

**NCET  
2020**

**NATIONAL CONFERENCE  
ON EMPIRICAL THEORIES  
IN ARCHITECTURE, PLANNING AND  
CONSTRUCTION MANAGEMENT**

M.C.E SOCIETY'S  
**ALLANA COLLEGE OF  
ARCHITECTURE, PUNE**

IN ASSOCIATION WITH

**COUNCIL OF ARCHITECTURE, NEW DELHI  
AND  
INDIAN INSTITUTE OF ARCHITECTS, PUNE CENTRE**

**e-Proceedings of  
the National e-Conference  
on Empirical Theories  
NCET-2020**

**7TH & 8TH AUGUST 2020**

[www.allanaarchitecture.org](http://www.allanaarchitecture.org)

ISBN : 978-93-5416-259-6

**ACOA** 



ALLANA COLLEGE  
OF ARCHITECTURE, PUNE



Council of Architecture

NEW DELHI,  
INDIA



INDIAN INSTITUTE OF  
ARCHITECTS, PUNE CENTRE

3	<b>Gazala Asrab Tamboli</b>	Analysis Of Intelligent Lighting Systems In Washrooms In Commercial Malls: Case Studies: Amanora Mall And Seasons Mall, In Hadapsar, Pune	PG-10
4	<b>Ketaki Deshpande</b>	Sustainable Practices In Construction Management	PG-15
5	<b>Daksha Ajit Deshmukh</b>	Documentation On Management Of Accommodation Facility For Pilgrims Of Kumbhmela 2015 At Nasik	PG-18
6	<b>Nupur Ravindra Bobde, Aparna Panganti</b>	Study Of Labour Productivity For Small Scale Construction Projects In Pune	PG-22
7	<b>Shubham Chauhan</b>	Current Scenario Of Construction Workers In Pune (PMC Limits)	PG-26
8	<b>Shubhra Pathak</b>	Planning Of Warehouse With Respect To Today's Requirement Of Market	PG-30
9	<b>Deepti Pardeshi</b>	Review On Just-in-time Technique For Material Management In Construction Industry	PG-34
10	<b>Deepti Rajendra Pratap Shaahi, Bhagyashree Apte</b>	Research On Project Management For Construction Of Residential Building (G+3) In "Sustainable Ferrocete Construction technology" Ferrocete Technology-project Management Of Sustainable Resilient Technology For Future...	PG-38
11	<b>Dipti Sameer Bapat</b>	Soil And Plantation Management For Landscaping Of Residential Projects In And Around Pune (Site Area 10 - 40 Acre)	PG-43
12	<b>Manisha Atul Patil</b>	Impact Of Usage Of Bathroom Pods In High Rise Or Mass Residential Housing Projects Review & Evaluation Of Bathroom* Construction Systems In Contemporary India	PG-47
13	<b>Manjiri Deshpande, Laxmi Salgia</b>	Behaviour Based Safety Approach For Fire Safety In High Rise Residential Buildings - Case Study Of Pune	PG-51
14	<b>Radhika Ronak Bhattad</b>	A Review Of Conventional Rigid & Flexible Paving Materials For Sustainable Urban Road Construction At Nashik, Maharashtra, India	PG-55
15	<b>Neha Chandrashekhar Hiremath, Prachi Aiyer</b>	Feasibility Of Including Water Recycle Plant - A Case Study For An Existing Residential Project at Solapur	PG-59
16	<b>Rajashri Halgane</b>	Reviewing The RERA Clauses To Study The Impact On RERA Registered Project With Respect To Timeline Housing Projects Located On The Outskirt Areas Of Pune Region	PG-63

# A REVIEW OF CONVENTIONAL RIGID & FLEXIBLE PAVING MATERIALS FOR SUSTAINABLE URBAN ROAD CONSTRUCTION AT NASHIK, MAHARASHTRA, INDIA

**Ar. Radhika Ronak Bhattad**

*Student, M. Arch (CM), Allana College of Architecture, Pune*

*E-mail: [radhikabhattachad2207@gmail.com](mailto:radhikabhattachad2207@gmail.com)*

## **ABSTRACT:**

*The development and maintenance of urban road infrastructure systems is an integral part of modern city expansion processes. With the rise in awareness of environmental issues and diminishing natural resources, the focus of infrastructure construction industry is shifting towards eco-friendly materials and technologies. Rehabilitation of urban roads involves construction of rigid or flexible pavements depending upon its existing typology of pavement. This research paper shall be a review of conventional sustainable rigid and flexible pavement materials. A comparative analysis of materials such as, Plain Bitumen, Plastic in Hot Bituminous Mix, Reclaimed Asphalt Pavement (RAP), Pavement Quality Concrete (PQC) and Ground Granulated Blast Furnace Slag (GGBFS) in Ordinary Portland Cement shall be done with respect to the construction management principles. The comparison matrix shall be derived from the existing literature review and suitable case studies. The research would culminate to encourage the use of Waste Plastic in Hot Bitumen Mix and Ground Granulated Blast Furnace Slag (GGBFS) in Ordinary Portland Cement as sustainable flexible and rigid pavement materials respectively.*

**KEY WORDS:** *Sustainability, rigid, flexible, pavements, bitumen, concrete*

## **INTRODUCTION:**

Urban roads are a part of urban infrastructure. These roads are required for both intra-city and intercity movement and render much higher level of service compared to Rural Roads, State Highways and National Highways. The planning, development and maintenance of urban roads are often a challenge to the engineers.[1] Nashik is one of the emerging cities in Maharashtra. The road network of the city have been developed rapidly due to its social, cultural, industrial and mythological importance. From the current road conditions, it can be seen that these urban roads will require maintenance from time to time.

The road pavements are broadly classified in two types: rigid and flexible pavements. Generally, for the maintenance of rigid pavements Pavement Quality Concrete (PQC) is used and for flexible pavements, plain bituminous mix is overlaid. These materials consume a remarkable amount of energy during the production, construction, operational and the end of life phase. If the maintenance of roads is done using appropriate sustainable materials it shall: reduce the costs, reduce the emissions and reduce the consumption of raw materials thus preserving the resources for the future generations.

The aim of this study would be to review the sustainable rigid and flexible pavement materials which can be opted with regards to maintenance of major urban roads (12 m wide) in Nashik. The research is carried out with the objective to lay down a comparative matrix of materials (plain bitumen, waste plastic in hot bituminous mix, reclaimed asphalt pavement, PQC, GGBFS) with respect to the construction management principles and ultimately recommend the most sustainable material.

## **ROAD PAVEMENT MATERIALS:**

### **Road Pavement:**

A road pavement is a structure consisting of superimposed layers of processed material above the natural soil sub-grade, whose primary function is to distribute the applied vehicles load to the sub-grade.[2] Considering the vehicle distribution, for 12 m wide four lane single carriageway roads, the design of the pavement should be based on 40 % of the total number of commercial vehicles in both directions.[3] The road pavements are broadly classified in two types namely, flexible and rigid pavements.

### **Types of Road Pavements:**