INTI INTERNATIONAL UNIVERSITY

Faculty of Engineering and Quantity Surveying

Investigation on Optimum Bitumen Content of Asphaltic Concrete Mix (ACW 14) with Replacement of Fine Aggregates with LDPE

Shahbaz Ahmed Memon

B.Eng (Hons) in Civil Engineering

Mr. Sudesh Nair

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SUPERVISOR'S DECLARATION

This project report entitled Investigation on Optimum Bitumen Content of Asphaltic Concrete Mix (ACW 14) with Replacement of Fine Aggregates with LDPE is prepared and submitted by Shahbaz Ahmed Memon I12000520 as partial fulfillment of the requirement for Bachelor of Engineering (HONS) in Civil Engineering, INTI International University.

APPROVED BY:

..... Date 18/12/17

Sudesh Nair

STUDENT'S DECLARATION

I hereby declare that the final year project is based on my original work except for quotations and citations, which have been duly acknowledge. I also declare that it has not been previously or concurrently submitted for any other degree at INTI INTERNATIONAL UNIVERSITY or other institutions.

Signature : 

Student Name : Shahbaz Ahmed Memon

Student ID : I1200020

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ABSTRACT

50 % Partial replacement aggregate of size 75μm and <75μm been done with low density poly-ethylene. 4%, 5%, 6% and 7% bitumen content by weight of aggregates has been added to design mix for Asphaltic Concrete Wearing Course 14mm design. the result show that at optimum bitumen content of 5.78% by weight of aggregates the stability is 14200N which above 13000N minimum required. Flow is 4.8mm which is within the range of 2mm-5mm required. Voids filled with bitumen (VFB) are 67%, also within the range of 65%-75% and Voids in total mix are 6.8% which are at the border of the range 3.0%-7.0% which is acceptable. Overall the performance of the design mix is satisfactory and complainant.

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LIST OF ABBREVIATION

BI	Bitumen
FA	Fine Aggregates
CA	Coarse Aggregates
VTM	Voids Total Mix
VFB	Void Filled Bitumen
OBC	optimum bitumen content
Gmb	Bulk Specific Gravity
%	Percentage
LDPE	Low Density Poly Ethylene
CA	Coarse Aggregates
FA	Fine Aggregates

CHAPTER 1

INTRODUCTION

1.1 General

Transportation is necessity for human beings to survive on this planet. There are many ways of transport that human race has created. Among all the various ways modes of transportations, the most important and essential way through paved roads. Paved roads or in engineering terms pavements can be of many kinds. Use of asphaltic concrete is the most used material to constructing pavements or paved roads (Keane, 1996).

Asphaltic concrete is mixture of coarse aggregates, fine aggregates and bitumen. There are many methods in which these materials can be mixed together to achieve desired specifications. specifications contain durability, braking efficiency, load bearing capacity and permeability (Keane, 1996). Road construction is important for infrastructure development. People welfare and economic activity is directly affected by the roads they travel on. Initial construction cost in for road development are usually low and economical to bear. However, rapid increasing traffic volumes and traffic loads can cause rapid decrease in the road surface and quality. There can be various number of reasons for deformation such as environmental factors and poor workmanship. Due to all these above-mentioned conditions, maintenance cost in the long run can be a huge burden on the concerned parties (Keane, 1996).

Therefore, engineers are trying to modify characteristics of asphaltic concrete with extensive research. Previously different types admixtures and methodologies have tried and tested. One such way is to add materials that are adhesive in nature to bitumen and modify the characteristic of bitumen mixture. Testing of waste material and other materials have been undertaken to reduce the cost of road constructions (Keane, 1996). Also, at the same researcher have been heavily invested in modifications and improvement in asphaltic concrete mixture. One of way of modifications and cost reductions can be the use recycled plastic powder as filler. Plastic are adhesive in nature and can have positive effects of asphaltic concrete.

1.2 Statement of problem

Road development is expensive but important. Developing countries are still suffering from lack of infrastructure due to lack of funds for infrastructure development. Employing techniques and materials which reduce the cost of the construction, without compromising on the standard specification and constructions codes is a real-world problem to solve.

Secondly, increasing the efficiency of asphaltic mixture to resist permanent deformations such as rutting, shoving, bleeding, raveling and fatigue is also an aim to be achieved. This is important for road safety and longevity of the pavement which can be huge factor and cost reduction.

Effective use of waste produced is necessary for survival and betterment of environment. Plastics have adhesive quality and they are available in huge quantitates for cheap price. Use of recycled High Density Poly Ethylene (HDPE) and Low Density Poly Ethylene can be an effective way to reduce negative effects on environment and waste disposal.

1.3 Research Objective

- 50 % replacement of size 75μm and <75μm aggregates of recycled Low-density polyethylene (LDPE) in ACW 14
- Dry method will be employed for preparing the samples.
- Investigations and rigorous testing needs to be carried out to find optimum bitumen content.

1.4 Scope Of Study

The scope study to achieve the research objective will be limited to:

a) Hot mix asphaltic concrete of ACW 14 (14mm asphaltic concrete in wearing course).
b) Use of dry method to prepare the samples.
c) LDPE (low density poly-ethylene) is used for replacement of aggregates.
d) 3 Specimen of 4 %, 5%, 6%, 7% bitumen content are tested.
e) 2 tests (STABILITY and SPECIFIC GRAVITY) will be carried out. The values of Marshall Stability and Marshall Flow is measured by using Marshall Compression Machine. The different graphs will be plotted showing the relation of Bitumen with different properties of Asphalt like

- Bitumen content versus Marshall Stability
- Bitumen Content versus Marshall Flow
- Bitumen content versus % Air Voids
- Bitumen content versus Voids Filled
- Bitumen Content versus Density

The optimum bitumen content is found by using these graphs after doing the tests.