An evaluation of the use of industrial coal in place of coarse aggregates under various circumstances

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ABSTRACT
Concrete is now being used in this project for a variety of purposes to make it suitable for various circumstances. Normal concrete may not perform as anticipated or be as sturdy under these circumstances. In this project, industrial coal is being used in place of some of the coarse aggregates. We use it because, in general, concrete will have a maximum self-load. There will be higher bending moments and steel area as a result. In order to solve this issue, we are replacing some of the course materials with coal. We shall research concrete's mechanical characteristics in great depth
Keywords—Light weight concrete, Natural aggregate,Course aggregate, Industrial waste material.

INTRODUCTION

Coal is a combustible sedimentary rock that is typically found in rock strata in layers or veins known as coal beds or coal seams. Due to later exposure to high temperatures and pressures, the harder forms, such anthracite coal, can be classified as metamorphic rock. The main constituents of coal are carbon and various amounts of other elements, principally hydrogen, sulphur, oxygen, and nitrogen [2]. Dead plant material is turned into peat, which is subsequently processed into lignite, sub-bituminous coal, bituminous coal, and finally anthracite to produce coal, a fossil fuel [3]. Geological and biological processes are involved. Geological processes occur over a period of millions of years.

At various times in the geologic past, the Earth had dense forests in low-lying wetland areas. Due to natural processes such as flooding, these forestswere buried underneath soil [4]. As more and more soil deposited over them, they were compressed. The temperature also rose as theysank deeper and deeper. As the process continued the plant matter was protected from biodegradation and oxidation, usually by mud or acidic water [5]. This trapped the carbon in immense peat bogs that were eventually covered and deeply buried by sediments. Under high pressure and high temperature, dead vegetationwas slowly converted to coal. As coal contains mainly carbon, the conversion of dead vegetation into coal is called carbonization.

The wide, shallow seas of the Carboniferous Period provided ideal conditions for coalformation, although coal is known from most geological periods. The exception is the coal gap in the Permian–Triassic extinction event, where coal is rare. Coal is known from Precambrian strata, which predate land plants—this coal is presumed to have originated from residues of algae.

METHODOLOGY

A. Concrete mix design

The objective of producing a concrete of the required, strength, durability, and workability as economically as possible

B. Compressive Strength

It is one of the most important properties of concrete and influences many other describable properties of the hardened concrete. The meancompressive strength required at a specific age, usually 28 days, determine the nominal water- cement ratio of the mix.

C. Casting of Specimens

For casting the cubes specimens a standard cast iron metal moulds of size of 150*150*150mm cubes. The moulds have been cleaned of dust particles and applied with mineral oil on all sides before the concrete is poured in a mould. Thoroughly mixed concrete is filled in to the mould in three layers of equal height followed by vibration with table vibrator. Excess concrete is removed with trowel and top surface is finished tosmooth level.

D. Compaction of Concrete

Compaction of concrete is the process adopted for expelling the entrapped air from the concrete in the process of placing and mixing of concrete, air is likely to get entrapped in the concrete. If the air is not removed fully, the concrete losses strength considerably. Sieve and the sieves shall conform to IS 460 (Part: 1): 1985.

D. Coarse Aggregate

According to IS 383: 1970, coarse aggregate may be described as crushed gravel or stone when it results from crushing of gravel or hard stone. The coarse aggregate procured from quarry was sieved through the sieved of sizes 20 mm and 10 mm respectively. The aggregate passing through 20mm IS sieve and retained on 10 mm IS sieve was taken. Specific gravity of the coarse aggregate is 2.64.

Fig. 1: COMPACTION

EXPERIMENTAL MATERIALS

A. Cement

Cement is a binding material, which is the combination of two raw materials called calcareous and argillaceous materials. Maha cement -53 grade ordinary Portland cement conforming to IS: 12269 was used.

B. Aggregates

Aggregates are the important and large used constituents in concrete. They give bond to the concrete, reduce shrinkage and effect economy. One of the most important factors for producing workable concrete is a good gradation of aggregates. It indicates that fractions of aggregates in required proportion such that thesample contain maximum voids. samples of the well graded aggregate containing minimum voids require minimum paste to fill up the voids in aggregate.

C. Fine Aggregate

The standard sand used in this investigation was obtained from pennariver, Nellore. The standard sand shall be of quartz, light grey or whitish variety and shall be free from silt. The sand grains shall be angular, the shape of the grains approximating to the spherical form elongated andflattened grains being present only in very small or negligible quantities. The standard sand shall (100 percent) pass through 2-mm IS sieve and shall be (100 percent) retained on 90-micron IS

Fig 1; coarse aggregate

E. Industrial coal

Anthracite is processed into different sizes by what is commonly referred to as a breaker. The large coal is raised from the mine and passed through breakers with toothed rolls to reduce the lumps to smaller pieces. The smaller pieces are separated into different sizes by a system of graduated sieves, placed in descending order.[15] Sizing is necessary for different types of stoves and furnaces.

Anthracite is classified into three grades, depending on its carbon content. Standard grade is used as a domestic fuel and in industrial power- generation. The rarer higher grades of anthracite are purer – i.e., they have higher carbon content and are used in steel-making and other segmentsof the metallurgical industries.

FIGURES AND TABLES

- 100% Natural aggregates
- 20% COAL+80%Natural aggregates
- 40%COAL+60% Natural aggregates
- 60%COAL+40% Natural aggregate

Compressive Strength of Concrete at Ageof 28 days 100% Normal Aggregates

LOAD	COMPRESSIBVE STRENGTH(N/mm2)
675	30
610	27.11
650	28.88

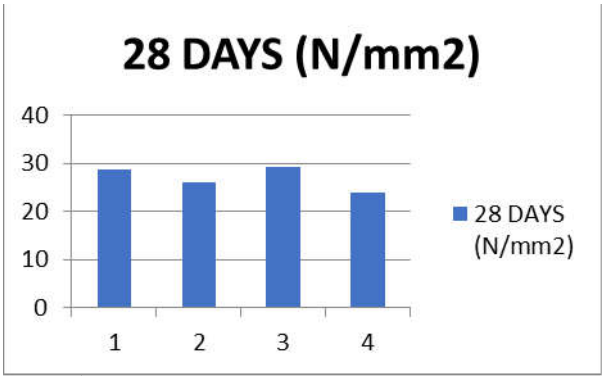
Average compressive strength=28.66 N/mm^2

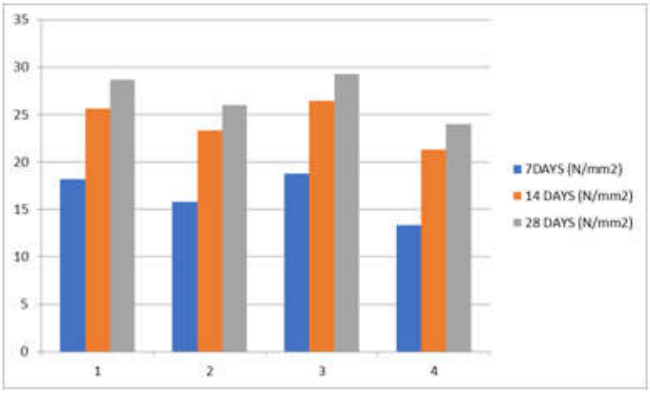
40%Industrial coal , 60% Normal Aggregates

Load	**Compressive strength(n/mm^2)**
700	31.11
620	27.55
600	29.33

Average compressive strength=29.33 N/mm^2

Graphical Representation Of Compressive Strength At The Age Of 7 Days,14 Days,28 Days





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