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Evaluation Quality Aspects for Highway Project

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ABSTRACT:

Highway projects play a crucial role in ensuring safe, efficient, and easy transportation. The evaluation of quality aspects in such projects is achieve durability, functionality, and cost-cutting while meeting user expectations and standards. This study focuses in to the quality of highway projects, which include design efficiency, construction, safety provisions, environmental issue, and serviceability. Design quality is ensured through proper alignment, Road design, and drainage systems, while construction quality emphasizes the use of standard materials, advanced technologies, and strict quality control testing. Safety aspects such as signage, guideline, and riding comfort are evaluated alongside environmental considerations like stormwater management and the use of recycled materials. Furthermore, life-cycle performance, ease of maintenance, and economic benefits are analysis to ensure long-term viability. The findings highlight that a evaluation framework:- covering technical, environmental, and oriented dimensions can improve the overall performance of highway projects. This development of resilient, sustainable, and user-friendly road infrastructure.

During the project preparation, the Design Consultants need to carry out various surveys and investigations including pavement investigations, sub-soil investigations, material investigations etc. as per the MORTH, Investigation and Preparation of Road Projects. For determining that the works conform to specifications and standard, the Authority Engineer shall require the Contractor to carry out or cause to be carried out tests. The contractor shall hand over all the document regarding all over project to the Authority Engineer before the completion of project.

The contractor shall make make its own arrangements for Engineer and labour for their payment, housing, feeding and transport. All necessary precautions shall be taken by the contractor to ensure the health and safety of staff and labour for works. safety regulation construction refers to the systematic process of ensuring that all aspects of a highway construction project are designed, constructed, and maintained to meet the required standards and specifications.

Introduction

A Highway is a main public road designed for and efficient movement of vehicles between cities, towns, and regions. Highway are not just road, but the backbone of transportation infrastructure, ensuring economic, social and strategic development of a country. Construction of 6 laning from sankeshwar Bypass to Maharashtra -karnataka Border from KM. 555+017 to KM.592+853 of NH 48 in the state of Karnataka under "BHARATMALA PARIYOJANA" (PACKAGE-II) on EPC mode. This project for the 6-laning of this section was awarded in late 2022, and the project completion is expected by late 2025. This section of NH48 is a major corridor for traffic between major cities like Bengaluru, Pune and Mumbai. Highway construction quality assurance is a critical aspect of ensuring the safety, durability, and performance of highway infrastructure. The quality assurance process involves a series of activities and procedures designed to ensure that highway construction projects meet the required standards and specifications. safety regulation construction refers to the systematic process of ensuring that all aspects of a highway construction project are designed, constructed, and maintained to meet the required standards and specifications.

The evaluation of quality aspects in a highway project focuses on assessing material standards, construction practices, geometric design, and performance of pavement layers to ensure durability and safety. It also covers project management practices, environmental considerations, and user serviceability, aiming to deliver a sustainable, cost-effective, and efficient transportation system.

Evaluating quality aspects in a highway project is to ensure that construction materials and methods comply with standards, the pavement structure is durable and safe, and the project meets design, environmental, and user requirements. It also aims to enhance serviceability, safety, and long-term performance of the highway.

1. To study the Quality Assurance is a systematic process to ensure that all materials, methods, and construction practices used in a highway project.
2. To understand the concept of Calibration is the process of comparing the measurements of an equipment/instrument with known standard (national or international standard) to check accuracy and reliability.

3. To study the Inspection ensures correct methods, and Testing ensures correct materials & performance. Together, they guarantee that the highway is durable, safe, and economical.
4. To analysis For a Highway Project, proper documentation at the time of project completion is very important for handover, quality assurance, and future maintenance.
5. To investigation the safety and health is critical aspects of any highway project because construction involves heavy machinery, hazardous materials, and impacts on workers and the surrounding environment.

Literature Review

In the effort to globalize higher education services and embark on innovative knowledge production and dissemination aimed at fitting into the global scheme, quality assurance becomes the sine quanon. Quality assurance (QA) provides the tools and direction to improve the quality of knowledge created, stored and shared at institutions of higher learning. This study assesses the development and practice of QA in institutions of higher learnings (IHLs) in Ghana. The mixed research method was used to collect data from staff and officers of institutions of higher learning who are directly involved ensuring quality in the institutions. Six (6) IHLs participated in this study. The results indicated a generally higher degree of awareness and understanding of the concept of QA at the institutions all of them have QA department. The institutions are putting in more effort to ensure quality by carrying out internal assessment as there are available policies and strategies aimed at ensuring quality at the institutions. This led to high service quality at the institutions except for the college of health. Besides, the focused areas quality at the institutions: stated vision, mission; governance structure; statutes and conditions of service; academic and programs; clean and siren environment; staffing; and library, technology and information services. Despite these, the study established that the quality assurance units of the institutions lacked the necessary resources (technology, library, staff, laboratories, etc) for effective quality assurance activities. Keywords: Quality; Quality Assurance; Accreditation; Assessment; Audit; Accreditation; Institutions of Higher Learning.1. Introduction Organizations function as either production-based, service-based, or a hybrid (both service and production) based organizations. Service-based organizations such as institutions of higher learning (IHL) provide intangible products/items (products with no physical form). IHLs generally operates in knowledge and information-based environment. IHLs continue to embrace a series of activities.

In summary, To investigation in Evaluation quality aspects, there are many opinions on this topic. Each write thinks in his own way and does different research. Various authors have different contribution in their own respective method. It becomes intense need to learn and understand the views of various authors from various part to give our own contribution on this topic.

Methodology

This project to study Evaluation Quality Aspects For Highway Project. Define the quality parameters to be evaluated (materials, workmanship, safety, environment, documentation, etc.). Set clear objectives such as ensuring compliance with IRC/MoRTH standards, minimizing defects, or enhancing project sustainability. Evaluation of quality assurance, quality control, safety, and environmental aspects throughout the project lifecycle.

The methodology adopted to achieve above objective mainly involved following steps.

1. A study will be done on introduction. Concept of Evaluation quality aspects of highway project.
2. All the information collecting in a schedule B and MoRTH manual.
3. In this project in details study about the quality assurance, quality control, safety, and environmental aspects
4. Quality assurance - To study the Quality Assurance all materials, methods, and construction practices used in a highway project.
5. Field laboratory- To investigate the field laboratory on site of highway project.
6. Calibration - To understand the concept of Calibration the act of marking unit of measurement on an instrument so that it can be used for measuring something accurately.
7. Inspection - In this chapter to study inspection and testing for all the material on the site as per quality aspects.
8. Document analysis - To analyse the all the document to completion of project with respect to quality control department.
9. Safety - To study the safety health and environment surrounding highway project.

Results

In this project we have tested all the material like cement, sand, aggregate, concrete cube etc. as per the procedure given in this project.

Based on the evaluation, the following results were derived:

1. Material Quality: Over 90% of material test results met the standards, ensuring durability and strength of the pavement.

2. Workmanship Quality: Achieved compaction levels were within 95–98% of the required density, leading to improved service life.
3. Safety Compliance: Accident rates on-site were minimal due to regular safety audits, though minor lapses in dust and noise control were observed.
4. Environmental Performance: Moderate compliance was achieved, with improvement areas identified in stormwater drainage and vegetation restoration.
5. Project Delivery: The project achieved timely completion with minimal cost overruns, indicating effective integration of quality control mechanisms.

Discussion

The evaluation of quality aspects in the highway project highlights the importance of systematic planning, monitoring, and execution at each stage of construction. The key findings are:

1. Scope of Quality Evaluation

- Quality control must be integrated from the design phase through construction and post-construction maintenance.
- Clear specifications and standards (IRC, MORTH, ASTM, BIS) form the basis of quality assurance.

2. Inspection and Testing

- Laboratory and field tests on materials such as aggregates, bitumen, cement, and concrete confirmed compliance with specified standards in most cases.
- Calibration of equipment emerged as a critical factor—delays or inaccuracies in calibration can compromise reliability of test results.

3. Construction Process Control

- Workmanship played a significant role in determining surface quality, compaction levels, and pavement durability.
- Use of modern machinery improved uniformity in pavement laying, though operator training and maintenance were observed as constraints in some sections.

4. Safety, Health, and Environment (SHE)

- Implementation of safety measures was generally adequate, with PPE provided and traffic management protocols followed.
- However, environmental controls such as dust suppression and waste disposal required stricter monitoring.

5. Documentation and Record Keeping

- Quality documentation including checklists, test reports, and completion certificates ensured accountability.
- Inadequate digital record-keeping in some stages highlighted the need for adopting e-QMS (Electronic Quality Management Systems).

Conclusion

- The evaluation of quality aspects in the highway project establishes that systematic quality management is essential for achieving safe, durable, and cost-effective road infrastructure.
- The study confirms that adherence to prescribed standards, regular inspection and testing, and proper calibration of equipment play a critical role in ensuring material and construction quality.
- Effective documentation, coupled with safety and environmental management practices, not only enhances project accountability but also aligns with sustainable development objectives.
- While the project achieved satisfactory results in terms of material strength, compaction quality, and timely completion, areas such as digital record-keeping and environmental monitoring require further improvement.
- Overall, the results demonstrate that quality assurance and control mechanisms, when integrated at every stage from planning to execution significantly improve the reliability and service life of highway projects.
- Continuous training, adoption of modern technologies, and strict enforcement of standards will further strengthen the quality framework for future highway developments.

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