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The Preliminary Tests of Ingredients of Concrete Pavement Block

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Abstract

Pavement blocks, which are industrial products of pre-fabricated unarmed concrete, having various dimensions and special morphology are used for pavement laying of residential projects carrying pedestrian and vehicular traffic. Various researchers used different materials such as waste glass, fly ash, plasticizer etc. to overcome the problems of pavement blocks. Hence an attempt is made to improve the properties of paving blocks to overcome the problems through various proportions.

The present experimental investigation examines the effect of fly ash, as partial replacement to cement and dust as partial replacement to fine aggregate on the various properties of pavement block. Investigation is done on M30 mix using fly ash as partial replacement by weight of cement. Experimentation is carried out to find the compressive strength, flexural strength and abrasion resistance of the concrete paving blocks.

1. INTRODUCTION

Concrete block pavements ~CBPs! differ from other forms of pavement in that the wearing surface is made from small paving units bedded and jointed in sand rather than continuous paving. Beneath the bedding sand, the substructure is similar to that of a conventional flexible pavement. In concrete block pavement CBP the blocks are a major load-spreading component. The blocks are available in a variety of shapes and are installed in a number of patterns, such as stretcher bond, herringbone bond, etc. A review of existing literature revealed considerable differences in findings regarding the contribution of various block parameters to the structural capacity of pavement. The surface of CBP comprises concrete blocks bedded and jointed in sand. It transfers the traffic loads to the substructure of the pavement.

Fly ash is a waste produced in coal-fired thermal power stations. It has pozzolonic properties and can therefore be stabilized with either cement or lime to achieve the strength required for use as base courses in pavements. Agencies such as the Electric Power Research Institute EPRI have specified criteria and guidelines for the determination of the stabilizer content. This requires carrying out unconfined compression tests on stabilized fly ash specimens prepared and cured as per standard procedures. The stabilizer content is the minimum amount of the stabilizer for which the unconfined compressive strength of the specimens complies with the specified values. The actual curing conditions of the stabilized fly ash bases in the field, however, will differ from those of the laboratory specimens. This will affect the strength development of the bases, their durability, and their performance. The paper explains the details and results of a laboratory experimental program carried out to study the influence of curing conditions and other factors on the development of strength. The program comprised compaction tests and unconfined compression tests. Two Indian fly ashes and a commercial portland cement were used in the study. Six different curing conditions, including controlled and ambient conditions, were adopted. The influence of differences in the dry unit weight and water content was also investigated.

As solid waste disposal has received increasing attention, waste glass has been heavily targeted for recycling efforts, with some localities contemplating prohibitions of glass in landfills. Not all waste glass can be recycled into new glass because of impurities, prohibitive shipping costs, or mixed color waste streams that may be difficult to separate into useful raw glass stocks. Use of this waste glass in construction materials is among the most attractive options because of the volume of material involved, the capacity for use of the material in bulk, and the likely ability of construction applications to afford allowances for slight variation in composition or form.

2. Methodology

The total experimental approach involved in this work has been divided into three different phases. The details of the work in phase are narrated below.

Phase-I:-

1) Procurement of natural coarse aggregate and river sand sufficient for experimentation.
2) Procurement of cement required for the experimentation.
3) Procurement of waste glass, fly ash and plasticizer for experimentation.
4) Carrying out all preliminary work such as testing cement, natural coarse and fine aggregate.

Phase-II:-

1) Designing concrete mix by using standard method of mix design using important parameters of the cement and aggregates.
2) Casting of specimen.
3) Storing of cast specimen for water curing with specific identification mark, for requisite period, in curing tank.
4) Testing of cast specimen for various strength properties after full curing period.

Phase-III:-

1) Replacing the fine aggregate by waste glass in certain percentage required.
2) Replacing the cement by fly ash in different percentage required.
3) Casting of specimen.
4) After testing, comparing the results.

Experimental details: -

The main steps are elaborated in detail as per IS Code provision.

Phase I: - Testing of materials:-

a) Cement: Various properties were evaluated such as fineness of cement as shown in Fig. 3.1, standard consistency , setting time as shown in Fig. 3.2, soundness, compressive strength through IS Code provision such as IS 1489 (Part I) 199112

b) Fine aggregate: Various properties such as specific gravity as shown in Fig. 3.3 , fineness modulus, bulk density, silt content as per IS 2386 Part I, III-196311

c) Coarse aggregate: Various properties such as fineness modulus, bulk density, water absorption as per IS 2386 Part I & III-196311.

Phase II: - Concrete mix is designed for M30 grade considering properties of materials like cement, sand and coarse aggregate. The controlled concrete specimens are cast and tested for compressive strength, flexural strength, abrasion resistance.

Phase III: - In the concrete thus designed, cement is replaced by fly ash in the percentages 25%, 55% (by weight of cement) and fine aggregate is replaced by waste glass. Specimen cast for this concrete for various strength tests and the results are compared with the control concrete.

For each fly ash replacement percentage (25%, 55%) and waste glass replacement plasticizer is added as an admixture to the concrete in various percentages like 0.35%, 0.50% (by weight of cement). The concrete is prepared and specimens are cast for various strength properties of hardened concrete such as compressive strength, flexural strength, abrasion resistance.

3. Objectives

This report presents the results of an experimental investigation that was carried out to evaluate the factors influencing the properties of pavement blocks with dust, fly ash, waste glass and admixtures. The primary objective of this project to determine the flexural strength, compressive strength, abrasion resistance of the concrete paving blocks concrete. The following were the objectives of the research.

a. To find the Compressive strength of M30 grade concrete by using fly ash, waste glass, dust, admixtures.

b. To obtain the flexural strength of M30 grade concrete by using fly ash, waste glass, dust, admixtures.

c. To obtain the abrasion resistance of M30 grade concrete by using fly ash, waste glass, dust, admixtures.

d. To observe the durability of the concrete paving blocks.

4. Tests on cement

a. Fineness of cement,
b. Standard consistency
c. Setting Time- Initial setting time
   Final setting time
d. Compressive strength of cement
e. Soundness of cement

5. Result and Discussion

Experimentation is an activity required by the majority of the engineering researches, where it comprises all preparation and plan of action to be taken and being situated into operation afterwards.
The tests carried out on the constituent materials & their results are discussed below,

Table 1: Testing of Cement

Sr. No.	Particulars	Remarks
1	Fineness of cement	1%
2	Standard consistency	32%
3	Setting time Initial setting time (minutes) Final setting time (minutes)	 93 383

4	Compressive strength (average of three 7 days)	31.14 N/mm^2
5	Soundness test	3mm

5. CONCLUSION

Cement used in this experimental work is Portland pozzolana cement (P.P.C.) as per IS 1489 (part I)-1991. The properties of cement are listed in the table 1 Cement satisfied the IS code.

As per the result of above listed tests Ambuja cement can be used for the purpose of production of pavement block for paving purpose.

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