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Experimental Study On Conventional Concrete Over Polymer Impregnated Concrete Using Silica Fumes

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ABSTRACT--*In this experimental study we are utilizing silica exhaust with styrene and polyester monomer for increment the quality of the solid. With the reference of study cases we can say that there are numerous materials are accessible for expanding the quality of the solid. In part polymer is utilized for improving the quality, yet it isn't usually utilized. There are numerous looks into has improved improvement the quality of cement by utilizing polymer. Polymer impregnated concrete is one of the generally utilized polymers composite. It is only a regular precast concrete, relieved and dried in broiler or by dielectric warming from which the air in open cells is expelled by vacuum process. At that point a low thickness monomer or pre polymer halfway or completely is impregnated or diffused into the pore arrangement of the solidified concrete composites or concrete and afterward polymerized utilizing radiation or by the use of warmth or by substance initation. Ferrocement is delivered by applying concrete mortar made out of fine totals and concrete into support utilizing plasterer procedures. Accordingly the property of ferrocement recognizes it from fortified cement. While of comparable sturdiness , it is more versatile than fortified cement.*

KEYWORDS--*Super plasticizer, polymer, split tensile strength, compression strength, flexural strength, cement and aggregates.*

I. INTRODUCTION

In this exploratory investigation we will do throwing ,relieving and testing process. In this assurance of pressure quality, flexural quality and split elasticity. Throwing will be accomplished for M20, M40,M60 grades. Here we are utilizing plain concrete solid which is generally utilized in development. PCC is minimal effort and successful from this we can get a typical quality following 28 days of relieving . Throwing will be done in crystal, 3D shape and chamber.

Subsequent to relieving process we can ready to see some air voids are happened because of that quality of the solid is diminished. As we probably am aware we regularly consider air voids of 2% in the base of useful encounters .For staying away from air voids the polymer impregnated concrete is utilized. After polymer impregnated solid we can take them for testing. In view of polymer impregnated solid thickness builds the dead burden additionally get expanded and contrasting and RCC the silica exhaust invigorates because of close dividing of polymer.

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II. METHODOLOGY

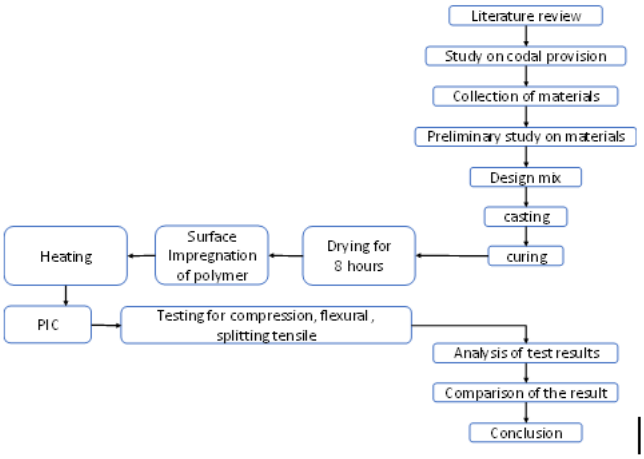

Figure 1 Implementation Process

- After designing the implementation of work , three cubes are casted for the trail test ,the mix ratio of the concrete is 1:2.17:2.35 (M20 grade) The mix contains cement (53 grade) , 12.5mm coarse aggregates, M-sand and water added into the concrete.
- After casting ,these cubes were kept in mould for 24hrs.
- Then, they are placed in curing for 7 and 28 days for compressive and split tensile test.
- For flexure test, the concrete is placed in curing for 7 and 28 days.
- After the completion of curing time, the concrete is dried and then coated in polyester-styrene polymer and allowed to dry for 8 hours.
- After, partial polymer impregnation the concrete is tested for strength.

III. MATERIALS

3.1 CEMENT

In this exploratory work OPC 53 evaluation is utilized .53 evaluation OPC gives high quality and strength to structures on account of its ideal molecule size appropriation and predominant solidified structure. Being a high quality concrete ,it gives various preferences any place cement to extraordinary high quality application is required, ,for example, in the development of high rises, spans, flyovers, stacks, runways, solid streets and other substantial burden bearing structures.

Table 1 Properties of Cement

S.no	Properties	Values
1	Fineness (%)	3
2	Soundness (cm)	2.5
3	Initial setting time (min)	35

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4	Final setting time (min)	450
5	Specific Gravity	3.13

3.2 FINE AGGREGATE

M-SAND

- It is all around evaluated in the necessary extent.
- It doesn't contain natural and dissolvable aggravate that influences the setting time and properties of cement, thus the necessary quality of cement can be kept up.
- It doesn't have the nearness of contaminations, for example, dirt, residue and sediment coatings, increment water necessities as on account of stream sand which disable bond between concrete glue and total. In this way, expanded quality and sturdiness of cement.
- M-Sand is gotten from explicit hard rock utilizing the cutting edge International technology, thus the necessary property of sand is acquired.

S No	Properties	Values
1	Specific Gravity	3.6
2	Fineness Modules	3.7
3	Water Absorption (%)	4.16

Table 2 Properties Of Fine Aggregate

3.3 COARSE AGGREGATE

- Coarse total is the segment of the solid which is comprised of the bigger stones inserted in the blend
- The size of coarse aggregate is used is 12.5mm

S No	Properties	Values
1	Specific Gravity	2.9
2	Fineness Modules	7.468
3	Water Absorption (%)	1.45

Table 3 Properties Of Coarse Aggregate

3.4 SILICA FUMES

The silica fumes is for the most part utilized in high quality solid it use to dodge air voids between concrete particles and it is multiple times better than concrete particles. It assists with filling in fine pores happened in the concrete particles because of which the quality get increments.

- Lowers solid porousness.
- Significantly builds solid sturdiness
- Beneficial in a wide range of high quality solid applications
- Provides magnificent protection from sulphate or ocean water assault

S.No	Properties	Values
1	Specific Gravity	2.2
2	Colour	Grey

Table 4 Properties Of Silica Fume

3.5 POLYMER USED

- In this test work we utilize both polyester and styrene monomer .Because of including a couple of monomer we said it as polymer.
- Styrene monomer, stabilized shows up as an unmistakable dull to dim fluid with fragrant smell.
- Vapors heavier than air and disturbing to the eyes and mucous films.
- If he polymerization happens inside a holder, the compartment may break brutally.
- Less thick than water and insoluble in water.
- Used to make plastics, paints and manufactured elastic.

S.No	Monomer Type	Density (Gm/Cm^2)	Boiling Point °C
1	Styrene	0.91	135
2	Polyester	1.38	206

Table 5 Properties Of Monomer

3.6 SUPER PLASTICIZER

In this super plasticizer is utilized TECH MIX 550. It goes about as the water reducer specialist and it is particularly utilized in high quality cement. In this test work for M60 grade 1.5% of super plasticizer is utilized in the Cementitious material.

IV. MIX RATIO

Blend configuration is accomplished for all the three evaluations for example M20, M40, M60. Configuration is finished by the IS strategy from IS 10262:2009 and IS 456: 2000. For M20 grade standard blend isn't gotten in light of the fact that 12.5 mm coarse total is utilized

for this work.

For M60 grade the concrete is supplanted by 5% of silica rage on the grounds that for high quality cement the hair like pore or air voids are happened because of which the quality and solidness of cement is decreases for staying away from that silica rage is utilized. As silica rage is better than concrete. Along these lines, void between the concrete particles are busy with silica smoke and super plasticizer is utilized 1.5% in cementitious material.

Grade	Mix Ratio	W/C	Admixture
M20	1:2.17:2.35	0.5	-
M40	1:1.58:1.86	0.4	-
M60	1:1.59:2.11	0.3	Silica Fume (Grey) And Super Plasticizer

Table 6 Mix Proportion

V. EXPERIMENTAL WORK

In this work 18 specimens are casted for cube in that 9 specimens for convectional concrete and 9 specimens for steel wire mesh with polymer impregnated concrete for a single grade of concrete and for same number of

specimens casted for beam and prism and curing is done for 7 and 28 days. Tests are done in compression strength machine and flexural strength machine shown in following figures. at the time of test 3 sample is tested and from that mean is taken for the result.

VI. RESULT AND DISCUSSION

The test result is obtained by comparing all the values that we obtained by the flexural , split tensile and compression strength tests.

6.1 Workability test (slump cone test)

- The slump cone test quantifies the consistency of new cement before it sets.
- It is performed to check the functionality of newly made concrete,and accordingly the straightforwardness with which solid streams.
- It can be likewise be utilized as a marker of an inappropriately blended group.

Slump cone test is directed stronghold all the three evaluations of cement i.e.,M20,M40 and M60.Because of utilizing super plasticizer M60 shows greater functionality when contrasted with M20 and M40.

Figure 2 Figure Showing About Slump Cone Test

6.2 COMPRESSION STRENGTH

- The compression strength of cubes gives us the information of the potential strength of the concrete mix from the which it is sampled.
- It helps in determining whether correct mix proportions of various mix proportions of various materials were used to get the desired strength.
- It helps in determining the rate of gain of strength of concrete samples if cubes from the sample are crushed at different periods of time.
- The test has been done in 2 stages that is 7 days and 28 days. In these the result has been compared with conventional concrete and silica fumes concrete along with polymer impregnated,
- Comparison between Silica fumes and conventional concrete is shown in below figure and table.

Figure 3 Compression Strength Test

The size of the cube is 150 X 150 X 150 . The test has been done for 7 and 28 days. The obtained result is compared with conventional concrete and silica fume concrete along with polymer impregnated.

Grade of Concrete	specimen no.	Compression strength in (N/mm²)		Average Compression strength in (N/mm²)		Compression strength in (N/mm²)		Average Compression strength in (N/mm²)	
		Convectional concrete		Convectional concrete		Silica fumes with PIC		Silica fumes with PIC	
		7 days	28 days	7 days	28 days	7 days	28 days	7 days	28 days
M20	1	15.6	21.06	15.54	22.38	16.25	30.28	16.9	32.42
	2	15.33	22.35			16.67	32.4		
	3	15.7	23.73			17.78	34.6		
M40	1	23.24	41.24	24.5	40.73	26.86	50.26	25.55	49.48
	2	25.73	41.11			25.48	49.63		
	3	24.53	39.86			24.31	48.57		
M60	1	42.8	61.8	52.8	65.87	56.2	74.69	59.23	75.83
	2	58.93	69.9			59.63	75.45		
	3	56.93	65.93			61.87	77.36		

Table 7 Comparison Between Compression strength for silica fumes and Conventional Concrete

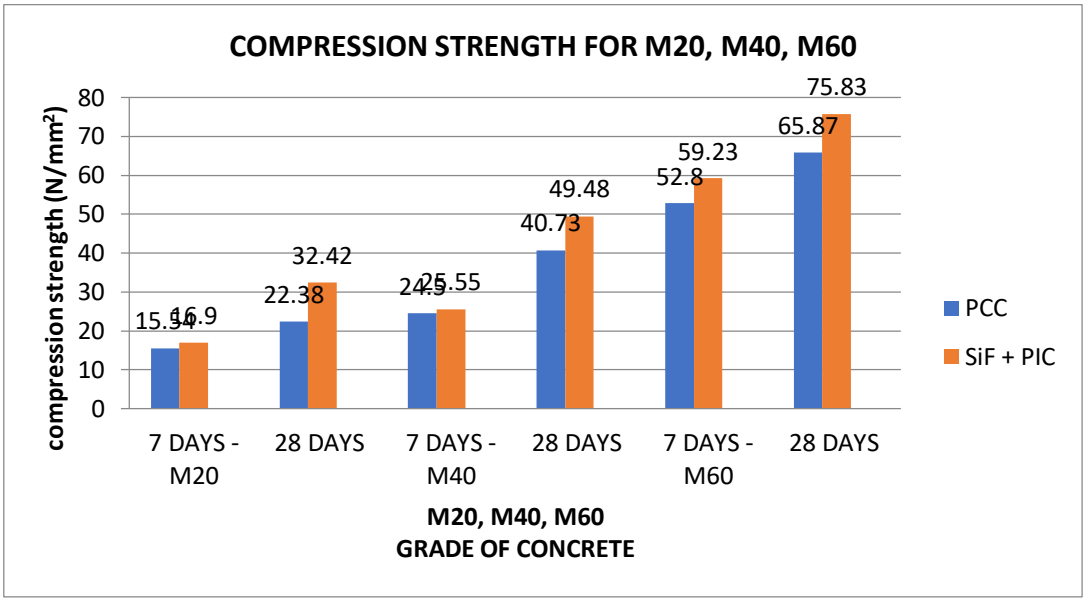

Figure 3 Comparison Between Silica Fumes And Conventional Concrete

6.3 FLEXURAL STRENGTH OF CONCRETE

- Flexural strength is one measure of the tensile strength of concrete.
- Designers of pavements use a theory based on flexural strength.
- Specifications and investigation of apparent low strengths should take into account the higher variability of flexural strength results.
- Flexural strength is also called as tensile strength.
- The testing has been conducted and for finding flexural strength the formulae is PL/bd2 in this P is load, L is length, b is breadth and d is depth for the standard size of 100*500 mm Specimen. For M20, M40, M60 flexural test is conducted in 2 stages that is 7 days and 28 days.

Figure 4 Showing Flexural Strength Of Concrete

Grade of Concrete	specimen no.	Flexural strength in (N/mm²)		Average Flexural strength in (N/mm²)		Flexural strength in (N/mm²)		Average Flexural strength in (N/mm²)	
		Convectional concrete		Convectional concrete		Silica fumes with PIC		Silica fumes with PIC	
		7 days	28 days	7 days	28 days	7 days	28 days	7 days	28 days

M20	1	5.5	10	5.75	9.58	7.89	12.63	8.08	12.65
	2	5.75	9.25			8.25	12.56		
	3	6	9.5			8.12	12.78		
M40	1	6.25	9.25	7.41	10.5	10.43	15.67	9.86	15.91
	2	8.25	11.75			9.65	16.43		
	3	7.75	10.5			9.52	15.65		
M60	1	10	16.5	9.16	15.3	11.56	18.58	11.81	19.29
	2	8.5	14.5			12.63	19.74		
	3	9	9			11.25	19.57		
*Note PIC - Polymer Impregnated Concrete									

Table 8 Comparison Between Flexural Strength Of Silica Fumes And Conventional Concrete

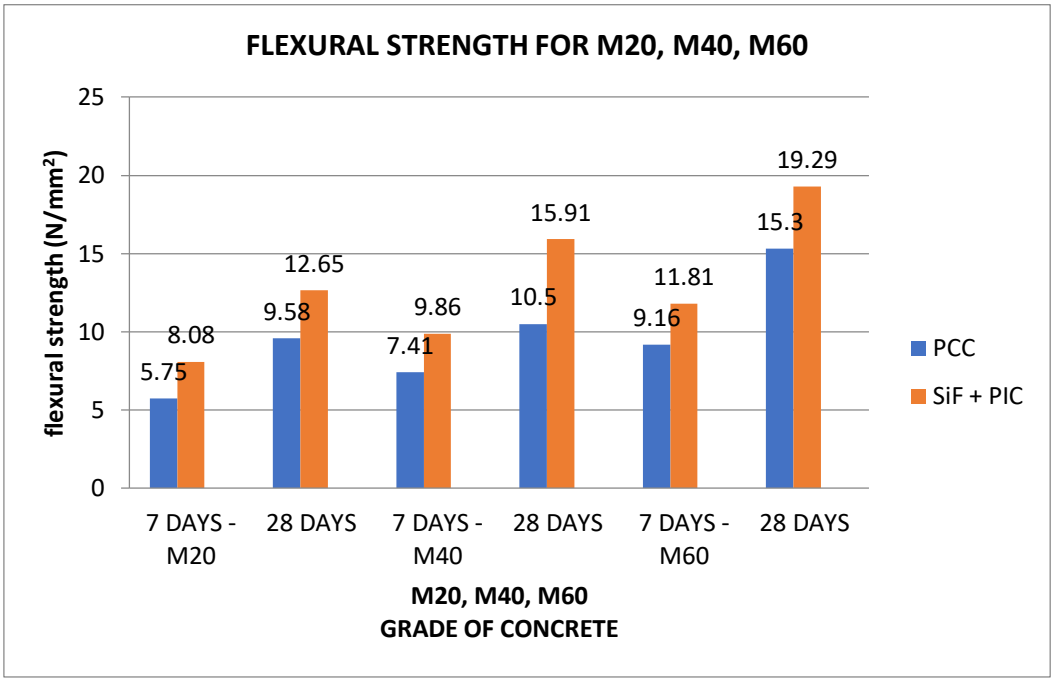

Figure 5 Comparison Between Silica Fumes And Conventional Concrete

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6.4 SPLIT TENSILE STRENGTH

- A method of determining the tensile strength of concrete using a cylinder which splits across the vertical diameter.
- It is simple to perform and it gives uniform results than the other tension tests like ring tension test and double punch test.
- The strength size of diameter of 100mm and height of 200mm cylinder has been casted and cured In two stages 7 days and 28 days, comparison between conventional concrete and silica fumes along with PIC is shown in below figure and table.

Fig 6 Figure Showing Split Tensile Strength

Grade of Concrete	specimen no.	Split tensile strength in (N/mm²)		Average Split tensile strength in (N/mm²)		Split tensile strength in (N/mm²)		Average Split tensile strength in (N/mm²)	
		Convectional concrete		Convectional concrete		Wire mesh with PIC		Wire mesh with PIC	
		7 days	28 days	7 days	28 days	7 days	28 days	7 days	28 days
M20	1	2.1	2.83	2.14	2.82	2.56	3.97	2.64	3.86
	2	2.26	2.73			2.63	3.65		
	3	2.07	2.9			2.75	3.98		
M40	1	2.57	4.58	2.55	4.28	3.80	4.44	3.37	4.63
	2	2.38	4.17			3.21	4.84		
	3	2.7	4.1			3.12	4.62		
M60	1	4.87	6.1	4.53	6.21	5.86	7.19	5.79	7.32
	2	4.14	6.25			5.98	7.46		
	3	4.59	6.3			5.55	7.32		
*Note PIC - Polymer Impregnated Concrete									

Table 9 Comparison Between Split tensile Strength Of Silica Fumes And Conventional Concrete

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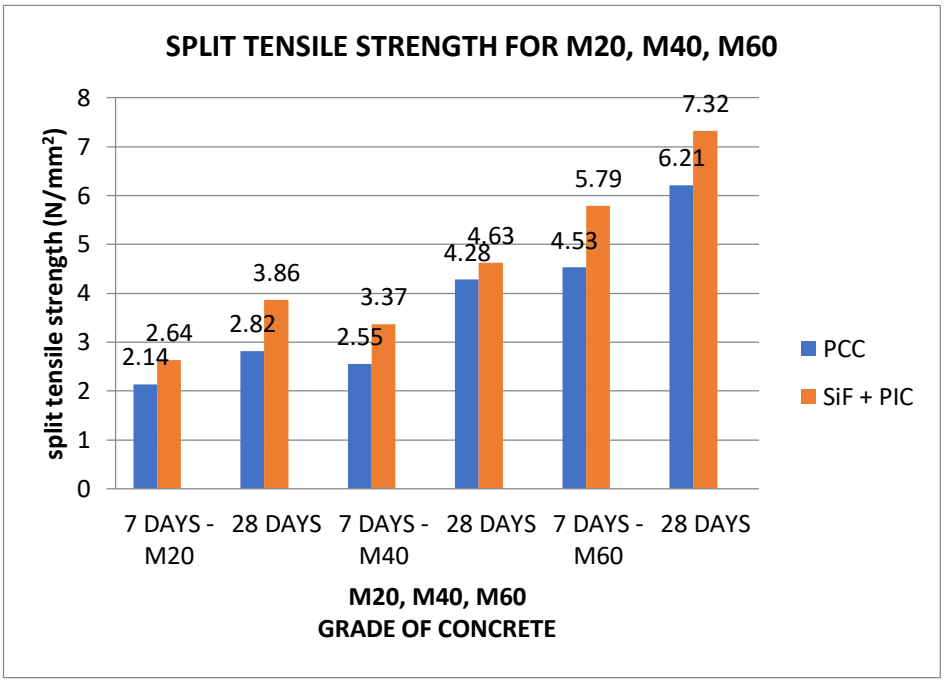

Figure 7 Comparison between silica fumes and conventional concrete

VII. CONCLUSION

Comparison of compression strength of cement for all the three evaluation at the underlying stage at 7days test 4 – 6 % of solidarity is been expanded on the grounds that for this case size of coarse total is utilized is 12.5 mm consequently beginning quality isn't increased more. Pressure quality at 28 days for M20 grade as contrasting and PCC and (silicafumes + PIC) quality is expanded by 29%, For M40 evaluation of solid quality is expanded by 26 % and for M60 evaluation of solid it is expanded by 12.6 %. For this outcome by utilizing silica vapor with polymer impregnated concrete on a normal quality increments by 15 – 32 % as contrasted and convectional concrete.

For split tensile for all the three evaluation of cement at the phase of 7 days test for M20 evaluation of solid quality is expanded by 17 % and at 28 days 39 % is expanding. For M40 evaluation of cement the quality is expanded by 9 % and at 28 days. What's more, for M60 evaluation of cement the quality is expanded by 20 % at 7 Days and for 28 days it is expanded by 26 % by this state of by utilizing silica vapor in solid it improves the quality since steel are more oppose the elasticity. It tends to be utilized as the restoration work.

For flexural strength test of cement M20 evaluation of cement for contrasting and convectional solid quality is expanded by 27 % by utilizing wire work in concrete. for M40 evaluation of solid it is expanded by 39 % and for M60 grade it expanded by 30% . For this outcome the normal quality is expanded by 39 %.

By silica exhaust we can improve the rigidity of cement and by polymer impregnation concrete the toughness of cement is been increments and void are been diminishes.

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