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Strength Properties of Concrete by Replacing Coarse Aggregate by Gabbro Rocks

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***Abstract*— Solid structure is comprised of cement, aggregate and water. In building development the aggregates normally utilized are limestone, in this way the determination of aggregate should to be in the major circumstance. To convey a good quality and excellent cement the materials utilized should be in promise to standard precise. A great deal of materials could be utilized as an admixture or even as a basic part of cement; the point of this examination is to utilize the Gabbro rock as a coarse aggregate in concrete. The pre-owned Gabbro in study is gotten from squander dark rock (as it's privately named). Results demonstrated as an increment in compressive strength. The extent of study remembers the examination for the quality, holding. The fundamental goal of the undertaking is to think about the properties of lime stone and a gabbro identified with quality and its properties. The test conducted for gabbro rocks are flakiness index, elongation index, specific gravity, water absorption test and compressive strength of concrete. Using gabbro rocks concrete higher compressive strength and its properties of concrete.**

Keywords: Coarse Aggregate, Compressive strength, fine aggregate, gabbro concrete.

I. INTRODUCTION

Nowadays, as the field of civil engineering have become so innovative hence providing economic constructions and good strength. Use of Igneous rock aggregates in concrete mixes is to develop their physical properties by the properties of Gabbro rock. To get high strength and good workability gabbro rocks are completely added to the concrete mix in. By the usage of such igneous rock the experiment is carried out till the desired properties are obtained. Since concrete is the most significant part in auxiliary components, the total substance should be in a type of good quality for basic purposes. Concrete is comprised of aggregate, concrete and water. Through this mix of materials, three – quarter of the blend is administered by aggregate. The aggregate itself is arranged as fine and coarse aggregate.

In this study, the scope of research will be focused on the use of coarse aggregate using Gabbro rock material. Before further discussion, it shall be better to have knowledge and clear understanding about the gabbro rock material and its properties and performances. Before further discussion, it shall be better to have knowledge and clear understanding about the gabbro rock material and its properties and performances.

Table 1: Classification of natural aggregates according to rock type (BS 812: Part 1: 1975)

Sl no	Classification of natural aggregate		
	Basalt Group	***Flinte Group***	***Gabbro group***
1	Andesite Basalt Basic porphyrites Diabase Dolerites of all kinds including theralite and Teschenite. Epidiorite Lamprophyre Quartz-dolerite Spilite	Chert Flint	Basic diorite Basic Gneiss Gabbro Hornblende-rock Norite Peridotite Picrite Serpentinite
2	***Granite Group***	***Gritstone Group (including fragmental volcanic rocks)***	***Hornfels group***
	Gneiss Granite Granodiorite Granulite Pegmatite Quartz-diorite Syenite	Arkose Greywacke Grit Sandstone Tuff	Contact-altered rocks of all kinds except marble.
3	***Limestone Group***	***Porphyry Group***	***Quartzite Group***
	Dolomite Limestone Marble Schist Group Phyllite Schist Slate All severely sheared rocks.	Aplite Dacite Felsite Granophyre Keratophyre Microgranite	Ganister Quarzitic sandstones Re-crystallized quartzite

2. MATERIALS AND METHODOLOGY

1. Cement
2. Fine Aggregate
3. Coarse Aggregate
4. Water
5. Gabbro Aggregate

Sampling of cubes for test

1. Clean the mounds and apply oil.
2. Fill the concrete in the moulds in layers approximately 5 cm thick.
3. Compact each layer with not less than 35 strokes per layer using a tamping rod (steel bar 16mm diameter and 60cm long, bullet pointed at lower end).

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REGION OF GABBRO ROCK AVAILABILITY IN INDIA:

1. Gabbro rock an area of about 5,00,000 sq.km. covers large part of Maharashtra.
2. Karnataka about 31,500 sq.km. covering Bidar, Belgaum, Bijapur, and Gulbarga Districts.
3. Chamarajanagara.
4. Gujarat.
5. Hyderabad. [1]

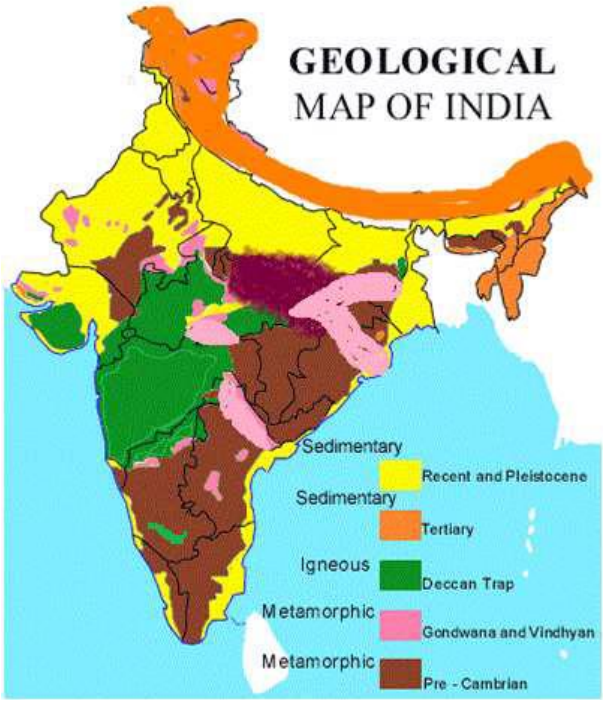


Fig 1: Geological map shows the gabbro rocks

To prove the specification of gabbro aggregate we are conducted flakiness and elongation test. Bonding between aggregate and cement paste depends on the aggregate surface. Since the rough surface requires more bonding than the smooth surface, the texture of aggregate to be tested should comply with the requirement of standard specification.

Energy Dispersive X-ray Spectroscopy (EDS)

EDS can be utilized to locate the synthetic of materials down to a spot size of a couple of microns, and to make component creation maps over an a lot more extensive raster zone. Together, these capacities give principal compositional data to a wide assortment of materials. An EDS finder contains a precious stone that ingests the vitality of approaching x-beams by ionization, yielding free electrons in the gem that become conductive and produce an electrical charge predisposition.

Precautions for test

The water for curing should be tested every 7 days and the temperature of water must be at 27+-2^0 C.

LABORATORY TEST

a. Sieve analysis **4.79 (F.A)**
b. Specific gravity **2.76 (F.A)**
c. Bulking of Sand 35.86%
d. Sieve analysis **4.37 – fineness modulus**
e. Standard consistency of cement – 34%
f. Setting time of cement – initial – **35 min.**
Setting time of cement –Final – **10 hrs.**
g. Fineness of cement – 6%
h. Impact text – 10.99%

CONCRETE TESTS

Flakiness and elongation –E index **- 43.68%**
a. Slump test – 125mm
b. Compaction factor test – 0.984

GABBRO ROCK TESTS

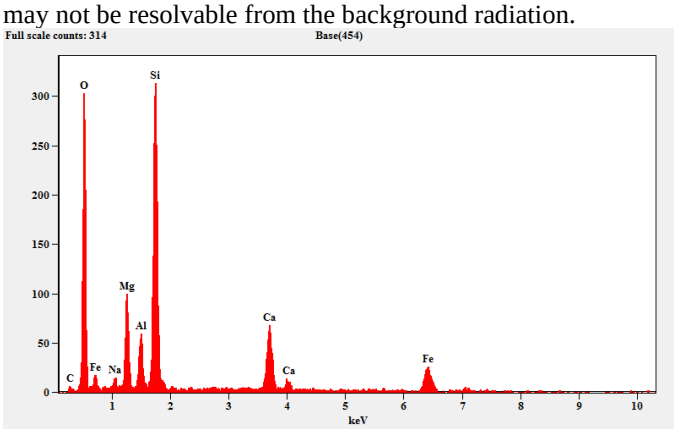
a. specific gravity – 2.62
b. sieve analysis – 2.01
c. Flakiness and elongation index – F index – **14.56 %**
Flakiness and elongation index – E index – **50.65 %**

A-7 MIX PROPORTIONS

Cement = 383.16 kg/m3
Water = 191.58 Litres
Fine aggregate = 731.4kg/m3.
Coarse aggregate = 1084.68kg/m3.
Gabbro aggregate = 1265.46kg/m3.

RESULTS OF EDS TEST

A typical EDS spectrum is portrayed as a plot of x-ray counts vs. energy (in keV). Energy peaks correspond to the various elements in the sample. Generally they are narrow and readily resolved, but many elements yield multiple peaks. For example, iron commonly shows strong Kα and Kβpeaks. Elements in low abundance will generate x-ray peaks that may not be resolvable from the background radiation.



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PROCEDURE FOR CONCRETE CUBE TEST

1. After curing specimen is taken out from curing tank and wipe out cube and clean well.
2. Measure the dimension of the specimen nearest to 0.1mm.
3. To remove the dust from compression or universal testing machine.
4. Test specimens are placed on the testing machine opposite to load direction and test is conducted as per Indian standard code.
5. Specimen is placed centrally on the specimen.
6. Apply the load gradually on the test specimen and note down the readings and calculate the strength of the cube.
7. Record the maximum load and note down the readings and find the usual features.

Fig 2: Compressive Testing Machine

3. RESULTS AND DISCUSSION

Table2: Chemical Composition of Gabbro Aggregate

Sl No	Compound	Percentage present
1	Silicon di-oxide	48
2	Aluminum Oxide	14.4
3	Iron oxide	15.1
4	Calcium oxide	6.18
5	Magnesium oxide	5.95
6	Sodium oxide	4.05
7	Potassium oxide	2.29
8	Titanium oxide	2.29
9	Otherwise	1.74

Table 3: Compressive strength of concrete at various ages

Sl No	Age (days)	Strength (%)
1	1	16
2	3	40
3	7	65
4	14	90
5	28	99

Table 4: Compressive strength test conducted

Sl No	proportioning of material	Load in KN	Compressive strength in N/mm^2		Avg compressive strength in n/mm2
Lime stone aggregate					
1	1:1.9:2.8	7	302.1	13.43	16.42
			437.1	19.43	
2	1:1.9:2.8	14	458.08	20.35	20.84
			480.02	21.33	
3	1:1.9:2.8	28	483.9	21.51	21.65
			490.43	21.79	
Gabbro aggregate					
1	1:1.9:3.3	7	430.08	19.14	20.5
			492.02	21.86	
2	1:1.9:3.3	14	593.41	26.37	26.47
			598.02	26.57	
3	1:1.9:3.3	28	785	34.88	35.66
			820	36.44	

Table 5: Quantitative Results for: Base (454)

Element	Weight in %	Weight of % Error	Atom %
CK	5.42	1.13	9.28
OK	47.49	1.27	61.05
Na K	0.66	0.35	0.59
Mg K	6.08	0.42	5.14
Al K	3.56	0.24	2.72
Si K	18.11	0.45	13.26
Si L	-	-	-
Ca K	7.49	0.48	3.84
Ca L	-	-	-
Fe K	11.19	0.76	4.12
Fe L	-	-	-
Total	**100**	-	**100**

Table 6: Compressive strength test conducted

Sl NO	Test Conducted	Lime stone Aggregate	Gabbro	IS code
1	S G	2.61	2.62	383-1970
2	Sieve analysis	4.37	2.01	383-1970
3	Impact Test	10.99	13.99	2386-1963
4	Compression Test	0.92	0.987	5515-1983
5	Loss angle	55.44	59.56	2386-1963
6	Flakiness	11.62	14.56	2386-1963
7	Elongation	43.68	50.65	2386-1963
8	Compression strength (N/mm2)			
	7 days	16.42	20.5	516-1959
	14 days	20.84	26.47	
	28 days	21.56	35.66	

4. CONCLUSION

As gabbro rocks is a normally accessible volcanic stone, one of the most solid and scratch obstruction material having dark/dark shading. The compound structure of gabbro contains a few liquefied minerals together framing extremely hard rock, it contains quartz, chromium, nickel, cobalt, gold, silver, platinum and iron.

1. They can be utilized as high quality solid aggregates in the concrete mix.
2. The need of this task examination is to utilize gabbro as coarse aggregate in study, since the gabbro is costly, the utilization of waste gabbro from nearby markets structures lessen the general expense of development.

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3. When in contact with different synthetic compounds they give no substance responses that may harm wellbeing on the earth.
4. So it is natural genial material. Subsequently, the gabbro rocks can be utilized as looking for structures, clearing, and deck and improvement purposes.

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