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EXPERIMENTALINVESTIGATIONONPERMEABLECONCRETEWITHDOLOMITE

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ABSTRACT

Concrete is the most widely used construction material. So advancement in the concrete is to improve its compressive strength and durability of structure. This project discusses about the permeable concrete that is made using coarse aggregates with no fine aggregates. Permeable concrete pavement increases groundwater recharge, thermal insulation and absorption of noise. An attempt has been made to study the mechanical and durability properties of permeable concrete. In this study the ratio of cement and coarse aggregate adopted is 1:4 and 1:5 at a water binder ratio0.33 and 0.34 respectively. For each of this mixes 0%, 10%, 20% and 30% of cement is replaced with fly ash. The compressive strength, and split tensile strength test were found for 7and 28 days. The results were determined with the normal cement concrete. It was found that the mix 1:4 with a replacement of 20% fly ash at a w/c ratio of 0.33 and 0.34 was found the optimum additionally adding dolomite with mixes 0%, 6%, 12% and 18%.

KEY WORDS: ***Permeable Concrete, Dolomite, Flyash, Compressive strength and Split tensile strength.***

1. INTRODUCTION

A composite substance, Portland cement, water, and fine aggregate make up the majority of concrete. These ingredients combine to create a manageable paste that, as time passes, gradually becomes harder. A structural material used in building that is composed of fine aggregate, a hard, chemically inert particle that is bound together with cement and water.

The components of permeable concrete (PC) include coarse aggregate, cement and other cementations materials, admixtures, and water. Permeable concrete is a unique variety of concrete with a high porosity that is

used for concrete flat work applications. Permeable concrete allows water and air from precipitation and other sources to pass through directly, decreasing run-off from a site and enabling groundwater recharge. Concrete of this type is often referred to as porous pavement, pervious concrete, no fines concrete, and porous concrete. Due to its efficiency in reducing pollution, reduced need for storm sewers, enhanced road safety due to better skid resistance, and recharge to nearby aquifers, the use of permeable concrete is growing. Despite being viewed as a novel and developing use, permeable concrete has drawbacks. The drawback of employing permeable concrete has been demonstrated by subpar performances in cold, arid, wind-prone, and areas with sole-source aquifers.

Dolomite is a calcium magnesium carbonate mineral that is anhydrous. Dolostone is also occasionally used to refer to the dolomitic rock type. In addition to serving as an attractive material and a source of magnesium oxide and concrete aggregate, dolomite is also used to make magnesium. Dolomite is occasionally used as a flux to smelt iron and steel in its place because calcite limestone is either rare or extremely expensive. The manufacture of float glass involves the use of a significant amount of processed dolomite.

As a byproduct of burning coal, fly ash is a naturally cementitious substance. To lessen pollution, fly ash is removed from the precipitators put in place in coal-burning power stations' smokestacks. The number of thermal power plants is expected to increase in the near future due to the growing demand for coal and power. Fly ash solidifies in the exhaust gases as a suspension and has a spherical shape. Silica (SiO2), alumina (Al2O3), and iron oxide (Fe2O3) are the main components of fly ash.

2. OBJECTIVES

The objectives of this study as follows,

a) To optimize the cement with flyash .
b) To optimize the permeable concrete with dolomite as an admixture..
c) To evaluate the compressive and splittensile strength tests and Upv.

3. MATERIALS:

a. Cement: Since it sets and hardens to bind other materials together, cement is typically used as a binder in concrete. Construction uses OPC (ordinary Portland cement), grade 53.
b. Fine aggregate: The most important component of natural sand or crushed stone-based concrete is called fine aggregate. The hardened properties of the concrete are significantly influenced by the fine aggregate density and quality.
C. Water: Potable water available in laboratory was used for casting all specimens in this investigation. The quality of water was found to satisfy the requirements of IS: 456 – 2000.
d. Flyash: The non-combustible mineral part of coal is what makes up fly ash. Prior to being used in a power plant, coal is first ground until it resembles powder.
.Dolomite: The most prevalent carbonate mineral after limestone is dolomite. Sedimentary and metamorphic rocks contain it as their main constituent. Furthermore, hydrothermal deposits frequently contain it. The main source of magnesium metal is dolomite, which is mined for construction stone, road construction, and the manufacture of

refractory bricks.

4. RESULTS AND DISCUSSIONS:

Compressive strength test: The 150mm x 150mm x 150mm cube specimens were cast and put to the test in a compression testing apparatus for cure times of 7 and 28 days using different concrete mix quantities.

Table 1: Compressive strength results for permeable concrete partial replacement of cement with fly ash (1:4mix) and (1:5 mix)

mix	% of flyash	Compressive strengthresults(N/mm^2),7days		Compressive strengthresults(N/mm^2),28days	
		0.33w/c	0.34w/c	0.33w/c	0.34w/c
1:4	0	12.69	13.41	18.42	19.58
	10	16.47	17.42	23.81	25.32
	20	17.24	18.31	24.81	26.35
	30	16.21	17.12	23.19	24.50
1:5	0	11.37	12.05	16.51	17.39
	10	14.77	15.68	21.47	22.43
	20	15.34	16.12	22.33	23.30
	30	14.46	15.08	20.82	21.73

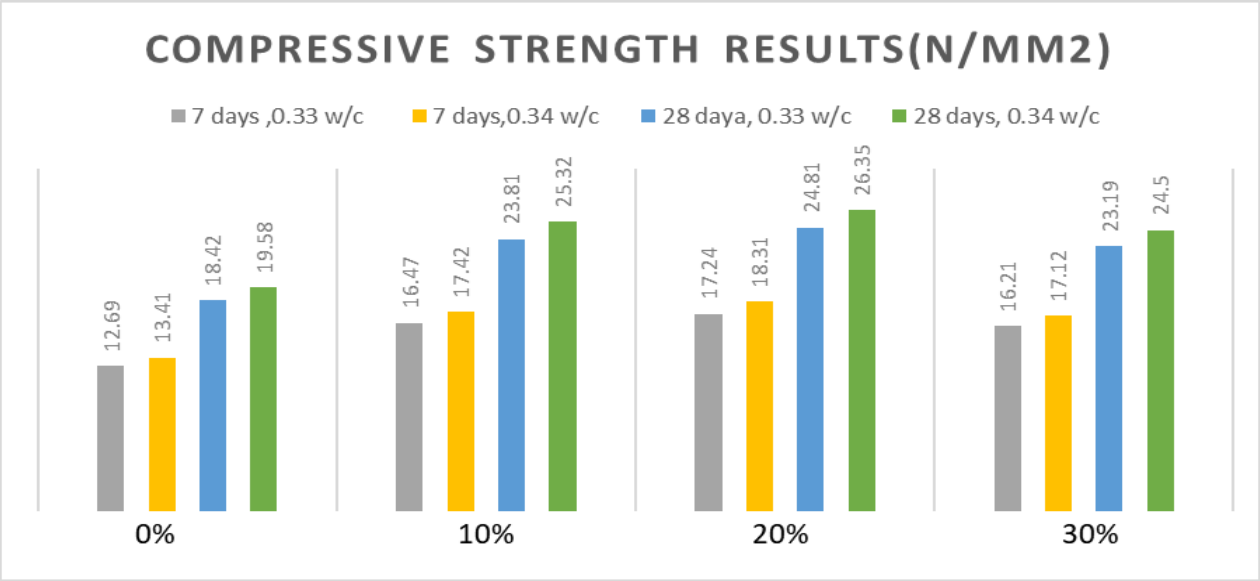

Figure 1: Compressive strength results of permeable concrete (1:4 Mix)

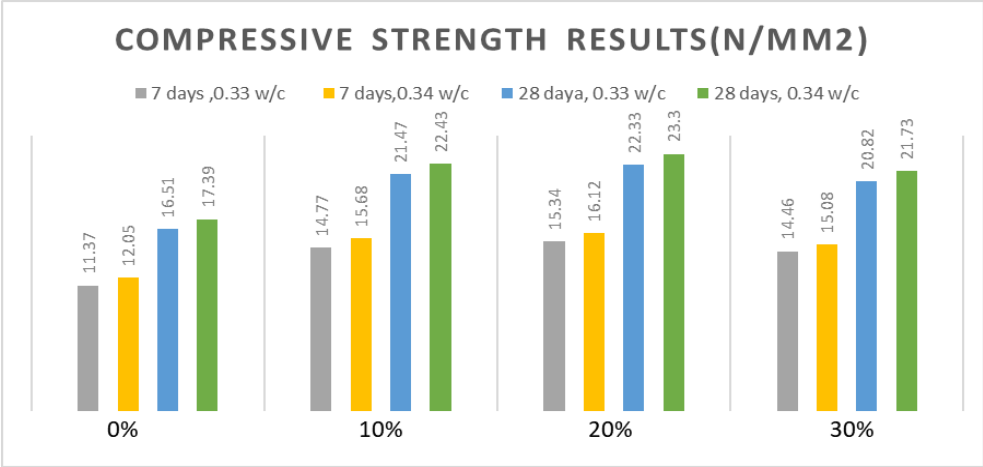

Figure 2: Compressive strength results of permeable concrete (1:5 Mix)

Table 2: Compressive strength results for permeable concrete by partial replacement of cement with 20% of Fly ash+% of Dolomite (1:4mix)

MIX	20% ofFly ash+% ofDolomite	Compressive strengthresults(N/mm^2),7days		Compressive strengthresults(N/mm^2),28days	
		0.33w/c	0.34w/c	0.33w/c	0.34w/c
1:4	20%FA+0%Dol	17.14	18.18	24.81	26.35
	20%FA+6%Dol	18.04	19.21	26.11	27.71
	20%FA+12%Dol	19.58	20.65	28.02	29.76
	20%FA+18%Dol	18.81	19.94	27.19	28.87

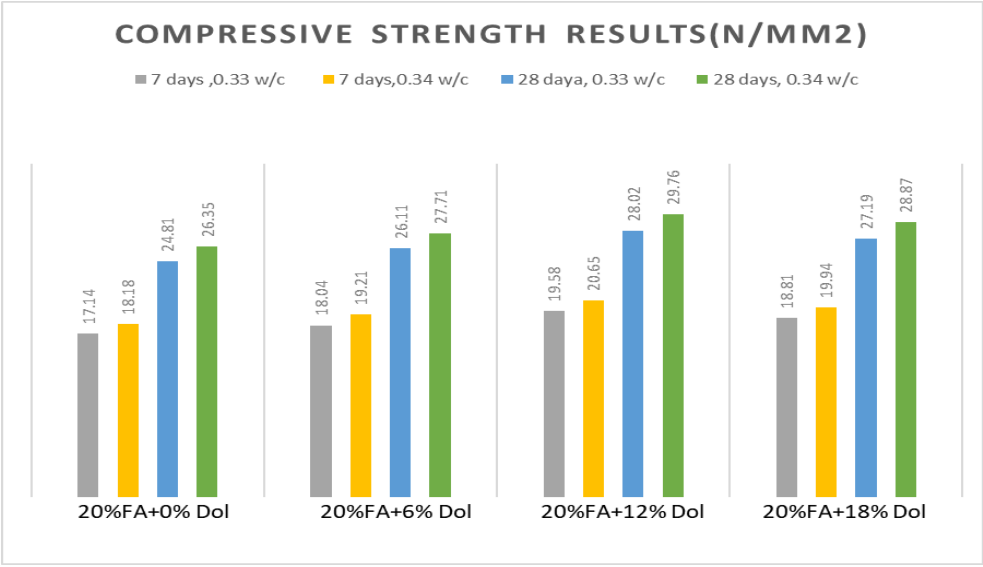

Figure 3: Compressive strength results of permeable concrete by partial replacement of cement with 20% of Fly ash+% of Dolomite(1:4mix)

Split tensile strength: At the age of 7 and 28days, the cylindrical specimens (150mm diameter x 300mm height) weretestedforevaluatingthesplittensilestrength.Theexperimentisperformedbyputtingacylindricalsamplehorizontallyb etweenacompressiontestingmachine.

Table 3: Split tensile strength results for permeable concrete partial replacement of cement with fly ash(1:4mix) and (1:5 mix)

Mix	%of flyash	Split tensile strengthresults(N/mm^2),7days		Split tensile strengthresults(N/mm^2),28days	
		0.33w/c	0.34w/c	0.33w/c	0.34w/c
1:4	0	1.25	1.35	1.80	1.92
	10	1.62	1.73	2.35	2.51
	20	1.72	1.83	2.47	2.62
	30	1.59	1.68	2.31	2.44
1:5	0	1.12	1.18	1.62	1.71
	10	1.46	1.53	2.12	2.22
	20	1.58	1.61	2.28	2.31
	30	1.42	1.49	2.06	2.15

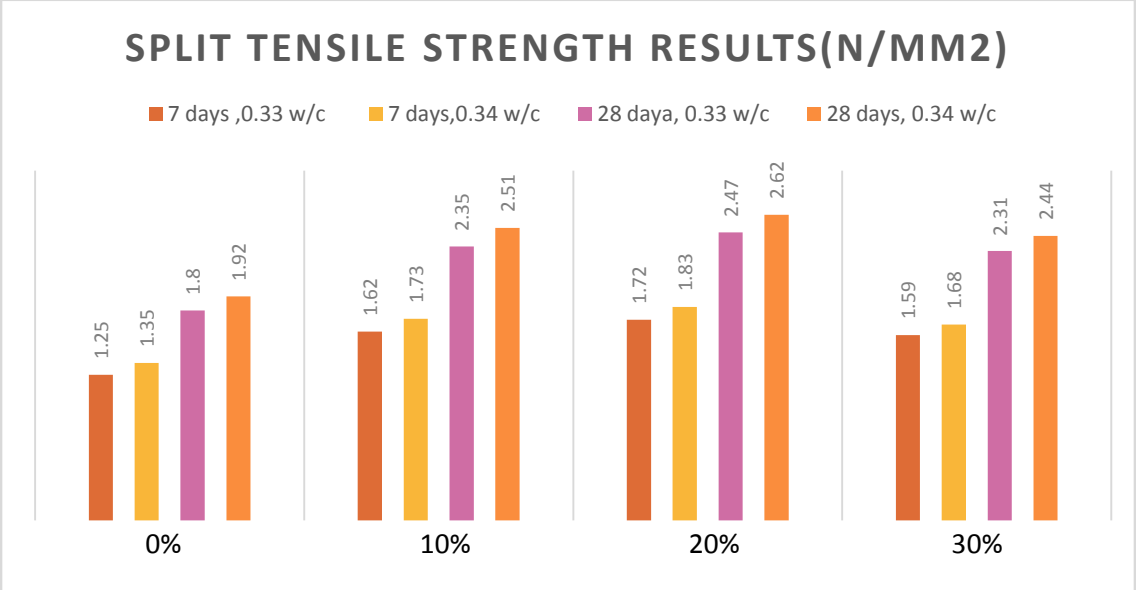

Figure 4: Split tensile strength results of permeable concrete (1:4 Mix)

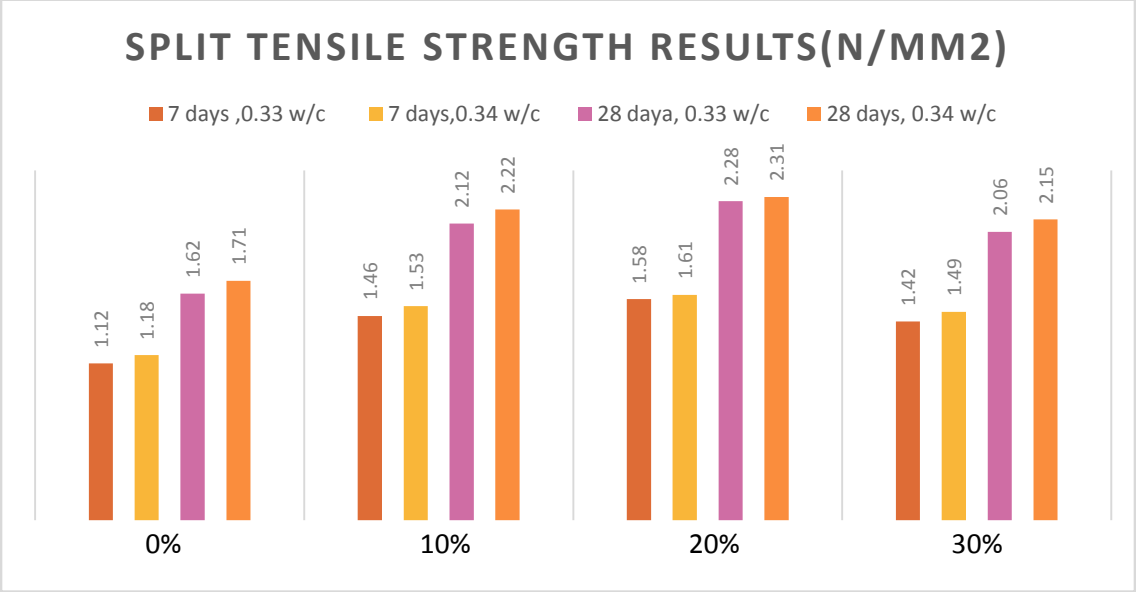

Figure 5: Split tensile strength results of permeable concrete (1:5 Mix)

Table 4: Split tensile strength results for permeable concrete by partial replacement of cement with 20% ofFly ash+% of Dolomite(1:4mix)

Mix	20% of Flyash+% of Dolomite	Split tensile strength results(N/mm^2),7days		Split tensile strength results(N/mm^2),28days	
		0.33w/c	0.34w/c	0.33w/c	0.34w/c
1:4	20%FA+0% Dol	1.68	1.79	2.26	2.44
	20%FA+6% Dol	1.74	1.89	2.44	2.61
	20%FA+12% Dol	1.95	2.05	2.71	2.86
	20%FA+18% Dol	1.87	1.99	2.61	2.81

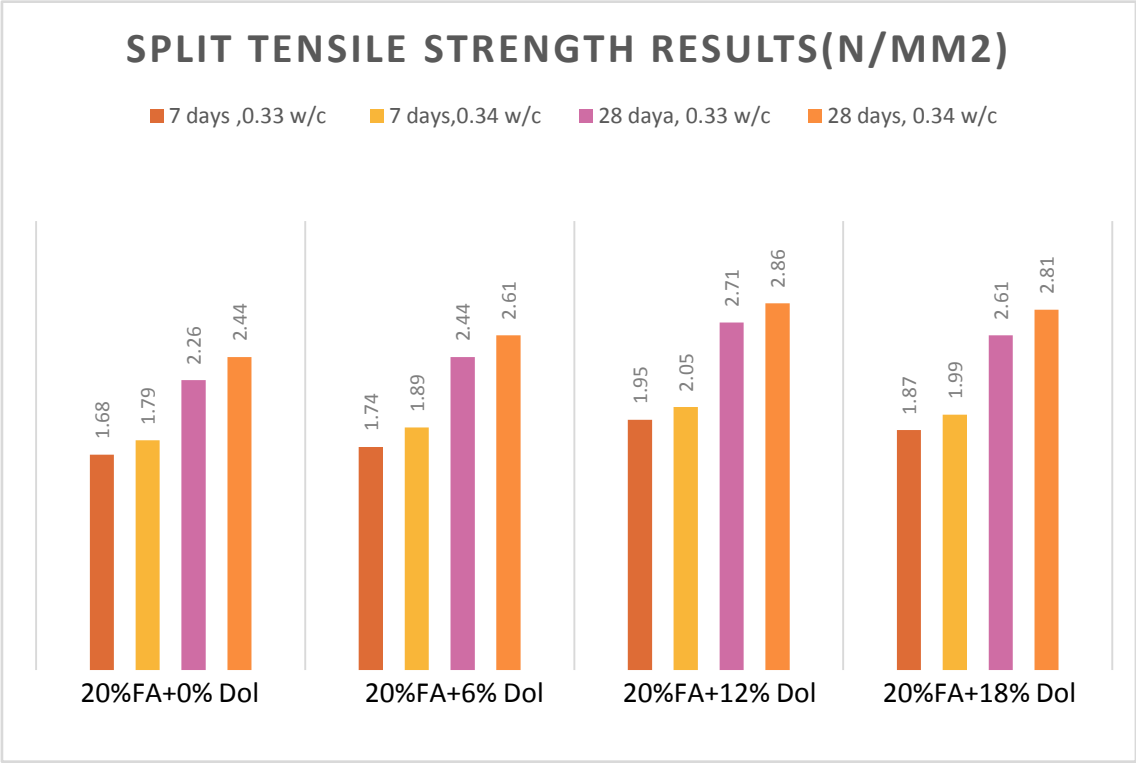

Figure 6: Split tensile strength results of permeable concrete by partial replacement of cement with 20% of Fly ash+% of Dolomite(1:4mix)

5. CONCLUSION:

1.Thecompressivestrengthof1:4mixpermeableconcretewithcement replacedwith0% fly ash for 0.33water cement ratio which gives compressive strength values for 7days and 28 days are given as12.69 N/mm^{2}and 18.42 N/mm^2.
2.Thecompressivestrengthof1:4mixpermeableconcretewithcement replacedwith0% fly ash for 0.34water cement ratio which gives compressive strength values for 7days and 28 days are given as 13.41 N/mm^{2}and 19.58 N/mm^2.
3.The compressive strength of 1:4 mix permeable concrete with cement replaced with20% fly ash for 0.33 water cement ratio which gives compressive strength values for 7days and 28 days are given as17.24 N/mm^{2}and 24.81 N/mm^2.
4.The compressive strength of 1:4 mix permeable concrete with cement replaced with20% fly ash for 0.34 water cement ratio which gives compressive strength values for 7days and 28 days are given as 18.31N/mm^{2}and 26.35 N/mm^2.
5.Thecompressivestrengthof1:5mixpermeableconcretewithcement replacedwith0% fly ash for 0.33water cement ratio which gives compressive strength values for 7days and 28 days are given as 11.37 N/mm^{2}and 16.51N/mm^2.
6.Thecompressivestrengthof1:5mixpermeableconcretewithcement replacedwith0% fly ash for 0.34water cement ratio which gives compressive strength values for 7days and 28 days are given as 12.05 N/mm^{2}and 17.39 N/mm^2.
7.The compressive strength of 1:5 mix permeable concrete with cement replaced with20% fly ash for 0.33 water cement ratio which gives compressive strength values for 7days and 28 days are given as15.34 N/mm^{2}and 22.33 N/mm^2.
8.The compressive strength of 1:5 mix permeable concrete with cement replaced with20% fly ash for 0.34 water cement ratio which gives compressive strength values for 7days and 28 days are given as 16.12N/mm^{2}and 23.30

N/mm^2.

9.The compressive strength of 1:4 mix permeable concrete with cement replaced with 20%flyashadditionaladdingdolomite12%for0.33watercementratiowhichgivescompressivestrengthvaluesfor7daysand28daysaregivenas19.58N/mm^2and28.02N/mm^2.

10.The compressive strength of 1:4 mix permeable concrete with cement replaced with 20%flyashadditionaladdingdolomite12%for0.34watercementratiowhichgivescompressive strength values for 7 days and 28 days are given as20.65 N/mm^2 and29.76N/mm^2.

11.The split tensile strength of 1:4 mix permeable concrete with cement replaced with 0%fly ash for 0.33 water cement ratio which gives compressive strength values for 7 daysand28 days are given as1.25 $N/mm^2$and 1.80 N/mm^2.

12.The split tensile strength of 1:4 mix permeable concrete with cement replaced with 0%fly ash for 0.34 water cement ratio which gives compressive strength values for 7 daysand28 days are given as1.35 $N/mm^2$and 1.92 N/mm^2.

13.The split tensile strength of 1:4 mix permeable concrete with cement replaced with 20%fly ash for 0.33 water cement ratio which gives compressive strength values for 7 daysand28 days are given as1.72 $N/mm^2$and 2.47 N/mm^2.

14.The split tensile strength of 1:4 mix permeable concrete with cement replaced with 20%fly ash for 0.34 water cement ratio which gives compressive strength values for 7 daysand28 days are given as1.83 $N/mm^2$and 2.62 N/mm^2.

15.The split tensile strength of 1:5 mix permeable concrete with cement replaced with 0%fly ash for 0.33 water cement ratio which gives compressive strength values for 7 daysand28 days are given as1.12 $N/mm^2$and 1.62 N/mm^2.

16.The split tensile strength of 1:5 mix permeable concrete with cement replaced with 0%fly ash for 0.34 water cement ratio which gives compressive strength values for 7 daysand28 days are given as1.18 $N/mm^2$and 1.71 N/mm^2.

17.The split tensile strength of 1:5 mix permeable concrete with cement replaced with 20%fly ash for 0.33 water cement ratio which gives compressive strength values for 7 daysand28 days are given as1.58 $N/mm^2$and 2.28 N/mm^2.

18.The split tensile strength of1:5mix permeable concrete with cement replaced with 20%fly ash for 0.34 water cement ratio which gives compressive strength values for 7 daysand28 days are given as1.61 $N/mm^2$and 2.31 N/mm^2.

19.The split tensile strength of 1:4 mix permeable concrete with cement replaced with 20%fly ash additional adding dolomite 12% for 0.33 water cement ratio which gives split tensile strength values for 7days and 28days are given as1.95N/mm^2 and2.71N/mm^2.

20.The split tensile strength of 1:4 mix permeable concrete with cement replaced with 20%fly ash additional adding dolomite 12 % for 0.34water cement ratio which gives split tensile strength values for 7days and 28days are given as 2.05N/mm^2 and2.86N/mm^2.

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