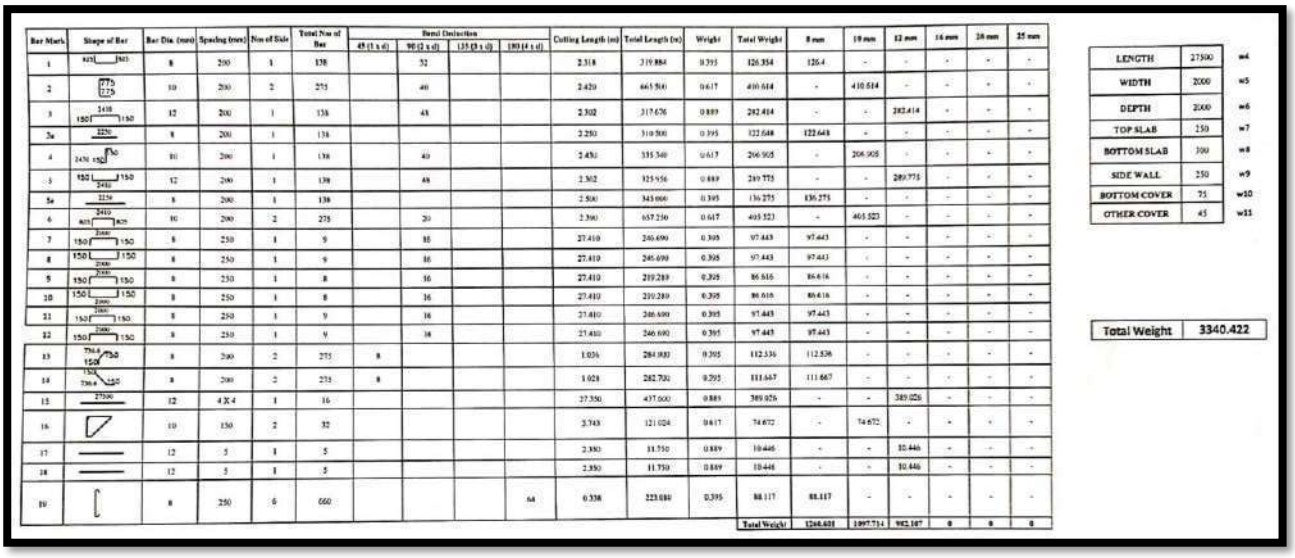
= 96mm

4.2.3 Number of bars:

Suppose the spacing of stirrups is 150 c/c and the length along which they are placed is 6800 mm, we can find the number of bars by the formula below. [4]

Number of bars = [Length / Spacing] + 1

[6800 / 150] + 1 = 46.33 nos.



Bar Mark	Shape of Bar	Bar Dia. (mm)	Spacing (mm)	Nos of Side	Total Nos of Bar	Bend Deduction 45 (1 x d)	Bend Deduction 90 (2 x d)	Bend Deduction 135 (3 x d)	Bend Deduction 180 (4 x d)	Cutting Length (m)	Total Length (m)	Weight	Total Weight	8 mm	10 mm	12 mm	16 mm	20 mm	25 mm
1	825 2825	8	200	1	138		32			2.318	319.884	0.395	126.354	126.4	-	-	-	-	-
2	775 775	10	200	2	275		40			2.420	665.500	0.617	410.614	-	410.614	-	-	-	-
3	2410 150 150	12	200	1	138		48			2.302	317.676	0.889	282.414	-	-	282.414	-	-	-
3a	2250	8	200	1	138					2.250	310.500	0.395	122.648	122.648	-	-	-	-	-
4	2450 150 150	10	200	1	138		40			2.450	335.340	0.617	206.905	-	206.905	-	-	-	-
5	150 150 2450	12	200	1	138		48			2.302	325.956	0.889	289.775	-	-	289.775	-	-	-
5a	2250	8	200	1	138					2.500	345.000	0.395	136.275	136.275	-	-	-	-	-
6	2410 825 825	10	200	2	275		20			2.390	657.250	0.617	405.523	-	405.523	-	-	-	-
7	150 2000 150	8	250	1	9		16			27.410	246.690	0.395	97.443	97.443	-	-	-	-	-
8	150 2000 150	8	250	1	9		16			27.410	246.690	0.395	97.443	97.443	-	-	-	-	-
9	150 2000 150	8	250	1	8		16			27.410	219.280	0.395	86.616	86.616	-	-	-	-	-
10	150 2000 150	8	250	1	8		16			27.410	219.280	0.395	86.616	86.616	-	-	-	-	-
11	150 2000 150	8	250	1	9		16			27.410	246.690	0.395	97.443	97.443	-	-	-	-	-
12	150 2000 150	8	250	1	9		16			27.410	246.690	0.395	97.443	97.443	-	-	-	-	-
13	750.4 150 750	8	200	2	275	8				1.026	284.880	0.395	112.536	112.536	-	-	-	-	-
14	150 750.4 150	8	200	2	275	8				1.028	282.700	0.395	111.667	111.667	-	-	-	-	-
15	27500	12	4 X 4	1	16					27.550	437.000	0.889	389.026	-	-	389.026	-	-	-
16		10	150	2	32					2.743	121.024	0.617	74.672	-	74.672	-	-	-	-
17		12	5	1	5					2.350	11.750	0.889	10.446	-	-	10.446	-	-	-
18		12	5	1	5					2.350	11.750	0.889	10.446	-	-	10.446	-	-	-
IV		8	250	6	660				64	0.338	223.080	0.395	88.117	88.117	-	-	-	-	-
												Total Weight	1266.601	1097.714	982.107	0	0	0	

LENGTH	27500	w4
WIDTH	2000	w5
DEPTH	2000	w6
TOP SLAB	250	w7
BOTTOM SLAB	300	w8
SIDE WALL	250	w9
BOTTOM COVER	75	w10
OTHER COVER	45	w11

Total Weight	3340.422

Fig 4.3 BBS for Box Culvert

CONCLUSION

Wagad Infraprojects is a well-established company specializing in and collaborating with government road infrastructure to accomplish major projects like the construction of bridges, roads, and highways, commercial projects, diaphragm walls, and infrastructure development. Being an intern, I have learned and accomplished a variety of activities and tasks related to planning and billing for the construction of a national highway during this 13-week internship, such as developing the project scope, developing strip charts for each structure, developing daily progress reports, developing inspection requests, sending drawings to NHAI via email, developing Excels for the plan and profile of the highway, and constructing structures on the actual job site. As a result, I've improved my project management abilities in the construction industry, gained a better understanding of the project's established flow, and learned how to perform various office duties in the planning and billing department.

REFERENCE

1. Mr. Ashok Jain – Founder, CEO since 1999, “Wagad Infraprojects Pvt. Ltd.”, Develop and Hosted by Uniekorn Advertising. <wagadinfra.com>
2. Technical Schedule B of the Scope of the Project.
3. Kama Koti Marg, sector – 6, R.K. Puram, New Delhi-110 022 August, 2019, “Indian Road Congress SP: 084 – 2019 – Manual of Specifications and Standards for Four Laning of Highways”.
4. Krishna, 2019, ‘Bar Bending Schedule [BBS] Estimate of Steel in Building Construction’, Civilread, 12 January 2019.

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1

Enrollment no: 200390106501

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Mihir Modha.

DIARY OF THE WEEK: Dt: 1/2/23 TO 4/2/23

DEPARTMENT: Civil SEM: 8th

NAME OF THE ORGANISATION: Waycool Infraprojects.

NAME OF THE PLANT/SECTION/DEPARTMENT: Planning & Billing

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT:

DESCRIPTION OF THE WORK DONE IN BRIEF

[1] Developed an excel spreadsheet for Elevated corridor Progress chart.

[2] Developed an excel spreadsheet for Major Bridge Progress chart.

[3] Developed an excel spreadsheet for Pipe culvert progress chart

[4] Developed an excel spreadsheet for Minor Bridge. Progress chart.

[5] Developed an excel spreadsheet for Flyover Progress chart.

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 32 hrs

Mihir Hodha
SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is: EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

WAGAD INDUSTRIES PVT. LTD.

Signature of Faculty Mentor

Signature of Officer-in-charge of Dept. / Section Or Plant

Date:

Date: 4/2/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

DESCRIPTION	DATE
Anchor Pile-01	
Anchor Pile-02	

Elevated Corridor Progress Chart

Location	Pile 1	Pile 2	Pile 3	Pile 4	Excavation	PCC	Pile Cap	Pier	Pier Cap
TEST PILE									
LA1									
LP1									
LP2									
LP3									
LP4									
LP5									
LP6									
LP7									
LP8									
LP9									
LP10									
LP11									
LP12									
LP13									
LP14									
LP15									
LP16									
LP17									
LA2									
Total	0				0	0	0	0	0
RA1									
RP1									
RP2									
RP3									
RP4									
RP5									
RP6									
RP7									
RP8									
RP9									
RP10									
RP11									
RP12									
RP13									
RP14									
RP15									
RP16									
RP17									
RA2						0	0	0	0
Total	0								

DESCRIPTION	DATE
Test Pile	
Anchor Pile-01	
Anchor Pile-02	

Major Bridge Progress Chart

96+814

Location	Pile 1	Pile 2	Pile 3	Pile 4	Pile 5	Pile 6	Pile 7	Pile 8	Pile 9	Pile 10	PCC	Pile Cap	Pier	Pier Cap
LA1														
LHS P1														
LHS P2														
LHS P3														
LA2														
Total	0										0	0	0	0

96+383

Location	Pile 1	Pile 2	Pile 3	Pile 4	Pile 5	Pile 6	Pile 7	Pile 8	Pile 9	Pile 10	Pile 11	Pile 12	Pile 13	Pile 14	Pile 15	PCC	Pile Cap	Pier	Pier Cap
LA1																			
LHS P1																			
LHS P2																			
LHS P3																			
LA2																			
Total	0															0	0	0	0

Widening and Strengthening of Patan to Gozariya Section of NH 68 to Four Lane with Paved Shoulders (km 52.000 to 128.940 and from km 52.000 to 128.940) (Length=76.940 km)

PROGRESS REPORT OF PIPE CULVERT

S.No	Design Chainage	Proposed Span	Type of Constructio n	Proposal As per Design	PIPE - LHS								U-Trough	PIPE - RHS								U-Trough			
					Excavation	PCC	Brik	WC 1st RR	WC 1st RR	WC 2nd RR	WC 2nd RR	Slab	LHS	Excavation	PCC	Brik	WC 1st RR	WC 1st RR	WC 2nd RR	WC 2nd RR	Slab	RHS	Pavgent work	Remark
1																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
9																									
10																									
12																									
13																									
11																									
15																									
12																									
17																									
15																									
19																									
20																									
21																									
22																									
23																									
24																									
25																									
26																									
14																									
15																									
16																									
17																									
18																									
32																									
33																									
19																									
20																									
21																									
22																									
23																									
24																									
25																									
26																									
27																									
43																									

Construction of Four Lane Divided Carriageway with Paved Shoulder from Patan (Near Rajpur) at Km 52+000 (design) to Gojariya at Km 128+940 (design), a length of 76.940 km (PKG-II) of NH-68 in the State of Gujarat under NH(O) on EPC Mode

Sr. No.	Structure	Existing Chainage (km)	Design Chainage (km)	Size m (N X W X H)	Type of Construction	Service Road-LHS										MCW-LHS										MCW-RHS																				Service Road-RHS								
						Excavation	PCC	Raft	Bottom Haunch	Wall 1st lift	Wall 2nd lift	Wall Final lift	Slab	Crash / Parapet		Excavation	PCC	Raft	Bottom Haunch	Wall 1st lift	Wall 2nd lift	Wall Final lift	Slab	Crash / Parapet		Excavation	PCC	Raft	Bottom Haunch	Wall 1st lift	Wall 2nd lift	Wall Final lift	Haunch	Slab	RE.Wall Excavation	RE.Wall PCC	RE.Wall Raft	RE.Wall 1st lift	RE.Wall 2nd lift	Curtain wall excavation	CURTAN WALL PCC	CURTAN WALL RAFT	Curtain wall 1ST LIFT	Curtain wall Final LIFT	Crash / Parapet		Excavation	PCC	Raft	Bottom Haunch	Wall 1st lift	Wall 2nd lift	Wall Final lift	Slab	Crash / Parapet
1	MNB																																																		
2	MNB																																																		
3	MNB																																																		
4	MNB																																																		
5	MNB																																																		
6	MNB																																																		
7	MNB																																																		
8	MNB																																																		
9	MNB																																																		
10	MNB																																																		
11	MNB																																																		
12	MNB																																																		
13	MNB																																																		
14	MNB					0	0	0	0	0	0		0	0		0	0	0	0	0	0		0	0		0	0	0	0	0	0			0										0	0		0	0	0		0	0

DESCRIPTION	DATE
Test Pile	
Anchor Pile-01	
Anchor Pile-02	

Flyover PROGRESS CHART

91+260

Location	Pile 1	Pile 2	Pile 3	Pile 4	Pile 5	Pile 6	Pile 7	Pile 8	Pile 9	Pile 10	PCC	Pile Cap	Pier	Pier Cap
LA1														
LHS P1														
LHS P2														
LHS P3														
LA2														
Total	0										0	0	0	0

Location	Pile 1	Pile 2	Pile 3	Pile 4	Pile 5	Pile 6	Pile 7	Pile 8	Pile 9	Pile 10	PCC	Pile Cap	Pier	Pier Cap
RA1														
RHS P1														
RHS P2														
RHS P3														
RA2											0	0	0	0
Total	0													

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1

Enrollment no: 200390106501

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Milin Modha.

DIARY OF THE WEEK: Dt: 6/2/23 TO 11/2/23

DEPARTMENT: civil. SEM: 8th

NAME OF THE ORGANISATION: Wagad Infraprojects.

NAME OF THE PLANT/SECTION/DEPARTMENT: Planning & Billing

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT:

DESCRIPTION OF THE WORK DONE IN BRIEF

1] Created an excel sheet for Box culvert Progress chart.

2] Created an excel sheet for VUP Progress chart

3] Created an excel sheet for LVUP Progress chart

4] Created an excel sheet for VOP Progress chart

5] Created an excel sheet for highway layers work Progress chart.

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 48 hrs

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 11/2/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Construction of Four Lane Divided Carriageway with Paved Shoulder from Patan (Near Rajpur) at Km 52+000 (design) to Gojariya at Km 128+940 (design), a length of 76.940 km (PKG-II) of NH-68 in the State of Gujarat under NH(O) on EPC Mode

						Service Road-LHS								MCW-LHS												MCW-RHS												Service Road-RHS							
Sr. No.	Structure	Existing Chainage (km)	Design Chainage (Km)	Size m (N X W X H)	Type of Construction	Excavation	PCC	Raft	Bottom Haunch	Wall 1st lift	Wall 2nd lift	Slab	Crash / Parapet	Excavation	PCC	Raft	Bottom Haunch	Wall 1st lift	Final lift	Slab	Retaining wall excavation	Retaining wall PCC	Retaining wall Raft	Retaining wall 1st lift	Retaining wall 2nd lift	Crash / Parapet	Excavation	PCC	Raft	Bottom Haunch	Wall 1st lift	Final lift & HAUNCH	Slab	Retaining wall excavation	Retaining wall PCC	Retaining wall Raft	Retaining wall 1st lift	Retaining wall 2nd lift	Crash / Parapet	Excavation	PCC	Raft	Bottom Haunch	Wall 1st lift	Wall 2nd lift	Slab	Crash / Parapet
1	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
11	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
12	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
13	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
14	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
15	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
16	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
17	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
18	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
19	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
20	Box Culvert																																															
21	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
22	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
23	Box Culvert																																														
24	Box Culvert																																														
25	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
27	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
28	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
29	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
30	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
31	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
32	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
33	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
34	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
35	Box Culvert					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																											n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Widening and Strengthening of Patan to Gozariya Section of NH 68 to Four Lane with Paved Shoulders (km 52.000 to 128.940 and from km 52.000 to 128.940) (Length=76.940 km)

VUP PROGRESS CHART

S. No	Design Chainage	Span	No. of Pile	LHS								RHS								Crash Barrier	Rallings	Approch Slab	BF & FM	Remark
				Excavation	PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Wall 4th lift	Slab	Excavation	PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Wall 4th lift	Slab					
1			W1																					
			W2																					
2			W1																					
			W2																					
3			W1																					
			W2																					
4			W1																					
			W2																					
5			W1																					
			W2																					

LVUP PROGRESS CHART

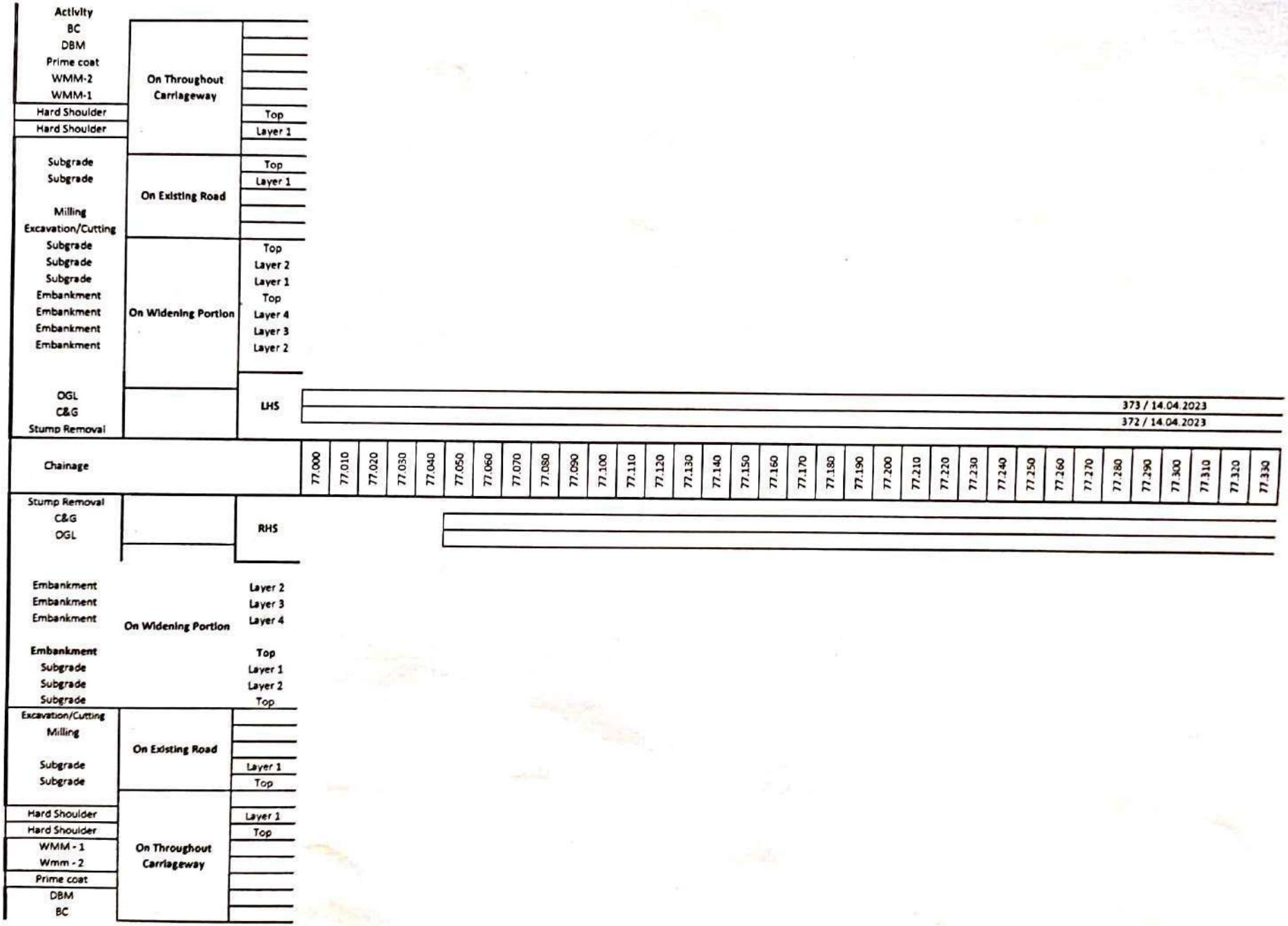
S. No	Design Chainage	Span	Type	Excavation	LHS						RHS						Crash Barrier	Railings	Approch Slab	Remark
					PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Slab	PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Slab				
1			W1																	
			W2																	
2			W1																	
			W2																	
3			W1																	
			W2																	
4			W1																	
			W2																	
5			W1																	
			W2																	

Widening and Strengthening of Patan to Gozariya Section of NH 68 to Four Lane with Paved Shoulders (km 52.000 to 128.940 and from km 52.000 to 128.940) (Length=76.940 km)

VOP PROGRESS CHART

S. No	Design Chainage	Span	No. of Pile	Excavation	PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Wall 4th lift	Cap	Slab	Crash Barrier	Railings	Approch Slab	Remark
1			A1													
			P1													
			A2													
2			A1													
			P1													
			P2													
			P3													
			A2													
3			A1													
			P1													
			P2													
			P3													
			A2													
4			A1													
			P1													
			A2													
5			A1													
			P1													
			P2													
			P3													
			A2													

S. No	Design Chainage	Span	No. of Pile	Excavation	PCC	Raft	Wall 1st lift	Wall 2nd lift	Wall 3rd lift	Wall 4th lift	Cap	Slab	Crash Barrier	Railings	Approch Slab	Remark
6			A1													
			P1													
			A2													


Activity
BC
DBM
Prime coat
WMM-2
WMM-1
Hard Shoulder
Hard Shoulder
On Throughout Carriageway
Top
Layer 1
Subgrade
Subgrade
Milling
Excavation/Cutting
Subgrade
Subgrade
Subgrade
Embankment
Embankment
Embankment
Embankment
On Existing Road
On Widening Portion
Top
Layer 1
Top
Layer 2
Layer 1
Top
Layer 4
Layer 3
Layer 2
OGL
C&G
Stump Removal
LHS
373 / 14.04.2023
372 / 14.04.2023
Chainage
77.000
77.010
77.020
77.030
77.040
77.050
77.060
77.070
77.080
77.090
77.100
77.110
77.120
77.130
77.140
77.150
77.160
77.170
77.180
77.190
77.200
77.210
77.220
77.230
77.240
77.250
77.260
77.270
77.280
77.290
77.300
77.310
77.320
77.330
Stump Removal
C&G
OGL
RHS
Embankment
Embankment
Embankment
Embankment
Subgrade
Subgrade
Subgrade
On Widening Portion
Layer 2
Layer 3
Layer 4
Top
Layer 1
Layer 2
Top
Excavation/Cutting
Milling
Subgrade
Subgrade
On Existing Road
Layer 1
Top
Hard Shoulder
Hard Shoulder
WMM - 1
Wmm - 2
Prime coat
DBM
BC
On Throughout Carriageway
Layer 1
Top

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1

Enrollment no: 200390106501

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Nikita Nadkar

DIARY OF THE WEEK: Dt: 13/2/23 TO 18/2/23

DEPARTMENT: Civil SEM: 8th

NAME OF THE ORGANISATION: Wagad Intraprojects.

NAME OF THE PLANT/SECTION/DEPARTMENT: planning & Billing

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT:

DESCRIPTION OF THE WORK DONE IN BRIEF

1) Tender study
2) Scope preparation in Excel.
3) IRC SP 90.2010 study (Manual for Cradle separators & elevated structure).

* Prepare Notes of above code. for understanding the components of the structure.

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંકઃ ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 48

Mihir Modha
SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-Charge of Dept / Section / Plant

WAGAD INFRAPROJECTS PVT. LTD.

Date:

Date: 09/03/2023

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Format for culvert + structure summary

Sr No.	Existing Chainage	Design Chainage	Type of Stucture	Size/span/opening	Type of construction	Remark	TCS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

Sr No.	Type of the Structure	Nos of the Stucture
1	Box culvert	
2	Pipe culvert	
3	Major Bridges	
4	Minor Briges	
5	ROB	
6	VUP	
7	LVUP	
8	Flyover	
9	Elevated Corridor	

Format For MNB, MIJB, MNB+MSW, ROB, Girder type.

Sr No.	Existing Bridge Location	Design Bridge Location (km)	Type of Structure/Proposed type	Existing width (m)	Extent of Widening (m)	Type of Crossing	Existing Span Arrangement	Proposed Span Arrangement (m)	Proposed Deck Width (m)		Proposed Deck Width (m)	Type of Construction	Total Width of the Structure	Adequacy or otherwise of the existing waterway	Remark
									LHS	RHS					
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															

Formed For VUP, LVUP, Flyover.

Sr no.	Existing Chainage (Km)	Design Chainage (Km)	Lateral clearance/clear span/opening	Vertical Clearance	Type of Structure	No. of Spans with span length (m)	Bridge Length(m)	Type of Construction	Remark
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

Formed For EC.

Sr No.	Description	Span	Nos of Piles	Nos of Pile cap	Nos of Peirs	Nos of Peirs Cap	Nos of Griders	Nos of Deck Slab
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
Total Sum								