International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 08 Aug. 2024, pp: 396-400 www.ijaem.net ISSN: 2395-5252

Experimental Study on IPB 80 mm

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Date of Submission: 15-08-2024 Date of Acceptance: 25-08-2024

ABSTRACT: The inter locking concreteblock pavement(ICBP) has gained rapid popularity in many foreign countries as analternative to concrete and as phalt pavements. However the manifest advantages of ICBP has not fully extended in India because of lack of proven indigenous design and construction information.There are not any IRC codes or IS codes available for specification and designofit.

This paper presents the results of a series of tests conducted to assess the influence of blockshape, thickness, size, compressive strength, and laying pattern on the overall pavement performance. The test setup discussed here was used to study these factors based on staticplate loading. The effect of load repletion on the pavement behavior is discussed. The mechanism of load transfer, the effect beddings and, jointings and edge restraints are discussed. The behavior of test pavement is characterized interms of deflection. The applied load was increased in10KN increments from zero to one half the single axlelegal limits. It is found that shape, size, thickness of block have a significant influence on the behavior of concrete block pavement

INTRODUCTION

Project Objectives

The objectives of this project are as follows :

1. The philosophical objective of the project is to contribute to the knowledge of the Interlocking tiles paver block , helping to extend the use of the material to structural design.
2. Study of the effect of using fiber on concrete compressive and strength.
3. Assessment of the effect of fiber in minimizing plastic and drying shrinkage cracks of the concrete.
4. Improve the overall compressive strength and long-term performance of concrete structures.
5. Develop joints between interlock by use of different frames of concrete block (especially in joint seismic performance).
6. Improve the Abrasion value of Interlocking tiles block.
7. Visualize the water absorption of an Interlocking tiles

1.1 Limitations

This focuses on use Interlocking tiles paver block in precast, is a limitation, and mainly on structural applications also is a limitation. There are several other possible civil applications, such as sidewalks, structural rehabilitation, channel linings and Railway station, foot path,street view etc

1.2 Importance of Study

The target of this research is to contribute to the knowledge of the Interlocking tiles paver block comparing to plain concrete, helping to extend the use of the materials alternative materials as concrete recycle.

1.3 Benefits of Interlocking tiles paver block of Concrete

1. Eliminate cracks, a homogeneous concrete, lowered permeability and increase split tensile strength, the resistance to shattering, abrasion, and impact forces.
2. The superior method and cost effective alternate to welded wire fabric for secondary reinforcement.
3. Decreasing the thickness of tiles block as load distribution.
4. Interlocking tiles can improve seismic performance when use in joints between interlock tiles .
5. Tie spacing can be increased without significantly sacrificing the improved seismic performance. This causes Easy to cast concrete in joints between columns and beams and produce efficient joints.

1.4 Application of Interlocking tiles paver block in flooring

Interlocking tiles has specialized properties and can enhance impact, toughness abrasives, compressive , and other mechanical properties. Fig. 1.2 shows some application of

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Interlocking tiles used in flooring . Initially tiles interlocking based concrete were used for pavement and industrial flooring only. Now a days, applications of Interlocking tiles concrete have wide variety of usage in structures as elaborated below:

- Floors, driveways and walkways where shrinkage and cracking problems exists.
- Buildings and pavement which subjected to shatter, impact, abrasion, and shear.
- Water retaining and reservoir structures where in permeability and better resistance to freeze-thawing required.
- Sanitary sewer tunnels where resistance against corrosion requires and improves ductility
- Pumped concrete project gets easy and safe with fibre, making concrete more cohesiveand prevent segregation.

Car park, driveway foot path

Heavy Duty Blocks

Historical Development

The concept of using concrete in the matrix was first recorded with the ancient Egyptians who used hair from animals and straw as reinforcement of mud bricks and walls in housing. This dates back to 1500 B.C. (Balaguru et. al, 1992). At the similar time period, about 3500 years ago, straws were used to reinforce sun-baked bricks for a 57m high hill of 'Aqar Quf, which is located near Baghdad. It is until the 1900's that were developed, manufactured and widely used to augment mechanical properties of cement matrix as described by Bentur and Mindess (1990).

Balaguru and Shah (1992) reported that the modern developments of using straight steel fibres began in the early 1960's. Till now, a wide range of other types of fibres were used in cement matrices. Construction industries have led the development of different type of conventional fibres such as steel, stainless steel and glass, where new types of fibres such as Kevlar and carbon: and several low modulus fibres, natural fibres (jute, sisal, bamboo and wood pulp). They are vary in their properties, cost and effectiveness. They may produce filaments orfibrillated films, or may be used as mats or woven fabrics (Bentur et. al, 1990). Primarily, in modern industries are discontinuous fibres are used. Development of concrete with modified fibres systems increases the explicit effects and mechanical properties of concrete. Some previous research concerning the present investigation is summarized below.

VIBRATING TABLE

A **vibrator** is a mechanical device to generate vibrations. The vibration is often generated by an electric motor with an unbalanced mass on its driveshaft.

There are many different types of vibrator. Typically, they are components of larger products such as smartphones, shaker by the vibration , concrete vibrating machine , etc

Vibrating screens are used to separate bulk materials in a mixture of different sized particles. For example, sand, gravel, river rock and crushed rock, and other aggregates are often separated by size using vibrating screens.

Vibrating compactors are used for soilcompaction especially in foundations for roads, railways, and buildings.

Concrete vibrators consolidate freshly poured concrete so that trapped air and excess water are released and the concrete settles firmly in place in the formwork. Improper consolidation of concrete can cause product defects, compromise

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the concrete strength, and produce surface blemishes such as bug holes and honeycombing. An internal concrete vibrator is a steel cylinder about the size of the handle of a baseball bat, with a hose or electrical cord attached to one end. The vibrator head is immersed in the wet concrete.

External concrete vibrators attach, via a bracket or clamp system, to the concrete forms. There are a wide variety of external concrete vibrators available and some vibrator manufacturers have bracket or clamp systems designed to fit the major brands of concrete forms. External concrete vibrators are available in hydraulic, pneumatic or electric power.

Vibrating tables or shake tables are sometimes used to test products to determine or demonstrate their ability to withstand vibration. Testing of this type is commonly done in the automotive, aerospace, and defense industries. These machines are capable of producing three different types of vibration profile sine sweep, random vibration, and synthesized shock. In all three of these applications, the part under test will typically be instrumented with one or more accelerometers to measure component response to the vibration input. A sine sweep vibration profile typically starts vibrating at low frequency and increases in frequency at a set rate (measured in hertz). The vibratory amplitude as measured in gs may increase or decrease as well. A sine sweep will find resonant frequencies in the part. A random vibration profile will excite different frequencies along a spectrum at different times. Significant calculation goes into making sure that all frequencies get excited to within an acceptable tolerance band. A random vibration test suite may range anywhere from 30 seconds up to several hours. It is intended to synthesize the effect of, for example, a car driving over rough terrain or a rocket taking off. A synthesized shock pulse is a short duration high level vibration calculated as a sum of many half-sine waves covering a range of frequencies. It is intended to simulate the effects of an impact or explosion. A shock pulse test typically lasts less than a second. Vibrating tables can also be used in the packaging process in material handling industries to shake or settle a container so it can hold more product.

Testing Details

Structural performance of the concrete mainly depends upon its strength in compression so it is essential to carry out tests to determine these properties. All the tests which were carried out in the study are as per IS 15658:2006 .

The test carried out on concrete are summarised as below

1. Compression Strength
2. Abrasion resistance
3. Water absorption
4. Length and measurement

(a) Compression Strength Testing

The compression strength of the concrete is very important parameter as it decides the other parameters like tension and flexure. So it is very necessary to carry out the test carefully on the specified testing machine.

The testing machine may be of any reliable type, of sufficient capacity for the tests and capable of ap1plying the load rate at the specified rate. The permissible error shall be not greater than ± 2 percent of the maximum load. The compressive strength of concrete is generally determined by testing blocks or cylinder made in laboratory. If the maximum size of the aggregate does not exceed 30 mm, the size of the blocks should be 198 mm x 165 mm x115 mm.

Compressive strength test were carried out on 198 mm x 165 mm x115 mm blocks with compression testing machine of 2000KN capacity. The specimen, after removal from curing tank was cleaned and dried. The surface of the testing machine was cleaned. The specimen was placed at the centre of the compression testing machine and load was applied continuously, uniformly and without shocks and the rate of loading was 14 N/mm^2 ($140Kg/cm^2$)/ minute i.e. at constant rate of stress.

The load was increased until the specimen failed. The maximum load taken by each specimen during the test was recorded. As shown in Fig 3.14. The compressive strength was found after 7 and 28 days in order to compare the strengths for different percentage of fibres in concrete.

Fig 3.14: Experimental Setup For Testing of blocks Specimen by Digitally

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1. The block shall be stored for 24hour in water maintained at a temperature of 20 “c
2. The bearing plate of the testing machine shall be wiped clean.
3. 4 mm ply wood sheet is provided in between the block both up and down.
4. The load shall be applied without shock and increase continuously at a rate of 15 N/mm^2/min until no greator load can be sustained by the specimen.
5. The max load applied to the specimen shall be noted.

CALCULATION:-
1. Plan area-
a) Mstd= Mass of standard pieces (200*100) 2.5 thick 35.63 gm
b) Msp=Mass of specimen , 52.15 gm
(Asp) , plan area= 20,000* Msp/Mstd -mm^2

1. **Compressive Strength = LOAD (N) / PLAN AREA**

Commpresive strength = 1215 kN /29273 convert it in N

1215*1000 / 29273 = 41.50 KN

PLAN AREA = 32.13 * 20,000 / 35.63 = 29,273 mm^2

- **Now the correction factor –**

1. Min commpresive strength should be more than 44N/mm^2 for grade M40 concrete.
2. Min commpresive strength should be more than 37.1 N/mm^2 –for grade M35 concrete

2.Abrasion resistance

1. Square shaped specimen measuring 71.0 shall be cut from the block specimen
2. the opposite face shall , if appropriate , be ground parallel or otherwise machined as to be parallel.
3.For dry specimen 105 c
4. for wet / saturated specimen – 7 days immersed in water wiped with a damp artificial sponge prior to each weighing , so that all specimen appear equally damp.
5. P.R (Density of specimen) = 670 gm before test .

Volume = 71*71*60 = 302460 mm^2

Mass / volume = 670 gm / 302460 mm^3 = 0.00221

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