Interlocking Concrete Block Pavement

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Abstract— In interlocking concrete block pavement, the blocks make up the wearing surface and are a major load-spreading component of the pavement. It differs from other conventional form of pavement that the wearing surface is made from small paving units embedded and joined in sand rather than continuous paving. Beneath the bedding sand the substructure is similar to that of a flexible pavement. The interlocking concrete block pavement (ICBP) has gained rapid popularity in many foreign countries as an alternative to concrete and asphalt 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 design of it. This paper presents the results of a series of tests conducted to assess the influence of block shape, 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 static plate loading. The effect of load repletion on the pavement behavior is discussed. The mechanism of load transfer, the effect bedding sand, jointing sand and edge restraints are discussed. The behavior of test pavement is characterized in terms of deflection. The applied load was increased in 10 KN increments from zero to one half the single axle legal limits. It is found that shape, size, thickness of block have a significant influence on the behavior of concrete block pavement.

Key words: The Effect Bedding Sand, Jointing Sand and Edge Restraints Are Discussed

I. Introduction

Concrete block pavement (CBP) was introduced in The Netherlands in the early 1950s as a replacement for baked clay brick roads. The general worldwide trend towards beautification of city pavements, the rising cost of bitumen as a paving material and the rapid increase in construction and maintenance cost have encouraged designers to alternate paving material such as concrete blocks. The strength, durability and aesthetically pleasing surface of pavers have made CBP ideal for many commercial, municipal and industrial applications. For the past 50 years, significant research activities for the development and refinement of CBP technique have been going on many on in many countries like Argentina, Australia, Canada, France, The Netherlands, UK and USA. The CBP is now a standard surface in Europe, where over 100,000,000 m2 are placed annually.

II. Study Area

This study was carried at BIT Campus (BIT Invention Centre) which is situated at Latitude 26.76 and Longitude 83.37 and selecting 100m length and 10m wide road for leveling.

III. Methods and Methodology

Forming of Interlocking The initial interlocking obtained after construction is not stable. Under the repeated loads, the permanent deformation will occur in the bedding sand layer, granular base course and sub grade, and the blocks will adjust themselves to a equilibrium state so as to the permanent deformation is transferred to the paving surface.

Arch Effect the improvement and stabilizing of interlocking provides a requisite condition for spreading loads. Because the blocks are very small in size, and there exist a lot of joints in the surface layer, therefore the load spreading mechanism of block layer must be different with the usual Portland cement concrete pavements and asphalt concrete pavements. Obviously, the bending stresses can not be transferred across the joints, but the interlocking between blocks has an ability to transfer the vertical shear stresses. Therefore, the resistance of joints to shear is a main reason for spreading loads.

Axisymmetric performance it is measure of the resilient deflection basins of paving with different block thickness

Shearing Performance in Joints It can be known from the above analysis that the loads are spread through the shear strength of joints, therefore it is critical for determining the bearing capacity of block paving to clarity the shear performance of joints. Under the vertical loads, D, the shear movement (deflection difference) between both sides of joint is

$$D = D_{left} - D_{right}$$

IV. Result and Discussion

A. Material Used

- Fly ash
- Cement
- Gravel
- Sand
- Water

B. Test Setup

Static plate load tests have been conducted in the test bed which is constructed inside the compressive. The plan area of the test setup is 2m x 2m, and the depth of the test pit is 1.5m from the floor level. The loading frame comprises of a reaction frame. It has been framed with three rigid I- section beam welded properly and founded suitably in the ground. Load was applied to the pavement structures manually by operating the hydraulic jack of 100kN capacity through the circular plate of 300mm diameter. Before the test is conducted on the different layers of the pavement structure, a pre calibrated proving ring is placed between loading jack and circular plate. Total eight dial gauges (four on each side of the proving ring) having least count of 0.01mm was used to measure the deflection of the sugared, sub base and surface of the pavement.

Block shape	Length(mm)	Width(mm)	Thicknes s(mm
zig - zag block	200	110	75
I-shapeblock	200	145	75

Table 1: Shape and size of block

Shape of the block	Compressive strength in N/mm^2
Zig - zag block	13.2
I-shape block	10.5

Table 2: Compressive strength of paving block

V. CONCLUSION

Based on the study carried out, the following conclusions can be brought out:

a) From the study it was observed that the sub base material undergo compression before it actually take the stresses from the applied load.
b) The use of jointing sand in the space between the blocks helps in distributing the load and reduces the deflection of concrete block pavement by about 14 %.
c) The Equivalent modulus of elasticity of concrete block pavement without jointing sand and with jointing sand are 470 MPa and 2352 MPa respectively.

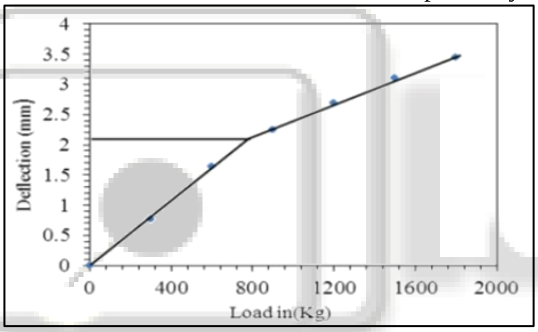

Fig. 1: Detemination of Compressibility Value

Layer	Elasticity Modulus (MPa)	Unit Weight (kN/m^3)	Poisson's Ratio	C kN/m^3	Φ (Deg)
Concrete block	2500	20	0.3	-	-
Bedding and joint sand	350	18	0.35	10	30
Base	225	18	0.35	10	30
Sub grade	225	18	0.35	10	30

Table 3:

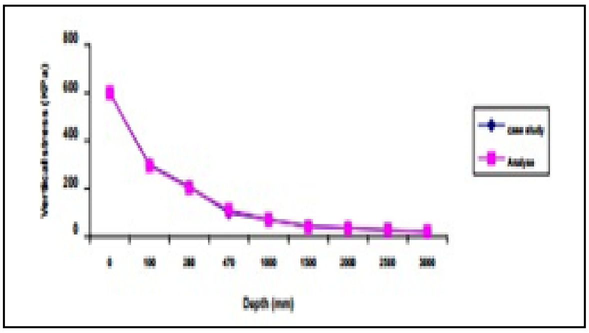

Fig. 2: Comparison of the Results Obtained from the Analysis with those from the case Study

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