

AN EXPERIMENTAL INVESTIGATION ON USING OF WASTE RUBBER TIERS AS A PARTIAL REPLACEMENT OF STONE AGGREGATE IN HIGHWAY CONSTRUCTION

Introduction

Historically, cement, bitumen, soil, gravel, sand, etc. are used for highway construction. Natural materials being consumable in nature and its quantity is declining gradually. Also, cost of well quality of natural material is increasing. As the world population grows, so the amount and type of waste materials are arising and being generated. This causes various environmental problems including air pollution due to burning of tires and aesthetic pollution which causes severe health related issues. Utilizing of these materials in highway construction can successfully reduce the pollution and disposal problems. For this investigation waste rubber tires (crumb rubber tires) will be used as a partial replacement of stone aggregate by various percentage for enhancing of strength, stability, fatigue life and other desirable properties of highway. Crumb rubber tire is a waste material which produced by shredding and comminuting scrap tires. During the recycling process, steel and tire cord are removed. Therefore, I have selected this topic because I want to know how much it contributes to either highway properties or economic development.

Research Method

This study is Experimental based on trials. To find the optimum result for this study, many trials will be prepared for determining the best ratio. For this study large no of waste rubber tires (crumb rubber tires) are collected. These waste tires cut to the rubber cutting machine in various sizes (80mm to micron). All the rubber pieces are sieved as per the required sizes for the mixing purposes. Various processes like de dusting and washing are used to clean the waste rubber tires. These clear pieces are added in bituminous mix, 5% to 15% by weight of stone aggregate. Then, these well sieved and cleaned rubber aggregate is mixed well with stone aggregate and bitumen at temperature of about 160C-170C for the proper mix design to enhance stability, strength durability and other desirable properties of highway. The different tests conducted on aggregate (Impact, Crushing, Abrasion, Specific Gravity & Water Absorption test) and the methodology and mix design will be according to Indian Code (IRC: SP20).

General Structure of the Study

The main objective of this investigation is to use the waste materials as raw materials for the industry. Environment friendly, one of the objectives of using waste rubber tires (crumb rubber tires) in highway construction is to reduce the industrial waste and to save natural materials. By saving the natural material it will reduce the greenhouse gas emission and makes environment green. Also, as we know that the use of this waste material is a new innovative and it will take place as a conventional material in future, so the use of this waste material as a partial replacement of stone aggregate in highway construction with different percentage (5% to 15% by weight of stone aggregate) for the purpose of increasing durability, strength, stability and other desirable properties of highway can cause to save energy and total cost of naturally available materials. The

material supposed to be used in this study are Crumb rubber, fine aggregate, coarse aggregate and bitumen.

Academic Contribution of the Study

Nowadays, the disposing of waste materials has become a vast problem. The use of these materials as a construction material is the hope of community to reduce air pollution. Utilizing of Waste rubber tires in different field of construction as a partial replacement of stone aggregate, crack/joint sealant, asphalt-rubber mixtures, surface/ interlayer treatment, for soil reinforcement, in subgrade/embankment, as a lightweight aggregate, will 1. reduce damage to health, 2. decrease maintenance cost of road pavement, 3. reduce the noise pollution due to the main property of rubber, 4. reduce the cost of bitumen due to the replacement of rubber tires, 5. reduce the cost of stone aggregate and will save the cost, energy source and waste management for industry.

Literature Review

Literature review has been done from 1. google scholar such as John Read, Tim Dodson and Joe Thomas (use of shredded tires for lightweight fill), 2. Springer Journal such as Mohammed Ali Mohammed Al-Bared, Aminaton Marto, and Nima Latifi (Utilization of Recycled Tiles and Tires in Stabilization of Soils and Production of Construction Materials), 3. Indian Journals such as Sayed Omar Sadat (Environmental impact and use of waste material in highway construction), Sanjay Ghuge, Rahul N. Tambe, Vikrant T. sahane, and Vijay A. Sonawane (A Study On The Properties Of Bitumen & Aggregate By Replacing Waste Tire Rubber With Bitumen & Aggregate Construction of Road Pavement) and many different sources and books Literature already reviewed in every specific material which will be used in this study and from every possible way which can be used this material in highway construction, so after all literature review it has been found that this topic is a new topic for research in Civil Engineering field and it will ensure the best result with high Performance for production of pavement in industry.