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BEHAVIOUR OF SELF-COMPACTING CONCRETE PRODUCED USING PUMICE LIGHTWEIGHT AGGREGATE

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Abstract: Concrete Is Used In All The Building Construction As Material Which Occupies A Unique Position In All The Modern Construction. Concrete Is A Mixture Of Fine Aggregate, Coarse Aggregate Cement And Water. Concrete Is One Of The Most Frequently Used Material Which Is Used Throughout The World Wide. Self-Compacting Concrete Is A Highly Fluid Form Of Concrete Which Consolidates Under Its Own Weight, Where Lightweight Aggregates Reduce The Dead Weight Of The Structure. Pumice Stone Is A Lightweight Aggregate Used For Lightweight Concrete. The Lightweight Is Formed Due To Escaping Of Gas From Molten Lava. In This Study An Attempt Is Compared With Conventional Concrete And Self-Compacted Lightweight Aggregate Is Made By Partial Replacement Of Coarse Aggregate With Different Ratios Such As 10%,20%,30% And40%. This Project Is Mostly Focused On Determining Mechanical Properties And Durability

Index Terms: **Pumice Stone, Fly-Ash, VMA, Super Plasticizer**

I INTRODUCTION

Self-Compacting Concrete Was First Developed In Japan In 1986. It Is A New Revolutionary Method With High Performance Concrete. Currently, In Industrial Constructions India Has Proved That The Large Construction And Complete Structures Were Increased And Often Lead To Difficult Concrete Conditions. Vibrating Of Concrete May Also Cause Some Risk To The Labour Regarding Noise Stress. The Design Applications Of SCC Have Been Developed By Many Professional Societies. The Self-Compacted Lightweight Aggregate Concrete Is A Concrete Whose Density Varies From 300 To 1900 Kg/M3. Self-Compacted Lightweight Aggregate Concrete Has Become Versatile Material In Modern Construction. It Had Many Varied Applications Including Multi-Storey Building Frames And Floors, Bridges, Offshore Oil Platforms, Prestressed And Precast Elements Of All Types. Structural Lightweight Aggregate Can Be Produced Naturally Or From Environmental By Products, Use Of These Aggregates Can Reduce The Density Of Concrete, The Self-Weight Of The Structure And It Helps To Construct Larger Precast Unit.

II LITERATURE REVIEW

Subhan Ramji Et.Al In This Paper Author Presented A Study On Pumice Aggregate Replacing Partially With Coarse Aggregate As Well As 5% Of Fly-Ash Is Replaced By Cement. From These Above Materials Optimum Value Is Obtained By 1.5% Of Glass Fibre Is Added. Mechanical Properties Were Determined Such As Compressive Test Split Tensile Strength And Flexure Test Experimental Investigation Consist Of Casting And Testing Of 18 Sets. Pumice Stone Is Replaced Partially With Different Percentages. It Is Concluded That Strength Of Concrete Is Found To Decrease With Increase Of Pumice Content. When Glass Fibre Is Added, Slump Value Obtained Is Very Less.

N.Bozkurt Et.Al (2017) This Paper Was Studied On Self-Compacting Concrete Using Acidic Pumice With Powder Materials. Two Sets Of Concrete Were Designed. In First Group, Acidic Pumice Powder And Fly-Ash Powder Is Used And In Second Group Fine Aggregate And Pumice Powder Is Replaced By Coarse Aggregate Fresh Properties Were Determined For Self-Compacting Concrete And Compressive Strength Is Also Determined As Which It Is An Important Parameter Of Concrete. It Is Concluded That Concrete Having Lower Unit Weight Gives Better Strength Properties. The Usage Of Pumice Leads To Eco-Friendly Concrete And Energy Saving

G.Ankamma Et.Al ((2015) In This Study, Author Presented Research On Pumice Lightweight Aggregate Which Is Replaced Partially By Coarse Aggregate. Mineral Admixture Such As Fly-Ash And Steel Fibres Were Used. Mechanical Properties And Slump Test Is Carried Out. Design Criteria Is Done By Different Percentages Of Pumice Stone, Fly-Ash And Steel Fibres. It Is Concluded That Pumice Lightweight Aggregate Which Is Replaced By Natural Coarse Aggregate Is Promising. By Adding Mineral Admixtures Compressive, Tensile Strength And Flexural Strength Of Concrete Were Increased. Lightweight Aggregate Can Be Used For Construction Purpose. By Using 1% Of Steel Fibres, Strength Decreases With Increase Of Steel Fibre And Pumice Stone.

A.Dinesh And S.Harini Et.Al (2017) This Paper Have Been Studied By Replacing Cement By Silica Fume And Fly-Ash Cement Is Replaced With 5%, 10%, 15% Of Fly-Ash And 2.5%, 5%, And 7.5% Of Silica Fume. It Is Concluded That Increasing Amount Of Fly-Ash And Silica Fume Have Decreased The Strength

M. Praveen Kumar Et.Al (2016) Author Studied The Mechanical Properties Of Lightweight Aggregate To Compare With Conventional Concrete By Replacing Partially With Pumice Stone It Is Concluded That Density Reduced When Compared With Normal Concrete

III MATERIAL STUDY

Materials

This Section Gives The Entire Information About The Different Materials Used In Experimental Investigation

Cement:

In This Investigation, Ordinary Portland Cement Of Grade 53 Cement Is Used. This Cement Is Found To Various Specifications. The Physical Properties Are Tested According To IS 4031-1998 And Results Are Tabulated In Table 1

Table1 Physical Properties of Cement

Test	Result
Specific Gravity	3.14
Standard Consistency	33%
Initial Setting Time	45 Min
Final Setting Time	680 Min
Bulk Density	1440 Kg/ M^3
Fineness Of Cement	2.14 %

Aggregates

Aggregates Are the Granular Materials Such As Fine Aggregate, Coarse Aggregate That Are Mixed Along With Water And Portland Cement To Prepare Concrete

Coarse Aggregate

Aggregates Used In Investigation Are Passed Through 12mm And Retained On 10 Mm Aggregates Are Used. Properties Of Coarse Aggregates Are Tabulated in Table 2

Table2 Physical Properties of Coarse Aggregates

Property	Coarse Aggregate
Fineness Modulus	6.41
Specific Gravity	2.43
Bulk Density	1420 Kg/ M^3
Water Absorption	0.6 %

Fine Aggregate

Fine Aggregate Is Used Which Is Locally Available River Sand And Is Free From All Impurities. The Requirements of Sand Is Confirming Of IS: 383-1970 And the Properties Of Fine Aggregate Are Tested And Results Are Tabulated In Table 3

Table 3: Physical Properties of Fine Aggregate

Test	Result
Fineness Modulus	2.83
Specific Gravity	2.59
Bulk Density	1570 Kg/ M3
Water Absorption	1%

Pumice

Pumice Is Used As Lightweight Aggregate Which Is Of Size Of 12mm, Properties Of Pumice Test Results Are Tabulated In Table 4

Table 4 Physical Properties Pumice

Property	Pumice
Fineness Modulus	5.84 5.84
Specific Gravity	1.04 1.05410

Water

Water Is The Most Important Ingredient Of Concrete Which Helps To Bind The Cement And Aggregates.

Super Plasticizer

In This Investigation CONPLAST SP430 Is Used Which Is Used for Improving Workability Of Concrete

Fly-Ash

Fly-Ash Is One of The Most Uneconomical Used By-Product Material In Construction Field, Non-Combustible Finely Divided Residue Which Is Collected From Exhaust Gases Of Any Industrial Furnace.

MIX DESIGN

Mix Design of SCC Lightweight Aggregates Was Done Using Rational Mix Design Method. Pumice Aggregate Is Replaced Partially by Coarse Aggregate in Concrete With Different Percentages Such As 10%, 20%,30% And 40%.

Curing Of Specimens

All The Specimens of Pumice Self-Compacted Lightweight Aggregates Were Casted and Cured By Placing The Specimens In Curing Tank For Duration Of 7 And 28 Days.

IV EXPERIMENTAL METHODOLOGY

Compressive Strength

Cube Size Of 100*100*100mm Specimens Were Casted and Cured For 7 And 28 Days and Tested Under Automatic Testing Machine

Fig1 Compressive Testing Machine

Tensile Strength

Cylinder Size Of 150*100mm Specimens Were Casted And Cured For 7 And 28 Days Under Testing Machine.

Fig2: Tensile Testing Machine

Flexure Strength

Prism Size Of 150*100*100mm Specimens Were Casted And Cured For 7 And 28 Days Under Testing Machine.

Fig 3: Flexure Testing Machine

Table 5 HARDENED PROPERTIES

Grade Of Concrete	Fresh Properties		
	Slump Flow Test	V-Funnel Test	L-Box Test
M20	4	4	0.82
	4.3	5.4	0.85
	4.8	.78	0.87
	5	2.88	0.2
M30	5	6.8	0.78
	5.2	7.4	0.84
	5.7	8	0.87
	5.	8.7	0.4
M40	4.8	5.8	0.81
	5	6	0.87
	5.5	6.4	0.9
	4.0	6.1	0.86

V EXERIMENTAL RESULTS

Table 6 WORKABLE PROPERTIES

Grade Of Concrete	Design Ation	Cube Compressive Strength (Mpa)		Prism Flexural Strength (Mpa)		Cylinder Split Tensile Strength (Mpa	
		7 Days	28 Days	7 Days	28 Days	7 Days	28 Days
M20	NSCC	24.6	37.8	5.12	7.4	5.92	8.06
	10%	22.83	36.76	4.96	6.37	4.84	6.37
	20%	21.73	33.2	4.28	5.84	4.26	5.12
	30%	14.79	25.6	3.01	4.01	3.14	4.05
	40%	14.7	23.79	3.12	3..8	2.1	4.02
M30	NSCC	29.3	39.6	5.73	9.5	5.98	8.62
	10%	28	38.33	5.12	8.92	5.02	7.05
	20%	27.06	32.12	5.07	7.02	4.92	5.22
	30%	21.26	25.9	3.48	6.12	3.91	4.28
	40%	20.3	25.16	3.12	6.12	3.11	4.14
M40	NSCC	31.8	44.9	6.20	9.7	6.12	8.69
	10%	27.56	42.96	6.18	9.26	5.18	7.58
	20%	28.62	44.8	5.23	9.73	6.26	8.73
	30%	22.7	38.2	5.01	8.68	4.98	5.27
	40%	21.2	26.12	4.98	6.18	4.02	4.1

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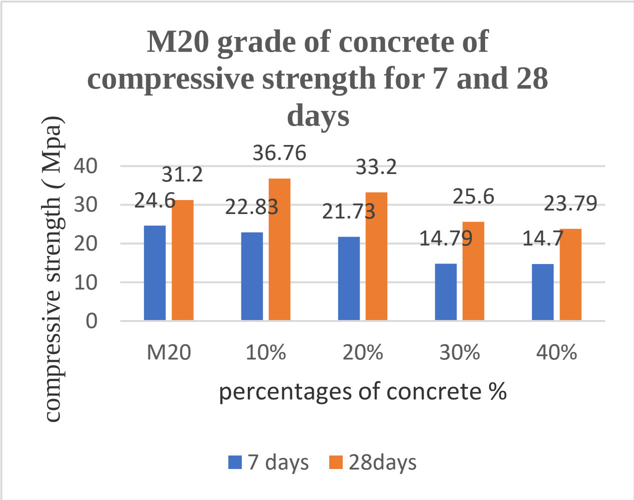
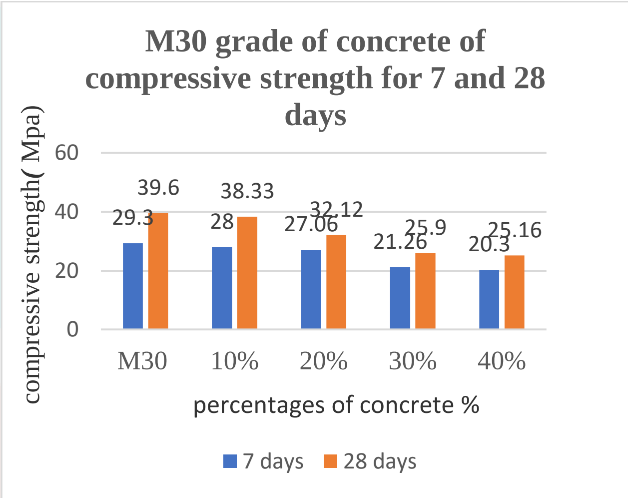
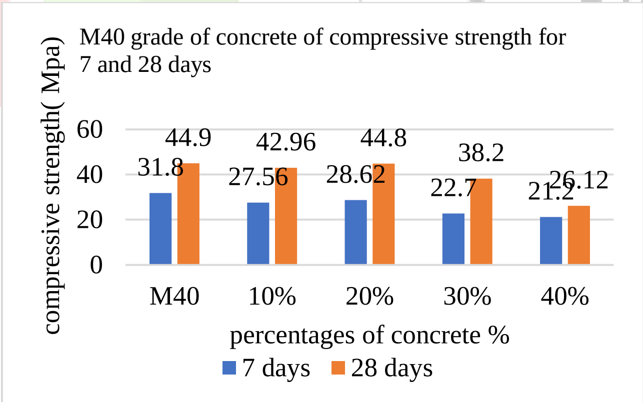


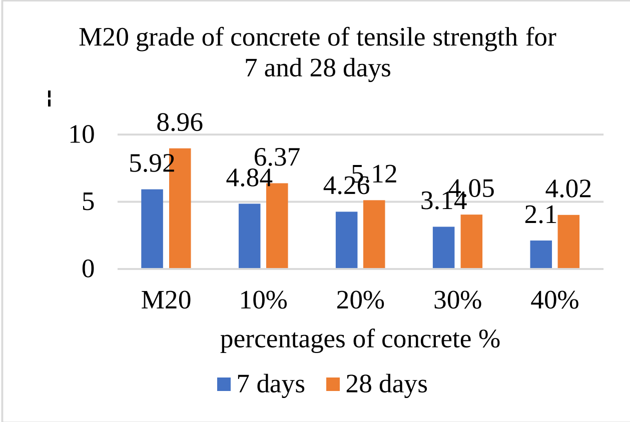
M20 Grade Of NLWSCC And LWSCC Compressive Strength For 7 And 28 Days



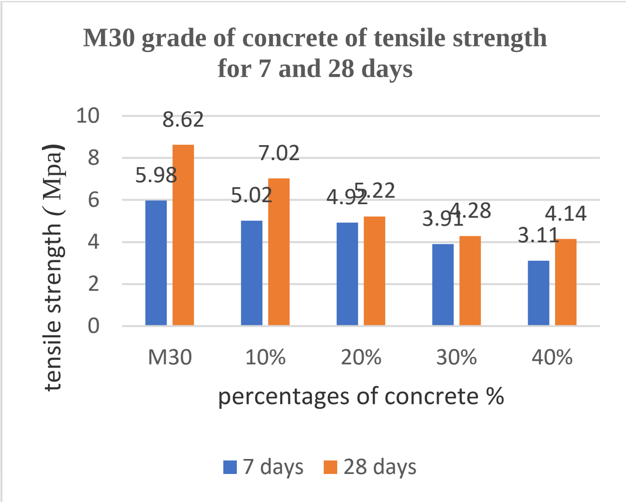
M30 Grade Of NLWSCC And LWSCC Compressive Strength For 7 Days And 28 Days



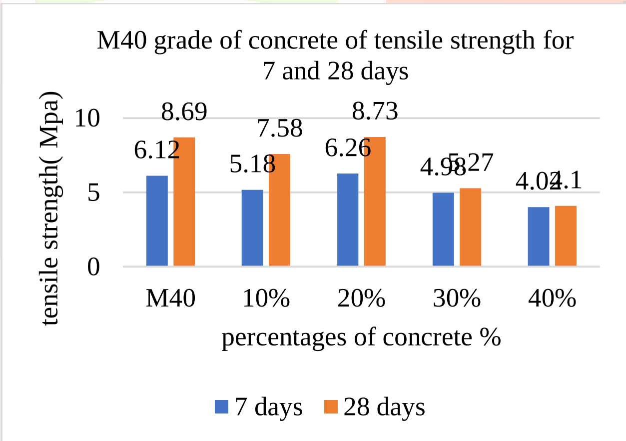
M40 Grade Of NLWSCC And LWSCC Compressive Strength For 7 Days And 28 Days



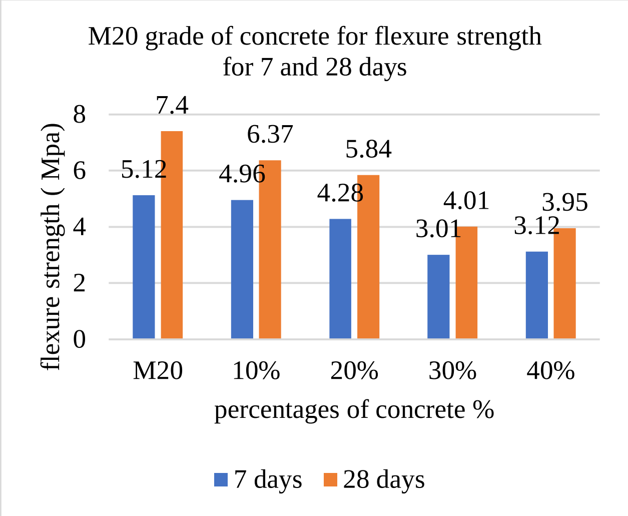
M20 Grade of NLWSCC And LWSCC Split Tensile Strength For 7 And 28 Days



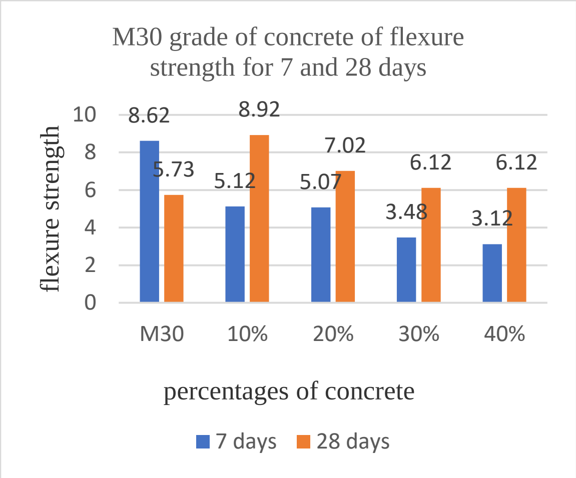
M30 Grade of NLWSCC And LWSCC Split Tensile Strength For 7 Days And 28 Days



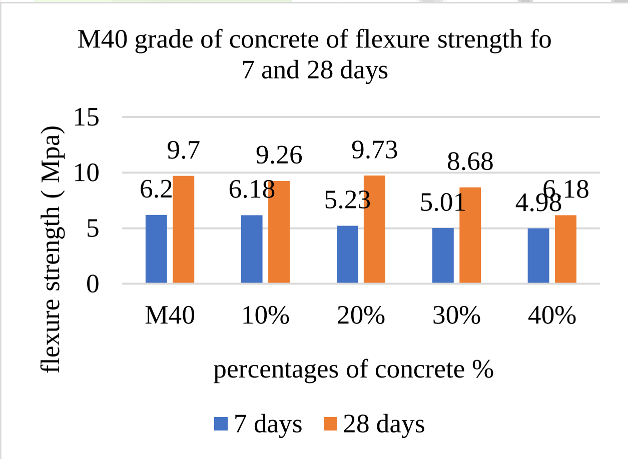
M40 Grade of NLWSCC And LWSCC Split Tensile Strength For 7 And 8 Days



M20 Grade Of NLWSCC And LWSCC Flexure Strength For 7 And 28 Days



M30 Grade Of NLWSCC And LWSCC Flexural Strength For 7 And 28 Days



M40 Grade Of NLWSCC And LWSCC Flexural Strength For 7 And 28 Days

VI CONCLUSIONS

1. In This Investigation Maximum Compressive Strength And Tensile Strength Is Obtained At 10% Replacement Of Coarse Aggregate To Pumice Lightweight Aggregate.
2. In M20 Grade Of Concrete, It Is Concluded That Maximum Tensile Strength Is Obtained At Replacement Of Coarse Aggregate By Pumice Aggregate.
3. In M20 Grade Of Concrete, It Is Concluded That Maximum Flexural Strength Is Obtained At Replacement Of Coarse Aggregate By Pumice Aggregate.
4. In M30 Grade Of Concrete, It Is Concluded That Maximum Compressive Strength Is Obtained At Replacement Of Coarse Aggregate By Pumice Aggregate.
5. In M30 Grade Of Concrete, It Is Concluded That Maximum Tensile Strength Is Obtained At Replacement Of Coarse Aggregate By Pumice Aggregate.
6. In M30 Grade Of Concrete, It Is Concluded That Maximum Flexural Strength Is Obtained At Replacement Of Coarse Aggregate By Pumice Aggregate.
7. In M40 Grade Of Concrete, It Is Concluded That Maximum Compressive Strength Is Obtained At Replacement Of Coarse Aggregate By Pumice Aggregate.
8. In M40 Grade Of Concrete, It Is Concluded That Maximum Tensile Strength Is Obtained At Replacement Of Coarse Aggregate By Pumice Aggregate.
9. In M40 Grade Of Concrete, It Is Concluded That Maximum Flexural Strength Is Obtained At Replacement Of Coarse Aggregate By Pumice Aggregate.
10. The Increase In Percentage Of Pumice Stone As Replacement Will Show Negative Impact On Strength Of Concrete (Strength Decreased).
11. Pumice Aggregate Absorbs More Amount Of Water When Compared To Normal Coarse Aggregate, Where This Problem Has Been Overcome By Using High Dosage Of SP.

VII REFERENCES

1. R. Kalpana P.S. Kothai, "Study On Properties Of Fibre Reinforced Light Weight Aggregate Concrete", International Journal For Scientific Research And Development (IJSRD), Vol.3, Issue 2, 2015, ISSN:2321-0613
2. Moh Azhar Azwar Manaf, Bambang Soegijono, "Rice Husk Ash And Pumice In Light Weight Concrete Of Engineering Materials To Improve Mechanical Strength Portland Cement Composites" International Journal Of Civil And Environmental Engineering, IJCEE-IJENS, June 14, Vol,14, No.3
3. N.Sivalinga Rao, N.Manju "Study On Mechanical Properties Of Silica Fume Light Weight Aggregate Concrete Self-Compacting", A Concrete Of Next Decade (2012), Journal Of Engineering Research And Studies, E-ISSN0976.
4. Dinesh.A, Harini.S, Jasmine Jeba.P, J.Shagufta Javed, "Experimental Study On Self-Compacting Concrete, International Journal Of Engineering Sciences And Research Technology", ISSN:2271-9655, March 2017,
5. Self-Compacting, A Concrete Of Next Decade (2012), Journal Of Engineering Research And Studies, E-ISSN0976.
6. Arul Shiva Gokulan Ravindiran, "A Review On Self-Compacting Concrete", International Journal Of Chem Tech Research ISSN:0974;4290, ISSN: 2455-9555, Vol. 10, No.11, PP62-69,2017
7. B.H.V Pai, M.Nandy A.Krishnamoorthy, "Experimental Study On Self-Compacting Concrete Containing Industrial By-Product", European Scientific Journal, April 2014, Vol.10, No.12, ISSN:1857-7881, ISSN; 1857-7431
8. V.Karthika, P.O. Awoyera, I.I. Akinwumi, R.Gobinath, R.Gunasekaran, N.Lokesh, "Structural Properties Of Light Weight Self-Compacting Concrete Made With Pumice Stone And Mineral Admixtures" , Romanian Journal Of Materials, 2018, 48(2), 208-213