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EFFECT OF GREY WATER ON CONCRETE PROPERTIES

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Abstract: Water scarcity involves water stress, water shortage or deficits, and water crisis. While the concept of water stress is relatively new, it is the difficulty of obtaining sources of fresh water for use during a period of time and may result in further depletion and deterioration of available water resources. Water shortages may be caused by climate change, such as altered weather patterns including droughts or floods, increased pollution, and increased human demand and overuse of water. A water crisis is a situation where the available potable, unpolluted water within a region is less than that region's demand. Water scarcity is being driven by two converging phenomena: growing freshwater use and depletion of usable freshwater resources.

I. INTRODUCTION

The reduction of water scarcity is a goal of many countries and governments. The UN recognizes the importance of reducing the number of people without sustainable access to clean water and sanitation. The Millennium Development Goals within the United Nations Millennium Declaration state that by 2015 they resolve to "halve the proportion of people who are unable to reach or to afford safe drinking water."

Around one fifth of the world's population currently live in regions affected by Physical water scarcity, where there is inadequate water resources to meet a country's or regional demand, including the water needed to fulfill the demand of ecosystems to function effectively. Arid regions frequently suffer from physical water scarcity. It also occurs where water seems abundant but where resources are over-committed, such as when there is over development of hydraulic infrastructure for irrigation. Symptoms of physical water scarcity include environmental degradation and declining groundwater as well as other forms of exploitation or overuse.

GREY WATER

Household wastewater is mainly divided in black water and grey water. Black water consists of the discharges from toilets. Black water contains nitrogen and phosphorous in high concentrations and most of the pathogens, hormones and pharmaceutical residues. Grey water consists of the discharges from kitchen sinks, showers, baths, washing machines and hand basins. It accounts for up to 75% of the wastewater volume

produced by households. Grey water is relatively low in pollution and therefore, after appropriate treatment, has great potential for reuse in non-potable water applications such as infiltration, irrigation, toilet flushing, washing water, and construction.

Some definitions include wastes from kitchen sinks although there is no consensus. Production and composition of grey water may vary due to quality of water supply, household activities, domestic waste water carrying system provided in the building etc.

CHARACTERISTICS OF GREY WATER:

Grey water is defined as wastewater without any input from toilets, which means that it corresponds to wastewater produced in bathtubs, showers, hand basins and laundry machines in households, office buildings, schools, etc. Production and composition of grey water may vary due to quality of water supply, household activities, domestic waste water carrying system provided in the building etc.

GREY WATER TREATMENT:

Grey water reuse methods can range from low cost methods such as the manual bucketing of grey water from the outlet of bathroom, to primary treatment methods that coarsely screen oils, greases and solids from the grey water before use via small systems, to more expensive secondary treatment systems that treat and disinfect the grey water to a high standard before using.

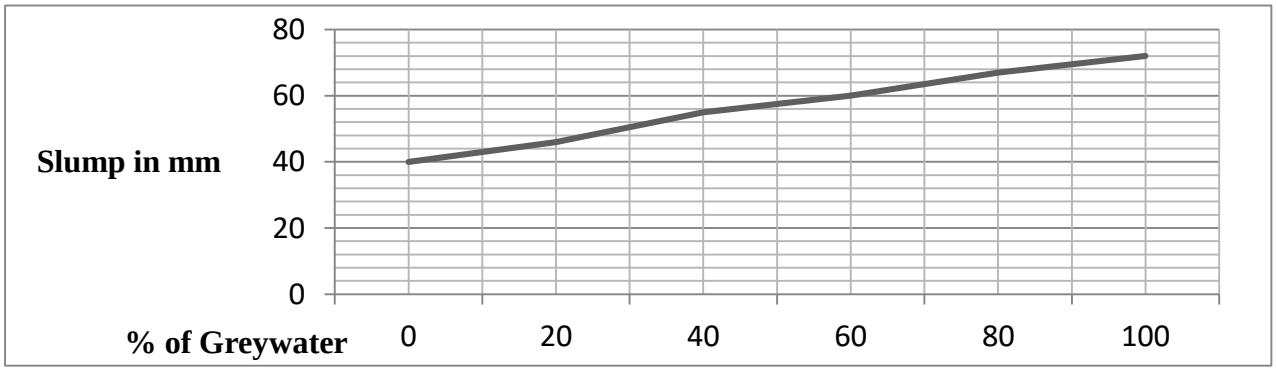
II. SYSTEM DEVELOPMENT

This project aims at finding out the “Effect of Grey water on properties of concrete”. This project work include the concrete mix design for w/c 0.5 as IS 10262-2009 by varying the % of grey water as 0%,20%,40%,60%,80%,100% as replacement of potable water. For concrete the fine aggregate was collected from Godavari River & the coarse aggregate where crushed &angular. Various tests on fine aggregate & coarse aggregate confirming to IS 5640-1970, where conducted at concrete lab. The fresh concrete was tested for workability by Compaction Factor Test & Slump Cone Test Confirming to IS 1199-1959& Workability was compared for different proportions of grey water. Harden concrete was tested for compressive strength on Compression Testing Machine (i.e. Destructive Testing) of concrete & compressive strength was compared for different proportions of grey water.

III. PERFORMANCE ANALYSIS

COMPARISON OF WORKABILITY BY SLUMP CONE TEST

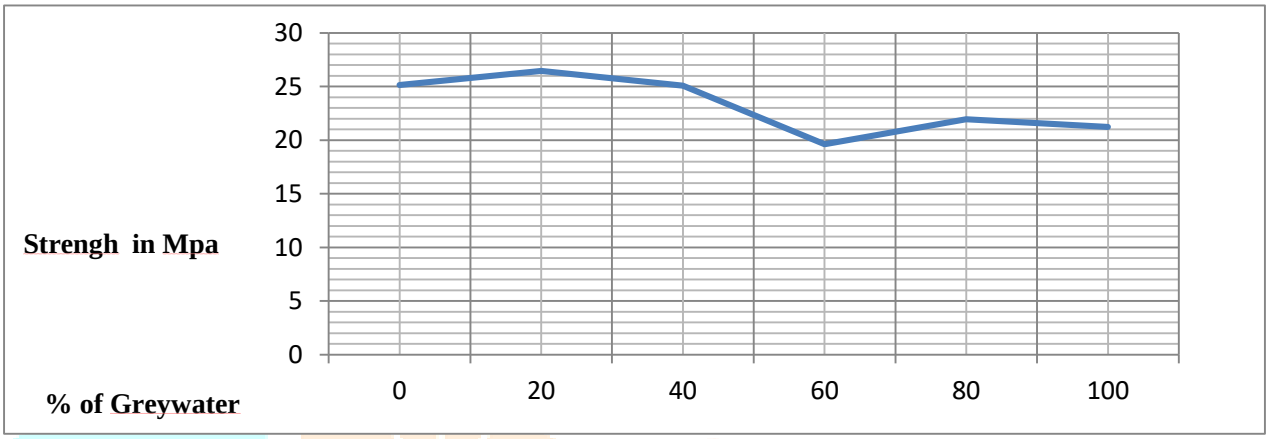
Following graph shows the value of slump in mm for different proportions of grey water as a replacement of potable water.



As shown in above graph we can conclude that as the percentage of grey water increases then workability of concrete also increases. As the percentage of grey water increases by 20%, 40%, 60%, 80%, 100%, workability increases by 15%, 37.5%, 50%, 67%, and 80% respectively.

COMPARISON OF COMPRESSIVE STRENGTH AT 7 DAYS OF CURING

Following graph shows the value of Comparison of compressive strength at 7 days curing for different proportions of grey water as replacement of potable water.



When the grey water is increased by 20% , 40%, then compressive strength of concrete at 7 days curing increases by 5.2%, 0.3% respectively and for increase in grey water by 60%, 80%, 100% then compressive strength of concrete at 7 days curing decreases by21.96%, 12.71%, 15.56%.From above results we can replace pure water by 40% grey water and variation of grey water as replacement of drinking water for concrete gives nearly same strength as concrete with drinking water at 7 days curing.

IV. CONCLUSION

1. Grey water usually contains hair dyes, hair oils, vegetable oils, cosmetics chemicals, soaps, detergents etc. But soaps and detergents are present more predominantly than others. Soaps and detergents generally contain carboxylic acid group, sodium alkyl sulphate, sodium alkyl benzene sulfonate, glycerol (a non-ionic detergent), sodium carbonate, sodium tetraborate, synthetic detergents, fat or oil, potassium hydroxide, sodium hydroxide, etc
2. Soap is a salt of a compound known as a fatty acid. A soap molecule consists of a long hydrocarbon chain (composed of carbons and hydrogen's) with a carboxylic acid group on one end which is ionic bonded to a metal ion, usually a sodium or potassium. The hydrocarbon end is nonpolar and is soluble in nonpolar substances (such as fats and oils), and the ionic end (the salt of a carboxylic acid) is soluble in water.
3. Detergents are structurally similar to soaps, but differ in the water-soluble portion. Because soaps are the salts of strong bases and weak acids they should be slightly basic. A laundry detergent composition generally comprises six groups of substances: surfactants, builders, enzymes, bleaching

agents, fillers and other minor ad-datives such as dispersing agents, fabric softening clay, dye-transfer inhibiting ingredient, and optical brighteners. Laundry detergents and, household and personal-care products account for over half the use of surfactant.