# To Study Effect of Gray Water on The Properties of Concrete

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***Abstract— This project aims to evaluate the potential of reused grey water in concrete and mortar in order to preserve fresh water for drinking purposes. Using both Treated Grey Water and Raw Grey Water (TGW and RGW, respectively) led to a significant increase in the initial setting time and a decrease in the concrete slump value. In addition, there was no effect on mortar soundness properties. The mortar and concrete compressive strength results obtained at 7 days moist curing time showed a significant increase. Mortar and concrete mixes using TGW cast at curing times of 28 days led to no significant effects on compressive strength.***

***On the contrary, the RGW achieved slightly negative impact on compressive strength at all curing ages. According to the Indian Standards, TGW and RGW are suitable for mortar and concrete production. In conclusion, TGW and RGW are potential alternatives for fresh water in the concrete manufacturing industry.***

***Index Terms— Drinking Water, Grey Water, Used Water, Sewage Water, Ph meter, BOD, COD, compression testing machine, M25 grade concrete.***

## I. INTRODUCTION

Water scarcity is the lack of sufficient available water resources to meet the demands of water usage within a region. It already affects every continent and around 2.8 billion people around the world at least one month out of every year. More than 1.2 billion people lack access to clean drinking water.

Economic water scarcity is caused by a lack of investment in infrastructure or technology to draw water from rivers, aquifers or other water sources, or insufficient human capacity to satisfy the demand for water. One quarter of the world's population is affected by economic water scarcity. Symptoms of economic water scarcity include a lack of infrastructure, causing the people without reliable access to water to have to travel long distances in or fetch water, that is often contaminated from rivers for domestic agricultural uses. Large parts of Africa suffer from economic water scarcity; developing water infrastructure in those areas could therefore help to reduce poverty. Critical conditions often arise for economically poor and politically weak communities living in already dry environment.

## II. LITERATURE REVIEW

This chapter gives a comprehensive review of the work carried out by various researchers in the field of using plastic in paver blocks.

1. Lynn Schneider has been investigated “Grey water Reuse in Washington State”.(2-6-2009 - 17-9-2009):

This report summarizes the literature on the characterization of grey water by source inside of a home from on potable reuse in the State of Washington for single family homes, multi-family homes, and businesses. It summarizes available data related to the average quantity and constituents of concern associated with a variety of sources of grey water. It is meant to be used as a tool by the grey water rule advisory committee during rule development.This literature review demonstrates that the level of pollution in the total grey water stream that includes kitchen sinks, dishwashers, laundry machines used to wash dirty diapers can be equal to or greater than black water and requires regulations consistent with on-site sewage regulations. Wastewater from kitchens can be

heavily polluted with pathogens, chemicals from dish detergents, and fats, oils and grease. Wastewater from clothes washing machines used for washing soiled diapers contains increased levels of bacteria.

2. Lucy Allen Juliet, Christian-Smith, Meena and Palaniappan has studied "Overview of Grey water Reuse.(Nov18-2010):

The Potential of Grey water Systems to Aid Sustainable Water Management" Grey water, defined slightly differently in different parts of the world, generally refers to the waste water generated from household uses like bathing and washing clothes. This wastewater is distinguished from more heavily contaminated "black water" from toilets. In many utility systems around the world, grey water is combined with black water in a single domestic wastewater stream. Yet grey water can be of far higher quality than black water because of it slow level of contamination and higher potential for reuse. When grey water is reused either on site or nearby, it has the potential to reduce the demand for new water supply, reduce the energy and carbon footprint of water services, and meet a wide range of social and economic needs .In particular, the reuse of grey water can help reduce demand for more costly high-quality potable water.

## III. OBJECTIVE

- To study the property of gray water.
- To study the chlorine,ph,cod,bod test on the collected sample of gray water.
- To compare the result of ph chlorination bod cod with normal water.
- To compre compressive test of concrete with variation in percentage of gray water(20% 30% 40%).

## IV. MATERIAL USED AND MIX RATIO

A. Material used for making of mould –
Grey Water, Cement, Aggregate, normal water was used for making of block.

B. MIX DESIGN FOR 0.5W/C RATIO

| | |
|---|---|
| Grade designation | M40 |
| Type of cement | OPC 53 grade |
| Maximum nominal size of aggregate | 20mm |
| Minimum cement content | 300 kg/m3 |
| Maximum water-cement ratio | 0.5 |
| Workability | 100-120mm slump |
| Exposure condition | Moderate |
| Method of concrete placing | Hand placing |
| Degree of supervision | Good |
| Type of aggregate | Crushed angular |
| Maximum cement content | ) /m3 |

STIPULATIONS FOR PROPORTIONING

C. SELECTION OF WATER-CEMENT RATIO
Adopt water-cement ratio as 0.50.

D. SELECTION OF WATER CONTENT
Maximum water content = 186 lt .for 20 mm aggregate
For 25-50mm slump angle=186+(6/186)=197 lt.

E. CALCULATION OF CEMENT CONTENT
Water-cement ratio Cement content =0.50 Cement content =336kg/m3

F. PROPORTION OF VOLUME OF COARSE AGGREGATE AND FINE AGGREGATECONTENT
From , volume of coarse aggregate corresponding to 20 mm size aggregate and fine aggregate (Zone I) for water-cement ratio of 0.50 = 0.60. Therefore, volume of coarse aggregate = 0.60
Volume of fine aggregate content = 1 - 0.60 =0.40

## V. METHODOLOGY

- Manufacturing

Collection of sample.
Performing tests on collected water sample:- a) pH b) Chlorination c) BOD d) COD.
Analyzing test Results.
Comparing test results with potable water sample.
Collection of materials
Performing tests on materials collected.
Test to be conducted:-
a) Workability: - 1) Slump cone, 2) Compaction factor test

Casting of concrete cubes using Grey water & potable water.
Performing tests On both cubes
a)Compressive strength Test
Comparison of compressive strength at 7 days and 28 days of curing.

## VI. RESULTS AND DISCUSSION

The tests are required to determine the quality and strength of specimen and therefore its suitability for the job.

- GREY WATER TEST

The test procedure is as follows:
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. Figures show some grey water treatments procedure.

PH Testing Machine

| Sr. No | Parameter | Result (For GRAY water) | Result (For Normal water) | Units |
|---|---|---|---|---|
| 1 | pH | 7.5 | 7.2 | - |
| 2 | DO | 2.4 | 6.4 | Mg\lt |
| 3 | BOD | 30 | 5.0 | Mg\lt |
| 4 | COD | 250 | Not standard | Mg\lt |

For Grey Water and Normal water

- Compression of workability by slump cone test

| % of grey water | Slump (mm) |
|---|---|
| 0 | 40 |
| 20 | 46 |
| 40 | 55 |
| 60 | 60 |

Comparison of workability by slump cone test

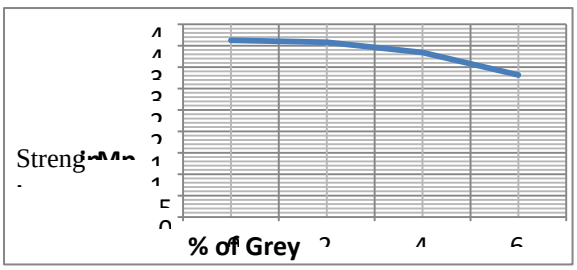
As shown in above graph we can conclude that as the percentage of grey water increases then workability of concrete also increases. . As the percentage of grey water increases by 20%, 40%, 60%, workability increases by 15%, 37.5%, 50% respectively.

Some synthetic detergents, fatty and resinous acids and their salts, alkylbenzeneulfonates are materials of air entraining admixtures and also of soaps and detergents. Therefore soapy water can improve workability.

Chart representing Comparison of compressive strength at 28 days of curing:

| % of Grey water | Casting Date | Test Date | Weight (Kg) | Strength (MPa) | Mean Strength (MPa) | Peak Load (KN) |
|---|---|---|---|---|---|---|
| 0% | 27/02/21 | 26/03/21 | 9.319 | 40.01 | 40.63 | 900.225 |
| | | | 9.579 | 42.30 | | 950.75 |
| | | | 9.230 | 39.60 | | 823.5 |
| 20% | 13/03/21 | 10/04/21 | 8.447 | 37.64 | 37.38 | 846.9 |
| | | | 8.485 | 38.10 | | 857.25 |
| | | | 8.397 | 36.40 | | 819 |
| 40% | 14/03/21 | 12/04/21 | 8.377 | 36.30 | 35.53 | 816.75 |
| | | | 8.311 | 35.40 | | 796.5 |
| | | | 8.401 | 34.90 | | 785.25 |
| 60% | 16/03/21 | 16/04/21 | 9.307 | 32.95 | 32.56 | 741.375 |
| | | | 8.107 | 30.30 | | 681.75 |
| | | | 9.203 | 31.45 | | 707.625 |

Results of compressive strength at 28 days of curing



Graph of Comparison of compressive strength at 28 days of curing

CTM Machine

## RESULTS OBTAINED

As shown in above graph we can conclude that as the percentage of grey water increases then compressive strength of concrete at 28 days curing goes on decreases.

When the grey water is increased by 20% , 40%, 60% then compressive strength of concrete at 28 days curing decreases by 1.1%, 6.9%, 19.40%.

## CONCLUSION AND FUTURE SCOPE

- Increase in Workability: Air entraining admixtures can improve workability of concrete. Some synthetic detergents, fatty and resinous acids and their salts are materials of air entraining admixtures and of soaps and detergents both. Therefore, soapy water can improve workability. At the same time these materials are helpful for improving durability in freeze-thaw, deicer, sulphate and alkali-reactive environments.
- As we had taken the chlorinization test,PH, cod, bod test as the percentage of the gray water increases by 20% 40% 60% percent workability
- Compression stress at 28 days of curing goes on decreasing when the gray water is increased yb 20% 40% 60%
- As the conclusion we cat use the gray water more than 60% in a concrete as the strength of the concrete is decreaseing in high level.

## FUTURE SCOPE

- 1 As a result of reuse, fresh water drinking supplies are conserved enabling it to remain in natural ecosystems.
- Grey water has the potential to save on average 50 per cent of an average household's water use. Apart from savings to the consumer, grey water reuse saves water authority money, reduces sewage flows and reduces the demand on potable water supplies.
- load on wastewater disposal systems is reduced and therefore their life is prolonged and capital expenditure required for upgrading and expansion is delayed, if not potentially decreased.

## REFERENCES

[1] [1"Lynn Schneider" (2-6-2009 to 17-9-2009), "Grey water Reuse in Washington State". Chapter 246-247(pg-1,2,13)

[2] "Lucy Allen Juliet, Christian-Smith, Meena and Palaniappan" (Nov 18-2010) "Overview of Grey water Reuse" vol-7.(pg-24,27).

[3] "J. S. Lambe and R. S. Chougule"(2013) "Grey water Treatment and Reuse" vol5(pg-20,21).

[4] "Musfique Ahmed and Meenakshi Arora" (9-9-2012) "Suitability of Grey Water Recycling as decentralized alternative water supply option for Integrated Urban Water Management". Vol-2(pg-31,32).