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COMPARATIVE STUDY

ON

SULPHUR CONCRETE WITH MODIFIED GLASS FIBER

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Abstract-This project deals with the comparative study on complete replacement of cement using sulphur as binder and modifying using glass fibre on strength. Cement is the binding material, complete replacement of cement with sulphur leads to the reduction of water. The main components of sulphur concrete are sulphur , coarse aggregate, fine aggregate and glass fiber. Sulphur concrete helps in the replacement of water as well as cement. It has been said that in many journals that, it helps in gaining acid resistance. Results show that sulphur concrete can be used in areas subjected to heavy moisture content and where acid activities are more. Another advantage of sulphur concrete is that any type of fine aggregate can be used as a filler in sulphur concrete since it is a water repellent type concrete. Glass fiber gives more strength to the concrete they are fire resistant and ductile, which helps the concrete in gaining more strength.

Keywords- sulfer concrete, glass fibre,silica flour,strength

INTRODUCTION

Sulphur concrete is a composite construction material, composed mainly of sulphur and aggregate (generally a coarse aggregate made of gravel or crushed rocks and a fine aggregate such as sand). Cement and water, important compounds in normal concrete, are not part of sulphur concrete. The concrete is heated above the melting point of sulphur 115 °C - 140 °C in a ratio of between 12% and 25% sulphur, the rest being aggregate, the mould is also been heated to evenly distribute the heat in the mold . After cooling the concrete reaches a high strength, not needing a prolonged curing like normal concrete.
Sulphur concrete is resistant to some compounds like acids which attack normal concrete, however unlike ordinary concrete, it cannot withstand prolonged high heat without adjusted mixture material so that we are adding glass fiber to attain the required strength . Sulphur concrete is also a possible building material for a lunar base. Sulphur concrete was first experimented in moon surface it later became to be known as lunarcrete. Sulphur concrete has only been used in small quantities when fast curing or acid resistance is necessary.

HISTORY

One of the uses for sulfur which is again being considered is as the cementing agent in concrete instead of portland cement. Recent reports and papers9-12 have considered the properties and potential applications for sulfur concrete. Members of the Department of Civil Engineering at the University of Calgary are actively engaged

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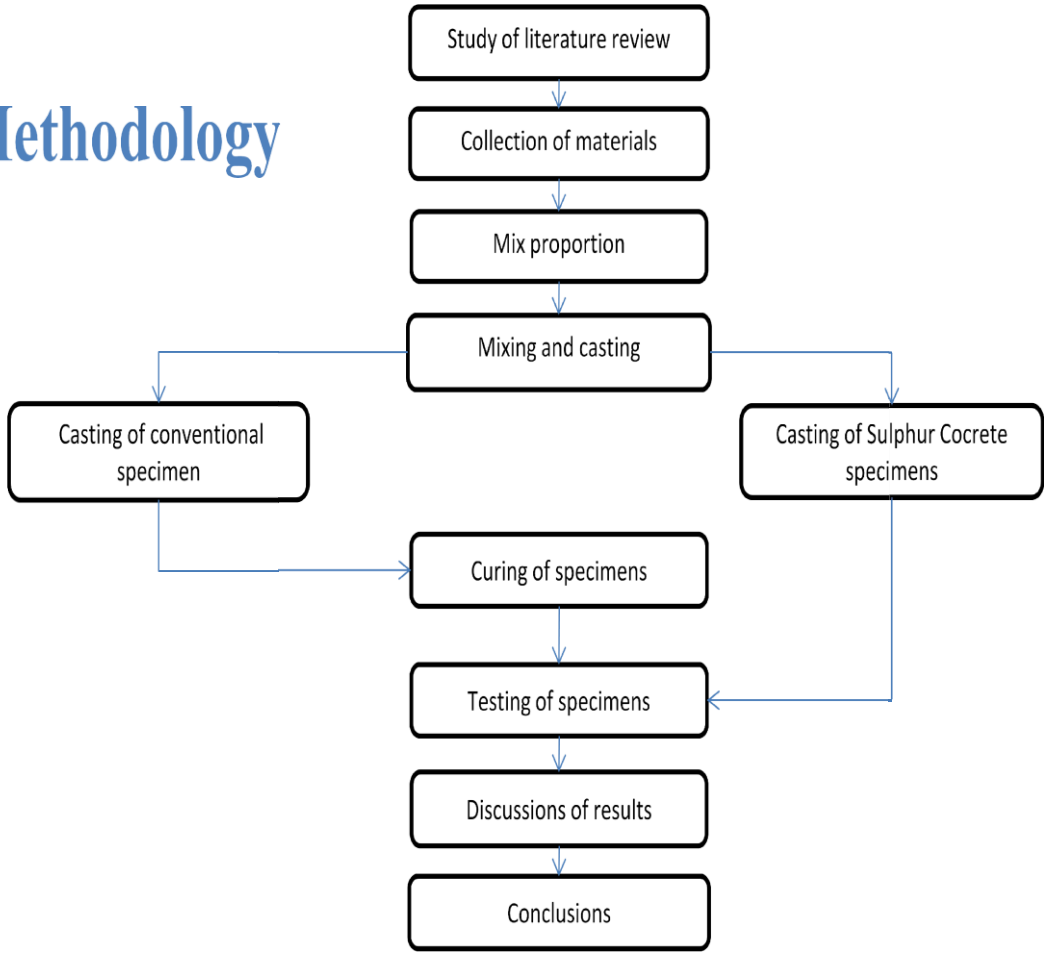
in studies which, it is hoped, will help to resolve some of the present uncertainties which impede use of this material.

It is useful to compare a new material such as sulfur concrete with a traditional construction material such as portland cement concrete. Sulfur may be combined with fine and coarse aggregates to produce a concrete with strength of 6000 to 7000 psi. Fig. 5 compares the mix proportions for a cubic yard of sulfur concrete with portland cement concrete of roughly equivalent strength. It is clear that the volumes of cementing material and filler material are roughly the same.

Some of the problems associated with the use of portland cement concrete result from shrinkage and creep. While sulfur concrete exhibits no shrinkage, a roughly equivalent problem may occur through the thermal contraction resulting as the concrete cools from its crystallization temperature of 240 F to the ambient temperature. Thermal movements of sulfur concrete can be expected to be significant moreover because the coefficient of thermal expansion of pure sulfur is greater than that of steel or concrete.

Sulfur concrete was developed and promoted as building material to get rid of large amounts of stored sulfur produced by hydrodesulfurization of gas and oil. As of 2011, sulfur concrete has only been used in small quantities when fast curing or acid resistance is necessary. The material has been suggested by researchers as a potential building material on Mars, where water and limestone are not available, but sulfur is available on Mars planet

Methodology



COLLECTION OF MATERIAL

- Sulphur
- Glass Fibre
- Silica flour
- Coarse aggregate
- Fine aggregate

CASTING OF SULFER CONCRETE

Introduction

This experimental work is made to investigate the properties of sulfer concrete. In this experiment work the glass fiber is used in a varying percentage of 0%, 1%, 2%, 3%, 4 %and 5%. Silica flour is added for better workability.

The compression strength was conducted. The specimen of standard size 150mmX150mmX150mm is casted and curing period is not required for Sulfer concrete. The reading of the compression value is recorded in a systematic manner. Specimen are tested on 2000kN capacity compression testing machine as per IS 516:1959

Casting Process

- The coarse aggregate and fine aggregate are first weighed.
- The coarse aggregate and fine aggregate are then heated until the mixture of aggregate are uniformly heated
- Silica flour is then weighted and poured into the mixture of aggregate
- The silica flour and aggregate are heated for some few minutes
- Then the mixture of silica flour and aggregate are then kept aside
- Sulfer powder is then weighted and heated until all the powder is completely melted
- As the sulfer is completely melted the mixture of aggregate and silica flour is poured into the melted sulfer
- The mixture is mixed properly, once all the ingredients are mixed properly and the colour changes into light green colour it is poured into the mould
- Once the sulfer is poured, compaction is carried out at the same time
- Glass fiber is added at into the mould at certain time.

Sulphur	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%
Fine Aggregate	27.4%	26.9%	26.45%	26.01%	25.5%	25.1%
Coarse Aggregate	26%	25.5%	25.14%	24.70%	24.2%	23.8%
Silica Flour	10.7%	10.7%	10.7%	10.7%	10.7%	10.7%
Glass fiber	0%	1%	2%	3%	4%	5%

Percentage of materials for sulphur concrete

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MIX RATIO OF SULPHUR CONCRETE						
	Sulphur	Fine Aggregate	Coarse Aggregate	Silica Flour	Glass fiber	No of cubes
S1	3000gm	2250gm	2140gm	900gm	74gm	3
S2	3000gm	2213gm	2103gm	900gm	148gm	3
S3	3000gm	2176gm	2066gm	900gm	222gm	3
S4	3000gm	2139gm	2029gm	900gm	296gm	3
S5	3000gm	2102gm	1992gm	900gm	370gm	3

TABLE : Mix ratio of sulfer concrete

CONCLUSION

From the above experimental investigation the following conclusion were drawn
We should have use a better admixture
We should have used smaller size of aggregate as the admixture and sulfer enlarges the size of the aggregate when mixing with melted sulfer

This concrete is recommended where acid attack are more
We observed that the glass fiber must be cut into smaller pieces so that the sulfer and glass fiber are mixed uniformly.

Day	Date	Mix No	Cube no.	Force applied (kN)	Value in N
1ST DAY	14TH June	M1	2	120	5.33
			1	120	5.33
			J	410	18.22
		M2	8	310	13.77
			F	254	17.28
			12	240	10.66
		M3	A	216	19.60
			I	220	9.77
			6	129	5.733
		M4	7	308	13.68
			5	233	10.35
			4	264	11.73
		M5	10	170	7.55
			C	210	9.33
			G	180	8

Compression test value

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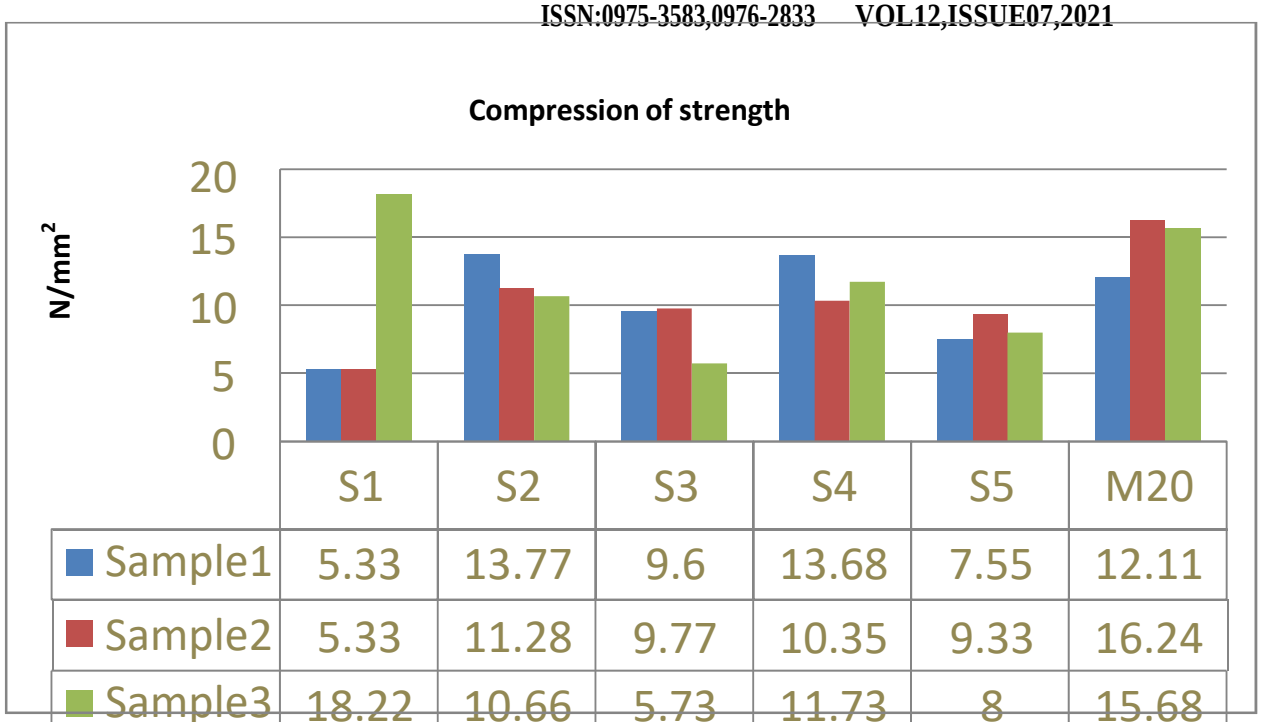

Compression strength graph

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