Behavioural Study Of Light Weight Concrete In Structural Element

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Abstract— Concrete is the widely used building material in the world. Juniper bark has been the most popular choice for coarse aggregate in concrete. But over use of this material lead to environmental concerns, reduction of sources and an increase in price. Lightweight concrete is a type of concrete which includes an expanding agent in that it increases the volume of the mixture while giving additional qualities such as nailbility and lessened the dead weight. It is lighter than the conventional concrete. The main specialties of lightweight concrete are its low density and thermal conductivity Western juniper has several properties which could be commercially marketed. Volatile and essential oils can be extracted from foliage and terminal branches as well as from the wood of western juniper. The wood can be successfully dried, cured and made into products. The wood of juniper has a very attractive smooth finish with pleasing coloration and aroma. Veneer, hard board and particle board have all been successfully manufactured from juniper.

Keywords— Flexure strength, specific gravity, and tensile strength

I. INTRODUCTION

Concrete has been around for many centuries, the first known use of a material resembling concrete was by the Minoan civilization around 2000 BC. During the early stages of the Roman Empire around 300 BC the Romans discovered that mixing a sandy volcanic ash with lime mortar created a hard water resistance substance which we now know as concrete.The predominant type of cement used in modern concrete is Portland cement, other types of cement available include; Blended cement, which is similar to Portland cement but may contain materials such as fly ash slag or silica fume; High early strength cements, which as the name suggests gains strength a lot quicker then Portland or blended cements; Low heat cements, used when limits are placed on the heat of hydration of the concrete; Shrinkage limited cements; Sulphate resisting cements; Coloured cements; Masonry cement

II. OBJECT AND SCOPE OF THE PRESENT INVESTIGATION

The main objective of the thesis is to decrease the weight of the concrete by partially replace the aggregate by adding Juniper bark. Increase the strength of the light weight concrete. Assessment of the effect of Juniper added light weight concrete and drying shrinkage cracks of the concrete. Improve the overall durability and long-term performance of concrete structures. Improve the compaction of this light weight concrete by using admixtures like Silica fumes, Blast furnace etc...

III. METHODOLOGY

Many researchers throughout the world have conducted testing of juniper bark added to concrete over the past three decades. This thesis aims to add to that body of knowledge by the following steps:-Detailed study of journals, magazines, websites, researches, and reference books where done. Data collection by experimental investigation where, one concrete mix made from local ingredients were used to cast and testing (7-day,14-day and 28-day curing) of 18 specimens (150mm diameter x 300 mm height) as the following:-

- 9 specimens with 30% Juniper Bark
- 9 specimens with50% Juniper Bark

2. Design of concrete
3. Molding of specimens
4. Testing of specimens
5. Results discussion of experimental investigation
6. Comparison of the results

A. JUNIPER BARK

Junipers are coniferous plants in the genus Juniper of the cypress family Cupressaceae. Depending on taxonomic viewpoint, there are between 50-67 species of juniper, widely distributed throughout the northern hemisphere, from the Arctic, south to tropical Africa , and to the mountains of

Central America.

B. ADMIXTURE IN CONCRETE

- Silica fumes
- Cellulose
- Hemi cellulose
- Blast furnace
- Cornplaster
- Lighnin

C. PHYSICAL PROPERTIES OF SILICA FUME

- Particle size (typical) < 1 µ m
- Bulk density (as-produced) 130 to 430 kg/m3
- (slurry) 1320 to 1440 kg/m3
- (densified) 480 to 720 kg/m3
- Specific gravity 2.2
- Surface area (BET) 13,000 to30,000 m2/kg

D. CHEMICAL PROPERTIES OF SILICA FUME

- Amorphous
- Silicon dioxide > 85%
- Trace elements depending upon type of fume

IV MIX DESIGN PROPORTIONS

A. GENERAL

It is essential to determine the optimum amount of ingredients required for preparing a concrete mix so that it performs well in both workability and strength aspects. IS 10262-1982 "RECOMMENDED GUIDELINES FOR CONCRETE MIX DESIGN" gives the procedure for preparing a good mix

TABLE I

Cement	**Fine aggregate**	**Coarse aggregate**	**Water**
303	879	992	185
1	2.9	3.2	0.61

A. TOTAL SPECIMENS USED

- Cubes = 10nos
- Cylinders= 10nos
- Prisms = 10nos

B. TESTS FOR SPECIMENS:

- Compressive strength test for cubes.
- Split tensile strength for cylinders.
- Flexural strength test for prisms.

V. TEST RESULT

A. *TESTING HARDENED CONCRETE*

Concrete prepared using the mix obtained is used for casting the cubes and cylinders. Cube Compressive strength and Split tensile strength of the concrete were found.

OBSERVATIONS AND RESULTS

TABLE II
RESULTS FROM COMPRESSION TEST ON

Day of curing	Compressive strength of cube			
	Specimen	Specimen	Specimen	Aver age
	1	2	3	
7thday of curing	30.45	26.75	24.36	27.18
14thday of curing	35.45	34.23	37.48	35.72
28th day of curing	38	41.25	43.4	40.88

CONCRETE CUBE FOR M20

B. SPLIT TENSILE STRENGTH TEST

Split tensile strength of concrete is usually found by testing plain concrete cylinders. Cylinders of size 100mm x 200 mm were casting After 24 hours, the specimens were removed from the mould and subjected to water curing for 28 days. After curing, the specimens were tested for compressive strength using a calibrated compression testing machine.

OBSERVATIONS AND RESULTS

TABLE III
RESULTS FROM SPLIT TENSILE TEST ON
CONCRETE CUBE FOR M20

Day of curing	Tensile strength of cube			
	Specimen	Specimen	Specimen	Aver age
	1	2	3	
7thday of curing	4	3.8	4.5	4.8
14thday of curing	5.7	5.65	5.8	5.71
28th day of curing	6.8	6.5	7	6.76

C. FLEXURAL STRENGTH TEST

Flexural strength, also known as modulus of rupture, bend strength, or fracture strength a mechanical parameter for brittle material, is defined as a material's ability to resist deformation under load. The transverse bending test is most frequently employed, in which a specimen having either a circular or rectangular cross-section is bent until fracture or yielding using a three point flexural test technique.

TABLE IV
RESULTS FROM FLEXURE STRENGTH TEST ON CONCRETE CUBE FOR M20

Day of curing	Flexure strength of cube			
	Specimen	Specimen	Specimen	Aver age
	1	2	3	
7thday of curing	2.8	3.1	3.2	3.03
14thday of curing	3.83	3.6	4.1	3.84
28th day of curing	4.3	4.5	4.2	4.33

VI. STRENGTH ANALYSIS

TABLE V
RESULTS FOR STRENGTH ANALYSIS OF REPLACEMENT CONCRETE

Day of curing	Flexure strength of cube		
	7thday of curing	14thday of curing	28th day of curing
Compressive strength of cube	27.18	35.12	40.88
Tensile strength of cube	4.8	5.71	6.76
Flexure strength of cube	3.03	3.84	4.33

TABLE VI
RESULTS FOR STRENGTH ANALYSIS OF CONVENTIONAL CONCRETE

Day of curing	Flexure strength of cube		
	7thday of curing	14thday of curing	28th day of curing
Compressive strength of cube	31.3	39.56	43.41
Tensile strength of cube	5.21	6.23	7.14
Flexure strength of cube	3.8	4.52	5.21

VII. CONCLUSION

- A concrete specimen using bark with the process was examined. the sample contained cement ,bark and water.
- The bonding of the bark was superior by the use of silica fumes. these results that a concrete with juniper bark product could be developed.
- The cost of the treatment process and the amount of total bark used would have to be identified to evaluate the economic feasibility.
- The initial findings have shown that the light weight

concrete has a desirable strength to be alternative construction material for the industrialized building system.

- The silica fume used as a binder for bark. it resulted good binding capacity. the test results have indicated the light weight concrete (with the bark) is suitable for partially replace the aggregate.
- The light weight concrete(Juniper added) reducing cost of the construction it means the cost of 1unit coarse aggregate is approximately 6000 .Here the aggregate have partially replaced by juniper bark. So the cost of the construction is reduced.
- The juniper bark added to light weight concrete also reducing the weight of concrete structures.It means for 15*15*15 concrete cube the weight will reduce to 2kg by adding 30% juniper bark.so weight will reduce by using juniper bark.
- High load structures need more depth of foundation.when we using light weight concrete the foundation not need that much of depth offoundation.

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