INTERNSHIP REPORT

ON

INDORE METRO RAILWAY

Submitted to –

MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE GWALIOR

(A Govt. Aided Autonomous Institute under RGPV, Bhopal (M.P) Established in 1957)

IN PARTIAL FULFILLMENT FOR REQUIREMENT FOR THE AWARD OF THE

DEGREE OF

BACHELOR

IN

CIVIL ENGINEERING

(2018-2022)

Submitted By-

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INDUSTRY MENTOR-

Er JAYAKUMAR

SENIOR MANAGER,

URC Construction, Indore (M.P)

CERTIFICATE

URC Construction (P) Ltd

URC
Building Values

May18.2022

TO WHOM SO EVER IT MAY CONCERN

This is to certify that Mr. Suraj Patel, a final year (B. Tech -Civil Engineering) student from Madhav Institute of Technology and Science. Gwalior has completed internship training at our construction site (Metro construction Package[N03&IN02] Indore) from 03.01.2022 to 16.05.2022

He has completed his training in various departments including Quality Assurance & Quality Control and Survey department. We found him to be punctual, hardworking and inquisitive.

His attitude and performance during the training was found excellent. He has the capabilities to supervise primary work sand concrete.

We wish all success in his future Endeavor.

For URC Construction (P) Ltd

URC CONSTRUCTION (P) LTD. JODHPUR

thorized Signatory

RECOMMENDATION

It is hereby recommended that the internship report entitled – Indore Metro Railway which is being submitted by Suraj Patel completed under the guidance of Prof. Gautam Bhadoriya may be accepted in the partial fulfilment of the award of the degree of Bachelor of engineering in Civil Engineering.

for Prof. and Head (Sanjay Jain)

Civil Engineering Department

MITS GWALIOR, (M.P)

HEAD
Civil Engg. Deptt.
M.I.T.S. Gwalior

Faculty Mentor-

Prof. GAUTAM BHADORIYA

Civil Engineering Department

MITS GWALIOR, (M.P)

DECLARATION

I hereby declare that the work, which is being presented in this training report submitted to MITS, Gwalior as part of curriculum is an authentic record of my own work, carried within the presence of URC Construction Private Limited.

ACKNOWLEDGEMENT

When it comes to properly acknowledging someone's support and assistant, it may be a challenging undertaking chiefly when the support offered is so wholehearted and unwavering.

I am eternally grateful to my renowned guide, **Prof Gautam Bhadoriya** from Civil Engineering Department.

Also I would like to thank **Dr M.K Trivedi,** Head of Civil Engineering Department, MITS Gwalior and all other academics and staff members of MITS Gwalior's Civil Engineering Department for their unwavering support throughout the project.

I am really grateful to **Dr R.K Pandit ,** Director of MITS Gwalior, for establishing an outstanding institutional environmental and for giving all facilities and assistance in the preparation of my dissertation. I also acknowledge with gratitude to our supporting **Mr VIKRAM** for providing the facilities needed for the accomplishment of this project.

The Environment of company has been valuable experience for me. it has provided an opportunity to learn at our own pace in discipline of interest. I would like to thank all those who helped me during different stages of completion of this project.

SURAJ PATEL (0901CE181112)

Department of Civil Engineering

MITS GWALIOR, (M.P)

ABSTRACT

The metro rail system introduced in the major cities in recent years has resulted in significant improvements in the country's transportation infrastructure and intra-city connectivity.

This first of its kind study maps the story of India's largest mass rapid transit system and uses data, analysis, and first hand information to provide a comprehensive and authentic analysis of the urban transport scenario in Indian cities.

Covering metro projects proposed and undertaken across the major Indian cities of the Delhi, Bangalore, Chennai among others this volume focusses on the complexities of project planning. In addition, it also looks how large cities across the globe effectively addressed their urban transport problems to provide a comparative view.

The study also helps to distil important lessons for other infrastructure projects undertaken in developing countries.

TOPICS	Page no.

1. INTRODUCTION

The metro rail corporation which is the project implementing agency awarded work contracts for Indore metro rail project phase 1 to Rail Vikas Nigam Limited (RVNL), a rail infrastructure engineering firm operated by ministry of railways.

RVNL and DBL are used for the construction of elevated viaducts.

URC construction Private Ltd. Has won 8 substations contract in Indore metro Rail construction.

The Indore metro is a rapid transit system which is under construction for the city of Indore India. The total system Consists of 11 corridors (lines) covering a distance of 124 km. The cost of project is approximately 12000 Crore.

The term corridor or line means here is that each line has several travelling points, and consist of Sub Station points.

1.1 MISSION OF THE ORGANISATION

The mission of the organisation are as follows –

- To make work life balance in this challenging and rewarding environment.
- To encourage the employees to work.
- To make employees aware on latest technologies used for construction.
- To give value with integrity and transparency for well use.

1.2 Quality Management System

To check and maintain the quality of the products used for construction in a systematic way as per required.

1.3 Project partners of Indore Metro Railway

Client: Rail Vikas Nigam Limited (RVNL)

CONTRACTORS: DILIP BUILDCON Limited and URC Construction private limited

1.4 GOAL OF METRO PROJECT

The goal of the metro project construction is to undertake and promote technoeconomic studies and research into matters pertaining to planning metro rail projects/ organisation. To make efforts for research and development of metro rail technologies so that India can emerge as world leader in metro rail technologies.

2. ABOUT THE DEPARTMENT

2.1 SECTION OF THE COMPANY

The URC Construction will ensure that all staff understand the importance of quality in their work and accept the need to employ the working practises and procedures as defined in the quality manual and the process procedure manual. All the working drawings like structural drawing, sanitary drawing and electrical drawing are provided to the sub-contractors based on the agreement is calculated.

3. ROLES AND RESPONSIBILITIES

3.1 Roles of QA/QC Manager

The Quality Assurance and Quality Control manager shall report to the Management Board.

- They are advised to get prepare for the plan and to check the quality which is to be used for the construction process in the site.
- They should be well aware of the and matters to get interacted with the clients, agencies, subcontractors and internal departments.
- They should submit the reports to the management
- They are inspecting outgoing services progress at the construction sites.
- Responsible for organizing third party external audits.

3.2 Roles of QA/QC Assistant Manager/Engineer

- They should Report to the QA/QC Manager.
- They are requested for the selection of the materials and mix combinations within certain cost limit.
- They are used to conduct test on materials
- Documents all test in standard formats.
- Follow ups through remedial measures.

4. BATCHING PLANT

In URC Construction private limited Batching plant was of 60mcubic/hr and 30mcubic/hr. This is used to form the concrete with the help of several ingredients that contains sand, water, aggregates, fly-ash, admixtures and cement.

This batching plant contains several types of parts that include hooper, conveyor belt, bin, skip container, mixing container, cement silos batch plant control and dust collectors.

Its procedure – first of all the loader truck is used to dump the materials into the hooper than with the help of conveyor belt several materials are transported to the Bin. In Bin there are different compartments for different materials and from bin container it comes to skip and through that it comes to mixing container.

T.M(miller) used for the transportation of the mixed concrete to the field used.

BATCHING PLANT

4.1 QUALITY CONTROL DEPARTMENT IN THE COMPANY

Quality control is one of the important parameter to be taken into consideration for the construction. It gives us the detailed knowledge about the various parameters like the tests conducted, materials of different grades being used and so on. The role of quality control begins at the inception of the project and goes on till the completion of the project. Every material must meet the requirements so that the final construction is avoiding of defects. Different types of concrete are checked for quality for different works such as pile foundation, pile caps, precast drains, etc. And the design mix specimen is evaluated for the suitability of its purpose. A civil engineer ensures the quality of each batch. The mix design is

approved by a third party consultant who have worked out the various constraints and determined the various testing parameters for the mixed specimen. The people working here recreate the specimen by using the materials suggested by the consultant and test the specimen. Various admixtures are employed in making of concrete

4.2 QUALITY IMPLEMENTATION AT SITE

The main objective of the work is to quality of the work placed at the site. All quality management system must have objectives. Each employee must appreciate their influence on quality. Quality objectives are derivatives of your quality policy. It is measurable and set up throughout the organisation.

5. QUALITY CONTROL TEST CONDUCTED AT THE SITE

Their role is to establish an acceptable variation range for products and identify when something fails to meet those requirements. Quality control inspectors document the results of their inspections and make recommendations on how to prevent common errors or defects.

5.1 SLUMP TEST

SLUMP TEST

Slump test is the most widely used test in the field and laboratory which is used to check the workability of the concrete used at a construction site. In this we use slump cone of height 300mm. in this concrete is to be poured in four different layers each layer should be of 75mm and each layer should be tapped with the help of rod of height 16mm to 26 tapping. After that we cane remove the cone and check its workability.

5.2 Compressive Strength Test

COMPRESSIVE STRENGTH TEST

The purpose of the test is to determine the compressive strength of the concrete.

Procedure

This test is done for 28 days because maximum strength of concrete we get in that time period only.

In this concrete is to filled in the cube box which is of 150-150mm. cube is to be filled with concrete in 3 layers 50mm of each and to tap with 35 strokes of each layer with 16mm of the rod.

After that place it in room of temperature 27*c for 24 hours.

Then for curing in water the temperature should be 27*c of the water and in every 7 days the water should be replaced.

6. SAFETY DEPARTMENT

As we know that safety is very important term used when humans are working. Basically we are talking about construction of bridges, industries, buildings roads because in this cases precautions of safety equipment are very important for our health. In industry field as more no of accidents are increasing day by day the responsibility of the subcontractors site engineers and attention to give to safety of workers.

6.1 Health, safety and Environmental policy

URL Construction Limited has proved that it has good implementation of health, safety and environmental policy. This company gives its first priority to the work safety and environment in the construction site. To wear head protection, eye protection wear face mask, wear vest, wear hand protection, wear safety boots this are the very important equipment that should be strictly mentioned and observed to the guidelines.

6.2 Daily site safety instruction

The workers and site engineers should follow the several signs that are mentioned before entering to any on going work place and with proper safety equipment. If safety equipment are not with them than they should not be allowed to the enter into the site.

6.3 Accident and Incident Investigation

Accidents are caused due to inappropriate use of safety equipment and not having the proper knowledge of the use of the equipment and modern technologies. Sometimes due to fatal of the body pain or structural activity this may also cause several accidents. To avoid such type of accidents we should be carefull regarding use of the technologies. If accidents happens than there should be proper investigation regarding that issue and try to solve on the particular day so that no further accidents should take place.

6.4 Safety precautions at site

The safety precautions should be taken by yourself for your own and try to look after others to so that no harm should caused to anyone. This helps not to be delayed in the work and the project work gets completed within given time period.

Never try to take any shortcut method for completing work or travelling to another location that is not safe to go. This may cause severe injury.

The use of the right tools and equipment there should be proper knowledge of the use of equipment, if not then their should be expert advisor to guide.

Always wear all the protective equipment that are required in the field, before wearing always check the PPE kits, that should not be damaged or loose.

Before working in the field there should be proper training of the workers and they should be well aware of the equipment.

There are several procedures that helps in reporting the faulty equipment. As we know that safe practises lead to success so maintain workers safety should be the first priority to be claimed and to provide proper health conditions and safety

7. SURVEYING DEPARTMENT

Surveying – it is an art of determining the relative position of any point on surface of the earth.

7.1 TYPES OF SURVEY

- Plane survey – used for short distance
- Geodetic survey – used for long distance

Now day's the most common way of surveying is done with Total station point survey and in metro construction the whole process of surveying is done under this method

7.2 TOTAL STATION POINT SURVEY

In this we can do every types of survey that are like levelling, to measure horizontal angle and vertical angle, distance etc.

Temporary adjustment of total station three steps are done

- Levelling – to level the instrument with the help of screw (to put the bubble on the centre of the instrument)
- Centring – to put the bubble of the instrument in the centre with the help of vertical plumbet screw
- Foxing – to focus on the object with the help of telescope and prism pole

Prism pole – it is placed on the location point

Horizontal and vertical tangent screw are used to lock the movement

7.3 FUNCTIONS OF TOTAL STATION POINTS

TO FIND THE DISTANCE BETWEEN TWO POINTS

In instrument Go to apps –R. LINE (reference line)

Then bisect the two given points (location of two given points)

With the help of instrument function we can get their distance

TO FIND THE HEIGHT MEASUREMENT –

Go to apps – REM (remote height)

Next same as used to find the distance

TO FIND THE ANGLE MEASURED WITH TOTAL STATION –

Go to R- survey

same procedure.

8. CASTING OF SEGMENTS FOR VIADUCTS

SEQUENCE OF CONSTRUCTION:

The general sequence of construction is outlined below: • Clean the bed.

• Check for any local undulations and apply correction.

• Apply de-molding agent.

• Place sheathing and check with drawing for cable Profile

• Fix insert plates and check for their trueness as per drawing and record jointly.

• Shift the reinforcement to the Segment casting bed

• Fix the anchor cones and fix.

• Place and fix the formwork.

• Check for the dimensions and verticality of sides

• Check the boom placer and its working condition and keep ready for placing concrete with such as priming etc.

• Check the vibrator used for compacting concrete is in working condition.

• Check the quality control personnel available at the site along with thermometer, slump cone and required no. of cubes.

• Check the safety control measures implemented as per the requirement of HSE plan.

• Receive concrete and check for its workability by slump cone, temperature and batch Slips.

• Pour the concrete from top and ensure there is no segregation.

• For the proper compaction of cement mortar, vibrators are used namely,

• Bottom vibrator

• Side vibrator

• Needle Vibrator

CONCRETING AND CURING OF SEGMENT:

CONCRETING –

The concrete shall be poured in layers each not exceeding 450mm. Same shall be continued from one end of the segment. Proper compaction of the concrete shall be ensured with the compaction vibrators. The sequence of placing concrete is as follows:

a). Soffit slab

b). Half height of web – 1

c). Half height of web – 2

d). Remaining height of web – 1

e). Remaining height of web – 2

f). Deck slab including cantilevers on both the side

CURING

Initial Curing:

As soon as surface finishing of wet concrete on top surface of segment is completed, a polythene sheet shall be spread over and tied down till the warping with hessian cloth. As soon as the stripping of form work is completed. Curing shall commence. The curing shall be done using wet hessian.

Final Curing:

The segment shall be shifted to stacking yard and cured for 14 days. As an alternate method to hessian cloth or sprinkling water, the segment may be cured applying one coat white resin based curing compound. And also pond curing is done here. Any damage occurred shall be repaired. It shall be ensured that curing compound shall be applied to the ends of the segment where the joining of segments shall be done by bonding agent application.

CHECK CONDUCTED FOR SEGMENTS MAINLY FOR HONEY COMB.

INTEGRITY TEST:

ULTRASONIC PULSE VELOCITY TEST:

Ultrasonic pulse velocity test was conducted on 16 numbers of precast segments to assess the quality/uniformity of in-situ concrete at all accessible regions. The segments were observed to have minor damages and minor blow holes. The test is conducted PUNDIT (Portable Ultrasonic Non Destructive Digital Indicating Test) equipment as per the guidelines in Indian Standards IS: 13311-1992 (Part-1). Direct method of scanning is adopted at sight. The result of the test is illustrated in the sketches enclosed and corresponding quality grading chart is tabulated.

RESULT OF TEST:

From the result of ultrasonic pulse velocity test, it is inferred that the quality of concrete falls under the category of "Good Concrete" as per quality grading chart. Based on experience, for a given grade of concrete ultrasonic velocity values of 4km/s and above are considered "Acceptable" quality. The values that are obtained less than 4km/s are called for appropriate treatment. This happens when in anchorage regions due to inference from the steel plate, steel cone, and non-availability of adequate space to keep the probes for testing etc. Hence pressure grouting with low viscosity epoxy is recommended at these regions in order to fill up the entrapped voids if any during the process of concreting. Such grouting, if executed as per standard practice will ensure the soundness of the concrete at these regions. Any minor distress features observed, such as minor edge damage and surface honey combs shall be called for appropriate treatment. Further, in regions where the pulse velocity reading obtained is less than 4km/s, such regions shall be pressure grouted with low viscosity epoxy as per standard practice

RECOMMENDATIONS:

It is recommended to take utmost care in casting these segments so as not to have any damages/surface blow holes in concrete and achieve a smooth and uniform surface which is an essential feature in match casting of segments.

SEGMENTS:

Span consists of number of segments.

Segments are pre-casted elements which are casted in casting yard and are brought to site. Segments are lifted by launching girder and segments trolley which are made to rest on alternate piers. The lifting of segments by using of macalloy bars.

Segments are match casted at casting yard and are dry matched at site. Epoxy glue is applied on both the face of segments and they are fixed together. The extra glue oozes out and is trimmed of before it hardens. Segments are held together by epoxy glue and are post tensioned by drawing tendons through the ducts provided while match casting as per the

cable profile. Different spans have different cable profile as mentioned in the drawing. Parapets are casted in casting yard and are to be erected above the segments.

COMPONENTS OF SEGMENTS:

The component parts of a segment include the following:

- Soffit slab
- Webs
- Decks with cantilevers on both sides
- Shear keys
- Pre-stressing duct

LAUNCHING OF THE SEGMENTS:

The segments which are casted at the casting yard is brought to the site and launched. It is basically done by two methods:

- Suspended type launching gantry
- Under slung launching gantry. The segments are launched sequentially by the above methods. The under slung method is preferable for launching at curves.

ALIGNMENT AND GLUING:

- The segments are glued together using a special glue called Epoxy. It is highly viscous.
- This is applied manually, 1.5mm on each face of the segment

Spot life of this glue is 20 min, i.e., after this time a little amount of setting will start.

- Open time is 60mins i.e. this time period the glue can let open to air. The glue will not take up any load.
- It only acts as a waterproofing material, which protects the pre-stress cables from corrosion

STATION:

Each station structure can be divided into different levels

- Road level
- Concourse level
- Platform level. 47 Hence any station plan consists of three plans at each level. ROAD LEVEL: The station in the road level consist entry area, footpaths, and pump house, electrical substation at some station etc.

CONCOURSE LEVEL: The station in the concourse level consist of ticket counter, automatic fare collecting system, office room, control room etc.

PLATFORM LEVEL: The station in the platform level consists platforms, tracks, signals etc.

The metro runs on the rails which is parallel to each other at a distance of distance of 1.435m which is called as meter gauge.

- Metro runs on the unique system called as Third rail system.
- This is located next to the track which runs parallel to the two rails. • The power of 750DC volts will be passed through the third rail.
- Where it is connected to the locomotive of the train by which the power passes and locomotive moves by converting the electric energy into mechanical energy

The rails are supported by the track beam which is permanent until concrete fails.

- The rails are placed on the track beam where rails are fitted using bolts, nuts and chairs.
- The load of the train is directly applied on the rails and then the load from the rail is transferred to the sleepers. The flat bottom rails are used in the metro construction.

9. WEATHER CONDITIONS AT THE SITE

The main objective of the weather condition is faced during the rainy season. In this season there can be more possibility of facing difficulties and even can have severe injuries during construction work at the site. There can be shortage of the products or equipment required for the work in the field. And due to weather conditions there may be delay in the work due to unavailability of the products.

10. OVERALL BENEFITS OF THE INTERNSHIP

Internship in the field work has given us a lot of practical knowledge and experience regarding the civil sites like practical knowledge, communication skill, leadership skill.

10.1 Practical skill

- The main aim of the internship is to give the practical knowledge of the work going on to get better understanding of the skills.
- In this by working on the field we get the experience of various technologies that how they work, and what are their uses, their several functions etc.
- In the class we get the theoretical knowledge but in the civil field without practical knowledge their will be no use of it.
- Practical skill knowledge helps us to develop our field knowledge.
- Many modern technologies are used in the construction site.
- Machines are more capable of adopting high weight as per humans.

10.2 Communication skill

In internship training as far we know that we have to communicate with many persons regarding work like our senior project manager, or more than that of upper class head. So in that case our communication skills get developed and improve.

We learn in the specific way how to treat how to react how to obey and many more things regarding our personal experience of talking.

This even helps us to improve our English proficiency, sometimes someone corrects us our grammer mistakes .

In URC construction private limited this company belongs to Tamil Nadu so during our whole internship ongoing we faced lot of difficulties because their either English or Hindi was not good. It was only like to understand little things but that was okay.

10.3 Leadership skill

In URC construction limited as I earlier told that this company belongs to Tamil Nadu and their maximum engineers and workers also belongs to same.

So for them it was easy to communicate in their language but some of workers were local so they were facing difficulties in understanding the command of their site engineers. But even after that the site engineers tried there best and try to explain the things to them in very easy steps and in every stage of they required their needs.

This shows that the leadership skill among them was very good and having good communication skill between them.

This good leader ship quality also shows that their good behaviour and personality development.

11. Pile Foundation

11.1 INTRODUCTION

Piling is the work that is done by inserting the large amount of steel or concrete into the soil of the ground. The deep insertion of these elements ensures a sturdier base for the construction project to take place. This piling is, mainly done when the base of the soil is weak so to give the strength it is done.

Ventonite powder – this is used so that soil do not collapse it makes the layers around surrounding walls. This powder is mixed with the water and poured in the hole.

This powder is tested with the help of hydrometer.
After pilling the foundation pile chipping process is done. In this process the upper part of the concrete is carried out which is above the earth surface. After pile chipping reinforcement process is done, in this the rods are fully covered with equal distance and better quality.
Then taking its centre to make the pier then pier cap on that then pedestal – gride launch- slab.

PILE CAP:

Piles are grouped and pile cap is constructed over them to direct the load coming over Pier to Pile. In site at some places 4 piles and 6 piles are grouped based on the soil condition and pile cap is constructed.

- Concrete should not come in contact with soil. So leveling course (PCC) of 75-100mm is laid on the ground before
pile cap is constructed to have a levelled surface. Pile cap is of depth 1.8-2.0 m.
- Reinforcement Fe500 are provided as per design specifications of different diameter at given Spacing on the site with a clear cover of 75 mm.
- Formwork is placed and concreting is done. Top level of pile cap is provided 0.5m below the existing ground level The pile caps may be designed by assuming the load from pier.
- Pile caps will be deep enough to allow the necessary anchorage for the column and pile reinforcement, the concrete of grade M35 is used.
- The pile cap would be rigid enough so the imposed load
could be distributed on the pile in a group equally.
- The clear overhang of the pile cap are the outermost pile in the group shall be minimum of 150 mm.
- To do pile cap the pile's concrete is should cut up to cut off level leaving reinforcement up to 1.8 m from the cut off level, because to remove the waste concrete which includes sludge as well.
- In viaduct the dimension of pile cap is (square) 5.2*5.2*1.8 m.
- At stations the dimensions of pile cap is(rectangular) 8.3*5.3*2.5 m.

Pile chipping in progress

PIER AND PIER CAP:

Pier are raised structure typically supported by well spaced. They are open structure help the movement of traffic below the elevated structure to move without obstruction. Its construction activities are as follows:

- **Pier Starter: Before construction** of pier, pier starter is constructed to have to check level. It is in the shape of pier. It serves as the base for placing formwork.

- **Reinforcement: Reinforcement for Pier is tied to the pile cap and are projected** throughout the length of pier as per design specification. The length of the reinforcement falls short, they are extended by connecting them to reinforcement by coupler joint (threading process) since diameter of these reinforcement are greater if it is more 16mm. Suitable cover is provided by tying cover blocks to the outer reinforcement

PIER REINFORCEMENT AND SHUTTERING

- **Form work:**

Formwork is erected as per the shape of the pier and is connected using nuts and bolts. The inner surface of the formwork is thoroughly before concreting. Drain pipe is installed at the centre of the pier to drain out the water from the structure.

- **Concreting:**

According to design concrete of grade M50 is to be used for casting pier. Concreting is done by Pump or Boom placer. Required slump must be 125mm±25mm at the time of casting. To pour the concrete to fill duct of pier tremie pipe is used to prevent segregation of concrete. The depth of pour above the structure must not exceed 1.5m according to IS standards. Compaction is done using needle vibrator to achieve design strength. The dia of neddle vibrator is 40mm-60mm Care should be taken to avoid more compaction which might lead to segregation.

- **Curing:**

De-shuttering is done for vertical structure after 24hours of casting and is cured for 14 days to achieve desired strength.

PIER CAP:

PIER CAP INFORECEMENT

Pier and Pier cap are monolithic structures. But transition zones, Portal and Cantilever Pier cap are casted separately. The upper or bearing part of pier made of concrete is designed to distribute concentrated loads evenly over entire area of the pier. Construction steps of pier cap are same as that of pier.

CRASH BARRIER

CRASH BARRIER

Crash barrier is strong fence at the base of the pier to protect pier from damages caused from the traffic. Certain gap must be left between pier and crash barrier. Thermocol is provided to maintain the gap and it acts as shutter. Reinforcement is tied according to design, formwork is placed and concreting is done using M35 grade concrete

BEARING:

A bearing is component which provide a resting surface between pier cap and segment. The purpose is to allow control movement and thereby reduce the stresses involved. Movement can be thermal expansion or contraction and from other sources.

Bearing pedestal is constructed before placing the bearing. For this project for straight and curved alignment ELASTOMERIC bearings are used and when vertical load is greater, POT PTFE bearings are used.

ELASTOMETERIC BEARINGS

PEDESTALS:

Pedestals acts as height boosters that transfer load from bridge deck to the pier and substructure. The process to install the pedestals is the cost effective and uses well-understood technologies to jack the bridges and to install the bearings.

Although pedestals increase the vertical clearance height of bridges thereby reducing the likelihood of impact damage, they make the bridges more susceptible to instability and damage from lateral loads such as those produced by small and moderate earthquakes. The Typical pedestal dimensions are 0.8*1*0.15 m.

TYPICAL BEARING PEDESTAL

SEGMENTS:

Span consists of number of segments. Segments are pre-casted elements which are casted in casting yard and are brought to site. Segments are lifted by launching girder and segments trolley which are made to rest on alternate piers. The lifting of segments by using of macalloy bars.

Segments are match casted at casting yard and are dry matched at site. Epoxy glue is applied on both the face of segments and they are fixed together. The extra glue oozes out and is trimmed of before it hardens. Segments are held together by epoxy glue and are post tensioned by drawing tendons through the ducts provided while match casting as per the cable profile. Different spans have different cable profile as mentioned in the drawing. Parapets are casted in casting yard and are to be erected above the segments.

COMPONENTS OF SEGMENTS:

The component parts of a segment include the following:

- **Soffit slab**
- **Webs**
- **Decks with cantilevers on both sides**
- **Shear keys**
- **Pre**-stressing duct

SEGMENT

TYPES OF SPANS

Depending upon the geometry the spans that include in the construction are of two types. They are as follows:

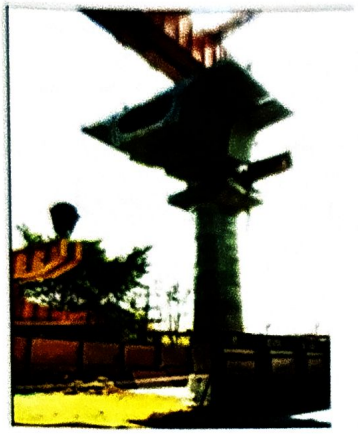
- **Straight span**

* Curved span

LAUNCHING OF THE SEGMENTS:

The segments which are casted at the casting yard is brought to the site and launched. It is basically done by two methods:

- **Suspended type launching gantry**
- **Under slung launching gantry. The segments are launched sequentially by the above** methods. The under slung method is preferable for launching at curves.



LAUNCHING GIRDER

ALIGNMENT AND GLUING:

- **The segments are glued together using a special glue called Epoxy. It is highly viscous.**
- **This is applied manually, 1.5mm on each face of the segment.**
- **Spot life of this glue is 20 min,** i.e., after this time a little amount of setting will start.
- **Open time is 60mins i.e. this time period the glue can let open to air. The glue will not** take up any load.
- **It only acts as a waterproofing material, which protects the pre stress cables from** stress.

ALIGNMENT

STATION:

Each station structure can be divided into different levels

- **Road level**
- **Concourse level**
- **Platform level**

Hence any station plan consists of three plans at each level.

ROAD LEVEL:

The station in the road level consists entry area, footpaths, and pump house, electrical substation at some station etc

CONCOURSE LEVEL:

The station in the concourse level consists of ticket counter, automatic fare collecting system, office room, control room etc.

PLATFORM LEVEL:

The station in the platform level consists of platforms, tracks, signals etc.

METRO STATION

VIEW OF TRACK IN A VIADUCT

The metro runs on the rails which is parallel to each other at a distance of distance of 1.435m which is called as meter gauge.

- Metro runs on the unique system called as Third rail system.
- This is located next to the track which runs parallel to the two rails.
- The power of 750DC volts will be passed through the third rail.
- Where it is connected to the locomotive of the train by which the power passes and locomotive moves by converting the electric energy into mechanical energy.
- The rails are supported by the track beam which is permanent until concrete fails.
- The rails are placed on the track beam where rails are fitted using bolts, nuts and chairs.
- The load of the train is directly applied on the rails and then the load from the rail is transferred to the sleepers. The flat bottom rails are used in the metro constructions.

12. CONCLUSION

Overall, I had a fantastic experience while training with the engineers of URC Construction. I feel extremely fortunate to be a part of this construction company.

This summer training helped me grow a lot and get a deeper look into the construction field.

The summer training programme is unique because of more exposure we get in the company. For past four months of internship has proven to be very useful and interesting as we could learn and experience the concepts of civil engineering practically. We tried to make the best use of given opportunity in learning the professional ethics and practises followed in the workspace.

Thanks URC Construction PVT Ltd staff for making my internship an unforgettable journey.

THANK YOU!!

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Suraj Patel		Department	Civil Engineering	
Industry/Organization	URC Construction (P) Ltd		Date/Duration	03-01-2022 to 15-01-2022	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/ Timely completion of assigned work				✓	
Learning capacity /Knowledge up gradation			✓		
Performance/Quality of work					✓
Behaviour/Discipline/ Team work					✓
Sincerity/Hard work			✓		
Comment on nature of work done/Area/Topic	1. Actively involved in all activity assigned 2. Showed self responsibility during the training period 3. Learned the things in QC/QA lab				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	S. JAYAKUMAR (A.G.M)				
Signature of Industry Mentor					

Receiving Date		**Name of Faculty Mentor**	G. Bhadoriya	**Sign**	
21/1/22					

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Suraj Patel		Department	Civil Engineering	
Industry/Organization	URC Construction (I) Ltd		Date/Duration	18-01-2022 to 31-01-2022	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/ Timely completion of assigned work				✓	
Learning capacity /Knowledge up gradation			✓		
Performance/Quality of work					✓
Behaviour/Discipline/ Team work					✓
Sincerity/Hard work			✓		
Comment on nature of work done/Area/Topic	(i) Actively involved in activity assigned ii) Showed self responsibility during training period.				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	S. JAYAKUMAR (AGM)				
Signature of Industry Mentor					

Receiving Date 04/02/22		**Name of Faculty Mentor**	G. Bhadoriya	**Sign**	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Suraj Patel		Department	Civil Engineering	
Industry/Organization	UEC Construction (I) Ltd		Date/Duration	01-02-2022 to 15-03-2022	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/ Timely completion of assigned work				✓	
Learning capacity /Knowledge up gradation			✓		
Performance/Quality of work					✓
Behaviour/Discipline/ Team work					✓
Sincerity/Hard work			✓		
Comment on nature of work done/Area/Topic	1. Actively involved in all activity assigned 2. Showed self responsibility during the training period 3. Learned the things in QC/QA lab.				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	S. JAYA KUMAR (AGM)				
Signature of Industry Mentor					

Receiving Date 24/2/22		**Name of Faculty Mentor**	Cr. Bhadoriya	**Sign**	

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FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Swaj Patel		Department	Civil Engineering	
Industry/Organization	URC Construction P. Ltd		Date/Duration	16-02-2022 to 28-02-2022	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/ Timely completion of assigned work				✓	
Learning capacity /Knowledge up gradation			✓		
Performance/Quality of work					✓
Behaviour/Discipline/ Team work					✓
Sincerity/Hard work			✓		
Comment on nature of work done/Area/Topic	1. Actively involved in all activity assigned. 2. Showed self responsibility during the traing period. 3. Learned the things in QC lab.				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	S. JAYAKUMAR C.A.G.M.				
Signature of Industry Mentor					

Receiving Date 14/3/22		**Name of Faculty Mentor**	G. Bhadoriya	**Sign**	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Suraj Patel		Department	Civil Engg.	
Industry/Organization	URC Construction P. Ltd.		Date/Duration	01-03-2022 to 15-03-2022	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/ Timely completion of assigned work				✓	
Learning capacity /Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/ Team work					✓
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	i) Actively involved in all activity assigned. ii) Showed self respect, responsibility during the training period.				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT** ✓				
Name of Industry Mentor	M. VIJAYRAGHVAN (Senior Engg.)				
Signature of Industry Mentor	M. Vijay Raghav				

Receiving Date 30/3/22		**Name of Faculty Mentor**	G. Bhadoriya	**Sign**	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Suraj Patel		Department	Civil Engg.	
Industry/Organization	URC Construction P. Ltd.		Date/Duration	16-03-2022 to 31-03-2022	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/ Timely completion of assigned work				✓	
Learning capacity /Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/ Team work					✓
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	1) Actively involved in all activity assigned 2) Showed self respect, responsibility during training Period				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT** ✓				
Name of Industry Mentor	M. VIJAYRAGAVAN (Senior Engg.)				
Signature of Industry Mentor	M. Vijay Ragav				

Receiving Date		Name of Faculty Mentor	G. Bhadesiya	Sign	
05/4/22					

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Suraj Patel		Department	Civil Engg.	
Industry/Organization	URC Construction P. Ltd.		Date/Duration	01-04-2022 to 15-04-2022	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/ Timely completion of assigned work				✓	
Learning capacity /Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/ Team work					✓
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	i) Actively involved in all activity assigned ii) Showed self responsibility during the training period. ✓				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	M. VIJAYRAGVAN (Senior Engg.)				
Signature of Industry Mentor	M. Vijayraghavan				

Receiving Date 28/4/22		**Name of Faculty Mentor**	A. Bhadoriya	**Sign**	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Suraj Patel		Department	Civil Engg.	
Industry/Organization	URC Construction P. Ltd.		Date/Duration	16-04-2022 to 30-04-2022	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/ Timely completion of assigned work				✓	
Learning capacity /Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/ Team work					✓
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	i) Actively involved in all activity assigned ii) showed self responsibility during the training Period.				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT** ✓				
Name of Industry Mentor	M. VIJAYRAGUAN (Senior Engg.)				
Signature of Industry Mentor	M. Vijayraguan				

Receiving Date		**Name of Faculty Mentor**	G. Bhadoriya	**Sign**	
05/5/22					

14.PLAGIARISM CERTIFICATE

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR - 474005
(a Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to R.G.P.V. Bhopal)

Civil Engineering Department

Plagiarism Check Certificate

This is to certify that I am student of B.Tech. in Civil Engineering have checked my Internship entitled "INDORE METRO RAILWAY CONSTRUCTION" for similarity/plagiarism using the "Turnitin software" available in the institute.

This is to certify that,

- The similarity in my Internship report is found to be 14 % (which is within the specified limit of 20%)

The full plagiarism report along with the summary is enclosed.

Student name: Suraj Patel
Roll No.:0901CE181112

Faculty Mentor: Prof. Gautam Bhadoriya
Designation: Assistant Professor
Civil Engineering Department

Professor & Head of
Civil Engg. Dept.

02/6/22
(Turnitin Administrator)

HEAD
Civil Engg. Deptt.
M.I.T.S. Gwalior

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