A Review On -To Determine The Variation In Testing Results Of Compressive Strength Of Paver Blocks By Repetitive Testing

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Abstract- *The variation in testing results of compressive strength of paver blocks will be observed and similar reviews are studies in this paper. A repeatability test is an experiment performed to evaluate how repeatable your results are under a set of similar conditions. This paper is about review of repeatability and retesting n proficiency testing in compressive strength of paver blocks. In such case of compressive testing variation in same batch of paving blocks.*

Keywords- Repeatability Testing, Compressive testing in paving block.

I. INTRODUCTION

A repeatability test is an experiment performed to evaluate how repeatable your results are under a set of similar conditions. When performing a repeatability test, you will want to collect data using the;

a. Same method,
b. Same operator,
c. Same equipment,
d. Same environmental conditions,
e. Same location, and
f. Same item or unit under test.

Essentially, want to collect repeatable results over a short period of time without changing anything (if possible).

According to the Vocabulary in International Metrology (VIM), measurement repeatability is measurement precision under a set of repeatable conditions of measurement.

Furthermore, the VIM defines a repeatability condition of measurement as a condition of measurement, out of a set of conditions that includes the same measurement procedure, same operators, same measuring system, same operating conditions, same location, and same replicate measurement on the same or similar objects over a short period of time.

Defining measurement conditions and collect repeatable results over a short period time so you can evaluate the precision of your process.

PERFORM A REPEATABILITY TEST

To perform a repeatability test step by step. Follow the instructions below to add repeatability test data to your uncertainty budgets.

Here is a list of the steps in this process;

1. Select the measurement function to test,
2. Select the measurement range,
3. Select the test-point(s),
4. Select the method,
5. Select the equipment,
6. Select the operator,
7. Perform the test,
8. Collect the number n of repeated samples,
9. Analyze your results,
10. Save a record of your results (recommended),

Number of sample collections

$$n = \left[\frac{(z \cdot \sigma)}{MOE}\right]^2$$

1. Choose your desired confidence level (z).
2. Choose your desired margin of error (MOE).
3. Multiply the result of step 1 by the value by the standard deviation of the sample set.
4. Divide the result by the margin of error selected in step 2.
5. Square the result calculated in step 4.

although testing of five samples is recommended.

Objectives of the Study

1. To understand the concept of compressive strength of paving blocks by testing on CTM.
2. To perform compressive strength on CTM of same batch on atleast 8 block for average results for each shape of paver block.
3. Determine the results in testing and retesting and find deviation in compressive strength of same batch.
4. Results and discussion on acceptance criteria of repeatability of testing results.

Scope: Paver blocks are manufactured moreover in mechanized batch over batch. Uniformity in strength of paver blocks is essential parameter. This project helps to provide acceptance criteria and check the proficiency n manufacturing and testing accordingly.

II. LITERATURE SURVEY

Xinyi Wang 2019, suggests that the recycled aggregates have been widely studied and used in concrete products nowadays. There are still many waste materials that can be used as recycled aggregates other than crushed concrete particles. This paper aims to study the property variations of sustainable concrete paving block incorporating different contents of construction wastes. Five different types of waste materials were used in this project, including: recycled concrete coarse aggregate (RCCA), recycled concrete fine aggregate (RCFA), crushed glass (CG), crumb rubber (CB), and ground granulated blast furnace slag (GGBS). According to the test results of the properties of blocks mixed with different levels of wastes materials, it is concluded that adding both RCCA and RCFA in the block can decrease its strength and increase the water absorption. The suggested replacement levels for RCCA and RCFA are 60% and 20%, respectively. Mixing crushed glass in the concrete paving blocks as a type of coarse aggregates can improve the blocks' strength and decrease the blocks' water absorption. Addition of crumb rubber causes a significant deterioration of blocks' properties except for its slip resistance. [1]

Bhimaji Dashrath Kanawade 2018, opines that the concrete paving blocks are ideal materials on the footpaths for easy laying, better look and finish. It was found that rapid deterioration occurred on new pavers and the blocks became unserviceable within three years. This was a matter of grave concern and there was a need to identify the problem. The aim of this paper is to determine the properties of those blocks that deteriorated rapidly in contrast with those that had provided long-term satisfactory service, to identify test methods and specifications that will ensure that blocks are durable. [2]

Dinesh W.Gawatre 2017, suggests that in India total quantum of waste from construction industry is estimated to be between 12 to14 million tonnes per annum out of which 7 to 8 tonnes are concrete and brick waste. Construction, demolition, innovation generated large amount of concrete waste. This waste is either dumped or it is delivered towards landfill. This concrete waste can be qualitatively reused for manufacturing of various concrete blocks. In this report , we represent the concept of sustainable use of concrete waste in concrete which can be used in manufacturing of interlocking paver blocks , After crushing , this concrete waste can be used as a replacement of coarse and fine aggregate in one stage as half replacement in paver block by considering is specification. In this project by considering suitable material, size, shape, mix design, etc. and by accepting Specific casting methodology and by performing various specific tests, we are going to cast interlocking paver blocks.[3]

Fatlind Dervishi 2015, investigates the relation between physical and mechanical properties of concrete paving blocks using regression method of analysis. For this purpose, 112 samples of concrete paving blocks were selected from different sources. The first phase included the determination of physical properties of the samples such as water absorption, porosity and specific gravity. After that for each block the tensile splitting strength test and the compressive strength test was performed. The second phase included the regression method of analysis, a linear regression is performed relating each of the physical property with mechanical properties. An equation is obtained relating each property of the paving blocks. The results show a strong relation between the physical and mechanical properties.[4]

Gitanjali Maharana studies that these days concrete paver block turned in to a component of towns and urban areas. It is to be locating in residential, commercial and industrial areas like as shopping malls, parking areas, footpaths, transport stops etc. The aim of this thesis is to construct paver block by using cement is replaced by different percentages of fly ash and various types of fibers. There are the motive behind using of fly ash in concrete to improve the durability and strength of harden concrete and fly ash also cost effective. In this thesis also discussed about the various types of chopped fibers which used in paver blocks like nylon fiber, steel fiber, coconuts fibers, glass fibers, polypropylene fibers etc for improving strength of paver blocks. The other materials have composed to design paver blocks like OPC 43 Grade cement, fine aggregate and coarse aggregate for concrete mixture. The curing process of paver block has done for 7days, 14 days and 28days. After curing days it is tested for compressive strength. [5]

Hanan A. El Nouhy 2011, evaluates the performance of interlocking paving when exposed to aggressive environments. Durability of paving units is an essential property as it determines its capability of withstanding the different conditions to which it is expected to be exposed to- Chemical, physical, and mechanical causes can result in lack of durability. Chemical cause can arise from attack by chlorides, physical cause may be due to exposure to high temperature variations, while mechanical causes are usually associated with abrasion. Experiments were carried out to determine product compressive strength, water absorption, and abrasion resistance according to both Egyptian Standard Specifications (ESS) and American Society for Testing and Materials (ASTM). An interlocking paving mix was chosen and exposed to various aggressive media for a duration of 2 months after being cured for 28 days. The aggressive environments were as follows: 1% HCl, 5% HCl solution (to simulate acid attack resistance), dry and wet cycles, as well as, air (room temperature) and dry cycles (to simulate different environmental conditions). The tested products were also X-rayed to investigate the mineralogical analysis. The following was concluded. The four aggressive media increased compressive strength when compared to the control mix. Also, they resulted in reducing water absorption percentages and met the criteria for water absorption concerning heavy duty according to ESS. Samples which were exposed to the four aggressive environments conditions did not satisfy both criteria of ESS and ASTM pertaining abrasion. [6]

R. Thirukumara Raja Vallaban 2011, suggests that the concrete paving blocks was first introduced in united stated in 1960s using German production and equipment and designs. Initially it was manufactured for aesthetic works such as sidewalks etc. Recently paving blocks has found to have high potential in heavy load applications. The use of concrete blocks in pavement is recognized as the greatest development in the long history of modular paving elements. And this project includes the construction of such pavement blocks. The main objective of this project is to increase the compressive strength and to avoid the cracks that are developed to impact loading on the pavement blocks and thereby increasing the durability of the pavement blocks. Concrete pavement blocks are manufactured using cement, fine aggregate and coarse aggregate. In this project the steel fiber are added in 0.5%, 1.0%, 1.5% and 2.0% to the pavement block and determining the mechanical properties of the pavement block. The steel fibers are available abundant in nature. So it can be used in the pavement block manufacturing. The various tests such as workability, water absorption, compressive strength test, acid and alkali test and abrasion test is to be made on the pavement blocks and it is compared with the conventional and the results are to be studied. [7]

SANJAY YADAV , 2008, Author gives the results of the proficiency testing (PT) accomplished for 17 laboratories, accredited by National Accreditation Board for Testing and Calibration of Laboratories (NABL). The measurements were performed in the pressure range 10-70 MPa using pressure dial gauge as an artifact. Only laboratories having best measurement capabilities 0.25 % or coarser than 0.25 % of fullscale pressure were included in this PT. The program started in May 2006 and completed during October, 2007. The comparison was carried out at 10 arbitrarily chosen pressure points i.e. 10, 20, 30, 40, 45, 50, 55, 60, 65 and 70 MPa. The results thus obtained show that out of the total 159 measurement results, 135 (84.91 %) are found in good agreement with the results of the reference laboratory. The relative deviations between laboratories values and reference values are well within 0.15 % for 75 measurement points, 0.25% for 108 measurement points and 0.50% for 148 measurement points. The difference of the laboratories values with reference values are found almost well within the uncertainty band of the reference values at 71.07 % measurement results, within their reported expanded uncertainty band at 62.26% measurement results and within the combined expanded measurement uncertainty band at 84.91 % measurement results. Overall, the results are considered to be reasonably good, being the first proficiency testing for most of the participating laboratories. [8]

Arif Sanjid M , 2008, Surface finish of products indicates the quality of machining process in manufacturing industry. Surface texture measurements provide index of quality of manufacturing stability. National Physical Laboratory, New Delhi, India (NPLI) maintains reference surface roughness standards and measuring equipment and established traceability in surface roughness measurement rendering the surface roughness calibration services. National accreditation board for testing, calibration laboratories (NABL) conducted proficiency testing (PT) program among NABL accredited laboratories for the measurement of surface roughness standard and groove depth. NPLI coordinated the PT Program and acting as reference laboratory among ten accredited laboratories. A technical protocol is designed in line with internationally adopted method. Results are analyzed statistically by arithmetic mean methods. The performance of the laboratories is described using the calculated normalized error (En) value as an index.[9]

Hong Huang , 2011, Author describes the statistical tools such as descriptive statistics, full factorial design and analysis of source of variation were used to identify

the potential factors that impact the validity of testing method for determining the strength of cement. The results showed that personal error impacted both accuracy and precision of test greatly. Experimental time associated with temperature fluctuation resulted in strength variation but did not impact the precision of test in all curing ages. Different compactions did not impact the precision of test but resulted in the strength variation on 3 d and 28 d significantly. Different methods for the initial moist air curing significantly impacted the precision of testing method and resulted in the strength variation of cement on 1 d. [10]

III. LITERATURE GAP

This paper is about review of compressive strength in paver blocks. Past authors have various studies based on iter-laboratory comparisons in various material as concrete, altman z score, and suggested methods of comparison. This study will further deal with testing of compressive strength and variation of results in same batch.

IV. CONCLUSION

Most of studies suggest strength in paving blocks by use of various admixtures in manufacturing of paver blocks. it is important to verify that full batch have no variation in the strength which will provide acceptability of paver blocks.

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