DEMOCRATIA

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REUSE OF GREYWATER IN CONSTRUCTION PURPOSES

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OBJECTIVES

- Reuse of Greywater in construction purposes and to check the strength of the concrete after 28 days for C35/45 class of concrete with different water-cement ratio.
- Comparison of compressive strength of concrete prepared by Greywater, Neckar water and tap water.

EXPERIMENTS

- Basic parameter testing of different types of water.
- Preparation of artificial Greywater.
- Casting of 18 concrete cubes of size 0.001 m^3.
- Curing for 7 days in the respective type of water.
- Drying of concrete cubes for 21 days at 26°C.
- Compression testing after total 28 days.

Day1-Casting of Cubes

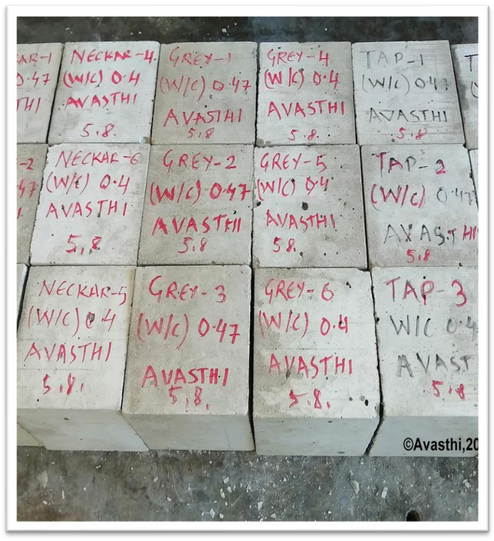
PREPARATIONS

Composition for preparation of Artificial Greywater			
Product	Quantity		
	Henkel AG	Avasthi	Unit
Toothpaste	2.53	4.83	$ml/(P \cdot d)$
Bathing Liquid	3.05	7.43	$ml/(P \cdot d)$
Soap	0.17	0.3	$g/(P \cdot d)$
Handwash	0.17	5.5	$ml/(P \cdot d)$
Dishwashing Tablet	7.44	15.2	$g/(P \cdot d)$
Oil	0.26	0.73	$ml/(P \cdot d)$
Shampoo	4.63	10.6	$ml/(P \cdot d)$
Washing Powder	15.15	26.2	$g/(P \cdot d)$
Cloth Washing Liquid	-	20.8	$ml/(P \cdot d)$
Dishwashing Liquid	-	7.5	$ml/(P \cdot d)$
Softener	0.22	10	$ml/(P \cdot d)$
Bathtub Bubble Liq.	1.81	-	$ml/(P \cdot d)$
Other	10.14	-	$ml/(P \cdot d)$

Prof Dr. Ing. Cornel, Prof. Dr. Ing. Wagner, 14.09.2020, Semizentrale Ver- und Entsorgungssysteme für urbane Räume Chinas – Teilprojekt 2

- The quantity of every product provided by Henkel AG in 2009 is doubled to carry out this project. So, the artificial greywater prepared is of very high concentration.
- The daily water consumption per pr person varies from country to country.
- In the table, “P” denotes per capita and “d” denotes day.

Artificial Greywater



Cubes after 24 hours

RESULTS

Compression test after 28 days				
Type of Water	Water-Cement Ratio	Number of Cubes	Compressive Strength [MPa]	Amount of water used [l/m^3 of Concrete]
Tap Water	0.47	3	41.4	180
	0.4	3	45.5	152
Neckar Water	0.47	3	31.1	180
	0.4	3	45.4	152
Grey Water	0.47	3	23.1	180
	0.4	3	27.5	152

Curing for 7 days

Day 28- Compression Test

CONCLUSION

- The quality of water has direct impact on the strength of the concrete.
- Approximately 28 litres of water can be saved while preparing $1m^3$ of concrete by using the water-cement ratio of 0.4.
- Almost same compressive strength as Tap water can be achieved by using Neckar water. This is more economical.
- Tap water and Neckar water can be replaced by Greywater for construction purposes.
- To use Greywater in constructing Reinforced Concrete structures, some tests still has to be done.

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QR Code for more pictures and data related to this project.