

The Need For Economically Viable & Eco-Friendly Road Construction

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ABSTRACT

Promoting green road construction has become indispensable in the coming years to emphasize on sustainable development and environmental protection. The paper discusses the significance and scope of green technology with references to road construction. It discusses the viability of using fly ash, waste plastic, marble waste, building wastes and et al. for environmental protection and cost effectiveness in road construction projects. The paper emphasizes on constructing green highway for economic, social and environmental reasons and for effectiveness in infrastructure building for rapid economic growth and development of a nation using recent advancements in the field of road construction technology.

Keywords: Sustainable development, fly ash, waste plastic, building waste, construction technology, infrastructure.

INTRODUCTION

With the advancements in the field of road construction technology, the construction of rehabilitated roads, which support environment providing long durability to road infrastructure, is required utilizing alternative materials, industrial and construction wastes and by products, facilitating road travel, travelers comfort and safety together with cost effectiveness and sustainable development.

Go green movement is gaining strength with increased global warming and climate changes. Going green in transportation projects implies environment friendly construction of roads with the availability of alternative materials and the unique question of disposal of non-decaying waste posing a problem for environmental protection. With increased industrialization and growth of population with increasing quantities of waste world over together with increased demand for traditional road construction materials such as bitumen, cement, aggregate etc, the question is of sustainable development. With advances in science and technology, the use of non-decaying materials such as Plastic, Blast furnace slag, Fly ash, Scrap tyres, Mine wastes, Marble dust etc, offer an economically viable and sustainable alternative towards increasing demand for better road construction. In this way these materials can be utilized in an eco friendly way, providing solutions to their disposal with a commitment towards development of infrastructure and accountability towards the society at large.

2. REASONS TO USE ECONOMICAL ALTERNATIVE MATERIALS IN AN ECO- FRIENDLY WAY

Increased global warming and climate changes.

The problem of creation and disposal of non-decomposing materials. Increased demand for infrastructures like road with increase in population.

Limited natural resources for road construction

Depletion of good quality material for road construction

Increased cost and a question of cost effectiveness. Adverse environmental impacts. Protection of environment with the use of alternative material

Reduction in construction time and enhancement in economic feasibility

3. ALTERNATIVES AND UTILIZATION OF WASTE MATERIAL IN AN ECONOMICAL AND ENVIRONMENT FRIENDLY WAY

A. FLY ASH

Causes of using fly ash as filling material in road construction:

It is having light weight, lesser pressure on sub-soil It has high shear strength

High permeability Ease of compaction

Non plastic and cohesion-less

Fly ash usage- Environmentally safe Best filler in Bituminous mix

Active support of government “IRC guidelines”

IRC code SP: 58 Guidelines for construction of road embankments using fly ash.

B. Waste Plastic In Road Construction

Causes of using waste plastic in road construction:

Disposal of plastic waste by land filling or burning is not Eco-friendly therefore an urgent need of alternate use of waste plastic.

Utilization of plastic waste in bitumen mix to improve the properties of the binders, which can prove to be a promising alternative.

Recent studies in this direction have proved that the fatigue life is doubled and resistance to rutting and water damages increased when plastic waste is used.

Gives higher strength

Resistance towards water stagnation, i.e. No pot holes are formed. Less bleeding during summer Higher Marshall stability

Burning of plastics waste could be avoided Lower maintenance costs

Reduction in consumption of bituminous mix.

This technology would help to produce better roads with longer service life and would also be economical as there would be considerable savings in the ever increasing costs of bitumen & also protect the environment.

Cost of waste plastic around Rs.6 per Kg vice-versa cost of bitumen being around Rs.14 per Kg. Hence there was a saving in cost of road construction also.

C. Use of Marble Waste

Marble waste flow in river and streams is hazardous to Aquatic life & this waste has been major pollutant to land, air and water bodies. Can be used for construction of road embankments. For construction of pavement blocks (layering up to 25 % to 35%).

D. Use of Building Waste

Crushed concrete can be effectively used as a road material in different layers as the properties satisfy the Ministry of Road Transport and Highway (MORTH) requirements. Brick aggregate found to be relatively soft compared with other recycled aggregate and can be used as a sub-base material but not in base course and wearing course.

Water absorption of all types of waste materials found to be high compared with conventional aggregate. Except brick masonry, all other materials satisfy the specific gravity requirements.

Los Angeles abrasion value for all the materials found to be within the limits as per Morth specifications except brick aggregate

Table 1: Laboratory results for different types of materials

Description of Materials	Specific Gravity	Water Absorption (%)	Aggregate Crushing Value (%)	Aggregate Impact Value (%)	Los Angeles Abrasion Value (%)
Crushed Concrete (Fresh)	2.64	2.71	33.2	26.5	28.7
Crushed Concrete (20 yrs old)	2.51	4.54	34.8	29.3	30.5
Stone Masonary (fresh)	2.42	4.93	38.4	31.7	36.3
Stone Masonary (20 yrs old)	2.28	6.82	42.7	33.5	38.9
Brick Masonary	2.10	10.36	65.3	59.3	72.4
Conventional Aggregate	2.73	0.45	24.2	20.7	19.8

To meet the needs of growing population, increased demand for benefits out of the transportation, urban growth, public health and protection of environment and surrounding communities, it should be emphasized that there is need for constructing green highways with use of alternatives which are eco- friendly and economically viable.

“A Green highway is a road way construction as per a relative new concept for road way design that integrates transportation functionality and ecological sustainability. An environmental approach is applied throughout planning, design, and construction.”

Green highways when built to standards of the concept floated by various agencies can provide invaluable benefits to environment preventing the flow of waste material and toxins into the rivers and streams. Since construction involves recycled materials, land fill usage is favorably reduced and with the help of technology the strength of the roads is also increased. This also helps in protecting certain resource areas and using alternative materials in innovative ways to enhance transportation opportunities and promoting proper utilization of resources available for sustainable growth and development which is utterly needed in the face of environmental degradation, change of climate and its adverse impacts on health of the community at large.

Instead of going for curative measures and the expenditure incurred for maintenance, it is better to emphasize on preventive type of construction technology there by reducing the risks of landslides and increased soil and water erosion together with the depletion of valuable natural resources. The catastrophe that occurred in Japan which was faced with an earth quake followed by tsunami emphasizes that the time has come for going green with green technology. e. g. road alignment along a ridge that avoids natural calamities like floods, drainage problems, problem of maintain vegetation cover, managing large among of excavated materials etc. leading to sustainable development with environmental protection. Green roads are economical and sustainable and easy to maintain.

There are social aspects of green road construction as well as mentioned earlier, that the technology offers employment opportunities by utilizing labour intensive techniques on construction promoting the interests of the people at large.

CONCLUSION

Green road construction technology aims at low cost road construction, offering employment opportunities to the masses – generating income at the disposal of the people involved thus improving the standard of living of the community at large. The technology also leads to appropriate and optimum resources utilization enhancing the country's potential to grow faster by eliminating the possibility of resource erosion (depletion), it also provides an opportunity to employ alternatives which are cheaper, easily available and are eco-friendly.

The need of the hour is to develop and accept the designs and technology which is environment friendly and economical feasible adding an edge to Road construction with lower cost and less maintenance.

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