ROAD CONSTRUCTION & BATCHING PLANT MANAGEMENT

A **PROJECT REPORT**

submitted in partial fulfillment of the requirements for the Degree

of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision

of

Mr. KAUSHAL KUMAR ASSISTANT PROFESSOR (GRADE-II)

By

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to

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY
WAKNAGHAT SOLAN-173234
HIMACHAL PRADESH INDIA
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STUDENT'S DECLARATION

I hereby declare that the work presented in the Project report entitled **"ROAD CONSTRUCTION AND BATCHING PLANT MANAGEMENT "** submitted for partial fulfilment of the requirements of the degree of Bachelor of Technology in Civil Engineering at **Jaypee University of Information Technology, Waknaghat** is an authentic record of my work carried out under the supervision of **Mr. Kaushal Kumar.** This work has not been submitted elsewhere for the reward of any other degree/diploma. I am fully responsible for the contents of my project report**.**

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CERTIFICATE

This is to certify that the project report titled "**ROAD CONSTRUCTION AND BATCHING PLANT MANAGEMENT**" submitted to the Department of Civil Engineering, **Jaypee University of Information Technology, Waknaghat**, in partial fulfilment of the requirements for the degree of Bachelor of Technology in Civil Engineering, is an authentic record of work conducted by **Ujjwal Tyagi (191632)** between February 2023 to April 2023, under the supervision of **Mr. Kaushal Kumar** (Assistant Professor, Grade II), Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat.

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

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Abstract

This abstract presents the work conducted by Raunaq Construction, a company specializing in road construction and concrete batching plants. The primary objective of the project was to implement efficient and sustainable road construction practices using state-of-the-art technology.

The project involved the construction of a new road, which required careful planning and execution. Raunaq Construction employed advanced techniques to ensure the road's durability and longevity. Additionally, the project incorporated eco-friendly approaches to minimize environmental impact, such as using recycled materials and optimizing energy consumption.

Furthermore, Raunaq Construction focused on improving the efficiency of their concrete batching plant operations. The company implemented automation and digitization measures to enhance productivity and accuracy in the batching process. This resulted in increased throughput and reduced material waste.

Overall, the work conducted by Raunaq Construction in road construction and concrete batching plant operations showcased their commitment to delivering high-quality infrastructure projects while prioritizing environmental sustainability and operational efficiency.

Keywords: road construction, concrete batching plant, sustainability, efficiency, automation.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

During my three-month internship at Raunaq constructions, Karnal and Faridabad, Haryana, India. I was involved in road construction and concrete batching plant operations. My responsibilities were divided into two parts, focusing on road construction and Quality check, procurement work at a concrete batching plant. My primary objective was to take care of the procurement of raw materials for concrete batching plant and for road construction, quality control of raw materials, setting standard operating procedures for the same (SOPs), and conducting tests to check to ensure the quality of the final product that is to be dispatched from our batching plant. The following sections provide a more detailed analysis of the work I accomplished.

CHAPTER 2

WORK DONE DURING THE MONTH OF FEBRUARY

The trainee was assigned a monitoring role during my first 10 days at the company, where training was provided on the procurement of bitumen and asphalt, as well as their application in road construction.

The training gave valuable insights into the critical components of road construction. Bitumen and asphalt are essential ingredients used in road construction to ensure that the road surface is durable and can withstand daily traffic wear and tear. The acquisition of these materials is a complex process, and it is critical to understand the various types and qualities of bitumen and asphalt to ensure proper application.

The training also included practical sessions and the objective was to learn about various asphalt application methods, such as hot mix and cold mix are examples. Understanding these techniques aids in ensuring proper material usage and minimizing waste.

The trainees had a better understanding of the processes involved in road construction and how the various components contribute to the overall quality and durability of the road by the end of the ten days. Now the trainees have the knowledge and skills needed to be an effective team member in road construction.

Finally, evaluating the ten-day training the team provided the necessary knowledge and skills for the procurement of bitumen and asphalt, as well as their application in road construction. It contributed to the overall quality of my work by laying a solid foundation for future work.

Figure 2.1: Laying of asphalt using paver

Figure 2.2: Rolling of pavement


Powered by NoteCam

Figure 2.3: Road after paving and rolling

CHAPTER 3

WORK DONE DURING THE MONTH OF MARCH AND APRIL

The trainees have completed their second month working as a quality checker at a ready-mix plant and bitumen plant. During this time, the trainee was responsible for ensuring that the products produced by the plants meet the required quality standards.

At the ready-mix plant, the trainee has conducted several tests to check the quality of the concrete mix. These tests included slump tests, compressive strength tests for aggregates and concrete, and air content tests. The trainee has also been checking the temperature and moisture levels of the concrete mix to ensure that they are within the recommended range.

At the bitumen plant, the trainee has been checking the quality of the bitumen produced. This also involved conducting various tests, including penetration tests, softening point tests, and viscosity tests. The trainee has also been checking the density and flash point of the bitumen to ensure that it meets the required standards.

Overall, the trainee has been able to maintain the required quality standards at both the concrete ready- mix plant and bitumen plant. The trainee has provided regular feedback to the production team to help them improve the quality of their products. The trainee look forward to continuing their work as a quality checker and contributing to the success.

The trainee performed various quality checks at a concrete ready-mix plant and a bitumen plant during my second month of deployment as a quality checker. The primary goal was to ensure that all products manufactured at these plants met the quality standards specified.

Test on Ready-Mix Concrete Plant:

The trainee performed several tests on the concrete mixes produced at the concrete ready-mix plant. Among the tests were:

The Slump Test:

The slump test measures the degree of consistency of the concrete mix to determine the workability of fresh concrete.

Compressive Strength Examination:

The compressive strength test measures the force required to break a concrete specimen to determine its strength.

Air Content Examination:

The air content test determines how much air is trapped in the concrete mix. Checking the

Temperature and Moisture Levels:

Temperature and moisture levels are checked to ensure the concrete mix is within the specified range.

The trainee verified that the concrete mixes produced during the second month met the required quality standards based on the results of these tests. However, the trainee suggested that the production team improve their control over the mixing water and conduct more frequent temperature and moisture level checks to ensure product consistency.

Bitumen Plant

The trainee performed various tests at the bitumen plant to ensure the quality of the bitumen produced. These tests included the following:

Test for Penetration

The penetration test measures the depth to which a standard needle can penetrate the bitumen to determine its hardness.

Softening Point Examination

The softening point test determines the temperature at which bitumen softens.

The Viscosity Test

The viscosity test determines the bitumen's resistance to flow, which is an important factor in determining its performance.

Checks for Density and Flash Point

Density and flash point tests are performed to ensure that the bitumen meets the specifications.

The trainee verified that the bitumen produced during the second month met the required quality standards based on the results of these tests. However, the trainee suggested that the production team improve their control over the heating process and conduct more frequent viscosity checks to ensure product consistency.

Figure 3.1: Control panel of batching plant

Figure 3.2: Dispatching of bitumen from bitumen plant

Figure 3.3: Batching plant

Figure 3.4: Batching Plant

CHAPTER 4

Part 1: Road Construction

Procurement of Raw Materials

As part of my responsibility, the trainee had to take care of the procurement of raw materials required for road construction. The procurement process was an essential step in ensuring that the road construction activities ran smoothly. The trainee had to identify the sources of raw materials in Ponta Sahib, Himachal Pradesh, and negotiate with the suppliers to get the best prices for the materials.

The procurement of raw materials for road construction and ready-mix plant was done in two phases. The first phase involved the procurement of aggregates, which included coarse aggregates and fine aggregates. The coarse aggregates were obtained from crushed rocks, while the fine aggregates were obtained from natural sand deposits. The second phase involved the procurement of water, which was sourced from local wells and boreholes.

Quality Control of Raw Materials

After procuring the raw materials, trainee next responsibility was to carry out quality control checks to ensure that the materials met the required standards. The quality control process was a critical step in ensuring that the road construction activities were carried out to the required standards.

The trainee was responsible for conducting tests to check the quality of aggregates, sand, and water, using the relevant equipment and tools. The tests were carried out in accordance with the standard procedures set by the company. The tests involved checking the gradation, shape, and size of the aggregates, and the consistency and pH of the water.

The tests carried out to check the quality of aggregates included the sieve analysis test, which involved passing the aggregates through a series of sieves to determine the size distribution of the particles. The trainee also carried out the Los Angeles Abrasion Test, which measured the resistance of the aggregates to wear and tear, and the specific gravity test, which determined the weight of the aggregates relative to the weight of an equal volume of water.

In addition to the tests on the aggregates, the trainee also carried out tests on the sand and water. The tests on the sand involved determining its fineness modulus and silt content, while the tests on the water involved checking its pH and electrical conductivity.

Setting SOPs for Raw Material Testing

As part of my responsibility, the trainee also had to set standard operating procedures (SOPs) for the testing of raw materials. The SOPs were critical in ensuring that the tests were carried out consistently and accurately.

The trainee developed SOPs for the sieve analysis test, Los Angeles Abrasion Test, specific gravity test, fineness modulus test, and silt content test. The SOPs included step-by-step instructions for carrying out the tests, including the equipment and tools required, the sampling procedure, and the acceptance criteria.

Part 2: Concrete Batching Plant Operations

Procurement of Raw Materials

In addition to my work on road construction, the trainee was also responsible for the procurement of raw materials required for the concrete batching plant operations. The procurement process was an essential step in ensuring that the concrete batching plant operations ran smoothly.

The trainee had to identify the sources of raw materials, including aggregates, cement, and admixture, and negotiate with the suppliers to get the best prices for the materials. The procurement of raw materials for the concrete batching plant was done in three phases. The first phase involved the procurement of aggregates, which included coarse aggregates, fine aggregates, and recycled aggregates. The coarse and fine aggregates were sourced from local quarries and sand deposits, while the recycled aggregates were obtained from the crushing and processing of waste concrete.

The second phase involved the procurement of cement, which was sourced from a nearby cement

factory. The third phase involved the procurement of admixture, which was sourced from a local supplier.

Quality Control of Raw Materials
After procuring the raw materials, my next responsibility was to carry out quality control checks to ensure that the materials met the required standards. The quality control process was a critical step in ensuring that the concrete batching plant operations were carried out to the required standards.

The trainee was responsible for conducting tests to check the quality of aggregates, cement, and admixture, using the relevant equipment and tools. The tests were carried out in accordance with the standard procedures set by the company. The tests involved checking the gradation, shape, and size of the aggregates, the fineness and setting time of the cement, and the compatibility and dosage of the admixture.

The tests carried out to check the quality of aggregates included the sieve analysis test, which

involved passing the aggregates through a series of sieves to determine the size distribution of the particles. The trainee also carried out the Los Angeles Abrasion Test, which measured the resistance of the aggregates to wear and tear, and the specific gravity test, which determined the weight of the aggregates relative to the weight of an equal volume of water.

In addition to the tests on the aggregates, the trainee also carried out tests on the cement and admixture. The tests on the cement involved determining its fineness, setting time, and compressive strength, while the tests on the admixture involved checking its compatibility with the cement and its dosage.

Setting SOPs for Concrete Batching Plant Operations

As part of my responsibility, the trainee also had to set standard operating procedures (SOPs) for the concrete batching plant operations. The SOPs were critical in ensuring that the batching plant operations were carried out consistently and accurately.

The trainee developed SOPs for the batching of concrete, which included step-by-step instructions for weighing and batching the raw materials, mixing the concrete, and discharging the concrete into the transit mixer. The SOPs also included instructions for cleaning and maintaining the equipment and tools used in the batching plant.

Test Conducted to Check the Final Product from the Batching Plant

My final responsibility was to conduct tests to check the quality of the final product from the batching plant. The tests were carried out to ensure that the concrete met the required standards and was suitable for use in construction activities.

The tests carried out to check the quality of the concrete included the slump test, which measured the consistency and workability of the concrete, and the compressive strength test, which determined the strength of the concrete. Trainee also carried out the air content test, which measured the amount of air entrained in the concrete, and the temperature test, which measured the temperature of the concrete.

Part 3: Tests Conducted

Los Angeles Abrasion Test

Introduction

The Los Angeles Abrasion Test is a widely used test to measure the resistance of coarse aggregates to abrasion and wear. The test simulates the abrasion caused by traffic and weather, which the aggregates may experience during their service life. The test is performed in accordance with ASTM C131, and the results are reported as a percentage of the weight loss of the sample.

Test Procedure

The test procedure involves the following steps:

1. Sample Preparation: A sample of about 5000g of the aggregates is taken from the stockpile and washed to remove any dust, dirt, or other impurities. The sample is then oven-dried at a temperature of 105°C to 110°C until it reaches a constant weight.
2. Los Angeles Abrasion Machine Setup: The Los Angeles Abrasion Machine consists of a hollow steel cylinder, closed at both ends, and mounted horizontally on stub shafts. The machine is rotated at a speed of 30 to 33 revolutions per minute. The sample is placed in the cylinder along with a set of steel balls.
3. Abrasion Cycle: The cylinder is rotated for a specified number of revolutions, typically 500, 1000, or 1500. The steel balls continuously fall and strike the aggregates, causing abrasion and wear. The machine is equipped with a counter to keep track of the number of revolutions.
4. Sample Removal and Sieving: After the specified number of revolutions, the sample is removed from the cylinder and sieved through a set of sieves with openings of 1.70mm, 2.36mm, 4.75mm, 6.35mm, 9.50mm, 12.5mm, and 19.0mm. The sieves are arranged in descending order of size, and the weight of the material retained on each sieve is recorded.

Calculation of Abrasion Value: The abrasion value is calculated as the percentage of the weight loss of the sample due to abrasion, using the following formula:
Abrasion value = [(A - B) / A] x 100 Where,
A = Initial weight of the sample

5. B = Final weight of the sample after abrasion

6. Sample Removal and Sieving: After the specified number of revolutions, the sample is removed from the cylinder and sieved through a set of sieves with openings of 1.70mm, 2.36mm, 4.75mm, 6.35mm, 9.50mm, 12.5mm, and 19.0mm. The sieves are arranged in descending order of size, and the weight of the material retained on each sieve is recorded.

Calculation of Abrasion Value: The abrasion value is calculated as the percentage of the weight loss of the sample due to abrasion, using the following formula:
Abrasion value = [(A - B) / A] x 100 Where,
A = Initial weight of the sample

7. B = Final weight of the sample after abrasion

Reporting of Results

The results of the test are reported as the percentage of the weight loss of the sample due to abrasion. The average value of three tests is usually reported. The test results are used to determine the quality and durability of the aggregates used in road construction.

Bitumen Content Test

The Bitumen Content Test is used to determine the percentage of bitumen in an asphalt mix used for road construction. The test is performed in accordance with ASTM D2172 and the results are reported as a percentage of the total weight of the asphalt mix.

The test procedure involves the following steps:

1. A representative sample of the asphalt mix is taken from the stockpile and weighed to the nearest 0.1 gram.

2. The sample is placed in a tared aluminum container and heated to a temperature of 538°C (1000°F) to remove the bitumen.

3. After the bitumen has been removed, the container is cooled to room temperature and weighed again to determine the weight of the aggregate.

4. The percentage of bitumen is calculated using the following formula:

% Bitumen = ((Weight of Sample - Weight of Aggregate) / Weight of Sample) x 100

The Bitumen Content Test is important because the amount of bitumen in the asphalt mix affects its properties such as strength, durability, and resistance to wear and tear. The test helps ensure that the asphalt mix meets the specified requirements for bitumen content.

Marshall Stability Test

The Marshall Stability Test is used to measure the resistance of asphalt mix to deformation and cracking under traffic loading. The test is performed in accordance with ASTM D6927 and the results are reported as the maximum load sustained by the specimen at a specified deformation.

The test procedure involves the following steps:

1. A representative sample of the asphalt mix is taken from the stockpile and compacted in a mold to a specified density and height.

2. The compacted specimen is placed in a testing machine and loaded at a specified rate of deformation until failure occurs.

3. The maximum load sustained by the specimen is recorded and reported as the Marshall Stability value.

4. The deformation at the maximum load is also recorded and reported as the Marshall Flow value.

The Marshall Stability Test is important because it helps ensure that the asphalt mix meets the specified requirements for stability and deformation resistance. The test is widely used for quality control and acceptance of asphalt mixes used for road construction.

Penetration Test

The Penetration Test is used to measure the consistency and hardness of bituminous materials. The test is performed in accordance with ASTM D5 and the results are reported as the distance in tenths of a millimeter that a standard needle penetrates the surface of the sample under specified conditions of loading, time, and temperature.

The test procedure involves the following steps:

1. The sample of bituminous material is heated to a specified temperature (usually 25°C or 77°F) to soften it.

2. A standard needle with a specified weight and shape is lowered onto the surface of the sample and allowed to penetrate for 5 seconds.

3. The depth of penetration is measured in tenths of a millimeter using a graduated scale.

4. The test is repeated at different temperatures and the results are reported as the penetration value at each temperature.

The Penetration Test is important because it helps determine the suitability of bituminous materials for use in road construction. The penetration value is used to classify bituminous materials into different grades based on their hardness and consistency.

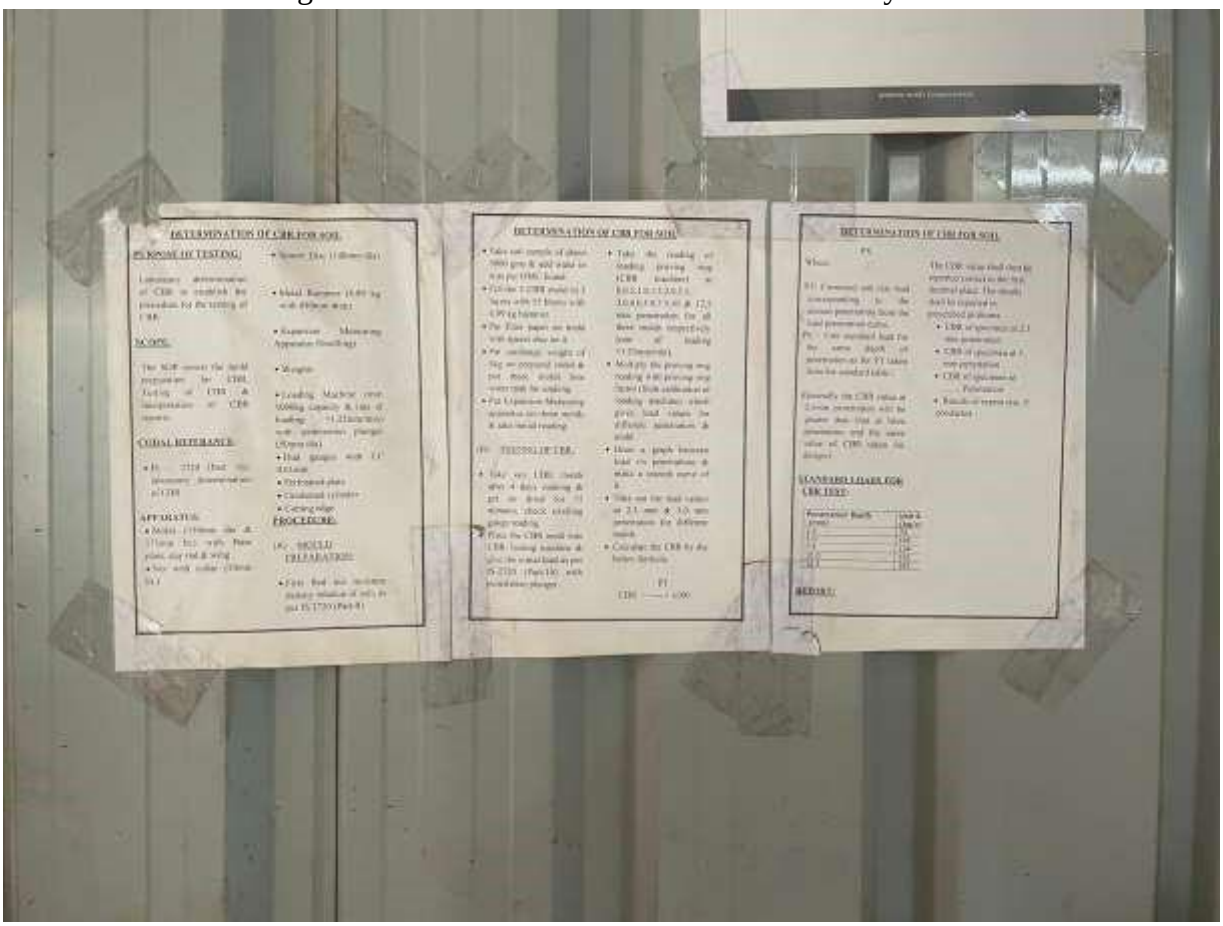

Figure 4.1: SOPs for raw material

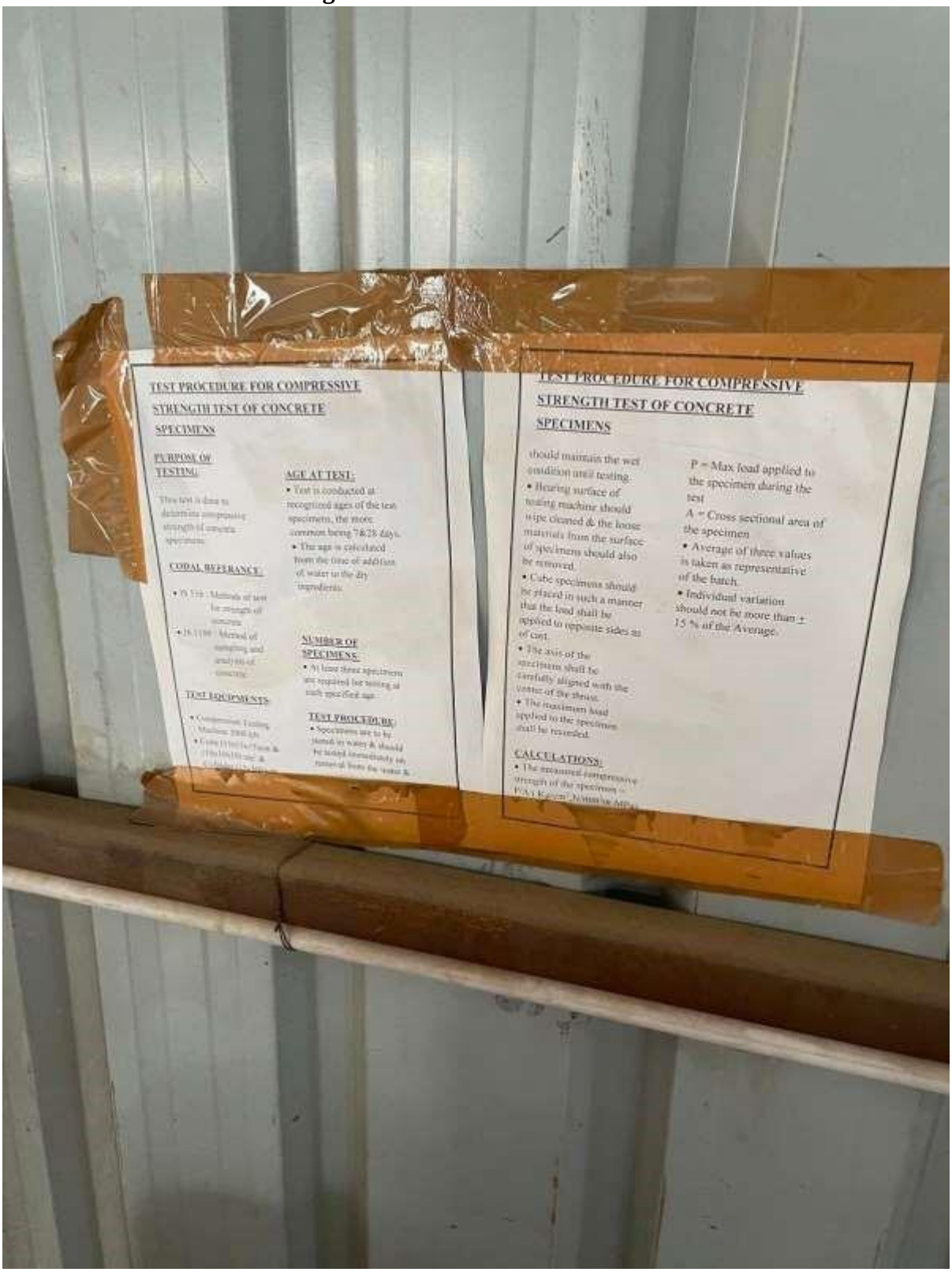

Figure 4.2: SOPs for soil testing

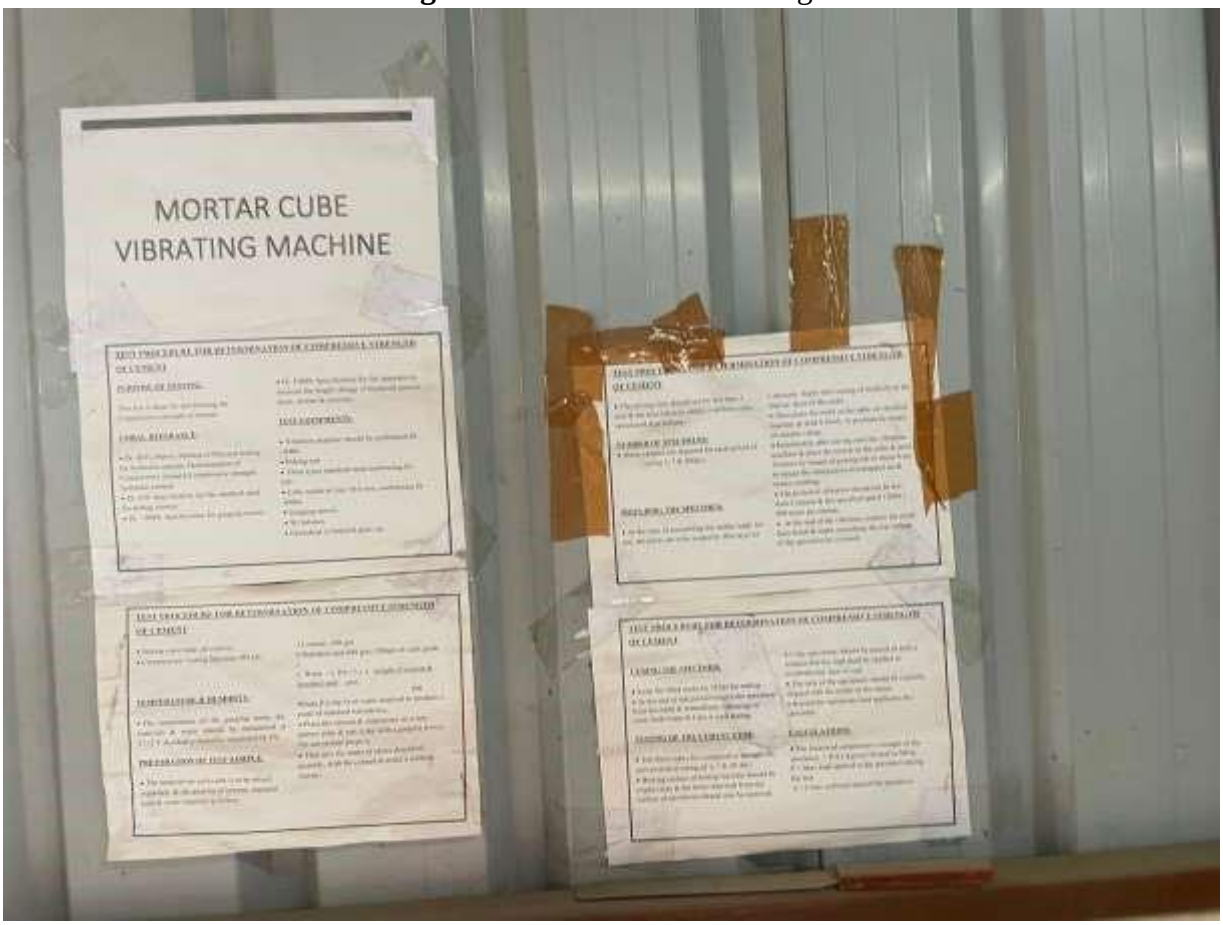

Figure 4.3: SOPs for mortar cube vibrating machine

Figure 4.4: Soil testing experiment

Conclusion

In conclusion, three-month internship at Raunaq construction, Haryana, India, was an enriching experience. Trainee's responsibilities were divided into two parts, focusing on road construction and concrete batching plant operations. Trainee primary objective was to take care of the procurement of raw materials, quality control of raw materials, setting standard operating procedures (SOPs), and conducting tests to check the final product from the batching plant.

Throughout the internship, the trainee learned a great deal about the construction industry, including the various types of raw materials used in road construction and concrete batching plant operations, the testing procedures for these materials, and the importance of adhering to SOPs in ensuring consistent and accurate operations.

The trainee also learned about the challenges faced in the industry, including issues with quality control and procurement of raw materials. However, the trainee was able to gain handson experience in overcoming these challenges, which will be invaluable in my future endeavors.

One of the highlights of my internship was the opportunity to work with a team of professionals who were highly skilled and experienced in their respective fields. The trainee was able to learn from them and exchange ideas on various aspects of the industry.

In addition, the trainee was able to develop my interpersonal skills, including communication and team-building skills. The trainee was able to work effectively with my colleagues and supervisors, which enhanced my ability to work in a team environment.

Overall, my internship was a valuable experience that provided me with practical skills and knowledge that will be beneficial in my future career. The trainee is grateful for the opportunity to work with such a reputable company and for the support and guidance provided by my supervisors and colleagues.

Recommendation

Based on my experience, the trainee would like recommend that the company continues to focus on quality control and procurement of raw materials. It is essential to ensure that the raw materials meet the required standards and are sourced from reputable suppliers.

In addition, it is crucial to maintain and adhere to standard operating procedures to ensure consistent and accurate operations. This will reduce the risk of errors and inconsistencies in the production process, which can result in a substandard final product.

Furthermore, it is recommended that the company invests in modern testing equipment and tools to enhance the testing process and improve accuracy. This will help to ensure that the final product meets the required standards and is suitable for use in construction activities.

Finally, it is recommended that the company continues to invest in the training and development of its employees to enhance their skills and knowledge. This will ensure that the company remains competitive in the industry and is able to provide high-quality products and services to its clients.