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EXPERIMENTAL INVESTIGATION ON STRENGTH AND DURABILITY PROPERTIES OF SISAL FIBER REINFORCED CONCRETE

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ABSTRACT

Acceleration in the cost of repair and analysis of concrete structure which enlarge distress much in advance than the design service life has twisted the meeting point on the durability aspect of concrete. headed for decide the chemical conflict of sisal fibre in Portland cement concrete elements. An investigational study result conducted to evaluate the durability character of plain and fibre reinforced special concrete and its association with Portland cement based humdrum concrete is accessible in this paper. The durability test measured in this study includes water absorption, saturated water absorption (SWA),impact load, rapid chloride penetrability test(RCPT). The experimental Test results discovered that plain and fibre reinforced special concrete possesses higher durability character than conformist concrete of the similar grade with respect to most of the durability tests.

Key words: Sisal, Durability, Fiber.

INTRODUCTION

Sisal fibre is obtain from Agave sisalana, a inhabitant of Mexico. The resilient plant grows well in a selection of hot climate, including dry areas not fitting for other crops. After harvest, its leaves are cut and flattened in regulate to disengage the pulp as of the fibers. Fiber is a normal or synthetic string. It is also used as a element of concrete, or when complete into sheets. It is used to make produce such as paper or felt. The thickness of the fiber is about 100 to 300 μm. According to producer arrangement, sisal fibers are separated into three category depending on their distance end to end as:

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- Small fibers with length 3 600 mm
- Middle sized fibers with extent in the range 600 -700 mm;
- Extended - sized fibers with extent in the range larger than 700 mm.

Plant description

Sisal flora, *Agave sisalana*, consist of a rosette of sword-shaped vegetation regarding 1.5–2 metres (4.9–6.6 ft) high. Youthful leaves may have little minute teeth along their limits, but drop them as they fully grown. The sisal plant has a 7–10 year lifetime and normally produces 200–250 commercially functional leaves. Each leaf contain an normal of around 1000 fibres. Sisal is measured a plant of the tropics and subtropics, since manufacture remuneration from temperature above 25 degrees Celsius and sunlight.

Fibre extraction

Fibre is extract by a procedure known as decortications, where vegetation are compressed and compressed by a turning wheel set with rounded knives, so that only fibres stay put. In East Africa, where construction is normally on fat estates, the leaves are elated to a central decortications plant, where water is use to wash away the dissipate parts of the leaf. The fibre is then dried out, brushed and baled for sell overseas.

Test for durability

The durability kind incorporated the microstructure associated properties such as saturated water absorption (SWA), rapid chloride ion penetrability tests (RCPT) and impact test are carrying out.

Saturated water absorption test

The saturated water absorption test were determined by drying the cube specimens (100 mm size) in an oven at a temperature of 105_C to constant weight (W1), then immersing in water after cooling to room temperature. These tests were done according to ASTM C 642-82. At regular intervals of time, the specimens were taken out of water and weighed. And the specimens were weighed after 30 min (W2) and 120 h (W3) of immersion in the water. The difference between the oven dried weight and measured weight expressed as fractional percentage of the oven dried weight gives water absorption. The initial absorption value of time interval at 30 min. The water absorption value at the end of 120 hrs was taken as the saturated water absorption (SWA). The concluding results of the test are

given in Table 3. And it can be seen that the absorption values of Special concrete and CC be lesser than the limit of 3% specified for good concrete. Absorption values for the special concrete were found to be the lower than that of CC.

Table 1: Results of saturated water absorption (conventional)

Mix	W1 (Kg)	W2 (Kg)	W3 (Kg)	Initial absorption	Saturated water absorption
M20	2.54	2.55	2.62	0.15	2.90
M30	2.47	2.43	2.54	0.40	2.83
M40	2.46	2.48	2.53	0.85	2.67

Table 2: Results of saturated water absorption : (Special concrete)

Mix	W1 (kg)	W2 (kg)	W3 (kg)	Initial absorption	Saturated water absorption
M20	2.43	2.46	2.50	1.22	2.91
M30	2.43	2.46	2.50	1.13	2.88
M40	2.42	2.43	2.46	0.82	2.68

Rapid chloride penetration test (rcpt)

The test was complete according to ASTM C 1202-97. In this way 60 V DC was practical across the opposite face of 100 mm length-50 mm thick concrete specimen. The test set up is exposed in Fig. 3. Six specimen be prepared from every mix. One face of each sample was expose to 3% NaCl resolution and the other face was showing to 0.3 M NaOH solution. The length of experiment was 6 hr. The recent between the electrodes was monitored at 30 min interval of time. The totality charge passed through the sampling indicated the chloride ion penetrability of the solid. The chloride ion penetrability limits recommended by ASTM C 1202 were compare with the test results and are given in Table 4. Since the table it can be seen that the chloride ion penetrability of equally plain and fibre reinforced M20 and M40 was graded low as per ASTM C1202, which indicate that the adding up of fibres have no difficult effect on chloride resistance of M20 and M40. These result are similar to those obtain by Rajamane et al. in the case of M20 and M40. The passé Chloride ipenetrability as per ASTM is low.

Table 4: Results of RCPT (conventional)

Mix	Depth of chloride penetration (cm)	Diffusion coefficient (m^2/s)	Charge passed (C)
M20	2.43	$1.22*10^{-11}$	1319
M30	2.40	$1.20*10^{-11}$	1442
M40	2.36	$1.16*10^{-11}$	1390

Table 5: Results of RCPT: (special concrete)

Mix	Depth of chloride penetration (cm)	Diffusion coefficient (m^2/s)	Charge passed (C)
M20	2.48	$1.26*10^{-11}$	1323
M30	2.45	$1.24*10^{-11}$	1447
M40	2.42	$1.20*10^{-11}$	1394

Impact test

Every series of recently mixed FRC was located in the cylindrical mould of measurement 100 x 200 mm forecast the specimens. From this cylindrical specimen, twelve discs of size 100 x 64 mm were cut with a diamond cutter. The discs were then subjected to fall weight test following the strategy of ACI committee 544.2R-89. The test consisted of frequent application of impact load in the form of blow, with a 44.5 N hammer declining from 457 mm height on the steel ball of 63.5 mm distance, located at the centre of the top face of disc. Number of blows (N1) and (N2) that cause the first in evidence crack and breakdown in that order was famous as first crack strength and the crash strength of the sample. The schematic figure of drop weight test machine is revealed in Fig. 4.

Table 6: Impact test of M40 grade of concrete (special concrete)

Days	Specimen	No. of blows-initial	No. of blows final
7^{th}	1	45	47
	2	47	48
	3	47	49

Cont…

Days	Specimen	No. of blows-initial	No. of blows final
14th	4	60	61
	5	63	65
	6	66	68
28th	7	103	105
	8	107	109
	9	105	107

Table 7: Impact test on M40: (Conventional)

Days	Specimen	No. of blows-initial	No. of blows-final
7th	1	36	38
	2	37	39
	3	35	37
14th	4	46	48
	5	51	53
	6	52	54
28th	7	74	75
	8	77	79
	9	75	76

CONCLUSION

Durability description of plain and fibre resistant special concrete and conformist concrete were assess in terms of water absorption, saturated water absorption, rapid chloride penetration test (RCPT) and impact test. From the learning conduct it can be complete that special concrete possess better durability characteristics than conventional concrete of equal grade and the addition of fibres enhanced the durability characteristics of special concrete auxiliary.

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