



BEHAVIOUR OF GEOPOLYMER CONCRETE WITH FERROCEMENT

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ABSTRACT

This paper presents the experimental investigations of the resistance of Geopolymer mortar slabs to impact loading for the specimens of size 200mmx210mmx100mm. The results obtained show that the addition of the above mesh reinforcement has increased the impact residual strength ratio of GeopolymerFerro cement by 4-28 that of the reference plain Ferro cement mortar slab. The combination of 1 layer of weld mesh and 4 layers of chicken mesh of GeopolymerFerro cement specimens show the best performance in the test, i.e. energy absorbed, residual impact strength ratio (I-rs), It was concluded that the increase in Volume fraction of reinforcement V-r, increases the energy absorption and also residual impact strength ratio of GeopolymerFerrocement than that of Ferro cement specimens.

Keywords: *Ferro cement, Geopolymer mortar slab, Residual impact strength ratio*

I. INTRODUCTION

Concrete usage around the world is second only to water. Ordinary Portland cement (OPC) is conventionally used as the primary binder to produce concrete. The amount of the carbon dioxide released during the manufacture of OPC due to the calcination of limestone and combustion of fossil fuel is in the order of one ton for every ton of OPC produced. In addition, the extent of energy required to produce OPC is only next to steel and aluminum. The fly ash worldwide creates opportunity to utilize this by-product of burning coal, as a substitute for OPC to manufacture cement products. When used as a partial replacement of OPC, in the presence of water and in ambient temperature, fly ash reacts with the calcium hydroxide during the hydration process of OPC to form the calcium silicate hydrate (C-S-H) gel. which enabled the replacement of OPC up to 60% by mass is a significant development. In 1978, Davidovits proposed that binders could be produced by a polymeric reaction of alkaline liquids with the silicon and the aluminum in source materials of geological origin or by-product materials such as fly ash and rice husk ash. He termed these binders as Geopolymer.

II. CALCULATIONS

2.1 For Cement Mortar Prisms & Geo Polymer Mortar Prisms

Size of the mortar cube=200*100*100=0.002m³

Density of geo polymer mortar=2200kg/m³

Weight of cube=2200*0.002=4.4

Table 1: Comparison of compressive strength values for Geopolymer mortar and cement mortar for different layers.

LAYERS	G-1:1	G-1:1.5	C-1:1	C-1:1.5
0	7	6	20	18
4	10	9	22	21
6	12	10	25	24
8	14	11	30	28

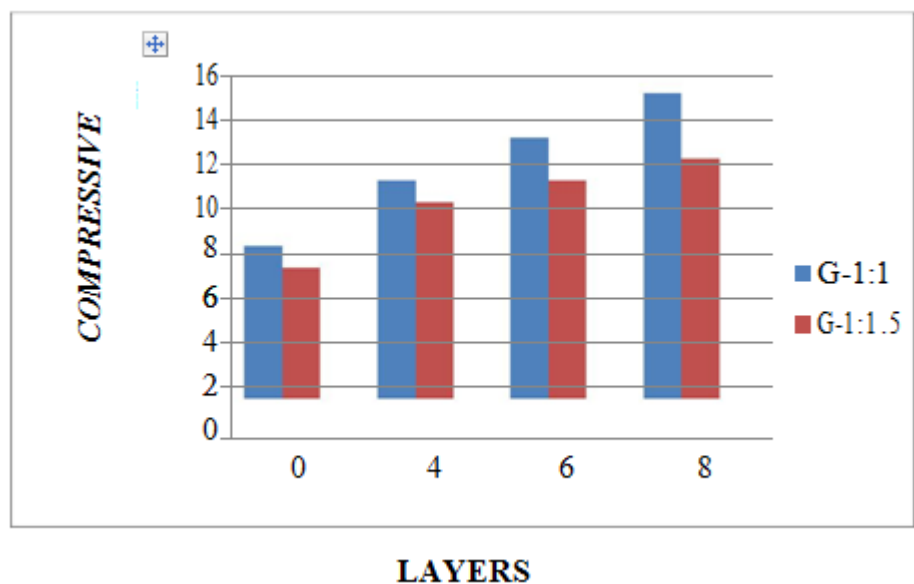


Fig.1 Graphical representation of compressive strength values of Geopolymer mortar with different ratios.

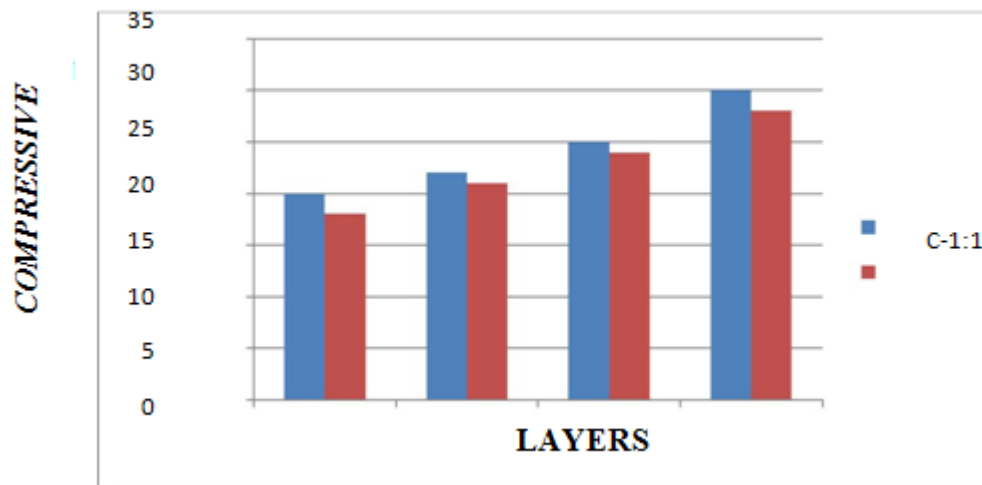


Fig.2 Graphical representation of compressive strength values of cement mortar with ratios
Table2: Stress-strain and load-displacement values for G 1:1.5 (8 layers).

DISPLACEMENT (mm)	LOAD (kN)	STRAIN	STRESS (N/mm ²)	Initial tangent line	AREA
0	0	0	0	0	
0.045	15	0.000225	1.5	11.4705	0.338
0.078	20	0.00039	2	19.8822	0.578
0.123	30	0.000615	3	31.3527	1.125
0.178	40	0.00089	4	45.3722	1.925
0.267	50	0.001335	5	68.0583	4.005
0.323	60	0.001615	6	82.3327	3.08
0.4	65	0.002	6.5	101.96	4.813
0.478	70	0.00239	7	121.8422	5.265
0.512	80	0.00256	8	130.5088	2.55
0.567	90	0.002835	9	144.5283	4.675
0.612	110	0.00306	11	155.9988	4.5
0.656	60	0.00328	6	167.2144	3.74
0.678	50	0.00339	5	172.8222	1.21
				toughness	44.54kN-mm

Table 3: Stress-strain and load-displacement values for C 1:1.5(8 layers).

DISPLACEMENT (mm)	LOAD (kN)	STRAIN	STRESS (N/mm ²)	Initial tangent line	AREA
0	0	0	0	0	
0.015	15	7.5E-05	1.5	8.814	0.1125



0.034	20	0.00017	2	19.9784	0.3325
0.054	30	0.00027	3	31.7304	0.5
0.076	40	0.00038	4	44.6576	0.77
0.098	50	0.00049	5	57.5848	0.99
0.121	60	0.00061	6	71.0996	1.265
0.154	70	0.00077	7	90.4904	2.145
0.189	80	0.00095	8	111.0564	2.625
0.212	90	0.00106	9	124.5712	1.955
0.234	100	0.00117	10	137.4984	2.09
0.267	110	0.00134	11	156.8892	3.465
0.283	130	0.00142	13	166.2908	1.92
0.312	150	0.00156	15	183.3312	1.885
0.356	170	0.00178	17	209.1856	2.31
0.376	180	0.00188	18	220.9376	3.5
0.389	190	0.00195	19	228.5764	2.405
0.412	200	0.00206	20	242.0912	4.485
0.445	210	0.00223	21	261.482	6.765
0.489	220	0.00245	22	287.3364	9.46
0.512	230	0.00256	23	300.8512	5.175
0.545	270	0.00273	27	320.242	8.25
0.589	240	0.00295	24	346.0964	11.22
				toughness=	80.435KN-mm

Table4: Stress-strain and load-displacement values for C 1:1(8 layers).

DISPLACEMENT (mm)	LOAD (kN)	STRAIN	STRESS (N/mm ²)	Initial tangent line	AREA
0	0	0	0	0	0
0.012	15	0.00006	1.5	6.456	0.09
0.034	20	0.00017	2	18.292	0.385
0.056	30	0.00028	3	30.128	0.55
0.098	50	0.00049	5	52.724	0.9
0.11	70	0.00055	7	59.18	0.72
0.122	80	0.00061	8	65.636	0.9
0.132	90	0.00066	9	71.016	0.85
0.145	100	0.00073	10	78.01	1.235
0.156	110	0.00078	11	83.928	1.155
0.178	130	0.00089	13	95.764	1.4025
0.2	140	0.001	14	107.6	2.97
0.222	150	0.00111	15	119.436	3.19

0.256	160	0.00128	16	137.728	5.27
0.278	170	0.00139	17	149.564	3.63
0.289	180	0.00145	18	155.482	1.925
0.312	190	0.00156	19	167.856	4.255
0.423	240	0.00212	24	227.574	5.625
0.489	260	0.00245	26	263.082	16.5
0.512	280	0.00256	28	275.456	6.21
0.545	300	0.00273	30	293.21	9.57
0.567	240	0.00284	24	305.046	5.94
				toughness=	92.525kN-mm

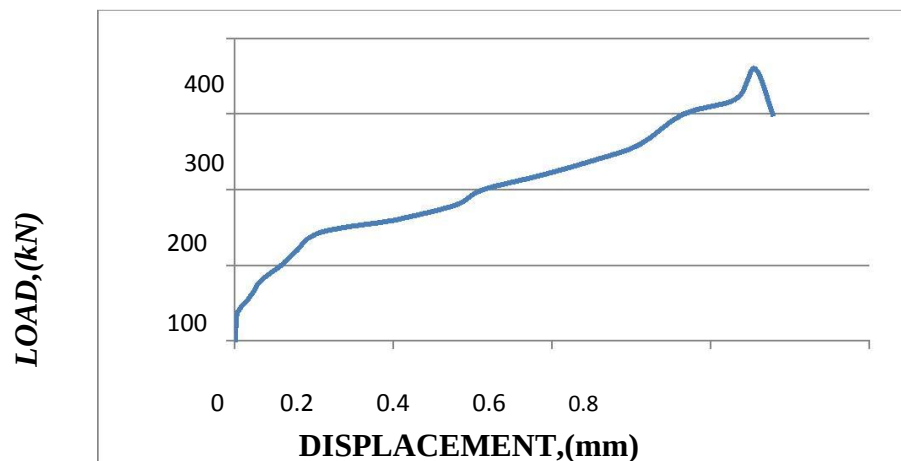
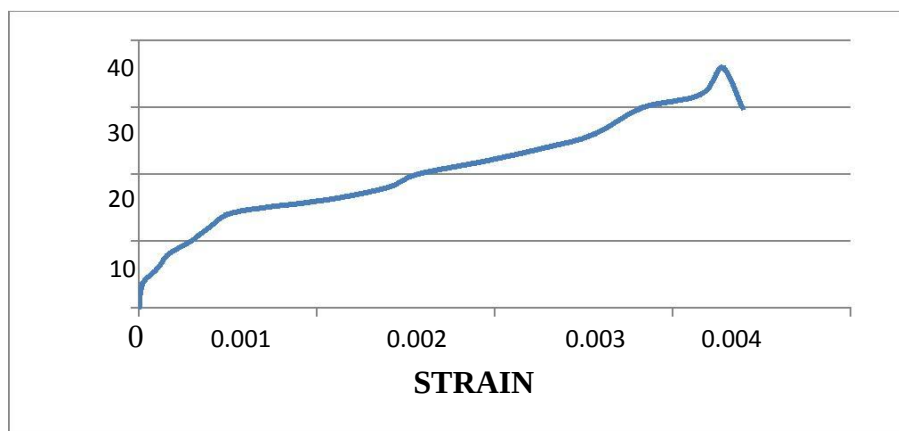


Fig.4 Graphical representation of load-displacement curve for C 1:1.5(8layers)

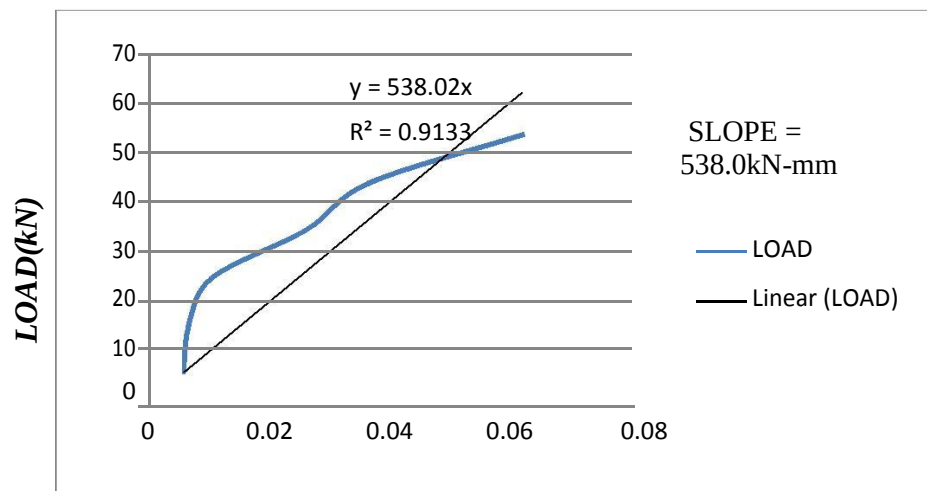


Fig.5 linear fit for C 1:1(0 layers)

III. FURTHER RESEARCH

In this paper used fly ash obtained from bituminous coal which contains 10% CaO. Fly ash from sub bituminous coal shall also be determined. Rice husk ash and GGBS shall be tried instead of fly ash and properties shall be determined. Investigation should be made on Structural members like beams, columns , and slabs using Geopolymer as binder. Using oven curing technology to improve initial strength of geo polymer members

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