

# ASSESSMENT ON THE EFFECT OF TEMPERATURE ON RESISTANCE PROPERTIES OF CONCRETE PAVEMENTS CONTAINING CRUSHED GLASS

*J.vidhya sagar<sup>1</sup>, D.Pavan kumar<sup>2</sup>*

*<sup>1</sup>PG student, <sup>2</sup>Assistant Professor, Department of Civil Engineering, Holymary institute of Technology & Science, Hyderabad, India.*

**Abstract-** *The main aim of this paper is to find effect of temperature on skid resistance of rigid pavements has to be assessed. An experimental approach has been utilized for this purpose and concrete blends containing crushed glass as fine aggregate with different surface texture were tested at different temperatures utilizing skid Tester, so concrete mixture containing crushed glass with 3 different surface texture with different patterns of contact surface (smooth, brushed, groved) were assessed at temperature run from 0 °C to 50 °C. The best measure of crushed glass in concrete mixture was determined by utilizing the compressive strength test and the mixture delivered by virgin lime aggregates were taken as control mixture. The outcomes demonstrated that the slide obstruction of concrete mixture with brushed surface had the most noteworthy sum contrasted with other surface surfaces. Squashed glass totals had a positive effect on compressive quality, flexural strength and skid resistance of concrete pavements. It was additionally discovered that the skid resistance of all mixtures decreased with an increase in temperature..*

**Keywords:** *Skid resistance; British Pendulum Test; Concrete pavement; Glassy concrete; Surface texture*

## I. INTRODUCTION

In the previous couple of decades tons of fatalities and injuries have occurred because of automobile accidents. though the bulk of those accidents are associated with driving faults, highways have a significant effect on this high proportion of traffic accidents. Skidding on wet pavements contributes to thirteen.5% of fatal and up to twenty fifth of all accidents and a substantial part of the general road toll. Skid resistance is that the force developed once a tire that's prevented from rotating slides on the pavement surface. additionally to increasing stop distance whereas breaking, loss of skid resistance reduces steer controllability and affects driver's ability to manage vehicle and slippery roads could cause irreparable damages to inexperienced drivers. So providing adequate skid resistance is preponderating and one among the simplest ways that to scale back skid connected accidents. The objective of constructing pavements is to arrange a sleek and safe surface for vehicles to commute. In recent years concrete pavements are wide used throughout the globe attributable to its high strength, smart service and long sturdiness. However, because the skid resistance of untextured concrete pavement could endanger road safety, providing surface texture is important for rising the friction of concrete pavements. There are 2 primary functions of textures, providing ways for water to flee from to a lower place the tires of craft or different vehicles and providing enough sharpness for the tire to interrupt through the residual film remaining once the majority water has loose. Therefore, different textures were provided during this study so as to judge and compare the skid resistance of concrete pavements with different textures. Glass is wide utilized in our lives and every year regarding ten million heaps of waste and crushed glass is made in massive cities world-wide, that compose regarding 3-5% of all household wastes. usage stuff will save tons of energy. one among the alternatives of

usage crushed glasses is exploitation them in different sections of business. Waste glass has been used as combination in road construction in several countries recently. Hence, it might be an honest plan to use them in concrete pavements. This paper aims to judge the resistance properties of concrete pavement containing crushed glass as combination. There are several ways for activity the skid resistance of surfaces of that British apparatus is one. this method involves activity the force needed to tug a non-rotating tire over a wet pavement. a people Pendulum is employed during this study because it will live the resistance properties of surfaces in laboratory scale. The skid resistance is thought to be the operate of the many factors like tire kind, surface body, sprucing of surface aggregate, tire wear, inflation pressure, vehicle speed, whether or not the wheel is rolling or bolted and whether the pavement is wet or dry. thus all the factors should be fixed or clearly defined throughout activity skid resistance of surfaces. Temperature is one among the factors that affects the frictional properties of road pavements. Researchers have found that the interactions between pavement surface and tires were affected by climate connected factors like temperature and precipitation. Therefore, the effect of temperature on concrete pavements was investigated during this study. Many researchers have investigated the skid options of different surfaces and therefore the parameters affecting them.

LUO investigated the effect of temperature on resistance properties of Hot-Mix asphalt. For this purpose the skid resistance of asphalt surfaces was measured below different environmental conditions. He illustrated that the skid number belittled by increasing temperature of surface at low speed. However, at high speed, the effect was reverted and pavement friction cared-for increase by increasing pavement temperature [13].

Khasawneh and Liang [11] investigated the effect of temperature on skid properties of HMA. They showed that the friction of asphalt surface belittled by increasing the temperature. They conjointly introduced a way for agencies WHO need to record skid variety (SN) at a reference temperature for a semipermanent observance purpose [11].

Wang and Flintsch [17] investigated the resistance properties of asphalt surfaces in terms of temperature and time. For this purpose they studied the surface characteristic of different sections of Virginia good Road pavement facility over a 6-year fundamental quantity. They confirmed that temperature had a significant effect on the seasonal and multi-year variations of pavement surface friction [17]. The effect of pavement temperature on skid properties of HMA pavement surfaces was conjointly investigated by Flintsch et al. (2003). a complete of seven HMA surfaces were sporadically evaluated exploitation AN ASTM skid trailer with each ribbed and sleek tires over 2 and 0.5 years. The analysis showed that pavement temperature had a significant effect on pavement resistance measurements [5,13]. In this study the skid resistance of concrete surfaces containing fine crushed glass and virgin lime stone aggregates was investigated in terms of temperature and surface texture. For this aim a laboratory study has been conducted on a pair of different concrete mixtures with three different textures (smooth, brushed and grooved). Compressive strength tests were administrated so as to find the optimum quantity of crushed glass and British apparatus check were conducted in different temperatures from zero °C to fifty five °C to check the resistance properties of surfaces.

#### Material and ways:

The main procedure of this study was divided into 3 steps. At first different percentages of crushed glass were replaced in concrete mixtures as fine combination (from 250 l to 600 l) so as to find the optimum quantity of crushed glass. The optimum quantity of crushed glass was chosen primarily based upon the most compressive strength of concrete that was administrated in accordance with ASTM C39 [6]. once the optimum quantity of crushed inclose mixtures had been chosen, compressive strength and flexural strength tests were conducted for all of the specimens at the top of 1th, 3rd, 7th, twenty eighth and ninetieth days of wet natural process. subsequently British apparatus check was conducted to check the resistance properties of concrete surfaces with different textures and at different temperatures. Crushed sedimentary rock was provided from quarries around Tello (located in north east of Tehran) that are primarily used for road construction. so as to find out the properties of sedimentary rock aggregates, specific gravity (ASTM C127-07, ASTM C128-12), la abrasion resistance check (ASTM C131-12) and water absorption test (ASTM C127-12) were conducted on sedimentary rock aggregates. Crushed glasses were obtained from Rashid usage company of Iranian capital and therefore the physical properties of crushed glass and sedimentary rock aggregates (LA) are shown in Table one. each forms of aggregates met the grading necessities of ASTM Physical properties of crushed glass and LA aggregates.

Physical Properties	Lime Aggregate	Crushed Glass
Specific Gravity (Fine Agg.)	3.87	2.54
Water Absorption	0.4	0.34
Specific Gravity (Coarse Agg.)	2.63	-
Los Angeles Abrasion (%)	24.1	-

#### Sample preparation

At first twenty four specimens with 4 different percentages of crushed glass were created to conduct the compressive of specimens at three and seven days of activity. Having found the optimum content of crushed enclose concrete mixtures, thirty specimens (3 specimens for every test) of size fifteen one5 15 cm were ready so as to work out the compressive strength of concrete strength with and while not crushed glass at 1, 3, 7, twenty eight and ninety days of activity. Then eighteen beams of size seventy fifteen 15 cm were ready so as to hold out flexural strength check for each concrete gradations. the most important samples for BPT were created and cured for twenty eight days with three different textures (smooth, brushed and grooved) for each concrete and concrete containing crushed glass mixtures. Grooves were finished depth and dimension of three metric linear unit and spacing of twelve mm [4]. Fig three shows the surface textures of specimens.

#### Testing program and discussion

##### 1. Compressive strength check

The results of compressive strength tests for mixtures containing different percentages of crushed glass are presented in Fig. 4. It ought to be noted that the results are a median of three specimens and therefore the error bars are provided. because it is shown in Fig. 4, the compressive strength of mixtures augmented by commutation up to 100 percent of crushed glass with lime aggregates so it fell. Thus, the optimum quantity of crushed enclose mixtures would be 100 percent. It ought to be noted that previous studies [16,8] have additionally investigated the optimum quantity of crushed enclose con- Kriti mixtures victimisation compressive strength that have diode to different results of optimum crushed glass contents

##### 2. Flexural strength check

Flexural strength is commonly accustomed judge the lastingness of concrete mixtures and is also notable to be a criterion for coming up with concrete pavements. it's a certain of associate unforced concrete beam or block to resist failure in bending. it's measured by loading 150–150 metric linear unit concrete beams with a span length a minimum of 3 times of the depth [15]. Flexural tests were conducted on con- Kriti beams at seventh, twenty eighth and ninetieth days from the day of casting in line with IS 516:1959

#### Conclusions

This study investigated the effect of temperature, surface textures and fine crushed glass aggregates on skid resistance of concrete pavements. in line with the findings of the experimental results, the subsequent main conclusions will be drawn:

#### REFERENCES

- [1] G.W. Flintsch, Y. Luo, I. Al-Qadi, Analysis of the effect of pavement temperature on the frictional properties of flexible pavement surfaces. 84th Transportation Research Board Annual Meeting, 2005.

- [2] M.A. Khasawneh, R.Y. Liang, Temperature effect on frictional properties of HMA at different polishing stages, 2012
- [3] Y. Luo, Effect of pavement temperature on frictional properties of hot-mix-asphalt pavement surfaces at the Virginia Smart Road, Virginia Polytechnic Institute and State University, 2003.
- [4] H. Wang, G.W. Flintsch, Investigation of short-and long-term variations of pavement surface characteristics at the virginia smart road. Transportation Research Board 86th Annual Meeting, 2007.