iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL
FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 Issue: VIII Month of publication: August 2017

DOI: http://doi.org/10.22214/ijraset.2017.8060

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VIII, August 2017- Available at www.ijraset.com

Compressive Strength and Workability of Concrete Using Stone Dust as Partial Replacement of Sand and Glass Powder as Cement

Chandrabati Charmkar[1], Dr. A. K Jain[2], Vikash Kumar Singh[3]
[1]M. Tech.Scholar,[2]Professor [3]Assistant Professor, Department of Civil Engineering
[1,2] National Institute of Technical Teachers Training & Research, Bhopal,
[3] Lakshmi Narain College of Technology(LNCT), Bhopal, India

Abstract: The main objective of this research is to investigated the use of Glass Powder and other is Stone dust as partial replacement of cement and concrete production. In this research we analyze the strength of concrete made with using these waste materials one is Glass Powder and other is Stone dust. The Glass Powder is used as 20% replace by weight of cement and Stone Dust as the partial replacement of Fine Aggregate from 0%, 10%, 20%, 30% and 40%. The grade of the concrete here is M-25 and M-30 grade. It has been used as a replacement of fine aggregates in many literature works but this paper presents the feasibility of the substitution of marble waste for cement to achieve economy and environment saving. Slump Test was carried out for the fresh concrete whereas Compressive Strength, Flexure Strength and Split Tensile Tests were carried for the Hardened concrete. All tests are done at 7- day, 14 - day, 28 -day, and 56 days with 0 to 40% replacement of sand at an interval of 10%. Again above tests are carried out with 20% replacement of cement by glass powder. It is observed that the glass powder improve the strength and stone dust can be used as sand. Experiment such as specific gravity test of stone dust and sand by pycnometer method, moisture content of sand and stone dust by oven drying method, normal consistency of cement, and initial setting time of cement, were performed to determine the physical property of concrete. On fresh concrete slump test was preformed to check workability of concrete and after then compressive strength was checked. Thus stone dust is appropriate substitute of fine aggregates in concrete mix for construction. This is great saving in costly material.

Keywords: Glass Powder, Stone Dust, Mix Design, Compressive Strength Test, Flexure Test, Split Tensile Test

I. INTRODUCTION

The concrete is useful materials in the construction industry. It is not only used in building construction but also in other areas like bridges, roads, harbors, dam, Railways and many more. It is comparatively economical, easy to make offers continuity solidity and indeed it lays the role of developing and improving or modern life. It is a composite material which is made up of sand, cement, aggregate and water. The fresh concrete can be mould into any desire shape. The life of the concrete is very high so it can be used as versatile material. In the concrete the cement is used as the binder material which has the binding tendency. Due to increase in activities for different regions and utilities scaring of the naturally available resources is being forced due to it's over exploitation. This is the threat to the environment. Also the use of conventional material becomes costly day by day. Hence conservation of the naturally available material is great challenge for the civil engineers. By using the alternative material which reduced partially, there is only way to search materials which can fully or partially replaced naturally available material in the construction field. The various alternative materials are used as partial for fully replacement of conventional material e.g. Rice husk ash, fly- ash, sugarcane bagasses ash, coconut shell, crushed sand, recycled aggregate etc. Here we use the two waste materials which is easily available. The stone dust produced from stone crushing zones appers as a problem for effective disposal. Which is used here as partily replacement as fine aggregate. Also the glass powder produced from industries is also a waste material which can be used as partial replacement as cement. Sand is a material used in concrete as fine aggregate.

II. LITERATURE REVIEW

Many works have been carry out to explore the benefits of using various waste materials such as granite dust, marble dust, stone dust and glass powder in making and enhancing the properties of concrete. The following works have done by the authors as describe below- Use of ston dust as a fine aggregate in concrete draws serious attention of researchers and investigators. The maximum compressive and flexural strengths were observed for specimens containing a 6% waste sludge when compared with control and it was also found that waste sludge up to 9% could effectively be used as an additive material in cement could effectively be used as an additive material in cement. With the inclusion of Marble powder the strength of concrete gradually increases up to a certain limit but the gradually decreases. With the inclusion of Marble powder upto10% the initial strength gain in concrete is high. At 10% there is 27.4% increase in initial Split Tensile strength for 7 days. At 10% there is 11.5% increase in initial Split Tensile strength for 28 days. The initial strength gradually decreases from 15%. It was found out that the optimum percentage for replacement of marble powder with cement and it is almost 10% cement for both cubes and cylinders, P. Aggarwal et al [5] carried out the experimental investigations on the effect of use of that material of ash as a replacement of fine aggregates. The strength progress for a variety of percentages (0-50%) replacement of fine aggregates with bottom ash can easily be equated the strength development of nominal concrete at a number of ages. Dr. Lalit Kumar, Er. Arvinder Singh. have investigate the possibility of using crushed stone dust as fine aggregate partially or fully with different grades of concrete composites. The suitability of crushed stone dust waste as a fine aggregate for concrete has been assessed by comparing its basic properties with that of conventional concrete. Two basic mixes were chosen for natural sand to achieve M25 and M30 grade concrete. The equivalent mixes were obtained by replacing natural sand by stone dust partially and fully. The test results indicates the crushed stone dust can be used effectively to replace natural sand in concrete. In the experimental study of strength characteristics of concrete using crushed stone dust as fine aggregate it is found that there is increase in compressive strength, flexure strength and tensile strength.

III. MATERIALS USES

A. *Cement*

In the present work locally available Portland Pozzolana Cement (fly ash based) brand name Birla Gold confirming to IS: 1489 (Part 1) -1991 was used. Having specific gravity 3.12 and normal consistency 33%

B. *Fine Aggreag.ate*

The fine aggregate in this research work are used from locally abailable from Banka District, Bihar and confirms to zone II of IS 383:1970. Having specific gravity 2.67 and fineness modulus 2.87.

Table 1. Sieve Analysis of Fine aggregate

Sieve Size	Weight retained (gm)	Cumulative weight retained (gm)	Cumulative Percentage weight retained	% Passing
4.75 mm	-	-	-	100
2.36 mm	55	55	5.5	94.5
1.18 mm	228	283	28.3	71.7
600 µ	348	631	63.1	36.9
300 µ	285	916	91.6	8.4
150 µ	75	991	99.1	0.9
Pan	5	996	100	0
Total 1 Kg	Fineness Modulus = 287.6/100 = 2.87			

C. *Coarse Aggregate*

Two aggregate of sizes 20 mm and 10 mm were used from local available from Bhopal in this work. The specific gravity of coarse aggregate was 2.72 for both the fractions. The sieve analysis of 10 mm and 20 mm coarse aggregate is given is table below.

The 20 mm and 10 mm aggregate were mixed in the ratio of 60:40. The coarse aggregates are confirms to IS 383:1970 and having specific gravity 2.84 and fineness modulus 6.026

Table 2. Sieve analysis for coarse aggregate of 20 mm size

Sieve size	Weight retained (gm)	Cumulativ e weight retained (gm)	Cumulative Percentage weight retained	% passing
40 mm	-	-	-	100
20 mm	484	484	9.68	90.32
10 mm	4165	4649	92.98	7.02
4.75 mm	345	4994	100	-
1.18 mm	0	4994	100	-
600 µ	0	4994	100	-
300 µ	0	4994	100	-
150 µ	0	4994	100	-
Total = 5 Kg	Fineness modulus = 602.66/100 = 6.026			

Table 3. Sieve analysis for coarse aggregate of 10 mm size.

Sieve size	We ight reta ine d (g	Cumul ativ e weight retaine d (gm)	Cumulativ e % weight retained	% passing
20 mm	-	-	-	100
10 mm	2856	2856	57.12	42.88
4.75 mm	1394	4250	85	15
2.36 mm	744	4992	100	-
1.18 mm	0	4992	100	-
600 µ	0	4992	100	-
300 µ	0	4992	100	-
150 µ	0		100	-
Total = 5	Fineness modulus = 642.12/100 = 6.42			

D. Stone Dust

Stone dust produced from stone crushing zones appears as a problem for effective disposal. Hence in this work stone dust is used in the concrete as partial replacement of the sand. The main purpose of this work is to waste minimization. The study focuses to determine the relative performance of concrete by using stone dust. Stone dust was collected from local stone crushing units Bhopal MP.

Table 4. Sieve analysis for Stone Dust

Sieve size	Weigh t retaine	Cumula ti ve weight	Cumulative percentage weight	% passing
4.75 mm	-	-	-	100
2.36 mm	24	24	2.4	97.6
1.18 mm	158	182	18.2	81.8
600 µ	185	367	36.7	63.3
300 µ	385	752	75.2	24.8
150 µ	197	949	94.9	5.1
Pan	46	995	100	0
Total = 1	Fineness modulus = 227.40/100 = 2.27			

E. Glass Powder

Waste glass powder in this study was used from locally available market. Glass waste is very hard material. The glass powder if ball pulverized and particles size are less than 150 µm and sieved through 75 µm.

F. Water

The clean portable water is used in this experimental work without any visible impurities.

IV. EXPERIMENTAL DETAILS

A. Mix design

In this experiment we select the two grades of concrete M-25 and M-30. The mix design was carried out as per IS: 10262-2009. The trials have been prepared and finally we find for M-25 grade was design for this experiment having the mix proportion 1:1.40:3.05 and the water cement ratio is 0.45. M-30 grade was design for this experiment having the mix proportion 1:1.32:2.85 and the water cement ratio are 0.43. All locally available materials are used during the preparation of the mix proportion.

B. Mixing and casting of samples

The mixing and casting were done with proper care and all materials were weighted properly and mixed in laboratory concrete mixer. The water is added after all materials are feed into in mixer in proper order. The cubes were filled and compacted by using table vibrating machine and the cylinder and beams were compacted using the tamping rod for around 25 times. The moulds were levelled properly. The specimens were kept for 24 hours and then it is removed from mould and kept in curing tank till the testing days. All specimens are tested at 7, 14, 28, and 56 days.

C. Compressive Strength Tests

The compressive strength tests were done by using the cubic specimen of sizes 150x150x150 mm. The moulds are confirming to the IS specification. For each test three specimens were taken and their average value is considered. The load should be applied gradually at the rate of 140 kg/cm^2 per minute till the specimens fails. The load at the failure divided by area of specimen gives the compressive strength of concrete. The cubes were tested at 7, 14, 28, and 56 days of curing.

D. Compressive Strength Tests

The compressive strength tests were done by using the cubic specimen of sizes 150x150x150 mm. The moulds are confirming to the IS specification. For each test three specimens were taken and their average value is considered. The load should be applied gradually at the rate of 140 kg/cm^2 per minute till the specimens fails. The load at the failure divided by area of specimen gives the compressive strength of concrete. The cubes were tested at 7, 14, 28, and 56 days of curing.

E. Flexure Strength Tests

The flexure strength also known as modulus of rupture, bends strength, or fracture strength. The value of modulus of rupture depends on the dimensions of the beam and manner of loading. The value of the flexural strength is about 10 to 20 percent of compressive strength depending on the type, size and volume of coarse aggregate used. In these tests the beams were casted having the size 150x150x700 mm. For this the moulds of the same sizes are taken which are confirming to the IS specification. During the casting it is compacted by using the tamping rod of around 25 times the diameter of the tamping rod is 16 mm. The flexure strength was tested at the age of 7, 14, 28 and 56 days curing.

F. Split Tensile Tests

We know that the concrete is weak in tension. The tensile strength is one of the important properties of the concrete. The tensile strength tests the cylinders were casted having the size 150 mm diameter and 300 mm lengths. This is the indirect method of the testing the tensile strength of the concrete. For this the moulds of the same sizes are taken which are confirming to the IS specification. It is also casted by using the 16 mm tamping rod of around 25 times. The split tensile tests were carried out at 7, 14, 28 and 56 days curing.

Table 5. Details of Specimen Designation

Design ation	Grade	Type	Cement %	Sand %	CA %	S.D. %	G.P. %
A1 - 0	M - 25	Cube	100	100	100	0	Nil
A1 - 10	M - 25	Cube	100	90	100	10	Nil
A1 - 20	M - 25	Cube	100	80	100	20	Nil
A1 - 30	M - 25	Cube	100	70	100	30	Nil
A1 - 40	M - 25	Cube	100	60	100	40	Nil
A2 - 0	M – 25	Beam	100	100	100	0	Nil
A2 – 10	M – 25	Beam	100	90	100	10	Nil
A2 – 20	M – 25	Beam	100	80	100	20	Nil
A2 – 30	M – 25	Beam	100	70	100	30	Nil
A2 – 40	M - 25	Beam	100	60	100	40	Nil
A3 – 0	M – 25	Cylinder	100	100	100	0	Nil
A3 – 10	M – 25	Cylinder	100	90	100	10	Nil
A3 – 20	M – 25	Cylinder	100	80	100	20	Nil
A3 – 30	M – 25	Cylinder	100	70	100	30	Nil
A3 – 40	M – 25	Cylinder	100	60	100	40	Nil
B1 – 0	M - 30	Cube	100	100	100	0	Nil
B1 – 10	M - 30	Cube	100	90	100	10	Nil
B1 – 20	M - 30	Cube	100	80	100	20	Nil
B1 – 30	M - 30	Cube	100	70	100	30	Nil
B1 – 40	M - 30	Cube	100	60	100	40	Nil
B2 – 0	M - 30	Beam	100	100	100	0	Nil
B2 – 10	M - 30	Beam	100	90	100	10	Nil
B2 – 20	M - 30	Beam	100	80	100	20	Nil
B2 – 30	M - 30	Beam	100	70	100	30	Nil

B2 – 40	M - 30	Beam	100	60	100	40	Nil
B3 – 0	M - 30	Cylinder	100	100	100	0	Nil
B3 – 10	M - 30	Cylinder	100	90	100	10	Nil
B3 – 20	M - 30	Cylinder	100	80	100	20	Nil
B3 – 30	M - 30	Cylinder	100	70	100	30	Nil
Designation	Grade	Type	Cement %	Sand %	CA %	S.D. %	G.P. %
B3 – 40	M - 30	Cylinder	100	60	100	40	Nil
A'1 - 10	M - 25	Cube	80	90	100	10	20
A'1 - 20	M - 25	Cube	80	80	100	20	20
A'1 - 30	M - 25	Cube	80	70	100	30	20
A'1 - 40	M - 25	Cube	80	60	100	40	20
A'2 - 10	M - 25	Beam	80	90	100	10	20
A'2 - 20	M – 25	Beam	80	80	100	20	20
A'2 - 30	M – 25	Beam	80	70	100	30	20
A'2 - 40	M – 25	Beam	80	60	100	40	20
A'3 - 10	M - 25	Cylinder	80	90	100	10	20
A'3 - 20	M – 25	Cylinder	80	80	100	20	20
A'3 - 30	M – 25	Cylinder	80	70	100	30	20
A'3 - 40	M – 25	Cylinder	80	60	100	40	20
B'1 - 10	M - 30	Cube	80	90	100	10	20
B'1 - 20	M - 30	Cube	80	80	100	20	20
B'1 - 30	M - 30	Cube	80	70	100	30	20
B'1 - 40	M - 30	Cube	80	60	100	40	20
B'2 - 10	M - 30	Beam	80	90	100	10	20
B'2 - 20	M - 30	Beam	80	80	100	20	20
B'2 - 30	M - 30	Beam	80	70	100	30	20
B'2 - 40	M - 30	Beam	80	60	100	40	20
B'3 - 10	M - 30	Cylinder	80	90	100	10	20
B'3 - 20	M - 30	Cylinder	80	80	100	20	20
B'3 - 30	M - 30	Cylinder	80	70	100	30	20
B'3 - 40	M - 30	Cylinder	80	60	100	40	20

CA= Course Aggregate, S.D = Stone Dust, G.P = Glass Pouder

V. RESULTS AND DISCUSSION

A. Compressive Strength

The result of the compressive strength with partial replacement of stone dust and without using glass powder for 7, 14, 28 and 56 days are shown in the Table 6 for M-25 concrete and in the Table 7 for M-30 concrete and their graphical representation in the Fig. 1 for M-25 concrete and in the Fig. 2 for M-30 Concrete. And by replacing 20% cement with glass powder along with stone dust is shown in the Table 12 for M-25 concrete and in the Table 13 for M-30 concrete and their graphical representation is shown in the Fig 7 and Fig 8.

Table 6. Compressive Strength of Different Mix of M-25 Concrete (without Glass Powder)

Designation	Compressive Strength in N/mm^2				% S.D.
	7 Days	14 Days	28 Days	56 Days	
A1 - 0	21.15	24.39	32.56	33.40	0
A1 - 10	21.60	24.76	32.30	34.36	10
A1 - 20	21.96	25.01	34.80	36.30	20
A1 - 30	22.50	25.08	35.40	37.26	30
A1 - 40	23.18	25.70	37.02	38.01	40

Table 7. Compressive Strength of Different Mix of M-30 Concrete (without Glass Powder)

Designation	Compressive Strength in N/mm^2				% S.D.
	7 Days	14 Days	28 Days	56 Days	
B1 – 0	23.06	27.50	37.50	39.20	0
B1 – 10	23.80	28.05	38.42	39.32	10
B1 – 20	24.16	28.70	39.30	41.26	20
B1 – 30	24.86	29.30	40.06	42.10	30
B1 – 40	25.10	29.82	42.10	43.31	40

B. Flexure Strength

The result of the flexure strength with partial replacement of stone dust and without using glass powder for 7, 14, 28 and 56 days are shown in the Table 8 for M-25 concrete and in the Table 9 for M-30 concrete and their graphical representation in the Fig. 3 for M-25 concrete and in the Fig. 4 for M-30 Concrete. And by replacing 20% cement with glass powder along with stone dust is shown in the Table 14 for M-25 concrete and in the Table 15 for M-30 concrete and their graphical representation is shown in the Fig 9 and Fig 10.

Table 8. Flexure Strength of Different Mix of M-25 Concrete (without Glass Powder)

Designation	Flexure Strength in N/mm^2				% S. D.
	7 Days	14 Days	28 Days	56 Days	
A2 - 0	3.70	3.96	4.86	5.12	0
A2 – 10	3.98	4.20	5.37	5.62	10
A2 – 20	4.10	4.51	5.86	5.98	20
A2 – 30	4.28	4.96	5.96	6.37	30
A2 – 40	4.36	5.10	6.31	6.67	40

Table 9. Flexure Strength of Different Mix of M-30 Concrete (without Glass Powder)

Designation	Flexure Strength in N/mm^2				% S.
	7 Days	14	28	56	
B2 – 0	4.20	4.98	5.20	5.47	0
B2 – 10	4.36	4.90	6.31	6.80	10
B2 – 20	4.42	5.01	6.70	6.86	20
B2 – 30	4.83	5.10	6.86	7.12	30
B2 – 40	4.72	4.92	6.20	6.73	40

C. Split Tensile Strength

The result of the split tensile strength with partial replacement of stone dust and without using glass powder for 7, 14, 28 and 56 days are shown in the Table 10 for M-25 concrete and in the Table 11 for M- 30 concrete and their graphical representation in the Fig. 5 for M-25 concrete and in the Fig. 6 for M-30 Concrete. And by replacing 20% cement with glass powder along with stone dust is shown in the Table 16 for M-25 concrete and in the Table 17 for M-30 concrete and their graphical representation is shown in the Fig 11 and Fig 12.

Table 10. Split Tensile Strength of Different Mix of M-25 Concrete (without Glass Powder)

Designation	Split Tensile Strength in N/mm^2				% S.D.
	7 Days	14 Days	28 Days	56 Days	
A3 – 0	2.25	2.40	3.04	3.21	0
A3 – 10	2.40	2.49	2.96	3.12	10
A3 – 20	2.32	2.62	3.14	3.39	20
A3 – 30	2.50	2.96	3.55	3.72	30
A3 – 40	2.46	2.80	3.46	3.71	40

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VIII, August 2017- Available at www.ijraset.com

Table 11. Split Tensile Strength of Different Mix of M-30 Concrete (Without Glass Powder)

Designation	Split Tensile Strength in N/mm^2				% S.
	7 Days	14 Days	28 Days	56 Days	
B3 – 0	3.05	3.70	4.12	4.28	0
B3 – 10	3.21	3.61	4.31	4.48	10
B3 – 20	3.15	3.47	4.16	4.38	20
B3 – 30	3.42	3.68	4.44	4.63	30
B3 – 40	3.50	3.76	4.49	4.68	40

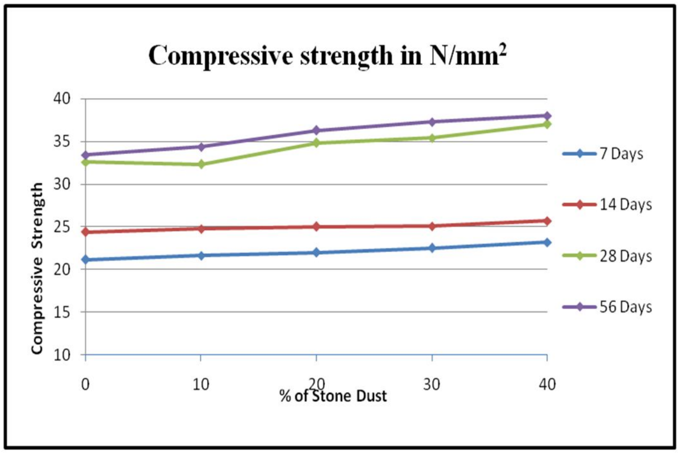
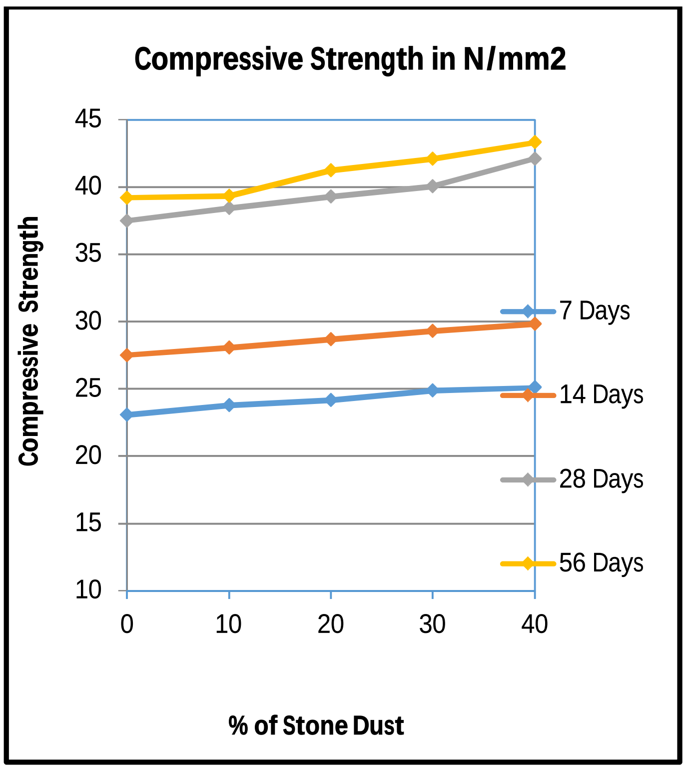


Figure: 1. Compressive Strength of Different Mix of M-25 Concrete (Without Glass Powder)



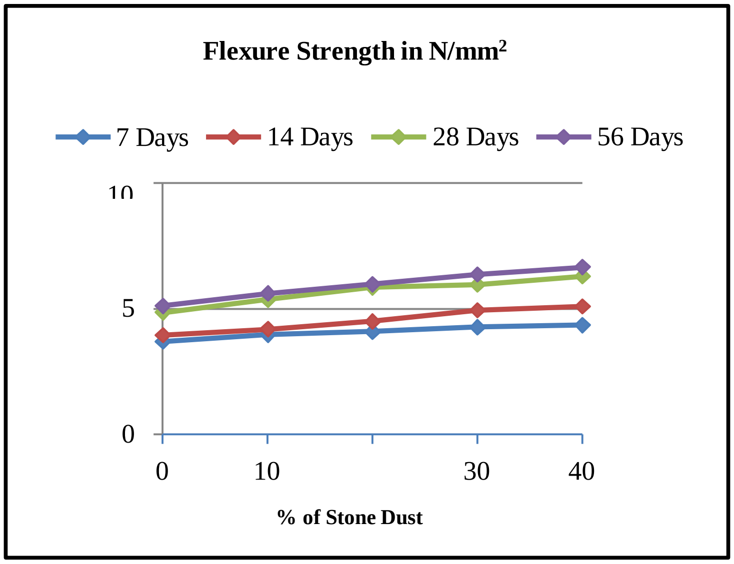


Figure 2. Compressive Strength of Different Mix of M-30 Concrete (Without Glass Powder)

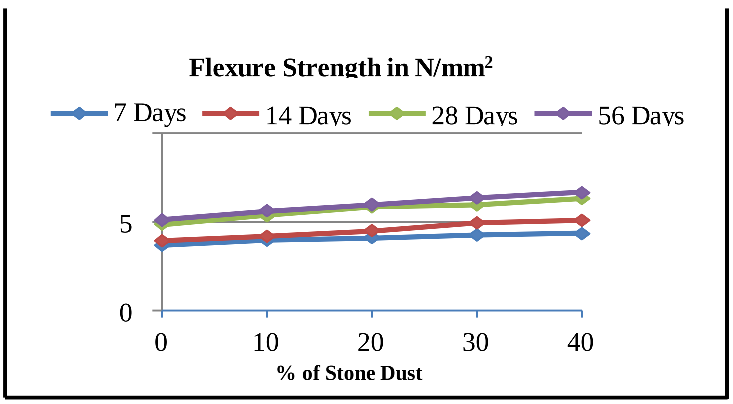


Figure 3. Flexure Strength of Different Mix of M-25 Concrete (Without Glass Powder)

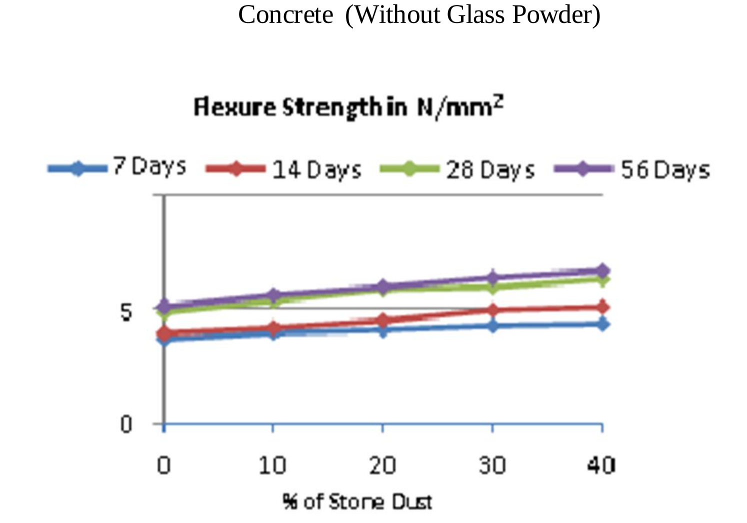


Figure 4. Flexure Strength of Different Mix of M-30 Concrete (Without Glass Powder)

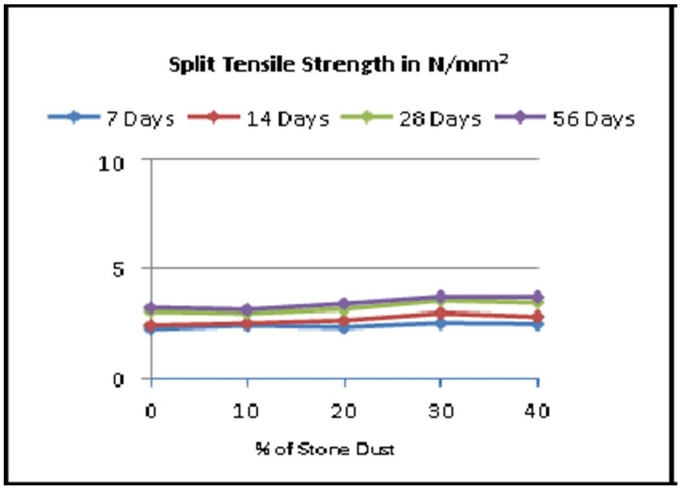


Figure 5. Split Tensile Strength of Different Mix of M-25 Concrete (Without Glass Powder)

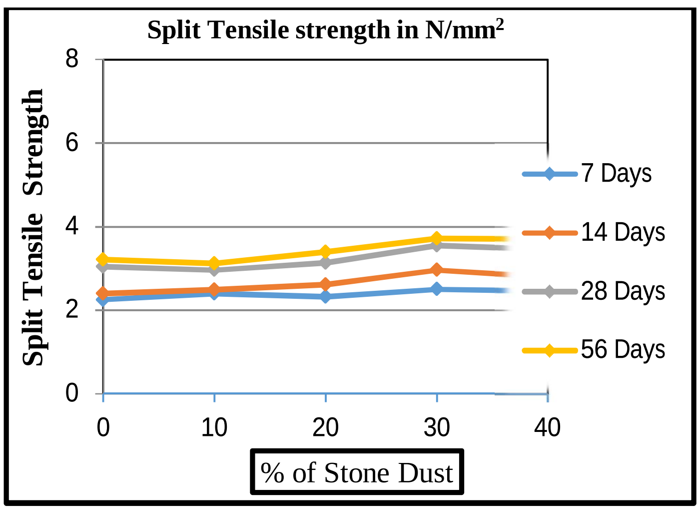


Figure 6. Split Tensile Strength of Different Mix of M-30 Concrete (Without Glass Powder)

Table 12. Compressive Strength of Different Mix of M-25 Concrete (with Glass Powder 20% & Cement 80%)

Designation	Compressive Strength in N/mm^2				% S.D .
	7 Days	14 Days	28 Days	56 Days	
A'1 - 10	25.62	26.15	31.70	33.20	10
A'1 - 20	26.32	27.30	33.72	35.46	20
A'1 - 30	25.90	27.80	34.20	36.13	30
A'1 - 40	27.12	28.12	38.40	41.36	40

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VIII, August 2017- Available at www.ijraset.com

Table 13 Flexure Strength of Different Mix of
M-30 Concrete (with Glass Powder 20% & Cement 80%)

Designation	Compressive Strength in N/mm^2				% S.D.
	7 Days	14 Days	28 Days	56 Days	
B'_1 - 10	28.70	28.40	39.36	41.33	10
B'_1 - 20	28.96	29.90	39.80	41.36	20
B'_1 - 30	29.14	30.21	40.26	42.43	30
B'_1 - 40	30.00	31.60	41.96	42.41	40

Table 14. Flexure Strength of Different Mix of
M-25 Concrete (with Glass Powder 20% & Cement 80%)

Designation	Flexure Strength in N/mm^2				% S.D.
	7 Days	14 Days	28 Days	56 Days	
A'_2 - 10	4.48	5.10	6.40	6.76	10
A'_2 - 20	4.70	5.60	6.76	7.06	20
A'_2 - 30	4.96	5.21	6.96	7.14	30
A'_2 - 40	5.10	5.36	7.01	7.36	40

Table 15. Flexure Strength of Different Mix of
M-30 Concrete (with Glass Powder 20% & Cement 80%)

Designation	Flexure Strength in N/mm^2				% S.D.
	7 Days	14 Days	28 Days	56 Days	
B'_2 - 10	4.20	5.40	6.36	6.87	10
B'_2 - 20	4.36	5.32	6.72	7.06	20
B'_2 - 30	4.80	5.62	7.01	7.34	30
B'_2 - 40	4.98	5.36	7.42	7.87	40

Table 16. Split Tensile Strength of Different Mix of
M-25 Concrete (with Glass Powder 20% & Cement 80%)

Designation	Split Tensile Strength in N/mm^2				% S.D.
	7 Days	14 Days	28 Days	56 Days	
A'_3 - 10	2.32	2.48	3.10	3.28	10
A'_3 - 20	2.38	2.56	3.16	3.34	20
A'_3 - 30	2.60	2.68	3.30	3.42	30
A'_3 - 40	2.80	2.98	3.46	3.63	40

Table 17. Split Tensile Strength of Different Mix of
M-30 Concrete (with Glass Powder 20% & Cement 80%)

Designation	Split Tensile Strength in N/mm^2				% S.D.
	7 Days	14 Days	28 Days	56 Days	
B'_3 - 10	3.12	3.72	4.20	4.37	10
B'_3 - 20	3.18	3.58	4.26	4.46	20
B'_3 - 30	3.06	3.70	4.32	4.51	30
B'_3 - 40	3.20	3.93	4.46	4.60	40

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VIII, August 2017- Available at www.ijraset.com

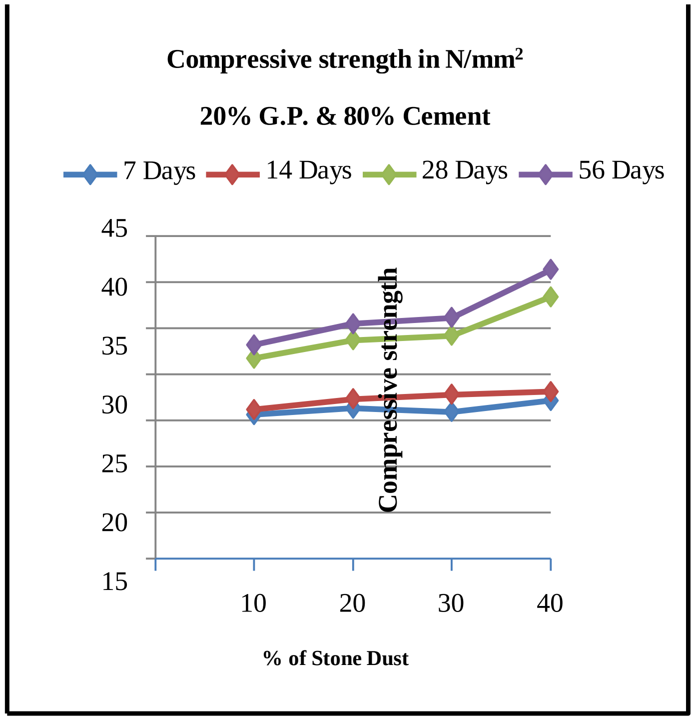


Figure 7. Compressive Strength of Different Mix of M-25 Concrete (with 20% Glass Powder & 80% Cement)

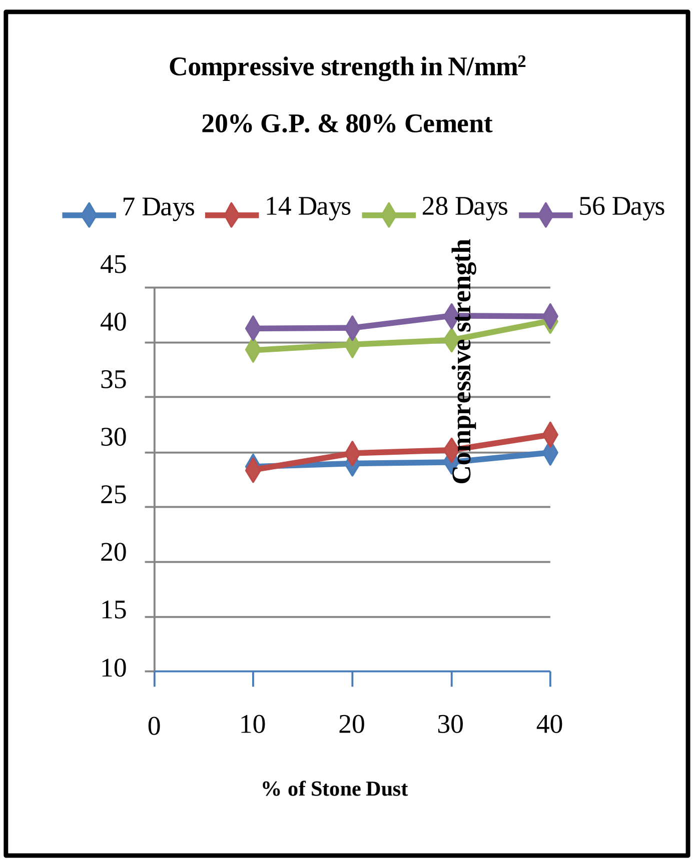


Figure 8. Compressive Strength of Different Mix of M-30 Concrete (with 20% Glass Powder & 80% Cement)

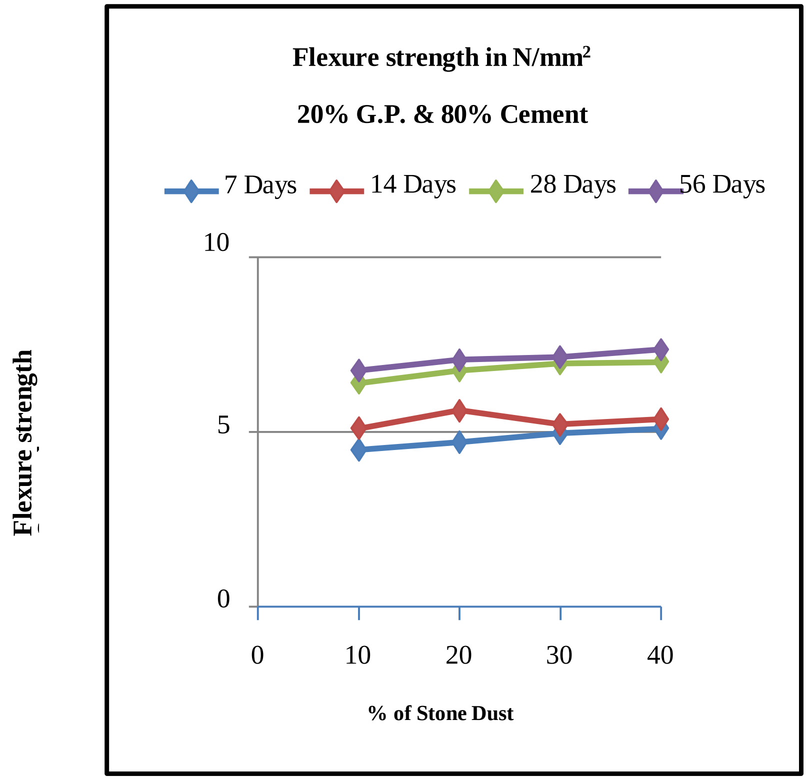


Figure 9. Flexure Strength of Different Mix of M-25 Concrete (With 20% Glass Powder & 80% Cement)

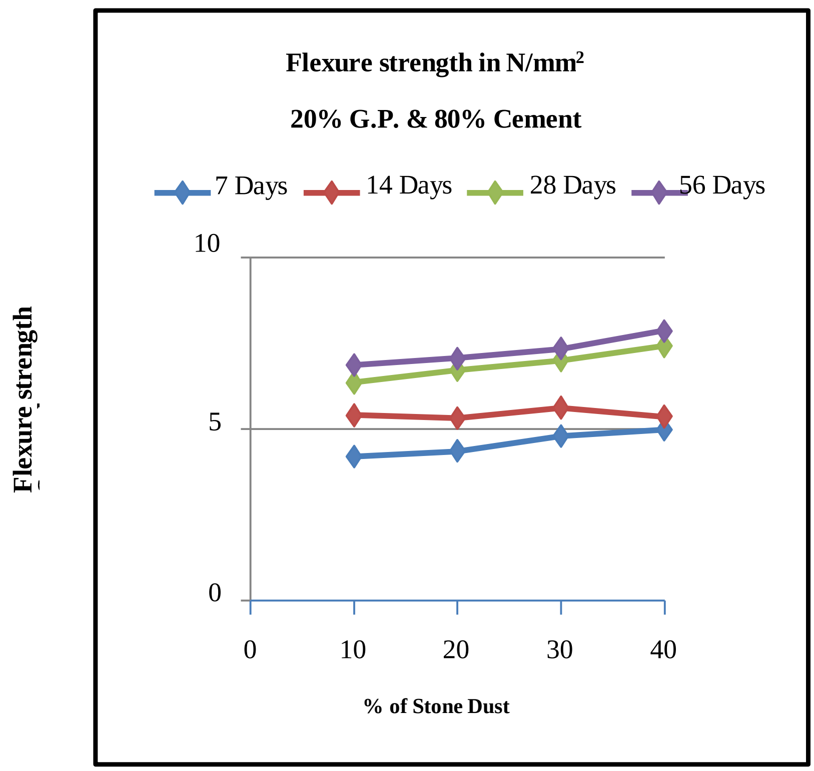


Figure 10. Flexure Strength of Different Mix of M-30 Concrete (With 20% Glass Powder & 80% Cement)

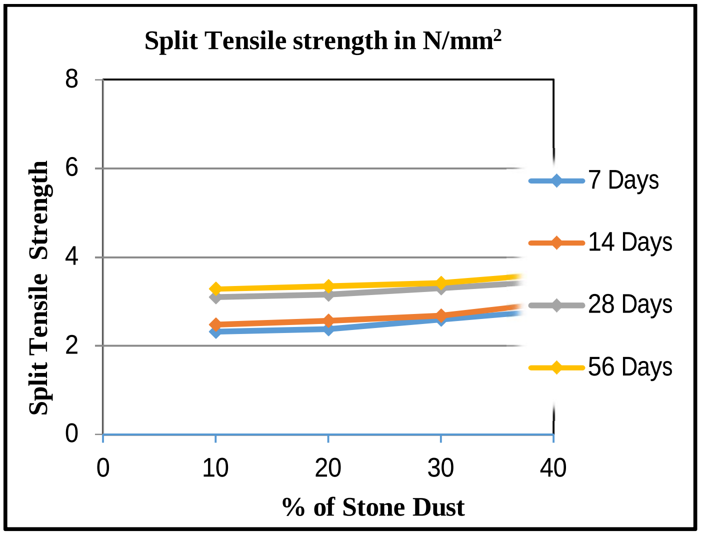
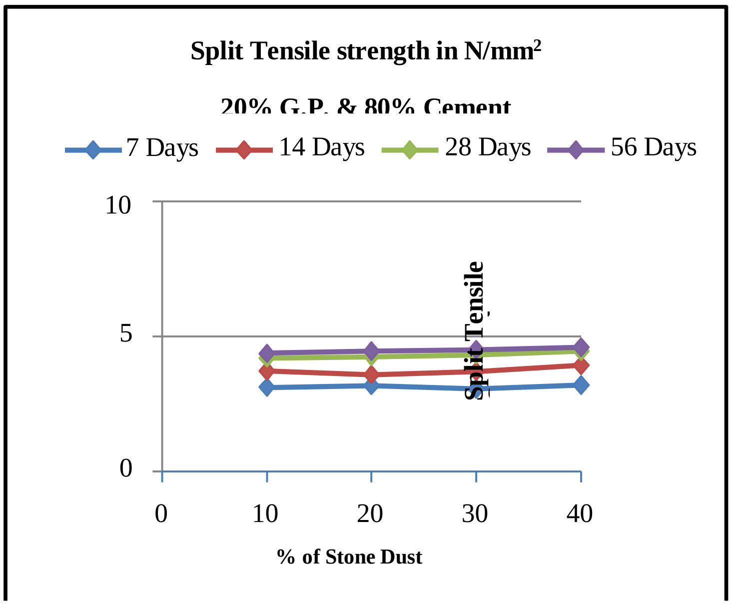


Figure 11 Split Tensile Strength of Different Mix of M-25 Concrete (With Glass Powder 20% & Cement 80%)



Figu1Figure 12. Split Tensile Strength of Different Mix of M-30 Concrete (With 20% Glass Powder & 80% Cement)

VI. CONCLUSION

From the about experiments following conclusions are observes

A. The compressive strength by replacing 40% sand by stone dust the strength increases by 10, 5, 13 and 14% at 7, 14, 28 and 56 days respectively in M-25 concrete and 9, 8, 12 and 10% at 7, 14, 28 and 56 days respectively in M-30 concrete. As compared to the conventional concrete. Thus stone dust increases the compressive strength of the concrete and reduce the cost of material and also its great use of waste materials.

B. The compressive strength of the concrete by replacing the 40% sand by stone dust and 20% cement by the glass powder the strength increases by 28, 15, 18 and 24% at 7, 14, 28 and 56 days respectively in M-25 concrete and 30, 15, 12 and 8% at 7, 14, 28 and 56 days respectively in M-30 concrete. As compared to the conventional concrete. Thus glass powder can also be used up to 20% which is also great saving in costly cement and use of waste material.

C. The flexure strength of the concrete by replacing the 40% sand by stone dust increase 18, 28, 29 and 30% at 7, 14, 28 and 56 days respectively in M-25 concrete but in M-30 concrete it increases 12 19 and 23% at 7, 28 and 56 days respectively and reduced by 1.2% at 14 days. As compared to the conventional concrete. Thus stone dusts also increase the flexure strength at the later ages of the concrete.

D. The flexure strength of the concrete by replacing 40% sand by stone dusts and 20% cement by the glass powder the strengths are increase by 37, 35, 44 and 43% at 7, 14, 28 and 56 days respectively in M-25 concrete and 19, 18, 42 and 44% at 7, 14, 28 and 56 days respectively in M-30 concrete. As compared to the conventional concrete. Thus flexure strength is also increase by including the glass powder. It also reduces the consumption of the cement.

The split tensile strength of the concrete by replacing sand 40% by stone dust the strengths increases 9, 17, 14 and 16% at 7, 14, 28 and 56 days respectively in M-25 concrete and 15, 2, 9 and 10% at 7, 14, 28 and 56 days respectively in M-30 concrete. Hence stone dust increases the tensile strength of the concrete which is also saving in fine aggregate.

E. The split tensile strength of the concrete by replacing 40% sand by stone dust and 20% cement by glass powder the tensile strength is increase 24, 24, 14 and 13% at 7, 14, 28 and 56 days respectively in M-25 concrete and 5, 6, 8 and 8% at 7, 14, 28 and 56 days respectively in M-30 concrete. Hence by adding the glass powder with stone dust is also increase the tensile strength of the concrete. Hence saving in cost is two ways cost of sand and cement.

VII. FURTHER SCOPE OF WORK

A. The study can by carry out by increasing the percentage of stone dust up to 100% and fully replacement of the fine aggregate.

B. The study can also be carry out by increasing the percentage of glass powder up to maximum level with or without stone dusts.

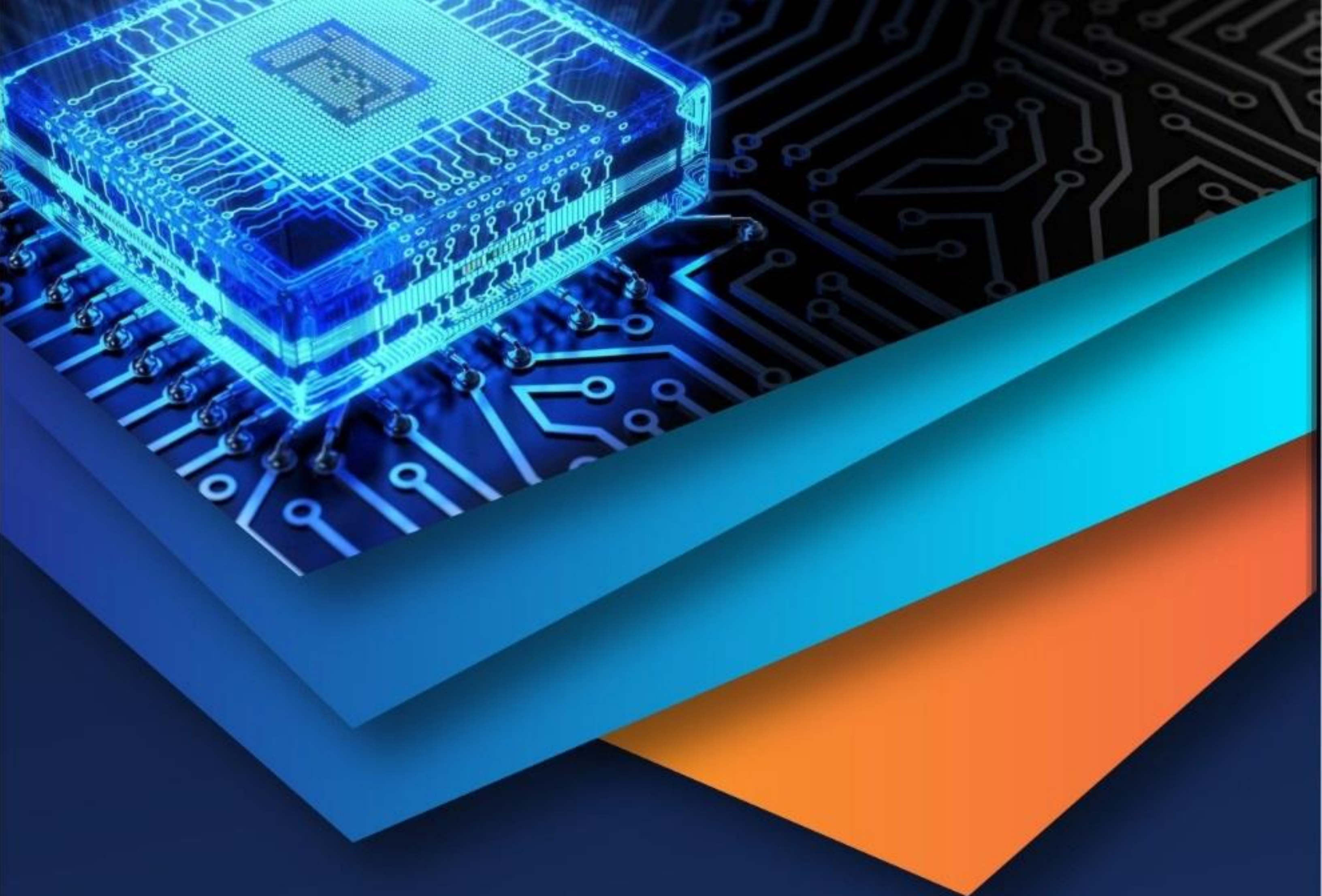
C. The engineering properties like water absorption, reduction in weight of concrete and density of the concrete can be study by using the stone dust and glass powder.

D. The effect temperature and humidity can also be study.

E. The study can also be carry out by using higher grade of concrete.

REFERENCES

[1] Dr. G. Vijayakumar, Ms H. Vishliny, Dr. D. Govindarajulu studies on glass powder as partial replacement of cement in concrete production. IJETAE: International journal of emerging technology and advanced engineering. Volume 3, Issue 2, Feb 2013.
[2] J.D. Chaitanya kumar, G.V.S. Abhilash, P.Khasim Khan, G.Mnikanta sai, V. Tarakh ram experimental studies on glass fiber concrete. AJER: American Journal of Engineering Research e-ISSN: 2320-0847 : p-2320-0936 volume-5, Issue-5, pp-100-104.
[3] Brajesh kumar Suman, Vikas Srivastava JMEST: Journal of Multidisciplinary Engineering Science and Technology ISSN: 3159-0040, vol. 2 Issue 4, April – 201
[4] Er. Lalit Kumar , Er. Arvinder Singh A study on the strength of concrete using crushed stone dust as fine aggregate. IJRASET: International Journal for Research in Applied Sciencde & Engineering Technology. ISSN: 2321-9653 vol. 3 Issue I, Jnauary 2015.
[5] A.K. Shau, Sunil Kumar and A.K. Sachan (2003) "crushed stone waste as fine aggregate for concrete" the Indian concrete Journal, pp 885848.
[6] Prakash Rao, D.s. & Giridhar Kumar, V.(2004) "Investigations on concrete with stone crusher dust as fine aggregate". The Indian Concrete Journal, M.E. Thesis submitted to Osmania University, Hyderabad, Indi
[7] : 383-1970. Specification for coarse and Fine Aggregates from natural sources for concrete.
[8] IS: 456-2000. Specification for plain and reinforced concrete.
[9] IS: 10262-2009: Guidelines for concrete mix design proportioning.
[10] IS: 456-2000. Specification for plain and reinforced concrete.



10.22214/IJRASET

INDEX COPERNICUS
45.98

IMPACT FACTOR:
7.129

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY