CIVIL PLUS

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2017–18

Pimpri Chinchwad Education Trust's

Pimpri Chinchwad College of Engineering & Research

HOD Desk

Mrs. Mayura Milind Yeole
HOD of Civil Engineering Departments PCCOER

Civil Engineering has to do with Civilization! With Civilization has developed Civil Engineering and with Civil Engineering has prospered Civilization! It is easily the oldest branch of Engineering.
When the first human form thought of taking refuge in a cave, Civil Engineering was borne.
Every man-made structure in this world is conceived, designed, constructed and maintained by Civil Engineers.
A Civil Engineer is thus Vishwakarmaa of the modern world!

Civil Engineering is very versatile and diversified. It has many sub-disciplines such as; Structural Engineering, Water Resources Engineering, Environmental Engineering, Transportation Engineering, Foundation Engineering, Earthquake Engineering, Construction Engineering, Project Management etc. Civil Engineers could be entrepreneurs, offering consultancy to projects on varied scales. Civil Engineers could seek employment in Government, Semi-government and Private sectors, contributing to the growth of nation with their skills and services.

Civil Engineering Department at PCCOER has experienced, dynamic and dedicated faculty and state-of-art laboratories. We nurture our students with strong scientific and technical know-how and impart critical thinking skills on which, are founded their careers or higher studies. We endeavour to inculcate in our students, professional attitude, ethical values, creativity, leadership, innovative thinking, effective communication, team work, multidisciplinary approach and social awareness. The Department is committed to fostering a stimulating and intellectual environment in which both faculty and students excel in their professions.

- Mrs. Mayura Yeole

Editors

Mrs. P. A Chiwhane | CESA Students

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Department of Civil Engineering

Compact Sewage Treatment Plant

Product Name : Compact Sewage Treatment Plant

Product Developed By :

Shubham Kulkarni | Reshma Hasabe | Ajay Parade | Priyanka Gadekar

Name of Guide : Mr. Sudarshan S. Bobade

Objective : To Reduce Size Of Sewage Treatment Plant So That It Can Be Used For Residential Properties

Outcome : Very compact sewage treatment plant which is designed for a capacity of 200 Litre.
This compact plant treats water from toilets, bathrooms & makes it usable for purpose of gardening.

Academic Year

2017-18

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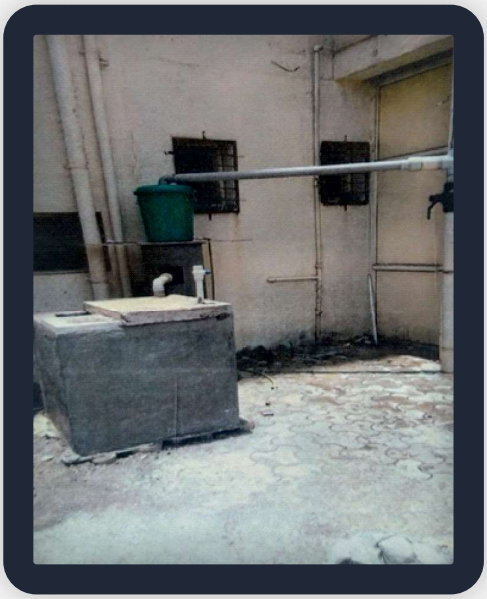
Department of Civil Engineering

Equipment For Sewage Treatment



Product Name : Equipment For Sewage Treatment

Product Developed By :

Omkar Jadhav | Ashish Kilkile | Vishal Khamgal | Mahesh Kandbhor

Name of Guide : Mrs. Pranjali Chiwane

Objective : To Treat Grey Water In Residential Buildings

Outcome : Grey water from residential building is treated so that it can be recycled for garden, washing and flushing.

Academic Year

2017-18

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Department of Civil Engineering

A Compost Bin

Product Name : A Compost Bin

Product Developed By :

Amita Tiwari | Sonal Salunkhe | Payal Ghotale | Nitin Mate

Name of Guide : Mrs. Pranjali Chiwhane

Objective : To Reduce Load at Landfill

Outcome : A compost bin treats waste at the source producing compost and load at landfill is reduced.

Academic Year

2017-18

PLASTIC EMBEDDED CONCRETE BLOCK (May 2018)

Mayur Khadke, Sagar Pagar, Mahesh Khandbhor

ABSTRACT Now a day's plastic waste is a new issue of being disposal. Generation of waste plastic is in tremendous manner and its recycling process is insufficient to hold the waste plastic and its recycling. In India more than 15000 tons of plastic waste is generated out of which 6000 tonnes of plastic remains uncollected and littered. This paper discusses about recycling the PET plastic which is non-biodegradable. So our aim is to use PET plastic in moulded form to recycle more volume of plastic in single concrete block. This will not recycle the plastic but also will gain the strength of concrete equal or more than normal concrete block. Volume of plastic is about 15% to 20% in one single concrete block.

KEYWORDS Compressive strength , Plastic Embedded concrete block , PET plastic plate , PET plastic strip

I. INTRODUCTION

Plastic waste is a huge problem as the population increased the generation of plastic waste is also goes on increases. The availability of dumping yard is insufficient to handle the waste plastic. By using the plastic waste in concrete block we can reuse and also load on dumping yard will be reduce. Many researchers have used plastic in proportion form in concrete. We are going to use plastic in casted form so more volume can be utilize in one single concrete block. This will reduce the load on recycling plant and more space will be available for other waste. The size of concrete block is 390x190x190 mm and size of the plastic strip is 210x60x50 mm.

II. LITERATURE REVIEW

In this article, with a more comprehensive approach than previous studies, effects of 5%, 10% and 15% substitution of sand with PET processed particles have been investigated. For this purpose, cubic and cylindrical specimens with different water to cement ratios were manufactured and physical properties of fresh concrete were evaluated.(1).

In these article the author has tried to use the air filled plastic bottle as suitable construction units for partition walls or as bearing walls for one roof slab. Plastic bottles (PET) are examined both structurally and thermally to be utilized as building units, replacing traditional concrete blocks (2).

This work aimed to investigate effecting of using plastic waste as partial replacement of fine aggregate, on the fresh characteristics of self-compacting concrete (SSC). For this purpose, different self-compacting concrete mixes were designed at constant water-to-binder ratio of 0.32 and 520 kg/m3 of binder content (3).In these paper the author has made an experimental study on the utilization of E-waste particles as fine and coarse aggregates in concrete with a percentage replacement ranging from 0 %, 20% to 30% i.e. (0%, 10%, 20% and 30%) on the strength criteria of M20 Concrete (4).

In this paper, the lightweight concrete made from cable, polystyrene and ethylene vinyl acetate (EVA) waste was studied. EVA waste from footwear industry, waste from

electrical cable and waste polystyrene were used as an aggregate in it (5).

This work aims at developing a new composite by incorporating Granite Sawing Waste (GSW) in Poly Propylene fibre (PP) reinforced self-compacting concrete along with Fly Ash (FA). It is found that the shrinkage of Self Compacting Concrete (SCC) is considerably reduced by using GSW and PP fibre (6).

In these author has made to developed the properties of self-compacted concrete (SCC) by adding waste plastic fibers (WPF) resulting from cutting beverage bottles. Different self-compacting concrete mixtures were designed at constant water-to-binder ratio of 0.35 and 490 kg/m3 of binder content. The class F fly ash was replaced with cement as 25% by weight (7).

III. MATERIAL USED

The materials used for this experiment are as follows:

1. Cement: Portland Pozzolona Cement (PPC) was used for this experiment.

2. Sand.

3. Crushed sand.

4. Plastic: The PET plastic in moulded form of size of 210 x 60 x 20 mm.

5. Water: Potable water was used for casting and curing of the concrete samples.

IV. METHODOLOGY USED

Following steps were followed in the sequence to complete this research.

A. Preparation of plastic strip

The raw material such as PET bottle and other plastic will be collected in a shredded waste plastic form and then rinsed. Rinsing will be done in order to remove any kind of foreign particles such as grease and dust particles. After the rinsing the bottle will be dried and then shredded to smaller sizes for convenience of melting.

Melting was done under the controlled temperature of 240 - 250 C. The molten plastic was poured in a mould and then allow to set for 24 hrs. Finally it was cooled and the plastic strip was made.

(Fig. Casted PET plastic strip)

B. Concrete Mix Design :-

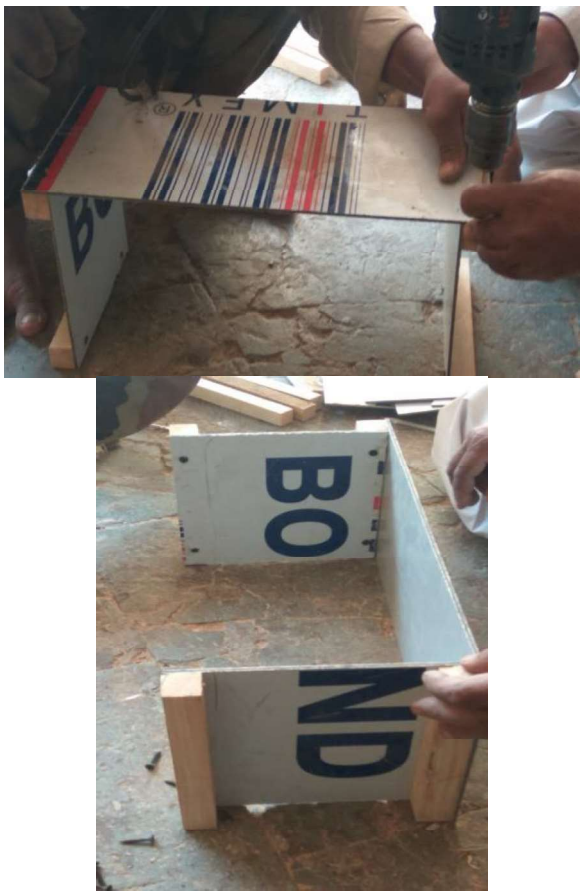
M10 mix was designed and a volumetric mix proportion of 1:3:6 was obtained. Water cement ratio of 0.45 was adopted for the mix design.

Sr.no	material	weight in kg
1	Cement	2.33
2	Sand	7
3	Crushed sand	14

V. PROCEDURE

A. Form work for block :-

For these we have selected the lightweight aluminum composite panel. The size of formwork is 430x230x210 mm.

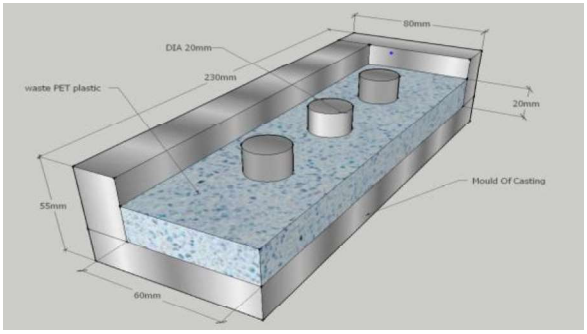


(Fig. Making of aluminum composite material mould for casting concrete block)

Total 3 block are made for casting concrete block. In these mould the first layer was filled with concrete at 95mm from bottom side. Then plastic strip was placed at the Centre of the block and compaction was done from side of the plastic strip then after the concrete was filled up to the top level of the mould .

B. Formwork for plastic mould :-

For these we have used lightweight aluminum plates of ½ inch thickness. The size of these block is 210x60x50 mm. It has three holes of diameter 2cm at 2.5cm center to center.



(Fig. Details of the mould of PET plastic strip)

First we have melted the plastic in a pan at 160°. These molted plastic placed in a aluminum mould carefully. For 1 hours we kept it for cooling purpose. After it was set completely then it was removed and placed in a concrete block at the Centre.

(Fig. Melted PET plastic in the mould)

For this 3 blocks were casted in which the casted plastic strip was placed. The size of concrete block is 390x190x190mm and plastic strip is 210x60x20mm **with** three holes of diameter 2cm at 2.5cm Centre to Centre distance provides the proper bonding with concrete.

(Fig. Plastic strip placed after one layer of concrete in mould)

Curing

Samples that was casted was placed for curing for the period of 7 days and 28 days in potable water.

(Fully submerged)

Testing

Our project aim was to check the plastic embedded solid concrete block for the compressive strength. Out of the 3 blocks 1 block was tested to check the compressive strength under the CTM and another 2 was tested under the UTM machine and the obtained results are compared with the standard strength of M10 concrete block. (As the strength of our block is near to strength of Standard M10 block.)

(Fig. Testing of block under CTM machine)

VI. OUTCOME OF THE WORK

The plastic embedded blocks are tested for the compressive strength and the results are nears to the standard strength of M10 block that is 10 N/m. If we compare the plastic embedded concrete block with standard M10 block - both are producing the same strength, so we can use this

"Plastic embedded concrete blocks" for various purposes.

(**ex**. For construction of compound wall).

These use of PET plastic in concrete block will help to reduce PET plastic disposal problem around the world.

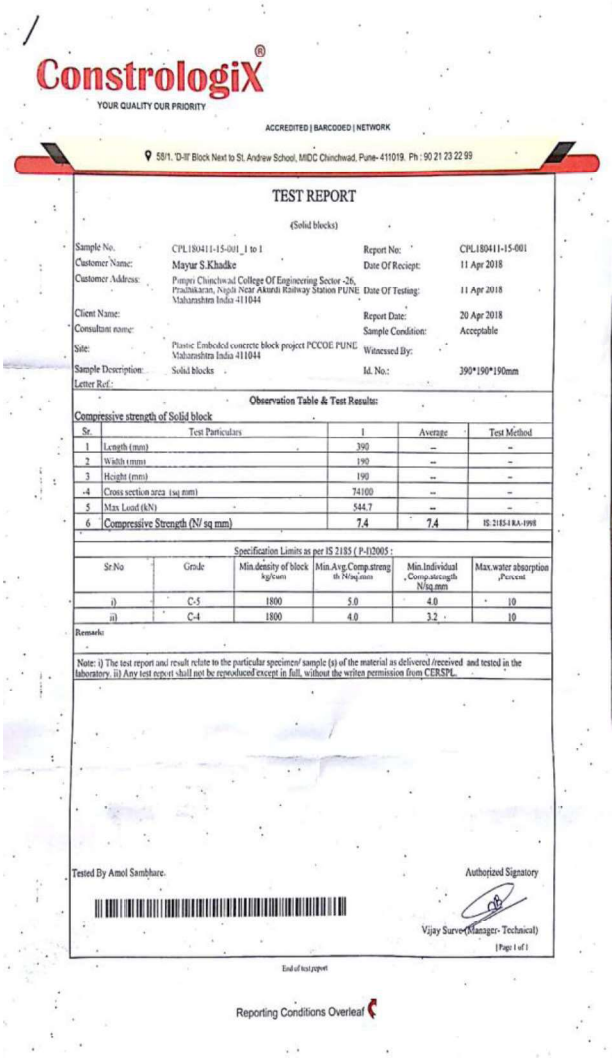
VII. RESULT OF THE WORK

We got the strength of 7.24 MPA after 14 Days of curing period.

1. Strength of the standard M10 concrete block **: 10 MPA for 28 Days curing period.**

2. Plastic embedded concrete block strength **: 7.24 MPA for 14 Days curing**

period



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TEST REPORT
(Solid blocks)

Sample No.	CPL180411-15-001_1 to 1	Report No:	CPL180411-15-001
Customer Name:	Mayur S.Khadke	Date Of Reciept:	11 Apr 2018
Customer Address:	Pimpri Chinchwad College Of Engineering Sector -26, Pradhikaran, Nigdi Near Akurdi Railway Station PUNE Maharashtra India -411044	Date Of Testing:	11 Apr 2018
Client Name:		Report Date:	20 Apr 2018
Consultant name:		Sample Condition:	Acceptable
Site:	Plastic Embeded concrete block project PCCOE PUNE Maharashtra India 411044	Witnessed By:	
Sample Description:	Solid blocks	Id. No.:	390*190*190mm
Letter Ref.:			

Observation Table & Test Results:

Compressive strength of Solid block

Sr.	Test Particulars	1	Average	Test Method
1	Length (mm)	390	--	-
2	Width (mm)	190	--	-
3	Height (mm)	190	--	-
4	Cross section area (sq mm)	74100	--	-
5	Max Load (kN)	544.7	--	-
6	Compressive Strength (N/ sq mm)	7.4	7.4	IS:2185-I RA-1998

Specification Limits as per IS 2185 (P-II2005 ;

Sr.No	Grade	Min.density of block kg/cum	Min.Avg.Comp.streng th N/sq.mm	Min.Individual Comp.strength N/sq.mm	Max.water absorption ,Percent
i)	C-5	1800	5.0	4.0	10
ii)	C-4	1800	4.0	3.2	10

Remarks:

Note: i) The test report and result relate to the particular specimen/ sample (s) of the material as delivered /received and tested in the laboratory. ii) Any test report shall not be reproduced except in full, without the written permission from CERPL.

Tested By Amol Sambhare.
Authorized Signatory
Vijay Surve(Manager- Technical)
[Page 1 of 1]
End of test report
Reporting Conditions Overleaf

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E. Rahmani, M. Dehestani, M.H.A. Beygi, H. Allahyari, I.M. Nikbin

International Journal of Innovative Research in Science,Engineering and Technology.

2.0 Reusing waste plastic bottles as an alternative sustainable building material

Ashraf Mansour Habib Mansour, Subhi A. Ali

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3.0 Fresh properties of self-compacting concrete with plastic waste as partial replacement of sand

Sheelan M. Hama, Nahla N. Hilal

Received 8 July 2016; accepted 20 January 2017

4.0 Partial replacement of E-plastic Waste as Coarse-aggregate in Concrete

Ashwini Manjunath

Department of Civil Engineering, Atria Institute of Technology, Bangalore, Karnataka, India

5.0 Investigation of Influence of Recycled Plastics from Cable, Ethylene Vinyl Acetate and Polystyrene Waste on Lightweight Concrete Properties

Valeria Gregorova, Miriam Ledererova, Zuzana Stefunkova

6.0 Durability Studies on Fibre Reinforced Self Compacting Concrete with Sustainable Wastes

K. Aarthi, K. Arunachalam

7.0 The Possibility of Enhancing Some Properties of Self-Compacting Concrete by Adding Waste Plastic Fibber's

Prof. Dr. Abdulkader Ismail Al-Hadithi, Dr. Nahla Naji Bilal

8.0Recycling of PET bottles as fine aggregate in concrete

Mariaenrica Frigione

International Journal of Innovative Research in Science,Engineering and Technology.

SMART WATER DISTRIBUTION SYSTEM. (May 2018)

O. Ladkat, M. Mane, Y. Lokhande and A. Thube, A. B. KUDOLI

[1]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[2]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[3]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[4]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
Assistant professor ,Department of Civil engineering Pimpri Chinchwad college of engineering, Ravet

ABSTRACT Water is a scarce resource in many parts of India. Access to safe water is a fundamental human need and, therefore, a basic human right. Two solutions are possible to address water scarcity: conservation of existing resources, or the further production of water from new sources e.g. through recycling of wastewater or desalination of seawater. While we think optimization and use of modern technologies and methodologies in the existing water distribution system of urban cities will greatly improve overall efficiency of the water supply system. By providing continuous water supply (24x7) to the consumer, We have done case study at Yamuna Nagar Sector No. 21, Pimpri Chinchwad Municipal Corporation, to get the detailed ideas about the management of 24x7 water supply scheme. The data collected provide quality of water, finding leakages in pipe lines, 100% metering, pressure monitoring. From studied case study, it is considered that wastage of water can be reduced by avoiding the storage of water in the pots and minimizing electricity bills by maintaining water pressure through pipelines.

INDEX TERMS

I. INTRODUCTION

Water is essential to our way of life and international water related issues include its short supply and uneven distribution. 50% of world population is going to be under high water scarcity according to World Water Development (UN) report. Water stress is increasing day by day. India is facing high scarcity of water, Low rainfall climate change which will amplify effect of scarcity. The increasing population and thus the wide expansion of urban residential areas have increased the need of proper distribution of water.

This distribution of water in every house within different areas needs the control and monitoring for preventing the wastage of water and the water theft practices. Different technologies have been studied to distribute/supply the water to each and every house of residential areas. This project tries to provide problems arising due to water scarcity in PCMC and how technology will help in finding out the solutions To manage the water quality, before provision of continuous water supply, we have considered 'leakages' in the distributaries as most responsible factor for water contamination. For detecting leakages and to provide safe qualities of water, helium (*He*) gas was used to detect leakages in the water mains.

1.1 Types of Water Supply System:

1. Intermittent Water Supply System
2. Continuous Water Supply System

1. Intermittent Water Supply System:

Generally, in India Intermittent Water Supply System is used to supply drinking water to people by the local bodies. In this system, water is supplied to the users for less than 24 hours in a day for specified hours i.e. in the morning or evening or as per available time. Water is supplied to the consumers usually at the peak hours of the water usage i.e. morning 6 am to 9 am and evening 5 pm to 8 pm. In this system, consumers have to store the water in between the supply hours.

Intermittent system should not be continued on long term policy due to thefollowing disadvantages-

1. The consumers have to store water for use during non-supply hours; which is likely to be contaminated. Some consumers may not have sufficient storage facilities; which may lead to insanitary conditions ultimately.
2. It has been observed that the consumers leave their water taps open every time; which causes much wastage of water.
3. If more storage of water is kept for the use during non-supply hours, it is thrown away, causing wastage of water.

4. If any incidents of fire-fighting occur during non-supply hours, no water is available; which may subsequently cause huge damages before the supply could be turned on.

The intermittent system creates problems like contamination of water in the pipes during non-supply hours, unhygienic as well as in sanitation problems due to inadequate use of water by certain group of people by utilizing minimum quantity of water. Besides, at majority of places, the intermittent supplies may not provide much savings of water because of the following reasons:

5. In intermittent supply system, water is generally stored by the consumers in tanks, drums, and utensils etc. for use during non-supply hours. They, if unutilized, as soon as the fresh supply is restored, usually throw this stored water away. This increases the wastage and losses of water considerably.

6. The consumers have a general tendency to keep the water taps open during non-supply hours; so that they may come to know the restoration of the supply. However, in majority of cases, water goes on flowing to waste, unattended even after the supply is restored, thus resulting into wastage of precious treated and potable water.

2. **Continuous Water Supply System:**

24x7 Continuous, pressurized water supply systemisa system supplying water for all seven days a week and all weeks a year.The water is adequately pressurized to reach the consumer at a pleasant pressure and flow.In this system, consumers need not store water for their usage and it generates excellent consumer satisfaction. Chances of wastage are comparatively less.

PROBLEM STATEMENT

The problems faced in water supply sector in urban cities of India are to supply water and to maintain the water pressure. This problem gets inflated if there is an undulated terrain. Water pressure is less for area with high elevation, hence giving rise to unequal water supply. In the intermittent water supply system the supply duration also plays a key role as the consumer needs to be home to store water at that specific time. Lack of meters and illegal connections has given rise to Non-Revenue Water (NRW) which results to distress in the management and overall low revenue collection.

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OBJECTIVES

- To study existing distribution system
- To analyses the short comings in existing system
- To study new technologies and methods in smart water management
- Comparing the conventional systems and smart water management system and to find out the amount of savings.
- To demonstrate the use of hydraulic model, best pipe material, house service connection and meters.

SCOPE OF PROJECT WORK

- This technology can be used in every urban city in India.
- Helium gas leak detection technology can accurately detect leakages in water distribution system.
- Problem of unequal water pressure due to undulated area is solved.

LITERATURE REVIEW

2.1 Aditya Gupta, Sudhir Mishra, Neeraj Bokde, Kishore Kulat. "Need of Smart Water Systems in India" International Journal of Applied Engineering Research ISSN 0973-4562 Volume 11, Number 4 (2016) pp 2216-2223.

Smart water system provides reduced water non-renewable water losses and reduced water consumption in field of agriculture. This paper tries to provide problems arising due to water scarcity in India and how technology will help in finding out the solution. Paper also provides review on smart water technology currently available that can be utilize by Indian citizen to save the nation from scarcity

2.2 N.B. Bhawarkar, D.P. Pande, R.S. Sonone, Mohd. Aaquib , P.A. Pandit, and P. D. Patil "Automated Water Supply with Monitoring the Performance System" International Journal of Current Engineering and Technology E-ISSN 2277 – 4106, P-ISSN 2347 – 5161.

The increasing population and thus the wide expansion of urban residential areas have increased the need of proper distribution of water. This distribution of water in every house within different areas needs the control and monitoring for preventing the wastage of water and the water theft practices. Different technologies have been studied to distribute/supply the water to each and every house of residential areas. This paper deals with the Literature review for the automated water distribution with monitoring the performance of the system through various application applied through the embedded system.

2.3ManishaMundhe, Pallavi Pandagale, Amin Khan "Smart Water for Aurangabad City"International Journal of Advanced Research in Computer Science and Software Engineering Volume 4, Issue 10, October 2014 ISSN: 2277 128X.

In this paper the author has studied the feasibility and advantages of implementing smart water management system in Aurangabad city.

2.4 Ms. Namrata B Pati,Dr. W N Deulkar. " Quality management of water supplies under 24x7 schemes, at sector no. 21, PCMC, PUNE." International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 Vol. 3, Issue 4, Jul-Aug 2013, pp.1965-1971. In this paper the author has aim Pimpri Chinchwad Municipal

Corporation (PCMC), Pune is to provide water to the consumer for 24x7 hours by framing the legislation on regulation of drinking water. Detecting leakages and to provide safe qualities of water, a sample of water from consumer water tap was analyzed for chlorine and turbidity test. Helium gas was used to detect leakages in the water mains.

2.5 Mohammed ShahanasKa, Dr. Bagavathi Sivakumar P.b. "Framework for a smart water management system in the context of smart city initiatives in India". 2nd International Conference on Intelligent Computing, Communication & Convergence (ICCC-2016).

In this journal paper the author has studied different techniques used to amplify the water supply system and increase its efficiency. The systems comprises of the following Point of Use, Echo Module & Data processing and Integration. The results has been positive and translated into savings of water.

2.6 Maria Mercedes Gamboa-Medinaa, Luisa Fernanda Ribeiro Reisb "Sampling design for leak detection in water distribution networks" Procedia Engineering 186 (2017) 460 – 469XVIII International Conference on Water Distribution Systems Analysis, WDSA2016.

The aim of the study here described is develop a sampling design (SD) method for localization and quantification of pressure sensors in WDS, aiming leak detection. The sensitivity definition is the first limitation to directly apply those methods for the leak detection problem. The proposed sampling design (SD) method for pressure sensors in WDS aiming leak detection consists of sensor location optimization and sensor number analysis.

2.7 Fredy Angulo, Elsa Urueta1, Gustavo Valverde, ObertPaternina "Cartagena's Water Distribution System" Procedia Engineering 186 (2017) 28 – 35XVIII International Conference on Water Distribution Systems Analysis, WDSA2016.

Mathematical modeling of the water distribution system has been fundamental to evaluate and solve problems such as: imperceptible leak detection; water quality; evaluation of systems capacity to meet demands of new urban developments, and coverage extension of the water distribution service in areas above service provision level through the implementation of pressure levels and pumping systems among other.

2.8 Nourhan Samir, Rawya Kansoh, Walid Elbarki, Amr Fleifle "Pressure control for minimizing leakage in water distribution systems" Irrigation Engineering and Hydraulics Department, Faculty of Engineering, Alexandria University, El-Horia St., 21544 Alexandria, Egypt Sanitary Engineering Department, Faculty of Engineering, Alexandria University, El-Horia St., 21544 Alexandria, Egypt Received 6 May 2017; accepted 15 July 2017 Available online 1 August 2017.

Pressure management, using the pressure reduction valves, is an effective way to control the amount of leakage in water distribution system (WDS). Reduce background leakage which is acoustically undetectable seeps at pipe joints and small cracks. It cannot be economically repaired on an individual basis. The most common methods of pressure management include establishing zone boundaries, fixed outlet pressure control valves, pump and level control, time modulated control valves and flow modulated control valves. However, one of the most common and effective method is using Pressure Reducing Valves.

METHODOLOGY

Helium leak detection tecnology

Helium Mass Spectrometer (MS) Leak Detection Method This method was first used in Manhattan, New York by the Uranium Enrichment Plant for „Manhattan Project". This method is used for the first time in India and for the second time in the world. In India it is been used for the project, „24*7 Water Supply System" in sector 21, PCMC. Helium gas is used for leak detection because it is Non-toxic, Inert and non-condensable, not present in the atmosphere at more than trace amounts, relatively inexpensive, readily passes through leaks due to its small atomic size, Non-flammable, Available in various size cylinders, and Available in purities appropriate for medical usage. This gas belongs to zero group (Noble gases) in periodic table having atomic mass 4.002202 2.1 Procedure for Helium Gas Leak Detection Leakage on the pipe line was finding out by carrying three steps. 1) Helium Injection 2) Pipe & Cable Detection 3) Leakage Detection The details of the above steps are given below 1. Helium Injection: ¬ Initially, a cylinder of Helium gas is fixed to the outlet of the ESR. ¬ The injecting pressure of the Helium gas was maintained such that 30% of the Helium gas in the cylinder has to be injected in 30 minutes. ¬ For this criterion, the pressure was to be maintained at 9.5 kg/cm2 .¬ The pressure was checked at an interval of 15 mins. ¬ A Pressure-meter to measure the pressure of the water in the pipe was attached to the pipe

2. Pipe & Cable Detection

- With the help of Pipe & Cable Detector, the underground pipes and cables are detected.
- The Locator is having the receiver and transmitter; receiver is divided in two parts – Antenna & Receiver.

- The Receiver receives reflected waves from the cables and indicates the location and the depth of cables.
- After detecting the cable, a hole is drilled at every 2 m. to 3 m. apart from the point where the cable isdetected so as to avoid drilling in the cable.

3. Leakage Detection

Above the drilled holes, a vacuum pipe is placed that is connected to the Spectrometer. There is a filter in between the vacuum pipe and spectrometer which filters the moisture and soil particles coming from the vacuum pipe, if any. Only air is carried away further. Next to the filter there are two jars containing silica gel (Blue color). A sniffing probe is connected to one of the jars. The silica gel filters the moisture if any after filtering and hence protects the spectrometer. The filtered air finally enters in the spectrometer. The spectrometer then shows the amount of the Helium gas. The saturated concentration of helium is 3.5x10-6 Kg/cm2 in the atmosphere but if the spectrometer reading is exceeding 7x10-6 kg/cm2 then there is a possibility of leakage. At such case, few more holes are drilled along the radius of the detected hole, if the reading is increasing or up to 7x10-6Kg/cm2 then surely there is a leakage.

Consumer Survey

We carried out consumer survey in c3 zone

We have carried out consumer survey and achieved it in following way:-

- Carried out house to house survey
- Collected information related to number of inhabitants, water requirements, connection size etc.
- Water supply duration
- Feedback on water pressure(high/medium/low)

Survey Results

- Number of house surveyed : 23
- Population of surveyed house : 106
- Water Connection type : Domestic
- No complaints regarding contamination and water quality
- Overall consumers were satisfied with water supply in recent times although few pointed out high inconsistency of supply duration and pressure during summer season

10 SUGGESTIONS

- For implementing 24x7 water supply system, divide the area into different parts (i.e. DMAs) depending on topography of the area i.e. roads, rivers, streams, nallahs, etc.
- Allocate different feeder mains to different parts.
- Introduce pressure reducing valves at points having lower elevations.
- The pipelines of diameter 200 mm and more used as feeder main and having tapings on it, keep as a supply line and introduce separate parallel feeder mains.
- Use isolation valves to control water supply distribution system.

11 CONCLUSIONS

- The water provided by PCMC to whole area is of good quality and meets safe permissible limit.
- In C-3 zone existing network is modified, by implementing pressure reducing valves, isolation valves, required pipe network and feeder mains.
- To maintain the pressure between 7m H2O to 21m H2O maintain head equal to 1/3 tank height.
- Dividing zone into DMAs helps to maintain pressure in a range and better operation of system.
- For efficient working of water supply system, to prevent water loss public participation and awareness is must.

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To Check Economy and Feasibility of Multistoried Building with the help of Softwares: Case Study (May 2018)

Ajinkya P. Tasgoankar , Satyam V. Shinde, and Swapnil S. Yewale, A. B. Kudoli
[1]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[2]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[3]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[4]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
Assistant professor ,Department of Civil engineering Pimpri Chinchwad college of engineering, Ravet

ABSTRACT Food, Shelter and Cloths are basic needs of human, building construction is one of the main source which provides shelter to us, through this study we come near to industry expectations as working with softwares used in industry on case study, there are mainly three parts on which we worked in building construction design, estimation, and management with the help of softwares ,ETABS software for design and analysis of building , QTO software for estimation and MSP software for management, in this study we also done the market study which helped us to know the market rates of various items used in construction of project.

INDEX TERMS building construction, ETABS, QTO, MSP.

I. INTRODUCTION

Developing countries like India having more focus on infrastructure development & construction projects, which are major sources of Indian economy. Delay in construction projects cause the cost overrun of project. Proper management of project not only helps in completion of project in time, but if managed properly, also helps in completion of project before the estimated time. Proper design and estimation also helps in reducing the cost of the project. In this study, we are developing a structural design plan, detailed estimate & project management plan for a multi storied residential building & comparing it with an ongoing project.

In our project we divided the work according to the three important processes of any residential building i.e. Management, Estimation and Design. Building construction is the process of adding structure to real property or construction of buildings. The majority of building construction jobs are small renovations, such as addition of a room, or renovation of a bathroom. Often, the owner of the property acts as laborer, paymaster, and design team for the entire project. Although building construction projects consist of common elements such as design, financial, estimating and legal considerations, projects of varying sizes may reach undesirable end results, such as structural collapse, cost overruns, and/or litigation. For this reason, those with experience in the field make detailed plans and maintain careful oversight during the project to ensure a positive outcome.

II. LITERATURE REVIEW

1) **Deshpande, R. D., Manoj N. Pai, N. Pawan, and Aashish P. Pednekar. "ANALYSIS, DESIGN AND ESTIMATION OF BASEMENT+ G+ 2 RESIDENTIAL BUILDING." (2017).**

Author has analyzed and design the structure with the aid of software called ETABS which is quiet feasible in using and offers more efficient designs and flexibility. Use of software help them to get faster results and simultaneously designing can also be done for that members. Easy in apply of load combinations. There is a difference between the theoretical and practical work done as the scope of understanding will be much more when practical work is done as they get more knowledge in such a situation where they have great experience doing the practical work.

2) **Smithwick, Jake, Joshua Jason Mischung, and Kenneth Timothy Sullivan. "Impact of quantity takeoff software on student performance in a university construction estimating course: A case study." In *121st ASEE Annual Conference and Exposition: 360 Degrees of Engineering Education*. American Society for Engineering Education, 2014.**

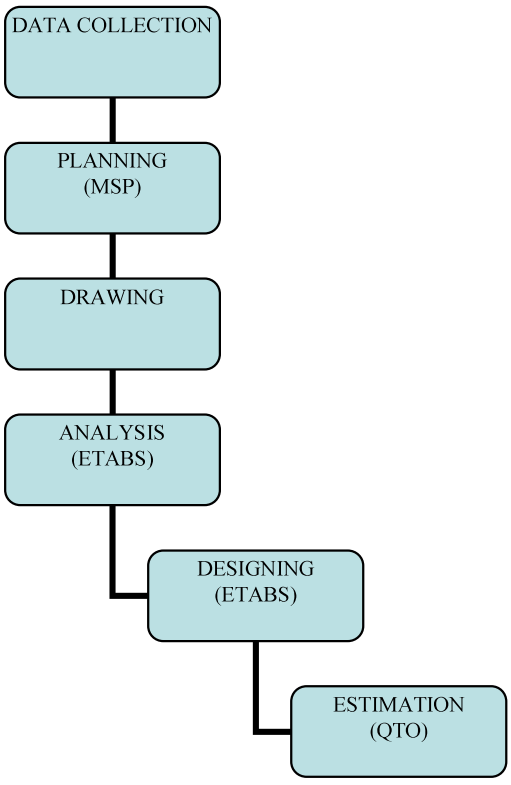
Author studied the impact that technology in the classroom has on student performance (as measured by a complex estimating project assignment). Students' self-reported understanding of estimating, and any previous estimating

experience they may have had, were used as factors to isolate the role of automated quantity takeoff has on student performance. The authors found that regardless of their perceived level of understanding or prior experience, students performed best on the group project when they used a combination of manual and automated takeoff methods. The authors propose that construction estimating educators (and others in similar fields) should use technology as a tool to supplement (instead of supplant) sound traditional estimating principles.

3) Wale, P. M., N. D. Jain, N. R. Godhani, S. R. Beniwal, and A. A. Mir. "Planning and Scheduling of Project using Microsoft Project (Case Study of a building in India)." *Journal Of Mechanical And Civil Engineering* 12, no. 3 (2015): 57-63.

Author states the advantages of Microsoft Project a modern tool of Project Management that aid to overcome the obstacles faced owing to traditional way of Planning and Management. They suggest with the help of Microsoft Project optimum and effective organization of activities to give the vision to complete the project in planned duration and within the Economy.

III. METHODOLOGY



1.ETABS

Softwares are tools which reduces the human efforts with provision of more accuracy and save in economy. ETABS software specially designed for designing and analysis of building structures. ETABS software's stepwise working methodology is described below:

a. Defining Properties: Properties include two terms Material properties and Section Properties. Material which we going to use in the construction we need to define it. It includes Concrete(Grade), Steel, Rebar(diameter), Masonry properties. Section which are going to construct on project are defined in these properties. Section properties includes columns, beams and slabs with their dimensions and rebar positioning.
b. Modelling: Modelling means build the skeleton of building structure which include drawing grid system, stories, columns, beams, slabs, staircase, water tank etc. on the modelling view page.
c. Assign: Different types of loads and load combinations are assign to the respective members.
d. Analysis: It is done to check the feasibility of structural members against the loads and load combinations provided.
e. Design: Every member is checked and design according to give dimensions and loads.
f. Detailing: Detailing is done for all the members i.e. for walls, beams, columns, slabs.
g. Report Generations: It generated directly according to our inputs.

2.QTO

QTO i.e. Quantity takeoff software is an Autodesk software dedicated for doing work of quantity survey. It helps in finding both quantity and cost of any project. The working methodology of QTO is explained below:

a. Importing File: The plan of the project in any format (DWG, DWF, JPEG, PDF, etc.) is needed to be impor0ted to the software.
b. Scale: Precise scale has to be set for the plan in order to measure the quantities. In case of autocad and rivet files, the published scale is automatically taken.
c. Quantity Takeoff: With various tools available in the toolbar of software, both linear measurements as well as area along with count can directly be taken.
d. Inputting Rates: Rates for various quantities including material, labour are inputted.
e. Report Generation: Reports of both measurement sheets as well as rate analysis are generated.

3.M S Project

Microsoft Project is a project management software developed and sold by Microsoft. It assists project manager in developing a plan, assigning project task, tracking progress, managing budgetand analyzing work loads. The working methodology steps of MSP are as follows:

a. Planning.

b. Scheduling.
c. Controlling Resources.
d. Estimating Cost.
e. Resource Levelling.
f. Updating Project.
g. Tracking Progress.
h. Earned Value Analysis.

IV. CASE STUDTY

We select "DEOKAR PLAZA" for our case study and our site for our implementation of softwares. It is located at Laxminagar, Ravet Pune 412001, Maharashtra, India. The

IMPLEMENTATION OF SOFTWARES ON CASE STUDY

ETABS:

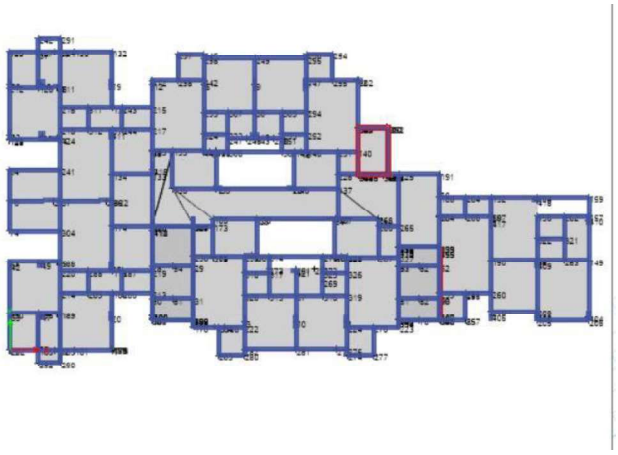


Image 1.1 – Plan of Building in ETABS

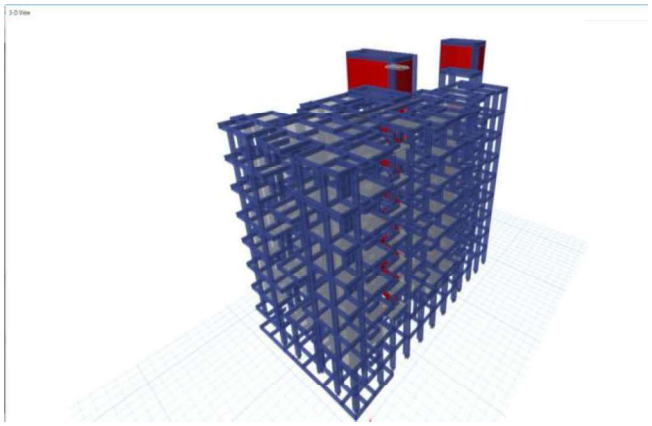


Image1.2 – 3D structure of Building in ETABS

Name	Height mm	Elevation mm	Master Story	Similar To	Splice Story
Story9	3000	27000	Yes	None	No
Story8	3000	24000	No	Story2	No
Story7	3000	21000	No	Story2	No
Story6	3000	18000	No	Story2	No
Story5	3000	15000	No	Story2	No
Story4	3000	12000	No	Story2	No
Story3	3000	9000	No	Story2	No
Story2	3000	6000	Yes	None	No
Story1	3000	3000	Yes	None	No
Base	0	0	No	None	No

Table 1.1 - Story Data

Table 1.2 - Load Patterns

Name	Type	Self Weight Multiplier	Auto Load
wall load external	Superimposed Dead	0	
floor Live	Live	0	
Roof Live	Live	0	
eqx	Seismic	0	IS1893 2002
eqy	Seismic	0	IS1893 2002
wind load x	Wind	0	Indian IS875:1987
wind load y	Wind	0	Indian IS875:1987
floor finish	Superimposed Dead	0	
staircase Dead load	Superimposed Dead	0	
wall load internal	Superimposed Dead	0	

Structure Results

Table 1.3 - Base Reactions

Load Case/Combo	FX kN	FY kN	FZ kN	MX kN-m	MY kN-m	MZ kN-m	X m	Y m	Z m
Dead	0.0118	0.0123	24770.3066	205899.3888	-394997	0.2804	0	0	0
Live	0.0013	0.0043	9817.1788	79284.1689	-148220	0.0946	0	0	0
Roof Live	0	0	0	0	0	0	0	0	0
floor finish	0.0021	0.0037	6714.5006	62608.1257	-131404	0.1109	0	0	0
staircase Dead load	0.0015	0.0032	3154.1498	25448.0407	-62139.9936	0.0912	0	0	0
wall load internal	0	0	0	0	0	0	0	0	0
eqx	-408.3531	0.0009	8.127E-06	-0.019	-8759.9672	3325.0435	0	0	0
eqy	-0.007	-408.3736	-5.352E-06	8759.3333	0.0494	-6597.6067	0	0	0
DCon1	0.0232	0.0287	51958.4354	440933.3327	-882812	0.7238	0	0	0
DCon2	0.0251	0.0351	66684.2036	559859.586	-1105142	0.8657	0	0	0
DCon15	-490.0036	0.0292	53347.3629	447887.646	-894626	3990.7447	0	0	0
DCon16	490.0438	0.027	53347.3629	447887.6915	-873602	-3989.3597	0	0	0
DCon17	0.0116	-490.0202	53347.3629	458398.8687	-884114	-7916.4355	0	0	0
DCon18	0.0285	490.0764	53347.3629	437376.4688	-884114	7917.8205	0	0	0
DCon19	-612.5064	0.0301	51958.4354	440933.3042	-895952	4988.2891	0	0	0
DCon20	612.5528	0.0273	51958.4354	440933.3611	-869672	-4986.8414	0	0	0
DCon21	0.0126	-612.5317	51958.4354	454072.3326	-882812	-9895.6862	0	0	0
DCon22	0.0338	612.5891	51958.4354	427794.3328	-882812	9897.1338	0	0	0
DCon23	-612.5157	0.0186	31175.0612	264559.9712	-542827	4987.9995	0	0	0
DCon24	612.5436	0.0159	31175.0612	264560.0281	-516547	-4987.1309	0	0	0
DCon25	0.0033	-612.5431	31175.0612	277698.9995	-529687	-9895.9757	0	0	0
DCon26	0.0245	612.5776	31175.0612	251420.9997	-529687	9896.8443	0	0	0

Table 1.4 - Centers of Mass and Rigidity

Story	Diaphragm	Mass X kg	Mass Y kg	XCM m	YCM m	Cumulative X kg	Cumulative Y kg	XCCM m	YCCM m	XCR m	YCR m
Story9	D1	662230.45	662230.45	16.3902	7.8085	662230.45	662230.45	16.3902	7.8085		
Story8	D1	574718.35	574718.35	15.7854	8.4169	1236948.81	1236948.81	16.1092	8.0912		
Story7	D1	728346.42	728346.42	15.9294	8.4591	1965295.22	1965295.22	16.0426	8.2275		
Story6	D1	662113.54	662113.54	15.9943	8.4334	2627408.77	2627408.77	16.0304	8.2794		
Story5	D1	730446.15	730446.15	15.9161	8.45	3357854.92	3357854.92	16.0055	8.3165		
Story4	D1	629070.39	629070.39	16.1513	8.0966	3986925.31	3986925.31	16.0285	8.2818		
Story3	D1	711710.99	711710.99	15.8318	8.3225	4698636.3	4698636.3	15.9987	8.288		
Story2	D1	635621.57	635621.57	15.7648	7.8385	5334257.86	5334257.86	15.9709	8.2344		

2. QTO

Table No. 2.1- Detailed Report 1

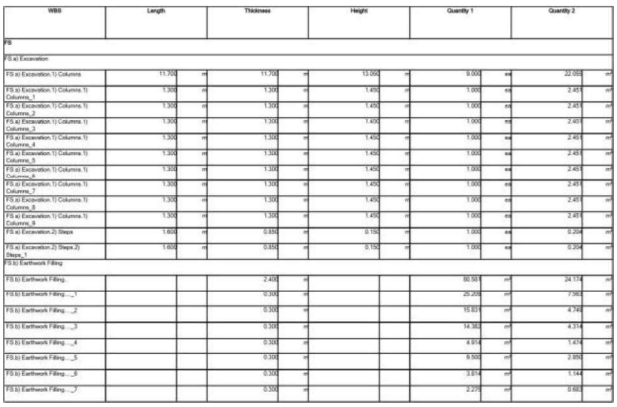


Table No. 2.2- Detailed Report 2

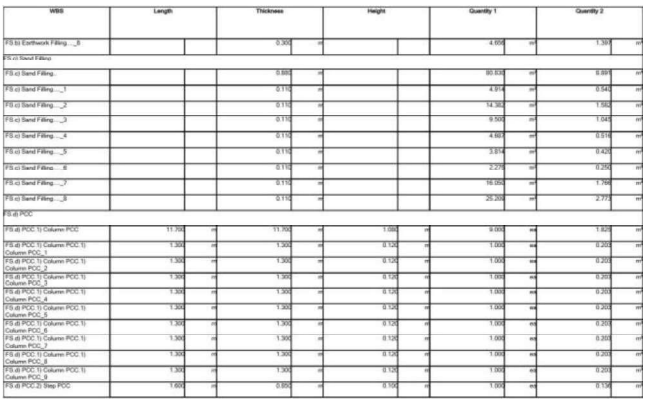


Table No. 2.3- Rate Analysis 1

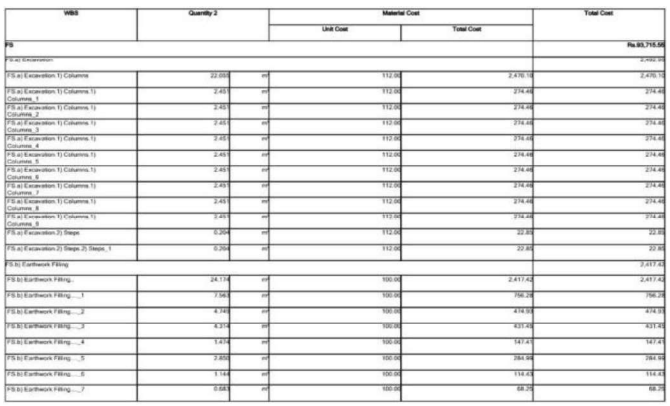
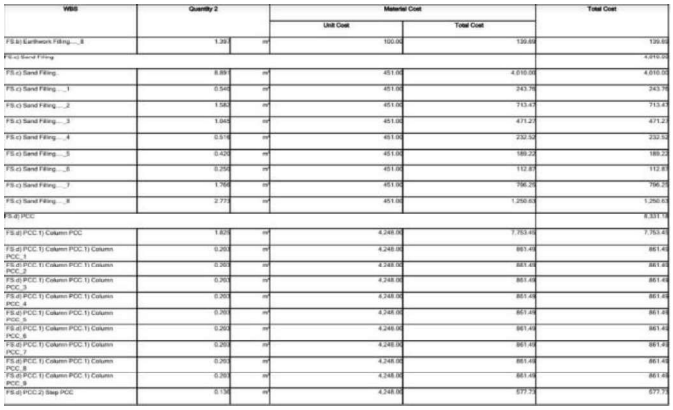


Table No. 2.4- Rate Analysis 2



3.ETABS

Table No. 3.1- Project Work 1

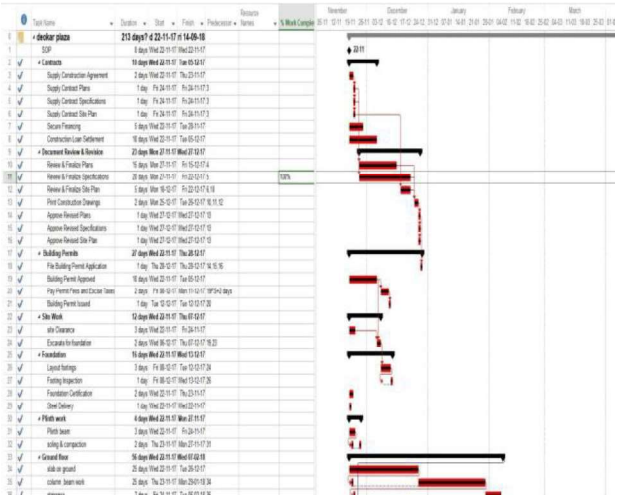
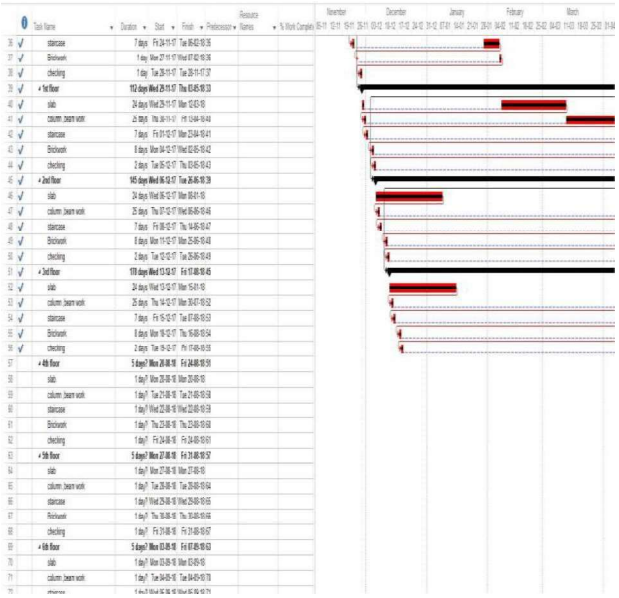


Table No. 3.2- Project Work 2



VI. CONCLUSION

- We can conclude that there is a difference between the theoretical and practical work done as the scope of understanding will be much more when practical work is done as we get more knowledge in such a situation where we have great experience doing the practical work.
- Using software's helps to get faster results and simultaneously designing can also be done for that members.
- ETABS gives more economical and convenient results than manual design results.

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4. Wale, P. M., N. D. Jain, N. R. Godhani, S. R. Beniwal, and A. A. Mir. "Planning and Scheduling of Project using Microsoft Project (Case Study of a building in India)." *Journal Of Mechanical And Civil Engineering* 12, no. 3 (2015): 57-63.
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To Improve Compressive Strength and Flexural Strength of Concrete by Adding Micro Silica and Polyster Fiber

S.Ashtekar[1], R.Gawade[2], J.Geeverughese[3] and V.Mishra[4].
[1]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[2] Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[3]Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet
[4] Department of Civil engineering, Pimpri Chinchwad college of engineering, Ravet

ABSTRACT Through indoor test of concrete cubes to explore the compressive strength of silica powder (microsilica) cement concrete, When the silica powder mixing content is 5%, 10% and 15%, compared with ordinary cement concrete, 7 days and 28 days compressive strength were varied significantly. Along with this test, concrete beams were tested by adding polyster fibers in accurate proportions, and hence significant changes were observed in flexural strength of beams. This paper concludes the graph of compressive strengths and flexural strengths of concrete at different proportions of micro silica and polyster fiber. It also explains the mechanism silica and polyster fiber with the concrete during it is in contact. Implementation of this method for buildings is also explained. There are many references available for the study of this method.

INDEX TERMS concrete cubes, compressive strength, silica powder (microsilica), polyster fibers, flexural strength, concrete beam.

I. INTRODUCTION

A. Concrete - The construction industry uses concrete to a large extent. It is the most used manmade material worldwide. In 2013, about 3.97 billion tons of cement was produced around the world (Global cement report, 2013). Based on this estimated value and considering average cement content of 11% and 70% of the cement-based product shared market, the worldwide production of concrete is about 30.6 billion tons. Another statistic estimated that on average, approximately 1 ton of concrete is produced each year for every human being in the word (Lippiatt and Ahman, 2004). The amount of concrete used worldwide, ton for ton, is twice that of steel, wood, plastics, and aluminium combined. Concrete's use in the modern world is exceeded only by that of naturally occurring water (Cement trust, 2013). Concrete is used in infrastructure and in buildings. It is composed of granular materials of different sizes and the size range of the composed solid mix covers several decades as is illustrated in Particle size range and specific surface area of concrete ingredients, adapted from Sobolev and Ferrara (2005) and Ye (2006). The overall grading of the mix, containing particles from 300 nm to 32 mm determines the properties of the concrete (Reinhardt, 1998; Neville, 2000). The properties in fresh state (flow properties and workability) are for instance governed by the particle size distribution (PSD), but also the properties of the concrete in hardened state, such as strength and durability, are affected by the mix grading and resulting particle packing (Hüsken and Brouwers, 2008). One way to further improve the packing is to increase the particle size spectrum, e.g. by including particles with sizes below 300 nm (Figure 1.1). Possible materials which are currently available are ground minerals like limestone and silica fines such as silica flour (Sf), micro-silica (mS) and nano-silica (nS) (Dunster, 2009). Because of extensive use of concrete worldwide, it is necessary to evaluate the environmental impact of this material. Additionally, to ensure the future competitiveness of concrete as a building material, it is essential to improve the sustainability of concrete structures.

B. Microsilica -Nowadays, there are different methods to produce nS products. One production method is based on a sol-gel process (organic or water route) at room temperatures. In this process, the starting materials (mainly Na2SiO4 and organometallics like TMOS/TEOS) are added to a solvent and the pH of the solution is changed, reaching the precipitation of silica gel. The produced gel is aged and filtered to become a xerogel (Sakka and Kosuko, 2000). This

xerogel is dried and burned or dispersed again with stabilization agents (Na, K, NH3, etc.) to produce a concentrated dispersion (20 to 40% solid content), suitable for use in concrete industry (Sobolev and Ferrara, 2005; Sobolev et al 2006). An alternative production method is based on vaporization of silica between 1500 to 2000 °C by reducing quartz (SiO2) in an electric arc furnace. Furthermore, nS is produced as a by-product of the production of silicon metals and ferro-silicon alloys, where it is collected by subsequent condensation to fine particles in a cyclone (Jonckbloedt, 1997; Dunster, 2009). Nano-silica produced by this method is a very fine powder consisting of spherical particles or microspheres with a mean diameter of 150 nm with high specific surface area (15 to 35 m2 /g). Estevez et al. (2009) developed a biological method to produce a narrow and bimodal distribution of nS from the digested humus of California red worms (between 55 nm to 245 nm depending on the calcination temperature). By means of this method, silica nanoparticles having a spherical shape can be obtained with a 88% process efficiency. These particles were produced by feeding worms with rice husk, a biological waste material that contains 22% of equivalent SiO2. Furthermore, nS can also be produced by precipitation method. By this method, nS is precipitated from a solution at temperatures between 50 to 100 °C, and is called precipitated silica (Iler, 1955; Lieftink, 1997; Sobolev et al., 2006). It was first developed by Iller (1955). This method uses different precursors like sodium silicates (Na2SiO3), burned rice husk ash (RHA), semi-burned rice straw ash (SBRSA), magnesium silicate and others (Iler, 1955; Lieftink, 1997; Sakka and Kosuko, 2000; Zaky, 2008; Thuadaij and A. Nuntiya, 2008).In addition, nano-silica (nS) is being developed via an alternative production route. Basically, olivine and sulfuric acid are combined, whereby precipitated amorphous silica with high fineness and purity but agglomerated form is synthesized (nano-sized particles between 6 to 30 nm), and even greener (lower CO2 foot print) than contemporary microand nano-silica (Lazaro et al., 2012). The feasibility to produce olivine nano-silica (OnS) has been proven in two preceding PhD theses and published data (Schuiling, 1986, Lieftink, 1997, Jonckbloedt, 1997; Jonckbloedt, 1998). Currently, Lazaro (2014) has investigated the process to produce nano-silica from the dissolution of olivine (on laboratory and industrial scale) in large quantities, for concrete production.

C. Polyster-Polyester is a category of polymers that contain the ester functional group in their main chain. As a specific material, it most commonly refers to a type called polyethylene terephthalate (PET). Polyesters include naturally occurring chemicals, such as in the cutin of plant cuticles, as well as synthetics such as polybutyrate. Natural polyesters and a few synthetic ones are biodegradable, but most synthetic polyesters are not. The material is used extensively in clothing.

Depending on the chemical structure, polyester can be a thermoplastic. There are also polyester resins cured by hardeners; however, the most common polyesters are thermoplastics.

Fabrics woven or knitted from polyester thread or yarn are used extensively in apparel and home furnishings, from shirts and pants to jackets and hats, bed sheets, blankets, upholstered furniture and computer mouse mats. Industrial polyester fibers, yarns and ropes are used in car tire reinforcements, fabrics for conveyor belts, safety belts, coated fabrics and plastic reinforcements with high-energy absorption. Polyester fiber is used as cushioning and insulating material in pillows, comforters and upholstery padding. Polyester fabrics are highly stain-resistant—in fact, the only class of dyes which *can* be used to alter the color of polyester fabric are what are known as disperse dyes.

Polyester fibers are sometimes spun together with natural fibers to produce a cloth with blended properties. Cotton-polyester blends (polycotton) can be strong, wrinkle and tear-resistant, and reduce shrinking. Synthetic fibers using polyester have high water, wind and environmental resistance compared to plant-derived fibers. They are less fire resistant and can melt when ignited.[3]

Polyester blends have been renamed so as to suggest their similarity or even superiority to natural fibers (for example, China silk, which is a term in the textiles industry for a 100% polyester fiber woven to resemble the sheen and durability of insect-derived silk).

PROBLEM STATEMENT

In a world of rapid growth in construction, the production of cement and its dependency also increases in proportion. Also concrete as a part has its ill effects on the environment which is not suitable for coming generation. The whole world is facing problem of pollution and microsilica contributes to it. Also fibres having cross link structures are the most difficult ones to easily breakdown in soluble form and to decompose it. Keeping the above points in consideration we can develop a method to replace cement by polyester fibre and microsilica which will help not only to reduce dependency on cement and the ill effects of silica and fibre on environment but also gain some flexural and compressive strength.

OBJECTIVES

1) To improve compressive strength of concrete by adding microsilica.
2) To improve flexural strength of concrete by adding polyester fibre.

LITERATURE REVIEW

2.1 Verma Ajay et .al, Effect of Micro Silica on The Strength of Concrete with Ordinary Portland Cement, Research Journal of Engineering Sciences, 2012, 1-4.
In this paper, the authors have replaced concrete by weight with microsilica. They concluded that addition of15% of microsilica gave the best result of 48.3N/mm^2. Thus optimum % of microsilica was found as 15%.

2.2 Vikash Kumar et .al, Effect of Micro Silica on the properties of hardened concrete, International Journal Of Engineering Research And Development, 2017, .08-12.
In this paper, the authors have replaced cement by weight by microsilica. The percentage variation was 6%, 7% & 8% for M25 grade of concrete. It can be concluded that the optimum percentage of replacement with MS lies at 8% for compressive strength.

2.3 N. K. Amudhavalli, EFFECT OF SILICA FUME ON STRENGTH AND DURABILITY PARAMETERS OF CONCRETE, International Journal of Engineering Sciences & Emerging Technologies, 2012, 28-35.
The main parameter investigated in this study is M35 grade concrete with partial replacement of cement by silica fume by 0, 5, 10, 15 and by 20%. This paper presents a detailed experimental study on Compressive strength, split tensile strength, flexural strength at age of 7 and 28 day. The conclusion obtained was maximum compressive strength observed at 15% replacement of silica fume.

2.4 Indrajit Patel, Study Effect Of Polyester Fibre On Engineering Properties Of High Volume Fly Ash Concrete, Journal Of Engineering Research And Studies, 2011,159-166.
In this paper, authors have used various grades of concrete. This paper throws light on strength gaining after replacing Polyesterfibre by mass of cementious material. The compressive strength gaining is comparatively slower at 3 and 7 days for all mix. All sample shows required flexural strength at 14, 28 and 56 days age. Increase in strength between 14 to 28 days is of order 22 to 30% and 28 to 56 days is 7.50 to 13.5%.However 55% cement replacement shows optimum gain of compressive and flexural strength.

2.5 N. K. Amudhavalli et .al, Relationship between Compressive Strength and Flexural Strength of Polyester Fiber Reinforced Concrete, International Journal of Engineering Trends and Technology (IJETT), 2017, 158-160.
In this paper, studies are carried out to determine the compressive strength and flexural strength of Polyester Fiber Reinforced Concrete (PEFRC) at different grades M20, M25, M30 and M35. Polyester fibers used in this paper are in different fractions ranging from 0.2% to 0.8% by addition to weight of cement. From the results it is found that there is a significant improvement in the mechanical and flexural properties by the use of fiber. However maximum compressive strength is at 0.4% of PFRC. The relationship between compressive strength and flexural strength of Polyester fiber reinforced concrete is ft = 0.039(fck).

2.6Manish Rohit et .al, Comparative Study on Flexural Strength of Plain and Fibre Reinforced HVFA Concrete by Destructive and Non Destructive Techniques, International Journal of Engineering and Science, 2012, 42-48.
In this paper, authors have used M25, M30, and M35 with 12 mm triangular shaped polyester fibre at rate of 0.15% and 0.25% by mass of cementing materials. Use of 12mm polyester shows marginal effect on increase in compressive strength at different ages but the increase is sufficient to achieve early age strength. Overall it is concluded that inclusion of fibre improves compressive strength of HVFAC by an average value of 9.75% to 15%,

TEST PROCEDURE-

- Cubes

1. Casting of cubes-
1) Prepare the mixture of cement, fine aggregate, coarse aggregate and water and mix well.
2) Mix the mixture till it is workable and fill 24 cube moulds with this mixture.
3) Keep the filled moulds for 24 hours in dry condition and then unlock the mould.
4) Keep the casted cube in curing tank.
2. Testing of cubes-
1) Remove the 7 days cured cubes from tank and test them on compression testing machine.
2) Remove the 28 days cured cubes from tank and test them on compression testing machine.

- Beams

1. Casting of beams-
1) Prepare the mixture of cement, fine aggregate, coarse aggregate and water and mix well.
2) Mix the mixture till it is workable and fill 9 beams moulds with this mixture.
3) Keep the filled moulds for 24 hours in dry condition and then unlock the mould.
4) Keep the casted cube in curing tank.
2. Testing of beams-
1) Remove the 28 days cured beams from tank and test them on universal testing machine in flexure.

OBSERVATIONS FOR CUBES-

Table 1 Compressive strength results of concrete cubes

Cubes	Microsilica	7 days Compressive	28 days Compressive

		strength (P/A)		strength (P/A)	
M1	0 %	10		32	Avg.
		12.22	13	33.23	32
		16.22		28.45	
M2	**5 %**	**22.45**		**38.23**	
		25.35	**22.3**	**39**	**39**
		19.11		**36.64**	
M3	10 %	18.22		28.4	
		20.23	21.1	28.6	30
		24.85		32	
M4	15 %	10		24.3	
		15	15	24.7	25
		20		26	

Calculations –

$$S = P / A$$

Where,

S – strength of concrete
P – load applied
A – area of cube

OBSERVATIONS FOR BEAMS-

Table 2 Flexural Strength results of concrete beams

Beams	Polyster fibre	28 days flexural Strength (N/mm^2)	Avg. Flexural strength (N/mm^2)
M1	0 %	3.65	3.62
		3.45	
		3.78	
M2	**0.1 %**	**3.93**	**4.06**
		4.11	
		4.15	
		3.25	
M3	0.3 %	3.1	3.26
		3.45	

Calculations –

$$F = P.L / B.D^2$$

Where,
F – flexural strength of beam
P – maximum load when deflection is zero
B – width of beams
L – length of beam
D – depth of beam

CONCLUSION

From the results obtained for concrete cubes it is observed that by the addition of microsilica there is significant increase in compressive strength of cubes, we achieve highest Compressive strength at 5% of microsilica i.e. 17.95 % increase in Compressive Strength than normal concrete.
Similarly for concrete beams it is observed that the 0.1% addition of Polyster fibre improves the flexural strength by 10.83% that of normal concrete.
So it is prove that addition of specific amount of polyster fibre improves the flexural strength of concrete.

- **Bar graph for results of cubes tested**

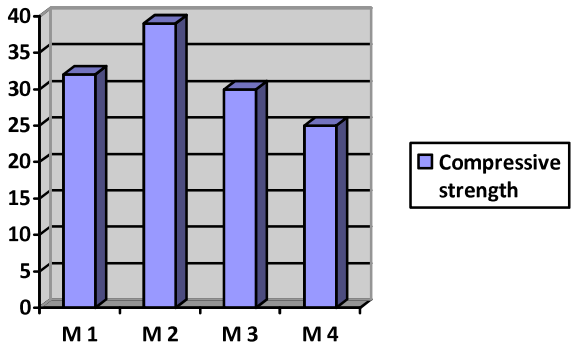

Figure 1 Variation of Compressive Strength Vs Mix proportion

- **Bar graph for results of beams tested**

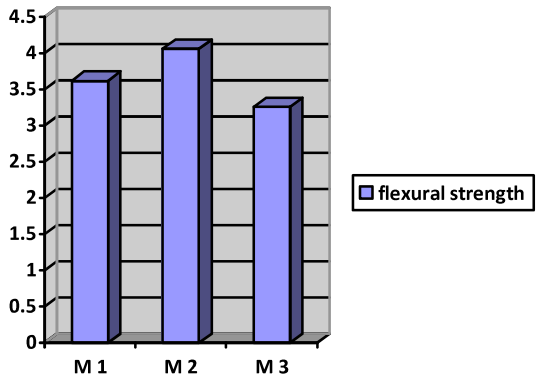

Figure 2 Variation of Flexural Strength Vs Mix proportion

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RAIN WATER HARVESTING – A CAMPUS STUDY AT PCCOE & R, RAVET.

Shyam Yesane, Gaurav Taras, Jayant Shinde, Yogesh Birajdar.
Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Reasearch, Ravet

ABSTRACT Water scarcity is serious problem throughout the world for both urban & rural community. Urbanization, industrial development & increase in agricultural field & production has resulted in overexploitation of groundwater & surface water resources and resultant deterioration in water quality. The conventional water sources namely well, river and reservoirs, etc. are inadequate to fulfil water demand due to unbalanced rainfall. While the rainwater harvesting system investigate a new water source. The aim of the present study is to use rainwater and thus taking close to the concept of nature conservation. In this study, the rain water harvesting (RWH) system is analysed as an alternative source of water at campus of Pimpri-Chinchwad College of Engineering and Research, Ravet (PCCOE&R) in the state of Maharashtra, India. The expected outcome of the study is the development of rainwater harvesting system for catchment area of campus from parking area. The result shows that the RWH system which will be applying in future will be of storage capacity 1521 cubic metre per year and the construction cost will be 3,90,840/-. The developed system satisfies the social requirements and can be implemented in rural areas by considering almost all the technical aspect.

Keywords: Catchment, Rain water harvesting (RWH), Recharge pit, QGIS.

I. INTRODUCTION

Rainwater harvesting is a technology used to collect, convey and store rain water for later use from relatively clean surfaces such as a roof, land surface or rock catchment. RWH is the technique of collecting water from roof, Filtering and storing for further uses. Rainwater Harvesting is a simple technique of catching and holding rainwater where its falls. Either, we can store it in tanks for further use or we can use it to recharge groundwater depending upon the situation. RWH system provides sources of soft, high quality water reduces dependence on well and other sources and in many contexts are cost effective. RWH system is economically cheaper in construction compared to other sources, i.e. well, canal, dam, diversion, etc.[1]

II. COMPONENT PARTS OF RAINWATER HARVESTING SYSTEM

A Rainwater harvesting system comprises of components for pipes or drains, filtration, and tanks for storage of harvested water. The details of the components of rainwater harvesting system has shown in figure 1.

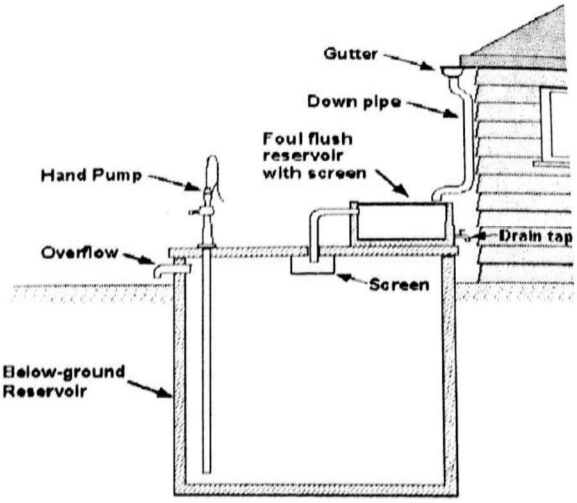

Figure 1:

The design and installation of RWH system includes following:

1. Rainwater Catchment and Conveyance
2. Rainwater Storage and Tank Sizing and
3. Rainwater Quality and Treatment

With above literature it is found that the rainwater harvesting system can be developed With above literature it is found that the qualitative and quantitative approach for the case study under consideration. This paper mainly aims to explore the economic benefit of rainwater harvesting system and the methodology has been demonstrated through application to the Pimpri-Chinchwad College of Engineering and Research, Ravet in the state of Maharashtra, India.

III. Study Area

The campus of Pimpri-Chinchwad College of Engineering and Research, Ravet (PCCOE&R) is situated at18^{0} 38$^{'}$ 00$^{''}$ N latitudes and 73 ^{0}44$^{'}$41$^{''}$E longitudes and is located in the Paschim Maharashtra region of Maharashtra.

The campus of this institute is situated at the corner area of Pimpri-Chinchwad city. The institute surrounded by agriculture and residential area. The total strength of campus including students and staff peoples is more 1200. Thus, with this present strength and also with the expansion, campus should also increase its facilities and maintenance requirements. Thus water is most natural resource being always in high demands by human beings and is indispensable part of the life. Hence, keeping in view all the above problems and status of campus PCCOER, Ravet, administrative body focussed on water scarcity problem. Therefore, in this situation, rain water harvesting system can be considered as a best solution for fighting against water scarcity in campus. [2]

IV. PROBLEM STATEMENT

Design of rainwater harvesting system of PCCOER campus using Geographic Information System (GIS). For this taking catchment area of campus from parking area and roof top area. Demarcate and calculate area by using GIS. The slope of the catchment shall be checked by auto level. Analyse the potential of runoff from the rainfall from the catchment and suggest suitable recharge pit locations and also volume of rainwater to be recharge in the ground. What will be the approximate expenditure for these recharge pits. If the institute wants to construct underground storage tank, what will be the approximate expenditure.

V. OBJECTIVES

- To conserve surface water runoff during monsoon
- To reduce soil erosion
- To use this rainwater for drinking, gardening, flushing purposes.

VI. Design of RWH system:

1. Recharge pit:

(A) Open area =2115.43 m^2
Assume,
Average rainfall intensity =4 cm per 2 hr.
Runoff coefficient, for open area = 0.8
4. Storm duration = 2 hr.

Now, by using rational formula,

For open area,
Q = C I A /3.6
= 0.8 × 20 × 2115.43 × 10^{-6} /3.6
= 0.009401m^3 /sec

Now,
Total runoff volume = peak runoff rate × storm duration
=0.009401×2×3600
= 67.68 m^3= 67680 lit.
For this volume of water, recharge pit of dimensions 5m ×5m ×0.8m can be constructed. As the topography of the area suggest the location, pit can be constructed in the south-west corner.

2. Design of catchment area and water tank:

Roof top area =1946.54 m^2
Volume of water received per year
=A (catchment) X Amt. of rainfall X runoff coeff.

Runoff coefficient = 0.5-1.0
(As our catchment area is impervious so we take as 1.0)
Average annual rainfall = 781.9 mm
Volume of water received per year = 1521cubic.m.
= 1521000 litre.

There are the two cases while design of water tank:

1) Storing the entire year's rainwater for emergency use in future.
2) Use the rainwater for daily purpose.

For case no 1:
Water to be collected per year = 1521 cubic metre.
Assume Height of tank = 4m
Area of base = 1521/4 = 380.25 sq.m.
Selecting the square water tank
Hence size of tank is = 20m X 20m X 4m

For case no 2:
Maximum rainfall occurs in JUNE, so considering JUNE's rainfall we calculate the size of tank.
Total water collected in June
= Rainfall in June * Catchment Area
= 0.171m * 1946.54 sq.m.
= 332.85 cubic metre
Therefore, average daily rainfall in June is 332.85/30
= 11 m^3 =11000 lit.
For future purpose we consider it as 15 m^3 tank size.

Assume height of tank = 2m
Area of tank = 15/2=7.5m
Size of rectangular tank = 3.3m X 2.3m X 2m

3. Design Gravity slow sand filter:
As per design the size of slow sand filter is 2.03m x 4.06m
Slow sand filter consists of two granular layers:
1. Sand 2. Gravel
Sand: depth = 0.6m
Size of sand = 0.25 to 0.35mm
Gravel: depth = 0.5m
Size of gravel = 25mm at base and 2mm at top.
Free board: 0.5 m
Back wash: 0.6 m

4. Distribution system:
1. Water pump :
Pump capacity = $\rho.q.g.h/ 3.6 X 10^6$
h= 30 m
q= 7.5 cu.m./ hr
Calculated capacity = 0.81 Hp = aprox. 1 Hp

Approximate estimate:
Water tank size - 2m x 2.3m x 3.3m
Cost for excavation – Rs. 110 per cubic m
Total excavation cost = Rs.15840
RCC work for tank – Rs. 25 per litre
so total cost for RCC = Rs. 3,75,000
Total construction cost for tank = Rs. 3,90,840
Requirement of material for piping:
1. 12" PVC Pipe - 330m length
2. L- PVC Pipe joints - 4 nos.
3. T- PVC Pipe joints – 22 nos.

CHLORINATION:
Types of chlorination-
1. Simple chlorination
2. Super chlorination
3. Dichlorination
4. Breakpoint chlorination

As the rainwater collected from relatively unpolluted sources its turbidity will not exceed 100 NTU.
So as per Manual on water supply and treatment we should use simple chlorination.
1. By addition of a weak solution prepared from bleaching powder.
2. By addition of weak solution of chlorine prepared by electrolysing a solution brine.
3. By addition of chlorine in gaseous form.

As the first method of chlorine application has the merits of simplicity, non-requirement of electrical energy and relative safety in operation we will use it for disinfection.

VII. CONCLUSION

Recharge of ground water table is a gradual process, we cannot suddenly increase the ground water table after constructing recharge structures. By constructing any type of recharge structures we can give our contribution in aquifer recharge. This will help to rejuvenate the depleting ground water resources. Also help to save little amount of rain water which used to drain away and use it for drinking, gardening, flushing purpose. Cost of installing of RWH system is nearby INR 3, 90,840.

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Use of Geotextile to improve soil properties

Twinkal Thakur[1], Priyanka Chavan[2],Yash Agrawal[3],Yogita Gurav[4] , Mayura M. Yeole[5]
[1]Department of Civil engineering, PimpriChinchwadcollege of engineering, Ravet
[2]Department of Civil engineering, PimpriChinchwadcollege of engineering, Ravet
[3]Department of Civil engineering, PimpriChinchwadcollege of engineering, Ravet
[4]Department of Civil engineering, PimpriChinchwadcollege of engineering, Ravet
[5]Head of Department, Department of Civil engineering Pimpri Chinchwad College of Engineering, Ravet

ABSTRACT

The paper discuses about the importance of Procter test, for deciding the procedure and methodology of the CBR test. So as to determine the optimum amount of water to be used in the soil to obtain maximum dry density. Thus helping us to have maximum compaction which increases the density of the soil per meter cube.

INDEX TERMS

OMC(Optimum moisture content),MDD(Maximum dry density),CBR(California bearing ratio)

I. INTRODUCTION

The compaction of soil by mechanical method plays the vital role to improve the engineering properties of soil. In early days, compaction achieved in field was relatively less. With improvement in knowledge and technology, the necessity of higher compaction was enlightened. Hence modified compaction test become relevant. It was developed during World War 2 by the U.S. Army Corps Of Engineering to better represent the compaction required to support heavy aircraft. due to such significant use of modified compaction test the further study taken out by scientist which resulted in the development of modified Procter test which now a days not only used in defence field but also in residential and commercial sectors.

A. MODIFIED PROCTOR TEST

Soil compaction is the process that soil particle are mechanically compacted to increase density. For each soil type, amount and type of compaction is given, there is an optimum moisture content will produce soil particles and maximum moisture content. This are determine by proctor compaction test.

The Proctor compaction test is the laboratory method intended for determining the relationship between the moisture content and dry density of the soil or flexible base material compacted and also determine the optimum moisture content and maximum dry density according to the standard procedure as mentioned in the IS code 2720 part 8.

In this test the soil is usually compacted into the mould to certain amount of equal layers, each layer receiving a number of blows from a standard weighted hammer at a specified height. This process is then repeated for various moisture contents and dry densities are determined for each. The graphical relationship of dry density to moisture content is then plotted to established the compaction curve. The MDD is finally obtained from the peak point of the compaction curve and its corresponding moisture content i.e OMC.

B. APPRATUS OF MODIFIED PROCTOR TEST

Metal mould volume =1000 cm^3
Balance capacity = 10 kg least count =1 gm
Oven =105 to 1100 ^oc
Sieve = 19mm
Metal rammer = 4.9 kg

C. CALCULATION

Bulk density, γb in gm/cm^3 of each compacted specimen is calculated form the following equation

$$Yb = (W_2-W_1)/V_m$$

Where,
W_1= weight in gram of mould + base plate.
W_2 = Weight in gram of mould + Base plate + Soil
V_m = volume of mould i.e. $1000cm^3$
Dry density, γ_d in gm/cm^3 of each compacted specimen is calculated from the equation below

$$\gamma_d = 100\ \gamma_b/(100+m)$$

γ_b = bulk density in gm/cm^3
m = moisture content of water in percentage

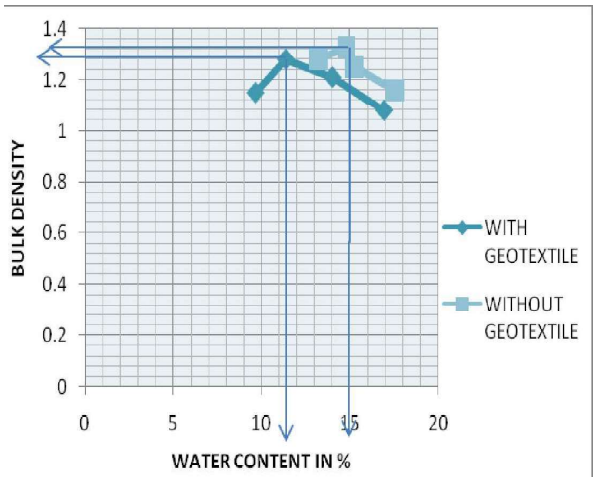
D. RESULT

	with geotextile		without geotextile	
Sr no.	dry density	water content	dry density	water content
1	1.15	9.63	1.28	13.2
2	1.28	11.36	1.33	14.81
3	1.21	14	1.25	15.25
4	1.08	16.95	1.157	17.56

E. GRAPH

The dry density γ_d, obtained in the series of determination is plotted against the corresponding moisture content m. a smooth curve is then drawn through the resulting point and the position of the maximum on this curve is determine which is called maximum dry density and th corresponding moisture content is called optimum moisture content.

The graph provides the value of OMC and MDD for pure soil and soil induced with geotextile which are for pure soil OMC , MDD are 14.98 and 1.35 respectively and that for soil with geotextile is 11.28 and 1.22 respectively.



II. CONCLUSION

The paper thus provided us with the significance of the Procter test with the all its specification it also discusses the test result of pure soil and the soil induced with geotextile where the value for OMC and MDD for pure soil is 14.95 and 1.35 respectively and that of for soil induced with geotextile is 11.28 and 1.22 respective

The data thus concludes that the OMC and MDD value for pure soil are greater than that of the soil with geotextile.

It means by use of geotextile the properties like OMC and MDD has been improved .

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ANALYSIS OF COMPRESSIVE PROPERTIES OF HARDENED CONCRETE: REPLACING NATURAL AGGREGATES BY STEEL SLAG

Mayura Yeole[1].,Gayatri S. Chaskar[1], Mohini A. Koli[2], JyotiS. Mishra[3]and Sumeet S. Sonwane.[4]

[1]Pimpri Chinchwad College of Engineering and Research , Ravet , Pune , India .

ABSTRACTThe natural resources are getting depleted day by day. The need to preserve natural resources has become necessary. This problem can be overcome by finding an alternative for natural aggregates. The huge amount of waste generated during steel production and its disposal is a serious environmental issue. The steel manufacturing industries in India produces 12MT/year by-product called steel slag. When this steel slag is directly dumped to ground it cause acquisition of huge land and also degrading the soil quality. In this research work , steel slag is used as a replacement for fine aggregates in concrete. Hence solving the problem of depletion of natural aggregates and dumping of steel slag, also reducing the cost of concrete up to some extent. The use of steel slag in concrete has enhanced the compressive strength of concrete.

INDEX TERMS: Aggregate, Concrete, Steel Slag, Compressive Strength.

I. INTRODUCTION

1.1 GENERAL

In construction material, concrete plays an important role. Concrete is prepared by mixing various materials like cement, aggregates, water etc. which locally available. Availability of natural aggregates is getting depleted and also is becoming costly. To meet the scarcity, it is necessary to find suitable alternative to natural aggregates for preparing concrete. Therefore replacement is becoming necessary, and in this research work an attempt has been made to replace natural aggregates by steel slag. As compared to other countries utilization of steel slag is very less in India.

Steel slag is a by-product obtained from steel industry. It is generated as a residue during production of steel. It is obtained either from conversion of iron to steel in Basic Oxygen Furnace(BOF), or by the melting of scrap to make steel in the Electric Arc Furnace . Primarily slag consists of calcium, magnesium, manganese and aluminium silicates in various combinations.The slag material is neutral and non-hazardous in nature as per chemical analysis report of CPCB. Slag actually has many uses and rarely goes to waste. Slag is a by-product of the iron and steel manufacturing process. The first step in production of steel is to manufacture iron. Iron ore, a mixture of oxides of iron, silica and alumina, together with a fuel consisting of coke, natural gas, oxygen and pulverized coal and also limestone as a fluxing agent, are fed into a blast furnace which consists of a large vertical chamber through which large volumes of hot air are blasted. The chemical reaction results into two products: molten iron metal and molten slag. Slag, which has a relatively lower specific gravity, does not mix with the molten metal as it leaves the furnace and is commonly called Blast Furnace slag. Generally a blast furnace operates on a continuous basis and produces approximately 250-300 kg of slag per tones of iron produced.

The Liquid blast furnace slag flows into pits where it is predominantly air cooled and sprayed with a small quantity of water .The cooled slag is then transported to a crushing and screening plant where it is further processed into various products including aggregates.

Alternatively, liquid slag can be rapidly quenched using large volumes of high-pressure water to produce a sandy material called Granulated Blast Furnace Slag(GBPS). It can be used as an aggregate, as ballast and also as component of phosphate fertilizer.

1.2 PROBLEM STATEMENT

Waste management is one of the most common and challenging problem in the world. According to Indian Mineral Year Book 54th edition in the year 2017, 12 MT per annum of steel slag is generated and disposed in stockpiles. As a result large area of land is being sacrificed for the disposal of this waste. As natural aggregates are getting deployed day by day and its increasing cost making the construction activities non-economical.Depletion of natural aggregates is creating serious impact on economy of construction. Hence an alternative is found out to replace

natural aggregate in construction by using steel slag aggregate. The uses and awareness of steel slag as a useful material is very limited in India .However many other countries particularly economically developed countries have used steel slag in variety of application.

1.3 SCOPE

Scope of the project is limited to test physical and chemical properties of steel slag and use it as replacement material for fine aggregate .Further work will consist of testing the sample and distinguish the cost and hardened properties with and without steel slag.

II.MATERIALS

CEMENT

Ordinary Portland cement of grade 45 was used. The specific gravity of cement is 3.15.

Fine aggregates

Crush sand passing through 4.75mm sieve with a specific gravity of 2.85. The grading zone of aggregate was zone 3.

Coarse Aggregate

Angular crushed aggregate of 20mm size were used. The specific gravity of coarse aggregate was 2.9.

Steel slag

Steel slag has been sourced from JSW steel industries ,dolvi. The specific gravity of steel slag was 2.54

Concrete mix design

Design concrete mix of 1:2.566:4.12 is adopted to attain 38.25 N/mm2 .The water-cement ratio of 0.45is used.

III. Methodology

The basic tests were conducted on OPC43 grade cement, fineaggregate , coarse aggregate and steel slag to check the suitability for making concrete. The experimental investigation has been carried out on the test specimens of cubes to study the strength properties as a result of partially replacing fine aggregate by steel slag in various percentages such as 0%,15%, 25%, 30%, 35%. Compressive strength test was conducted on hardened concrete after 7days, 14days, and 28 days of curing. And slump test was conducted on fresh concrete.

IV. Results

a) Slump Test

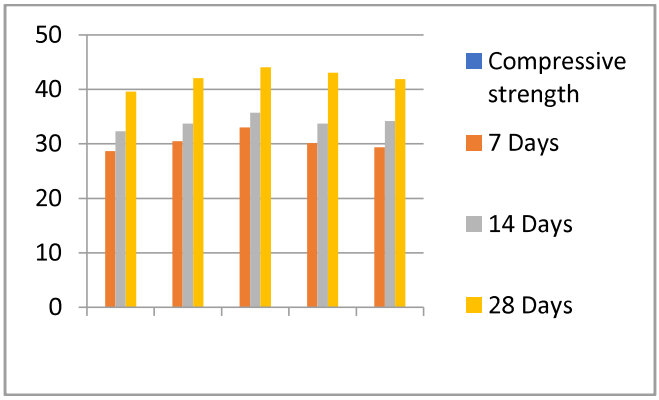
Slump Test was done on fresh concrete for various replacement of steel slag.

	For 0 %	For 15%	For 25%	For 30%	For 35%
Slump Value	80mm	70mm	65mm	60mm	60mm

b) Compressive Strength

12 cubes of M30 grade concrete were casted for each replacement . Among them 3 cubes were tested on 7th day , 3 on 14th day and 3 on 28th day, Total 60 cubes were casted and out of that 45 cubes were tested. Specimens were casted as per mix design and its size was 150mm*150mm*150mm.

Compressive strength on	For 0%	For 15%	For 25%	For 30%	For 35%
7 days	28.63	30.51	32.97	30.12	29.37
14 days	32.29	33.706	35.74	33.7	34.21
28 days	39.61	42.1	44.04	43.07	41.89



Compressive strength vs % of steel slag.

V.Conclusion

Compressive strength increases with increase in % of steel slag upto 25% replacement .
Compressive starts decreasing after 25% replacement of steel slag.
From the results of compressive strength of 7days , 14 days and 28 days of curing , 25% replacement of fine aggregate by steel slag is the optimum % of replacement for M30 grade of concrete and decreases considerably in further replacement of slag in concrete.
The replacement of steel slag as fine aggregate in concrete has positive impact on compressive strength , hence use of steel slag in concrete will eliminate one of the environmental problem created by steel industry.

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Reuse of waste water by using the emerging technique of sewage treatment

O.Jadhav[1], S.Darwade[2], V.khamgal[3], A.kilkile[4].
Guided By: Pranjali A.Chiwhane
Department of Civil engineering, Pimpri Chinchwad College of engineering, Ravet

- **ABSTRACT**India is facing a water crisis and by 2025 it is estimated that India's population will be suffering from severe water scarcity. Although India occupies only 3.29 million Sq.km geographical area which forms 2.4% of the world's water and area, it supports over 15% of world's population with only 4% of the world's water resources. With increased population growth and development, there is a need to critically look at alternative approaches to ensure water availability. These alternative resources include rainwater and bulk of water used in household will emerge as grey water and contain some minerals, organic waste material dissolved and suspended in it. When this is allowed to flow out this will join the sewage and bacteriologically contaminated, resulting in sewage stream. It is possible to intercept this grey water, at the household level, treat it so that it can be recycled for garden washing and flushing purpose and also used in college campus

- **INDEXTERMS**

I. INTRODUCTION

The problem of getting rid of wastewater is one of the main problems facing the world in the time being. That is due to bad effects of wastewater on human and environment when discharged into rivers. The amount of collected and treated wastewater is likely to increase considerably with population growth, rapid urbanization, and improvement of sanitation service coverage. Wastewater originates from domestic, commercial, and industrial sources. In many networks the domestic component is the largest. The defining variable is domestic water consumption, which is linked to human behavior and habits. Very little water that is used by households is actually consumed, but rather is degraded in quality and then discharged as wastewater. India is recognized as has having major problems with water Pollution, predominantly due to untreated Sewage. Rivers such as the Ganges, the Yamuna all flowing through highly populated areas, are polluted. 80 % of sewage in India is untreated and flows directly into the nation's rivers, polluting the main sources of drinking water. Indian cities produce nearly 40,000 million liters of sewage every day and barely 20 percent of it is treated. Hence treatment of sewage and its reuse is the need of the hour. Sewage treatment is the process of removing contaminates from wastewater, primarily from household sewage. It includes physical, chemical, and biological processes to remove these contaminants and produce environmentally safer treated wastewater. A by-product of sewage treatment is usually a semi-solid waste or slurry, called sewage

sludge that has to undergo further treatment before being suitable for disposal or land application."The term treatment means separation of solids and stabilization of pollutants. In turn stabilization means the degradation of organic matter until the point at which chemical or biological reactions stop. Treatment can also mean the removal of toxic or otherwise dangerous substances (for e.g. heavy metals or phosphorous) which are likely to distort sustainable biological cycles, even after stabilization of the organic matter.

Problem statement

We are now entering an era where abundant; clean freshwater is no longer guaranteed, even in "water-rich" countries like India. In many parts of the world, water scarcity is one of the most significant challenges to human health and environmental integrity. As the world's population grows and prosperity spreads, water demands increase and multiply without the possibility for an increase in supply. The mounting demand on this finite and invaluable resource has inspired creative strategies for freshwater management, including innovative techniques for wastewater recycling. Greywater reuse is one such strategy, and its usefulness to fulfill non-potable water needs should be thoroughly investigated.

Globally, over 70% of freshwater consumption is devoted to agricultural activities (FAO 2008). Recently, declining productivity of commercial farms has led international policy networks to recommend the promotion of urban and peri-urban agriculture as an escape from food crisis situations (FAO 1999). However, many households in poorer areas lack access to fertilizers and have a limited supply of fresh water. Wastewater treatment and reuse at the individual level can provide a combined solution to these problems by supplying the water and nutrients needed for household food production. Indeed, this strategy is already in use by millions of farmers worldwide and it is estimated that 10% of the world's population consumes foods irrigated with wastewater (WHO 2006). Wastewater treatment and reuse for irrigation may well hold the key to easing demand on limited freshwater reserves while improving the food production capacity of households and farms.

However, there are significant concerns about the safety of wastewater reuse for irrigation purposes. The key issue involved is the potential for damaging effects of poor-quality water on soil, plants and humans. Water quality requirements for agricultural irrigation are a subject of much interest to researchers- in theory; agricultural water need not be of potable quality, opening the door to wastewater and surface water irrigation (WHO 2006). However, the microbial population of untreated water is very diverse, and dangerous organisms can be present. Microorganisms that can cause illness or disease, collectively known as pathogens, are usually associated with human or animal fecal matter present in wastewater and surface water sources. Irrigation water contaminated with pathogens has often been blamed for outbreaks of forborne illness. It is important to carefully manage this risk when promoting the reuse of non-potable water sources to fulfill the water demand of agricultural irrigation activities.

Objective of the work

·To Analyze the waste water from PCCOER.

·To decide or select the optimum treatment solution.

·To reuse the waste water for flushing and gardening activities.

LITERATURE REVIEW

James E, Rogers Way et al. "Wastewater Treatment and Reuse" Department of Chemical & Environmental Engineering, University of Arizona, This paper provides an overview of the special issue on Wastewater Treatment and Reuse: Past, Present, and Future. New method is involved such as a bioreactor membrane, electrochemical technique and disinfection technologies. for the reliable and sustainable waste water recycle and reused from the conventional and traditional method.

Hemath Naveen, et al., "Sewage Treatment Methodology"The paper presents the various study about the sewage treatment and efficiency of cleaning process of various waste water. In our study we discussed the methodology to treat sewage by various experimental studies. They are presented in the different treatment methods of waste water in order to find the best conditions and parameter treatment process

J. S. LAMBE, and Dr.J.J.Magdum "Greywater - Treatment and Reuse"

In this paper to study of India is facing a water crisis and by 2025 it is estimated that India's population will be suffering from severe water scarcity. Although India occupies only 3.29 million km2 geographical area which forms 2.4% of the worlds land area, it supports over 15% of world's population with only 4% of the world's water resources. With increased population growth and development, there is a need to critically look at alternative approaches to ensure water availability. These alternative resources include rainwater and bulk of water used in household will emerge as grey water and contain some minerals, organic waste materials dissolved and suspended in it. When this is allowed to flow out this will join the sewage and bacteriologic ally contaminated, resulting in a sewage stream. It is possible to intercept this grey water, at the household level, treat it so that it can be recycled for garden washing and flushing purposes.

2.4 Amarnath D. et al. "Comparative study on wastewater treatment using activated sludge process and extended aeration sludge process Joshua" They are providing the various methods such as, Activated Sludge Process, Trickling Filter, Extended Aeration Sludge Process, Aerated Lagoon, Oxidation Ditch, Waste Stabilization Pond, Up-flow Anaerobic Sludge Blanket, Membrane Bio-Reactor, Moving Bed Bio-film reactor, Sequential Batch reactor and Rotating Biological Contact-discs. In this paper, a comparative study has been carried out to evaluate the performance (like Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand, Total Suspended Solids and other main constituents), installation, operation, maintenance cost comparison for the Activated Sludge Process(ASP) and Extended Aeration Sludge Process (EASP) is taken up to control the discharge limits. The average test results showed that the removal efficiency of BOD and TSS from the domestic wastewater in EASP is more than 96% and superior compared to ASP technology.

□STUDY AREA

-WATER SUPPLY = 2000 UNIT/MONTH

Water consumption –

1) 50% SBP SCHOOL
2) 10% SBP COLLEGE
3) 40% PCCOE&R COLLEGE

· RATE OF WATER = 35 RS / UNIT
· WATER BILL = 40000 / MONTH
· TOTAL POPULATION = 1600
· W.C. = 75 UNIT
· LABORATORY ANALYSIS OF WATER

A. BOD TEST RESULT

□SELECTION AND COMPARISON OF TREATMENT METHOD-

· Comparison study for various method

1. Activated Sludge Process

2. Trickling Filter
3. Root zone technique (wetland)
4. DOSIWAM(Decentralized On Site Integrated Waste Management System)

DOSIWAM-

· INTRODUCTION–

In rural as well as urban areas, the existing waste management systems are lacking in the use of appropriate technologies and the percentage coverage of population is very low. The existing waste management systems are grossly inadequate while the arrangements in peri-urban and rural areas are either virtually nonexistent or hopelessly inadequate. Further, there is no coordination between the methodologies used for managing different kinds of wastes. Keeping in mind; the resource crunch and expected coverage of maximum possible percentage of population in low income urban, peri-urban and rural population, it is necessary to adopt methodologies appropriate to the situation, based on the following important parameters. The suggested technologies should be nonconventional, appropriate, as low cost as possible technologies through which, as large a section of population as possible will have to be covered. Further, these technologies may be such that resource recovery is made possible by energy recovery, recycling and reuse. The processes need to be decentralized and 'on site' as far as possible, so as to minimize waste carriage. Thus, these could be established even in isolated peri-urban areas and remote villages. In tropical countries, biological and biochemical process would be very suitable because of appropriate ambient conditions and low capital and maintenance costs. Two such technologies that are used in various parts of Maharashtra and especially popularized by (Late) Dr. S. V. Mapuskar in Village Dehu of Pune district have been studied and evaluated by us for sustainability criteria and are found to be most appropriate for Indian Environmental Conditions.

This article is an attempt to introduce the work pioneered by (Late) Dr. S. V. Mapuskar for the various stakeholders who have not come across to his work due to one or the other reason.

· CONCEPT OF DOSIWAM–

All the processes appropriate for tropical countries are basically biodegradation processes or composting processes based on either anaerobic or aerobic digestion. In case of vermi composting, the process is of a slightly different nature where earthworms are the agents instead of bacteria. All these processes can be used in different ways for each individual type of waste. Therefore, while using these processes, sometimes waste can be brought together in a single process or at certain stage, the end products can be brought together. Thus, these processes could be complementary to each other and the management of all kinds of wastes can be integrated in a complementary manner. The end products of these processes are in the form of solid manure or stabilized waste water. Both these end products can safely be recycled back to the nature for agricultural, horticultural and plantation purposes. All these processes could be done „ON SITE" with maximum possible recycling and reuse. At the same time, the management with such processes becomes hygienically safe, energy productive and financially viable.

In DOSIWAM system, neither a drop of waste water nor a grain of biodegradable solid waste leaves the campus. All waste is treated hygienically in eco friendly non polluting way by bio digestive processes and end products are returned to the soil in nature in horticulture or agriculture in an ecologically sustainable manner, simultaneously recovering some energy as well. Nature, obviously, reciprocates in many ways.

In the initial stages, it was proposed to establish pilot projects for such integrated waste management systems in some residential institutions where plenty of waste is generated. These institutions, though willing for proper management of waste, are at a disadvantage, for want of proper advice regarding appropriate technologies suitable for them. As a result, some make-shift arrangements are done. The inadequately treated waste finds its way out from the institution's premises, polluting the neighborhood and nearby water resources. It was proposed to put in efforts to change this situation hygienically and go in for integrated waste management systems involving recycling, resource recovery and energy recovery profitably, in eco friendly processes.

Such integrated waste management system has a potential to take care of all the domestic waste which is considered as a nuisance. Further, these technologies prevent the spread of pathogens in the environment, thus improving the sanitation situation, ultimately leading to improved health status of the community. With such low cost appropriate technology, the various kinds of wastes, which, when improperly managed are hazardous, can be converted into wealth. Thus, properly managed integrated waste management systems, can be a great asset in sustainable development for rural masses in the country. Further, the whole process becomes ecologically very sound and environment friendly.

· Flow pattern in DOSIWAM System–

1. All the latrines are connected to biogas plant.
2. Effluent from biogas plant is combined with all the grey water from various places.
3. This water is taken to stabilization tank via intercepting tank.
4. Stabilized water is stored in stabilized water storage tank and onwards for irrigation.
5. Solid waste is segregated.
6. Wet waste is vermi-composted and returned to soil as manure. Dry waste goes for recycling.

DOSIWAM further can classify in to two parts:

1. Malprabha digester
2. Stabilization tank

MALPRABHA Digester-

Malaprabha technology basically is a „toilet – linked biogas plant" where human excreta are converted to biogas in a specially designed digester chambers.

Malaprabha system, or the toilet linked biogas plant has 3 chambers, the first chamber having Hydraulic Retention Time (HRT) of 30 days, and the rest two having together of 15 days of HRT. These final calculations have been estimated by research and development on many systems installed by Dr. Mapuskar. The HRT of the first chamber is high as compared to the other two as the gas from first chamber is only trapped for reuse. There is negligible amount of gas generation from the other two compartments, which escapes to the atmosphere. The effluent, after treatment, is discharged into the drainage system.

WORKING OF MALAPRABHA DIGESTER

1. The design of Malapraba Biogas Plants is governed by the average number of users a day.
2. The amount of water used for flushing per person per day and a hydraulic retention time(HRT) of 45 days.
3. The biogas plant comprises of 3 compartments, the 1st compartment is designed to provide for a HRT of 30 days and doubles-up as gasholder.

4. The second and third compartment provide for a total HRT of 15 days.
5. There is an opening at the bottom of the wall separating the 1st and the 2nd chamber and an aperture in the wall separating the 2nd and 3rd chamber to facilitate flow of water through the biogas plant.
6. The biogas plant is provided a pressure release pipe that vents biogas before excess gas pressure may damage the plant.
7. Propulsion pressure is required for using biogas for cooking and is provided by the fixed RCC cap over the 1st chamber, in which gas is compressed after it is produced by methanogenesis.

 BIOGAS GENERATION PROCESS:

Currently Biogas technology mostly makes use of cattle dung & if the same technology is used for other organic matter, it may result in some problems. Human night soil is a good substrate for generating biogas. Biogas is generated during the anaerobic digestion of any naturally produced dead organic matter. Biogas can be created by the digestion of animal / human excreta or non-excretal solid or liquid organic waste. In the biogas plant organic matter undergoes 3 processes of anaerobic digestion viz., liquefaction, acidification & methanogenesis. The three kinds of bacteria-Hydrolytic, Acidifying & Methanogenic, need 3 months to create a culture in anaerobic conditions.

Result

CONCLUSION

1) Do not need periodic cleaning and maintenance
2) Treated water is applicable for a flushing and gardening
3) Methane gas comes out from system which is used for a home and business purposes.

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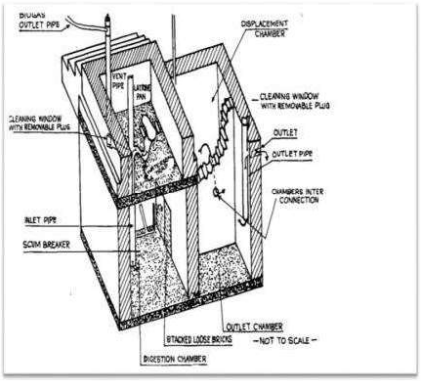

1.Wastewater Treatment and Reuse-Department of Chemical & Environmental Engineering, University of Arizona, 1133 E. James Rogers Way, Tucson, AZ 85721-0011, USA;
2. Sewage Treatment Methodology-A Review Hemath Naveen, Hema Priya, Swathi.S,Vinothan K., Assistant Professor 1 ,B.E(Final Year students)2,3&Associate Professor4 Department of Civil Engineering, S.K.P.Institute of Technology,Tiruvannamalai-606611,Tamilnadu.India
3. Greywater - Treatment and ReuseJ. S. LAMBE Asst.Professor, Department of Civil Engineering, Dr.J.J.Magdum College of Engineering, Jaysingpur, 416101, Maharashtra, IndiaR. S. CHOUGULE Asso.Professor, Department of Civil Engineering, Dr.J.J.Magdum College of Engineering, Jaysingpur, 416101, Maharashtra, India]
4. Comparative study on wastewater

Sr. No.	Sample	Day/ Date (2017)	Timing	D.O. (Initial Range)	Final range	D.F.	B.O.D. Mg/lit
1	Sample (1)	Tue/ 18/07	4:00 PM	7.9 mg/lit	6.4	20	30
2	Sample (2)	Fri/ 21/07	4:00 PM	7 mg/lit	4	20	60
3(i)	Sample (3) (Morning)	Tue/ 25/07	9:30 AM	3.5 mg/lit	2.5	20	20
(ii)	Sample(3) (Afternoon)	Tue/ 25/07	3:30 PM	7.6 mg/lit	3.6	20	60
(iii)	Sample (3) (Evening)	Tue/ 25/07	5:00 PM	6 mg/lit	3.3	20	56

treatment using activated sludge process and

extended aeration sludge processJoshua Amarnath D.,Thamilamudhan R. and Rajan S.Department of Chemical Engineering, Sathyabama University, Jeppiaar Nagar, Sholinganallur, Chennai, Tamil Nadu, India 2District Environmental Engineer, TNPCB, Ambattur Industrial Estate, Chennai

ENVIRONMENTAL BENEFITS OF REUSE OF ORGANIC WASTE ASA COMPOST FOR RESIDENTIAL BUILDING (MAY 2018)

Amita Tiwari[1], Sonal Salunkhe[2], Payal Ghotale[3], Nitin Mate[4]
Guided by :PranjaliChiwhane, NidhiKhare
[1] CivilEngineering Department, SavitribaiPhule Pune University, Ganeshkhind, India

ABSTRACT

India faces major environmental challenges associated with waste generation and inadequate waste collection, transport, treatment and disposal. Over 377 million urban people live in 7,935 towns and cities and generate 62 million tonnes of municipal solid waste per annum. Only 43 million tonnes (MT) of the waste is collected, 11.9 MT is treated and 31 MT is dumped in landfill sites. The world is undergoing the largest wave of urban growth and per capita income lead to high rate of municipal solid waste generation. Solid Waste collection efficiency in India is around 70%.Even today; large portion of solid waste is dumped indiscriminately on outpost of towns or cities without any prior treatment. This leads to groundwater contamination and increase in air pollution due to leachate percolation and release of gases respectively. Various studies reveal that out of total solid waste, 80% can be utilized again either by recycling or reusing. This paper deals with analysis of organic waste sorting and recycling it by composting practice. Major advantage of this method is reduction of the costly transportation of MSW to far away landfill sites.

INDEX TERMS Compost bin, Cultures, Leachate, Organic waste PCMC

I. INTRODUCTION

India rapidly shifting from agriculture based nation to industrial, rapid urbanization and uncurbed growth rate of population are main reason for MSW to become an obstacle. There is complete inadequacy at source for sorting out and management of solid waste. It is important to prosper and enactment an integrated solid waste management approach taking advantage of existing unorganized sector for its cost effective and sustainable management. Immoral scrapping of solid wastes pollutes all vital component of living environment at local and global level. Problem associated with MSW management have acquired on alarming aspect in developing countries. Current solid waste management systems are inadequate with waste having negative impact health, the environment and the economy. Land filling is still the dominant solid waste management option for other countries like India around the world.

There are four basic ways of waste management:

1) Waste minimization at source reduction
2) Recycling and Composting
3) Incineration
4) Waste to landfill

Most 90 % of waste in India is believed to be dumped is an unsatisfactory manner. There is need to develop facilities to disposed of increasing amount MSW. The creation of compost has become a more popular option of waste management as way of municipal solid waste to reduce pressure on landfill. Because importance of composting in order to achieve the objective of waste management in the world. Reusing material will incredible reduce final quantity of deposited waste. By reusing kitchen waste, invention of quality type compost in minimum 7 days will be the main focusable point of this research paper

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II. METHODOLOGY

At this stage carried out survey of collection of data which includes location for visit, its capacity, by-product, reuse and process of the plants. According to analysis of PCMC area compost plant (Moshi KacharaDepo).Compost plants include commercial waste, construction and festival extra waste generated.

A. ***Details of PCMC Area:-***

Pimpri-Chinchwad Municipal Corporation, Moshi KacharaDepo, Moshi. Area of the Site is 80 acres. Waste generation in PCMC area is 440ML/D and population the area is 1200000. Also method used in those used is composting and landfill, dumping, vermin-composting, segregation waste to energy.

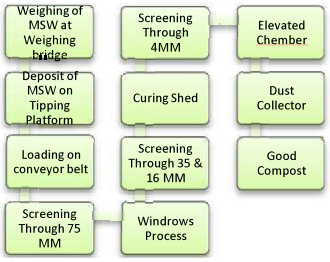

Figure 1: Flow Process at PCMC Moshi Plant

B . Process

When waste collected it is dumped to plant for 7days to remove the leachate and odour from the waste. After 7 days segregation is done in which separation of material is done .Then land filling, composting, recycling, and fuel generating etc.

As the process takes long times because it is mixed with wet and dry waste. So reduce waste problem of separation of dry and wet garbage, the municipal corporation in Pimpri-Chinchwad has distributed dustbins to citizens so that they separated which will facilitate the Govt. to implement the waste disposal rules or act. To carry the waste municipal corporation has started the system called as Hopper Auto Rickshaw, i.e. the vehicles to collect the garbage from place to place. These rickshaws have 2 separate carriages one of dry and one of wet waste. This process is eco-friendly, less hard work and helps to reduces garbage transport cost. It helps to reduce the load of garbage's to be disposed to Moshi depo. Depo consists of vermin-composting as well as mechanical composting method.

There is also rag picker which helps to collect dry waste separately which helps to recycle the item. As present it was impossible because recycles items get mixed waste. Which reduces quality of waste which to be minimized. As per Environmental Status Report, the waste generated at Moshi garbage's depo daily is about 811 tonnes. PCMC has supplied 401 vehicles for domestic garbage's collection which cost is almost 4500 per tonnes for turning the bio-degradable waste into compost. The compost which is generated from waste is used in all PCMC gardens as well as it is distributed to concessional rate to housing societies and free of cost to industrial units. This is a method which helps the environment to keep clean and green.

As, after the studying the projects Moshi plant, we have come to know that waste generated disposed in the plant is now-a-days overburden. So, civic official shared that PCMC is in possession of 22 hectares land for garbage depo at Punawale. And state government had given its approval to the project load back in 2008. The aims of this project is back to reduces load of the city for next 30 years. They hope this all is due to generation of waste is more day-to-day due e to growth in population. So, there should to be method to reduce waste generation at the initial stages i.e. at home only.

III. RESULTS

1.By using chemicals (Paul-o-pine, Sanitreat) and culture (Biomass) organic waste is recycled into compost.

2.This operation of recycling is done on designed system of compost bin.

3.Desired good quality compost obtained after 7-8 days of detention period.

IV. CONCLUSIONS

Compost bin is a simple and useful system to manage the organic fraction of household waste.This compost bin system helps alternatively reduce the stress on landfill site.As waste is treated at source only, this benefits our benefits our environment by decreasing transportation cost, control the environment pollution, leachate problem is also solved.Composting has clear benefits from both ecological and economical perspectives, as it is an important process for the promotion of organic waste recycling.

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Carbon Footprint for PCCOE&R Ravet, Pune Campus (May 2018)

Rohit Borate[1], Sameer Dakhanishaikh[2], Akshay Chaudhari [3], Pankaj Divekar[4], Satish Pitake[5].

[1] UG Student, Civil Engineering Department, Pimpri Chinchwad College of Engineering Research, Ravet
[2] UG Student, Civil Engineering Department, Pimpri Chinchwad College of Engineering Research, Ravet
[3] UG Student, Civil Engineering Department, Pimpri Chinchwad College of Engineering Research, Ravet
[4] UG Student, Civil Engineering Department, Pimpri Chinchwad College of Engineering Research, Ravet
[5]Asst.Professor, Civil Engineering Department, Pimpri Chinchwad College of Engineering Research, Ravet

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ABSTRACT

In greenhouse gas the carbon dioxide is the major pollutant gas which emits or results from human actions and affected on environment. The emission of carbon dioxide is depends on our daily activities. The transportation, cooking, burning of coal and CNG gas, Electricity, heating of oil, product manufacturing etc. are the source of carbon emission. It is measured in tones. The one carbon credit means one tone of carbon dioxide. This paper deals with the study and analysis of the factors which emits one of the greenhouse gas carbon dioxide in college campus and find out countermeasures over it. By analyzing data to suggest remedial actions for reduce carbon dioxide emission and possibly change the particular parameter which is more responsible of carbon dioxide emission.

INDEX TERMS Carbon footprint, global warming potential, Greenhouse gases, transportation, Electricity consumption, Population, canteen Waste

I. INTRODUCTION

Global warming is biggest challenge in the front of world. Main parameter responsible for global warming is greenhouse gas emission. Due to rapid industrialization and increasing population and urbanization carbon concentration in the environment increases day to day. Now days we cannot stop carbon emission through their sources but we can reduce the carbon emission and there certain limits. It not only increase global warming but also adversely affects on human body and animals.

Greenhouse gases emitted directly by transportation burning, combustion of fuel and consumption of domestic energy. These are primary carbon emission parameter. Secondary emission parameters are indirectly emit a carbon through their life

Greenhouse gases mainly contain carbon dioxide (CO2), methane (CH4), Nitrous oxide (N2O). Main Sources of greenhouse gases in college campus identified as population, vehicles, electricity, LPG gas, Canteen waste, Combustion of fuel.

Objectives

- To analyze and measure GHG (CO2, CH4, N2O) emission through various elements in college campus
- To calculate zone wise value of Carbon footprint through selected parameter in the college campus.
- To find out Carbon footprint of PCCOE&R campus for September 2017 to February 2018.
- To suggest the remedial actions for collage to reduce carbon footprint

II. METHODOLOGY

Determination of carbon footprint consists of two phases such as defining the carbon footprint and quantifying the carbon footprint.

Phase I: Defining the carbon footprint

A. Define project.
B. Define project location
C. Define project duration

D. Define relevant & convenient zones for the college campus as it is a large area.
E. Define GHG inventory parameters
F. Emission factors for different parameters

Phase II: Quantifying the carbon footprint
A. Collection of source data
B. Estimate and model missing data.
C. Calculate GHG emissions
D. Results and conclusion
E. Suggestion of measures to reduce GHG emission.

Phase I:

A. Define Project.

To find out quantity of carbon dioxide emission which causing harmful effects on environment also contribute some remedial measure for environment pollution. We defined project in zone wise for value of Carbon footprint for the college campus and to suggest the remedial actions for collage to reduce carbon footprint

B. Define project location

The selected area Pimpri Chinchwad collage of engineering and research Ravet Pune campus is situated at 18°39'03.76"N ,73°44'31.61"E.

FIGURE 1 Project Location PCCOER, Ravet, Pune

C. Project Duration

Relevant data collected from September 2017 to February 2018 and in these 6 months found out the carbon emission monthly, quarterly and analyzed most carbon emitter month.

D. Define relevant & convenient zones for the college campus as it is a large area.

We divided the college campus in five convenient zones on the basis of parking area and various departments are shown in as figure.

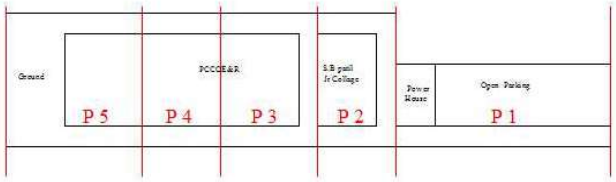

FIGURE 2 Divided Zones of college campus

E. Define GHG inventory parameters

1) Human Parameter

Humans are continuously emits carbon dioxide which cannot be neglect. The average respiration rate is around 16 breathes per minute an average person's respiration generates approximately 450 liters (roughly 900 grams) of carbon dioxide per day. Thus the carbon emitted through human body is 0.9 kg/day

2) Transportation Parameter

Transportation is main parameter contribute to emission of GHG in around world. Greenhouse gases take place in transportation due to fossil fuels consumption. GHG emission is different for different type of fuel and type of vehicle. In transportation parameter mainly CO2, CH4 and N2O are GHGs emits.

3) Electricity parameter

Electricity parameter which is much contributes to emission of carbon. An average electricity source generates 0.0005883 metric ton carbon dioxide per kilo watt. The electricity consumption in collage is different in different zone according to number of class room and labs.

4) LPG And Natural Gases

Burning of one liter LPG gas can release 1.5 kg of carbon dioxide to the environment. The consumption of LPG gas is observed in college canteen.

F. Emission factors for different parameters

Sr. no	Emission Parameter	Carbon Emitted
1	Human	0.9 kg/day
2	Petrol	2.3kg /lit
3	Diesel	2.7Kg/ lit
4	Electricity	0.6895 kg/kwh
5	LPG	1.5 Kg/lit

Transportation (2- wheeler)

Sr.no	Emission Parameter	CO_2 (kg/km)	CH_4 (kg/km)	N_2O (kg/km)	Total (kg/km)
1	Less Than 125 CC	0.085	0.00018	0.002	0.08718
2	125CC To 500 CC	0.103	0.00018	0.002	0.10518
3	Above 500 CC	0.137	0.00018	0.002	0.13918

Transportation (Petrol Car)

Sr. no	Emission Parameter	CO_2 (kg/km)	CH_4 (kg/km)	N_2O (kg/km)	Total (kg/km)
1	Small Car	0.243	0.00053	0.00123	0.245
2	Medium Car	0.271	0.00053	0.00123	0.273
3	Large	0.328	0.00053	0.00123	0.329

Transportation (Diesel Car)

Sr. no	Emission Parameter	CO2 (kg/km)	CH4 (kg/km)	N2O (kg/km)	Total (kg/km)
1	Small Car	0.151	0.00001	0.00187	0.153
2	Medium Car	0.239	0.00001	0.00187	0.241
3	Large	0.280	0.00001	0.00187	0.282
4	Bus	0.567	0.00009	0.00300	0.570

III. RESULT AND ANALYSIS

A. Zone wise monthly carbon emission

Month: September

Zone	P1	P2	P3	P4	P5	Total Kg
Carbon Footprint in Kg	493.12	4808.92	5199.33	7006.39	15035.59	26577.83

Month: October

Zone	P1	P2	P3	P4	P5	Total Kg
Carbon Footprint in Kg	258.72	2677.33	3834.98	4894.51	11882.3	23547.84

Month: November

Zone	P1	P2	P3	P4	P5	Total Kg
Carbon Footprint in Kg	235.68	4065.55	2159.34	2614.83	11499.39	20574.79

Month: December

Zone	P1	P2	P3	P4	P5	Total Kg
Carbon Footprint in Kg	230.1	4212.9	2424.95	3823.02	9357.52	20048.49

Month: January

Zone	P1	P2	P3	P4	P5	Total Kg
Carbon Footprint in Kg	785.38	2233.3	3748.67	5305.41	13716.8	25789.56

Month: February

Zone	P1	P2	P3	P4	P5	Total Kg
Carbon Footprint in Kg	368.88	2126.97	3920.14	5353.99	10751.93	22521.91

B. Total Monthly Carbon footprint

Sr. No	Month	Total Carbon Footprint In Kg
1.	September	26577.83
2.	October	23547.84
3.	November	20574.79
4.	December	20048.49
5.	January	25789.56
6.	February	22521.91

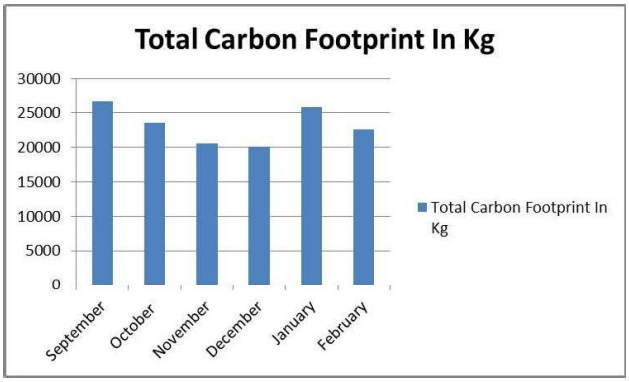

FIGURE 3 Graph showing Carbon Footprint monthly in Kg

IV. CONCLUSION

Analysis of the Carbon footprint is basically a fair evaluation of the Carbon dioxide potency in the region under study. This gave us an idea as to how contaminated our environment. It also provided us with the details regarding the amount up to which the inventories affect emission levels, helping us to know how and up to what extend each of our actions effect changes in the environment. This study is a sure shot that would help us realize and look back at each of our activities, and how exactly it have changed the very world we inhabit. The scope of such a study is very much relevant in the current scenario of rising carbon dioxide levels in our very own ecosystem. In PCCOE&R college campus it seems that higher carbon footprint parameter is Electricity consumption about 42% of total carbon footprint and second highest emission parameter is population about 31% of total carbon footprint. Also third and fourth emission parameters are LPG gas and Vehicles which have carbon footprint emission about 27% and 10% respectively. In Zone wise carbon footprint it seems in P5 zone is highest carbon footprint emission zone.

V. SUGGESTION TO REDUCE CARBON FOOTPRINT

The following effective measures can be suggested to reduce the present carbon footprint value in the next academic year.

A. HUMAN FACTOR

1) Emission through human which cannot be reduce but by plantation of trees
2) One student one tree

B. TRANSPORTATION

1) Use energy efficient fuels for transportation, especially in the case of college & school buses.
2) Use vehicles adhering to emission norms.
3) Purchase vehicles with competitive mileage & fuel efficiency.
4) Encourage use of public transport facilities.
5) Car pooling can be encouraged.
6) Ensure proper inflation of vehicle tires.
7) Use of Bicycles can be encouraged
8) Encourage walking when it comes to short distances.
9) Remove unnecessary weight from vehicles.
10) Use unleaded petrol in vehicles.
11) Reduce use of petroleum products.

C. ELECTRICITY

1) Use electricity effectively.
2) Use the 'OFF' switch, rather than the 'STAND BY' mode.
3) Switch off fans & lights when not in use.
4) Use LEDs instead of conventional light sources.
5) Check for Green Tags before purchasing goods.
6) Air Conditioning should be minimally used.
7) Keep equipments in power save mode.
8) Use solar power.
9) Make use of wind energy.

D. LPG

1) Use LPG efficiently.

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Compact Waste Water Treatment Unit with the Provision of Water Clarification and Sludge Processor.

Bobade Sudarshan S.[1], Kulkarni Shubham S.[2] ,Parade Vaibhav L.[3], Hasabe Reshma R.[4], Gadekar Priyanka K.[5]

[1]Assistant Professor, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.
[2] UG Student, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.
[3] UG Student, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.
[4] UG Student, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.
[5] UG Student, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.

ABSTRACT

Water pollution is increasing and becomes severe day by day and posing a great risk to human health and aquatic life. As per the analysis all these rivers are mainly get polluted due to waste water from industry and the domestic waste. Waste water treatment process becomes difficult due to input of highly contaminated raw water through tributaries, so it becomes lengthy and costly process. As per latest news from local newspaper as well as news channels the "river pollution" becomes a big problem in front of society. In urban area water treatment plant facing problem of overloading due to waste present in raw water. According to our observation we observed domestic as well as industrial waste into the river water. When domestic waste directly discharged into river the nitrate contain in the river is beyond their limit and due to nitrate contain, "growth of water hyacinth increases" and it effect on physical properties of river like- Decreasing DO contain, Blockage for boating and other water supply systems. So we have to provide a solution over this problem to reduce the concentration of water contamination of any river by controlling waste at tributaries level. The present study relates to a Compact waste water treatment unit. The study involves a system of sludge digestion, de-slugging, de-nitrification, activated carbon bed, sludge drying and chlorination for waste water purification. It reduces food for growth of water hyacinth. The entire system and its working mechanism protect the river form pollution by reducing the growth of water hyacinth. The said system mainly works on removal of nitrate, phosphate and sludge form waste water.

INDEX TERMS Water Hyacinth, Nitrate, Compact waste water treatment unit, Denitrification, Activated carbon bed and Chlorination.

I. INTRODUCTION

Water is one of the most precious resources on earth without which there would be no life on earth. Now a day's water pollution is a major global problem. It is an acute problem almost in all major rivers. Water pollution is increasing and becomes severe day by day and posing a great risk to human health and aquatic life. As per the analysis all these rivers are mainly get polluted due to waste water from industry and the domestic waste seen in Pavana river the velocity of water is much less during summer season, so due to pollutants the water hyacinth grows very rapidly and covers the entire surface area within a short time. Because of this the contact between air and water surface is completely reduced and the amount of dissolved oxygen present in the water is decreases.

Water hyacinth can tolerate low water nutrient levels but will only experience slow growth. It will readily invade and thrive in waterways that have high amount of nutrients, requiring high level of phosphorus, nitrogen and potassium for optimal growth. The ideal temperature for water hyacinth growth is 20-30^{0}C, but it can still maintain good growth rates at temperatures between 20^{0}C and 35^{0}C. Preferring tropical or sub-tropical climates, but temperature below 10^{0}C will slow or stop growth. It can survive mild frosting, but severe frosts and prolonged cold weather may result in plant death.

Water hyacinth mainly decreases the oxygen level results in a changed aquatic habitat, as it reduces fish diversity and impacts on other aquatic flora and fauna communities. Submerged plant communities are affected by the thick floating water hyacinth mats, as they block sunlight and absorb large amounts of nutrients that are required by these organisms to photosynthesis. There are potential ecological or economic damage due to large colonies of the water

hyacinth blocks the waterways and can affect transport and recreational boating activities due to physical barrier.

II. METHODOLOGY

a) Theoretical Approach: -

1. Water hyacinth blocks waterways and can affect transport and recreational boating activities due to physical barrier. To reduce the chances of blocking there is necessity of removing water hyacinth.
2. To increase the percentage of dissolved oxygen and to maintain good condition for aquatic life removal of water hyacinth is necessary.
3. To reduce the loss of evapotranspiration it mainly caused due to availability of water hyacinth on surface of river.
4. To reduce the chances of clogging of intake of irrigation, hydropower and water supply scheme by controlling the growth of water hyacinth.
5. To develop the fishing by increasing the percentage of dissolved oxygen and reduce the physical barrier which mainly caused by spreading of water hyacinth on surface of river.

b) Experimental approach: -

1. To collect various samples of river water at its tributary levels affected by water hyacinth.
2. To find food required for the growth of water hyacinth and to fix the remedial measures for reduction of water hyacinth there is necessity to conduct various standard tests under environmental engineering.
3. To prevent the growth of water hyacinth there is necessity to introduce chemical solution with suitable mechanical process.
4. To analysis the mechanical solution with respect to the feasibility, economy and the eco-social aspect.
5. To examine the introduced technique with respect to standards for validation.

III. WORKING PROCESS

1. Raw water tank (inlet tank)

Inlet tank provide for supply of raw water to all settling tank through connected pipe system. Inlet valve provided at top for supply the raw water in inlet tank and again one inlet tank provided at bottom side with foot valve and screens through this inlet raw water supply to all settling tank.

2. Screening system (inlet tank)

At the bottom side of inlet tank screening mainly provided for removing large and unwanted sludge and particles which mainly blockage the system so screening part is very much important in terms of maintenances and working of model.

3. Supplementary arrangement (inlet tank)

At top side another inlet provided for pure water supply so we provide pure water one twentieth (1/20 X sewage water) part of sewage water for dilution purpose or proper mixing of sludge without any difficulty. Supplementary arrangement provides on college site only due their necessity there is no compulsory provision at all place.

4. Settling tank no.: - 1

This is a first settling tank in which raw water enter through inlet tank and then all entering water passes from tank one to another tanks. This is very much important tank as per velocity and pressure control in this tank of settling of sludge also occur.

5. Settling tank no.: - 2

In this tank raw water coming from settling tank one and this tank also provides same function like settling tank one for settlement of sludge.

6. Odour removal tank: -

This is a tank number three which mainly provide for odor controlling of waste water for that we used bleaching powder as odor controlling solution. According to design of doses and analysis dose for bleaching powder is also design and as per design dose apply bleaching powder in waste water. Bleaching powder is not harmful for waste water hence without any confusion and difficulty we can easily use bleaching powder. Aeration also provide for proper mixing of bleaching powder and increasing dissolved oxygen of waste water.

7. Denitrate tank: -

This is a tank number four which mainly provide for removing nitrate from waste water for that we use Denitrate solution which is mainly stone type. This stones placed in net bag through this bags all waste water passes and percentage of nitrate remove after passing through this Denitrate stones. This are function of Denitrate solution we use mainly for removing the nitrate and achieve our main aim of nitrate removal by using this solution and also as per design doses their percentage is applying on waste water. Aeration also provide for proper mixing and increasing dissolved oxygen of waste water.

8. Activated carbon bed: -

This is a tank number five in which mainly activated carbon bed provided for removing the bacteria, pathogens or any

harmful substance as per we know activate carbon is absorption agent hence this bed absorb all types of impurities and removing this from water. Due to this function we used activated carbon bed it is economical, safe and easy for removing harmful substance as per design doses we fixed the dose for bed preparation and activated carbon bed are preparing for that we used small cotton activated carbon bags having some holes for proper functioning and through these bed all waste water are passes and absorption also carry out through this bed as per requirement this bed replaced.

9. Chlorination tank: -

This is a tank number six which provide for chlorination purpose chlorination mainly provides for killing pathogens and this is act as a disinfectant. Some residual chlorine is also available after treatment hence we safe against the future contamination. Chlorination also design the dose and as per design we fixed the doses for water which mainly passing from activated carbon bed and their polluted level is almost less as compare to first stage of raw water. Aeration also provide for proper mixing of chlorine and increasing dissolved oxygen of waste water.

10. Aeration tank: -

This is a tank number seventh and it is mainly providing after chlorination tank the main function of this tank is mixing the chlorine, aeration and settling if any and for that aeration provided in tank.

11. Sump tank: -

This is a tank number eight which mainly called as a sump tank means storage of treated water and after storage this water discharge through outlet provide in sump tank. The main function of this tank is only storage of treated water and supply through outlet at their respective place.

12. Outlets: -

Outlet provide at top portion of sump tank for proper discharging the treated water for that we provide proper arrangement and also sample collection system provide for testing the outlet sample and comparison both inlet and outlet test result for finding out efficiency of model. Also for sludge removal sludge outlet provided at bottom side of each tank.

13. Back washing system: -

Back washing system provide for cleaning the system automatically without any manual operation for that we provide a system such that through this system clean water enter in all tanks and after all cleaning water may recycle or again supply in inlet tank through pipe. And also we remove all water in tank which not discharge through outlet due to level difference after washing we recirculate water in inlet tank and this water is treated which mainly polluted due to cleaning hence chances of wastage of water for cleaning the system is totally remove.

14. Sludge mixing system: -

There is no settlement of sludge in inlet tank we provide sludge mixing system and also in case of raw water sewage the physical properties of sewage sludge are varying so for proper mixing of sludge and keep this sludge in suspension we provide sludge mixing system.

Figure 1. Compact waste water treatment unit

IV. OBSERAVATION TABLE

TABLE I
OBSERAVATION TABLE

Sr.No.	Parameter	Raw water (Influent)	Treated water (Effluent)	Permissible limit
1	Temperature	30^0C	28^0C	Shall not exceed 5^0C above the receiving water temperature
2	Turbidity (NTU))	10	5	5
3	pH	7.25	8.20	5.5 to 9.0
4	Nitrate (mg/l)	4.50	2.20	10

V. RESULT AND ANALYSIS

Temperature:-

Temperature of fresh sewage is slightly more than the normal water temperature. According to test result, temperature of fresh sewage was 30^0C and after treatment it decreases up to 28^0C hence after treatment we can directly discharge water into inland surface water.

Turbidity:-

The turbidity depends on the quantity of solid matter present in suspension state. The turbidity can be determined by the Nephlometric turbidity meter. According to test result, turbidity of raw sewage was 10 NTU and after treatment it decreases up to 5 NTU so the range of turbidity is reached up to permissible limit.

pH:-

The pH value of value of sewage indicates the logarithm of reciprocal of hydrogen ion concentration present in the sewage. According to test result, pH value of fresh raw sewage was alkaline (7.25) and after treatment it increases up to 8.20 so the result was in between permissible limit.

Nitrate:-

As we know the basic principal of this paper is removal of nitrate concentration from sewage water so more attention was given to the result of nitrate concentration. According to test result, nitrate value of fresh raw sewage was 4.50

mg/l and after treatment it decreases up to 2.20 mg/l hence the test result within the permissible limit.

VI. CONCLUSION

The result generated after the treatment we observed that all parameters like- temperature, turbidity, ph and nitrate meet the permissible standards.

Hence it is possible to discharge treated water directly into inland surface water.

ACKNOWLEDGMENT

Research or study on a project is of great importance in one's life because this is an overall application of the knowledge of one's mind. So we are now satisfied with our step of completing the research on our project i.e. **"COMPACT WASTE WATER TREATMENT UNIT WITH THE PROVISION OF WATER CLARIFICATION AND SLUDGE PROCESSOR"**.

We are thankful to our respected Principal **Prof. Dr. H. U. Tiwari**, and also our Head of Department, Prof. **M.M. Yeole**, for permitting us to work on this project and for encouraging us throughout this operation. We are very grateful to our project guide, **Prof. S. S. Bobade**, for being there with us in every step for completing this project and for showing the path of new ideas which helped us grow in every possible way we could. His readiness for consultation at all times, his technical comments and inputs, his concern and assistance have been helpful.

We are also thankful to the teaching and non-teaching staff of our department for supporting us by direct or indirect means. Lastly we are very grateful to our Parents and friends who have encouraged us throughout this project.

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Provision of Concrete H-Block for Construction

Sudarshan S. Bobade[1], Akshay B. Markad[2], Arbaaz S. Khan[3], Dhananjay G. Patil[4], Prateek R. Dabhade[5]

[1]Assistant Professor, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.
[2] UG Student, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.
[3] UG Student, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.
[4] UG Student, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.
[5] UG Student, Department of Civil Engineering, Pimpri Chinchwad College of Engineering and Research, Ravet.

ABSTRACT

Rapid urbanization and population growth has created terrific boost in construction industries. There is a need for economical as well as less time consuming work methods. As of now, we use conventional & mostly outdated work practices. To overcome this problem, many research works are being carried out throughout the world. Simultaneously on the other hand, landslides are common phenomenon occurring every year in many hilly areas throughout India and some major Asian countries. Due to increasing population, and for providing good transportation facilities along with slope modification for building roads, tunnels, etc. have gained significance. To support & stabilize these facilities, retaining structures play a very vital role. Many times these retaining structures are to be constructed in extremely challenging nature conditions, where proper transportation of materials &carrying out construction is quite difficult. To overcome these limitations alternate construction materials (methods) providing effective & efficient solutions needs to be devised. Detailed study of all the main properties affecting Hill Slope stability needs to be done beforehand devising a probable solution.

This project deals with development of a new construction material, which will be versatile, portable, possess interlocking property as well as overcome limitations of brickwork – which will indirectly reduce time taken for construction. H-blocks designed in this project will ease the process of construction of retaining structures by its interlocking property. Lowering of slope to gain stability to prevent landslides by skillful arrangement and design of H-blocks, these methods are devised in this project. The Interlocking property of the designed H-blocks will be useful for construction of compound walls, partition walls, & many other structures. Design & fixing dimensions for H-blocks is done by Pythagoras Method and by software sketch up.

INDEX TERMS RE Walls, H-blocks, Reinforced Earth Wall, Synthetic Geo Grid

I. INTRODUCTION

This is a project report from successive research and patent by Mr. Rajendra Ladkat on "A DESIGN AND STUDY OF RETAINING WALL METHOD OF PRECAST BLOCKS TO PREVENT LANDSLIDE" undertaken by patent co-operation treaty PCT with international search report received at international bureau on 19 April 2016 the original work done by Rajendra Ladkat and published internationally on DFID. The project is based on the new invention done by him, as entitled the name of project is carried out with new concept of precast H BLOCKS to prevent landslide by using it in constructing retaining wall. This report summarizes the approaches developed, which extracts common themes that are likely to apply whatever the region under study. Landslides are a common natural hazard throughout much of the developing and developed world. However, from a geological viewpoint landslides are nothing exceptional. Indeed, over longer periods, land sliding is probably the main erosional process operating in any region. Thus prevention may only be possible to a limited point of study. Few measures that should be taken For example are, a land clearance in inappropriate terrain could be prohibited or a road redirected across less hazardous ground.

A precast H-block interlocks each other to form sloping wall. A geo-synthetic material sheet passing through alternate layers of the aligned H-BLOCKS is to be used to strengthen the earth mass that needs to be stabilized.

II. LITERATURE REVIEW

1.Anand, K. B., and K. Ramamurthy. "Development and performance evaluation of interlocking-block masonry." *Journal of Architectural Engineering* 6, no. 2 (2000): 45-51.

This paper presents the status of interlocking block masonry, highlighting salient features of the widely used block geometries and following with details of the design concepts of solid interlocking blocks developed by the writers. A comparison is made of the axial and eccentric compression and flexural performance of mortarless masonry with those of conventional mortar bonded masonry. The need for further acceleration of the rate of construction led to the elimination of bedding mortarand thereby to the development of nonconventional methods of masonry construction techniques, ones that adopted special interlocking blocks as well as conventional blocks (Anand and Ramamurthy 1999). With the use of conventional blocks, adoption of partial grouting and surface bonding becomes essential. Interlocking blocks differ from conventional blocks in that the units are assembled together using geometrical features incorporated in the unit without the aid of mortar.

2.Ahmad, Rafiq, Mohammad Iqbal Malik, Mohammad Umar Jan, Parvez Ahmad, Himanshu Seth, and Javaid Ahmad. "Brick Masonry and Hollow Concrete Block Masonry–A Comparative Study." *International Journal of Civil and Structural Engineering Research (IJCSER)* 1, no. 1 (2014): 14-21.

Testing of individual hollow concrete block and brick units:

The individual hollow concrete block and brick units were tested for compression under Compressive Testing Machine and strength values were obtained and compared and are represented in table x. The average compressive or crushing strength for hollow concrete blocks of size (16”x8x8”) and (8”x8x8”) came out to be 34.99 Kg/cm2 and 28.05 Kg/cm2 respectively. While as the average compressive or crushing strength of individual brick units of size (22.5x10x7.5) cm comes out to be 113.33 Kg/cm2 .

3. Federal University of Technology, Akure (Nigeria). Dept. of Urban, and Regional Planning. *Journal of Urban and Environmental Research*. Vol. 3, no. 1. Department of Urban and Regional Planning, Federal University of Technology, 2003.

This paper reports a study on the preference level for the use of interlocking masonry over the conventional types in sustainable housing delivery in Nigeria. Globally, buildings are the largest energy consumers and greenhouse gases emitters, consuming over 50% in some cases. Common materials used for masonry works in housing delivery in Nigeria such as sandcrete blocks and burnt bricks impact high energy and greenhouse gases on the environment due to the production processes involved. Intelligent choice of building materials capable of reducing energy used in buildings is imperative towards achieving materials efficiency and cost reduction. In this study, a comparative survey was carried out empirically among selected professionals in the building industry from 4 out the 6 geo-political zones in Nigeria through the use of questionnaire, direct
observations, and interview schedules. Analyses of Chi-square test for significance of differences between materials price rating and acceptability of interlocking masonry as well as level of willingness of respondents to use the selected materials for future projects were conducted. Findings signify shorter time of construction and reduced cost of construction expended when interlocking blocks are used. The study concludes that interlocking masonry is a good replacement to the conventional types in construction of housing in Nigeria.

4. Singh, Harangad, and S. Aktar. "A review on economic analysis of Reinforced Earth wall with different types of Reinforcing materials." *Ultemas iv*.

This paper consists of reinforced earth technology in reinforced earth retaining wall construction which is cost effective compared to conventional concrete retaining walls. Further more, these systems are more flexible than the earth retaining walls. Therefore they are suitable for sites with poor foundation and seismicly active areas. The paper shows The retaining wall is designed on the basis that the earth is retained behind the wall and major loading is on the wall whereas, in its counterpart (Reinforced Earth Wall) the friction between the earth and the reinforcement shares the load which is then transferred to the ground. The reinforcement thus develops tension and the earth behaves as if it has cohesion. The economic benefit achieved from the Reinforced Earth Wall increases with the increase in the height of the wall. The per cent savings of the internally stabilized walls may range from 40 to 65%.

For this study they have considered a wall of different heights and changing its back filling material with Local Earth, Granular Sub base and sand to get a basic understanding of the cost economics of the backfill material. All these material were tested for the minimum requirement of backfill properties. Similarly, by changing the Various Reinforcing elements available in an RE Wall we can understand that the cost of RE wall is dependent on Reinforcing material and backfill material only. All the rates for study are in accordance with SOR 2014 issued by MPPWD for road and bridges.

III. PROBLEM STATEMENT

I) In case of extremely hilly terrains, it becomes tedious to carry out construction of retaining walls.
II) Outdated, time consuming, costly constructions are adopted.
III) No provision of economic, versatile construction material.
IV) Limitations observed in case of brick work and paving blocks.

IV. OBJECTIVES

I) Study feasibility of H-BLOCKS in retaining walls.
II) To develop a new construction material.
III) To commercialize H-BLOCKS.

V. METHODOLOGY

V.I) Experimental Analysis:

V.I.I) Material Selection:

1) Steel used is 6mm.
2) Aggregate used of size MSA 20.
3) Crush sand.
4) 53 Grade cement OPC.
5) Water as required.
6) Binding wire.

V.I.II) Quantities of material:

1) Cement used is 10.12 kg as per M20 grade concrete
2) Sand used is 15.18 kg.
3) Aggregate used is 30.36 kg
4) Steel used Fe500
5) H-Type steel frame 1.24 kg.

V.I.III) Mould & Steel frame:

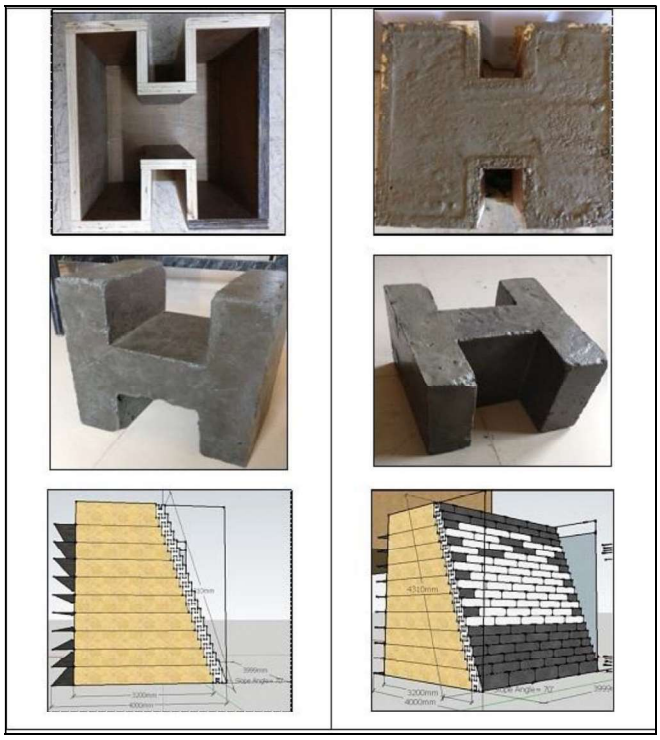
1) Mould size 24 x 30 x 30 cms.
2) Cover of 10mm from each sides.

V.II) Casting of concrete:

1) Casting is done with M20 grade of concrete.
2) Casting can produce very complex geometry parts with internal cavities and hollow sections.
3) It can be used to make small (few hundred grams) to very large size parts (thousands of kilograms)
4) Formwork removed in single day and cured for 28 days.

VI. ESTIMATION

ITEM	QUANTITY	RATE	AMOUNT
1. Excavation	23.8 m^3	69.2	1646.96
2. Concrete	4m^3	4771.1	19084.4
3. Geotextiles	108m	60	6480
4. AC Pipe	100mm dia. 4m	150	600
5. Backfill 1. Aggregates 2. Cohesive	 7m^3 25m^3	 638.6 144	 4470.2 3600
TOTAL			35880/-



Photograph No. 1.1: Mould for H-block, H-blocks and Software outputs

VII. CONCLUSION

1) Proper interlocking provides effective workmanship and strengthen wall with aesthetic effect.
2) These types of blocks reduce the construction time of retaining walls by using pre-casted blocks.
3) Proper interlocking provides effective workmanship and strengthen wall with aesthetic effect.
4) These blocks provide with an effective solution using reusable blocks.
5) Also these types of pre-casted blocks overcome the height limitations of the existing precast blocks.

VIII. ACKNOWLEDGMENT

Research or study on a project is of great importance in one's life because this is an overall application of the knowledge of one's mind. So we are now satisfied with our step of completing the research on our project i.e. **"PROVISION OF CONCRETE H-BLOCK FOR CONSTRUCTION"**.

We are thankful to our respected Principal **Prof. Dr. H. U. Tiwari**, and also our Head of Department, Prof. **M.M. Yeole**, for permitting us to work on this project and for encouraging us throughout this operation. We are very grateful to our project guide, **Prof. S. S. Bobade**, for being there with us in every step for completing this project and for showing the path of new ideas which helped us grow in every possible way we could. His readiness for consultation at all times, his technical comments and inputs, his concern and assistance have been helpful.

We are also thankful to the teaching and non-teaching staff of our department for supporting us by direct or indirect means. Lastly we are very grateful to our Parents and friends who have encouraged us throughout this project.

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Rainwater Harvesting - A Case Study at Pimpri Chinchwad College of Engineering and Research, Ravet

Amar Shitole[1], Yogesh Birajdar[2], Jayant Shinde[3], Shyam Yesane[4]

[1] *(Civil Engineering, Pimpri Chinchwad College of Engineering and Research Ravet, India)*

[2,3,4] *(Civil Engineering, Pimpri Chinchwad College of Engineering and Research Ravet, India)*

ABSTRACT

At the rate in which India population is increasing, it is said that India will surely replace China from its number 1 position of most densely populated country of the world after 20-30. These will lead to high rate of consumption of most valuable natural resource "Water" resulting in augmentation of pressures on the permitted freshwater resources. Ancient method of damming river and transporting water to urban area has its own issues of eternal troubles of social and political. In order to conserve and meet our daily demand of water requirement, we need to think for alternative cost effective and relatively easier technological methods of conserving water. Rainwater harvesting is one of the best methods fulfilling those requirements. The technical aspects of this paper are rainwater harvesting collected from rooftop which is catchment areas from Institute building at P.C.C.O.E.R. Ravet campus. First, required data are collected i.e. catchment areas & hydrological rainfall data. Water harvesting potential for the college building was calculated, and the tank capacity with suitable design is being considered. Volume of tank has been calculated with most appropriate method of estimation. Optimum location of tank based on hydrological analysis and GIS analysis was done in the campus. Finally, Gutter design, its analysis, gravity chamber and filtration mechanism are also dealt with in detail. The result shows that the RWH system which will be applying in future will be of storage capacity 1521 cubic metre per year and the construction cost will be 3,90,840/-. The developed system satisfies the social requirements and can be implemented in rural areas by considering almost all the technical aspect.

Keyword: *Rainwater harvesting, Roof water system, pipeline conveyance, Underground RCC tank.*

1. INTRODUCTION

Water is essential to sustain human life, economic development and the functioning of eco-system. The water level in most part of the world in general and in India is going down considerably very low. Most of the towns and cities find water shortage during summer. People roam here and there for want of water. If this scarcity of water is not taken into consideration days may not be off when there will be war for water, Deforestation, development of concrete jungles tremendous increase in population poor water management etc. are various reasons for water shortage.

Globally about 2.3% of total rain is received on land and rest in the ocean. Of this only 2.5% of total rainwater available is fresh water. Out of this 69% water is present in non-potable forms like glaciers, icecaps, moisture in air and soil etc. Thus, ground water alone constitutes a major water source for human activities on the earth is the only source to sustain this water balance. Rapid urbanisation and industrialization in India have increased the water demand many folds. This is severely depleted ground water. Other sources like rivers and lakes have been exploited injudiciously and as a result, these sources have been contaminated with wastewater discharge into the them. Under such conditions, rainwater harvesting alone can receive the hope of recharging of ground water to maintain the water level and its availability.

As land pressure rises, cities are growing vertical and in countryside more forest areas are encroached and being used for agriculture. In India the small farmers depend on Monsoon where rainfall is from June to October and much of the precious water is soon lost as surface runoff. While irrigation may be the most obvious response to drought, it has proved costly and can only benefit a fortunate few. There is now increasing interest in the low-cost alternative-generally referred to as 'Rainwater Harvesting' (RWH).

According to Kim et al. (2005), rainwater harvesting may be one of the best methods available to recovering the natural hydrologic cycle and enabling urban development to become sustainable. The harvesting of rainwater has the potential to assist in alleviating pressures on current water supplies and storm water drainage systems. Rainwater collection has the potential to impact many people in the world.

As water harvesting is an ancient tradition and has been used for millennia in most dry lands of the world, many different techniques have been developed. However, the same techniques sometimes have different names in different regions and others have similar names but, in practice, are completely different (Oweis 2004). Consequently, there are a dozen of different definitions and classifications of water harvesting techniques and the terminology used at the regional and international levels has not yet been standardized (Nasr 1999).

Today, only 2.5 per cent of the entire world's water is fresh, which is fit for human consumption, agriculture and industry. In several parts of the world, however, water is being used at a much faster rate than can be refilled by rainfall. In 2025, the per capita water availability in India will be reduced to 1500 cubic meters from 5000 in 1950. The United Nations warns that this shortage of freshwater could be the most serious obstacle to producing enough food for a growing world population, reducing poverty and protecting the environment.

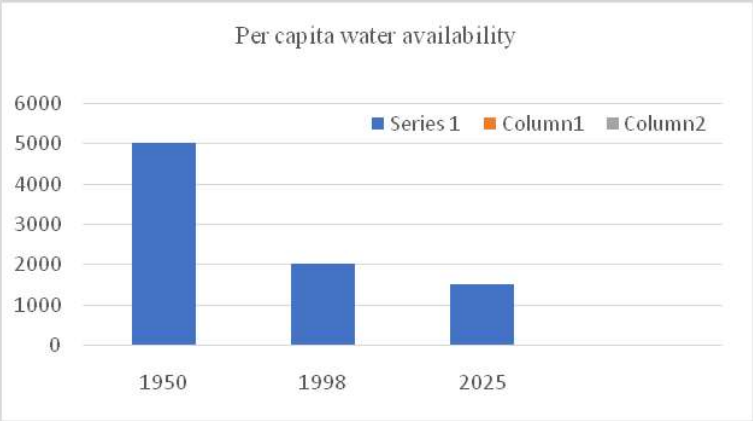

FIGURE 1: PER CAPITA WATER AVAILABILITY

1.1 PROBLEM STATEMENT

Design of rainwater harvesting system of PCCOER campus using Geographic Information System (GIS). For this taking catchment area of campus from parking area and roof top area. Demarcate and calculate area by using GIS. The slope of the catchment shall be checked by auto level. Analyse the potential of runoff from the rainfall from the catchment and suggest suitable recharge pit locations and volume of rainwater to be recharge in the ground. What will be the approximate expenditure for these recharge pits? If the institute wants to construct underground storage tank, what will be the approximate expenditure.

2. LITURATURE REVIEW

2.1 Reitano, Raffaella. "Water harvesting and water collection systems in Mediterranean area. The case of Malta." ***Procedia Engineering*** **21 (2011): 81-88.** systems of water collection and water harvesting, developing appropriate solutions to meet the specific needs of their ancient and present-day inhabitants by using traditional knowledge, building skills, and local resources, leading to solutions that to different extents, fit into the existing environment. This research helps to understand the different approaches in each country, resulting from climatic, geographical, socio-economic, and cultural conditions, as well as those related to spatial planning and urban development. Malta's case can be seen as a particular approach to this problem, which has led to a new source of water harvesting for common use. Malta has always been characterized by underground and rainwater shortages due to the intense but short rainfalls

2.2 Julius, J. R., R. Angeline Prabhavathy, and G. Ravikumar. "Rainwater Harvesting (RWH)-A Review." ***International journal of Innovative research and Development*** **2, no. 5 (2013).**This paper reviews the methods, design of rainwater harvesting systems, and its impacts adopted in all parts of the world. As water harvesting is an ancient tradition and has been used for millennia in most dry lands of the world, many different techniques have been developed. Gitte and Pendke (2002) conducted a study

on the water conservation practices, water table fluctuations and ground water recharge in watershed areas.

2.3 **Yadav, Manisha, and Baldev Setia. "Conceptualization and Design of an Efficient Groundwater Recharge System for NIT Kurukshetra."** ***Procedia Technology*** **25 (2016): 138-145.** NIT Kurukshetra is a large campus institute, Due to lack of an efficient drainage system, the campus turns into a system of pools at important locations. This accumulation of water for long durations creates an unhealthy environment for the inhabitants besides damaging the roads, pavement and foundation of buildings. Hence, keeping in view all the above problems and status of the campus, rainwater harvesting can be considered as one of the solutions for addressing the problem of accumulated rainwater in the NIT Kurukshetra. In this paper the have done detailed design of the components of rainwater harvesting through artificial recharge i.e. filter gallery, recharge well, recharge pit, inspection pit etc are provided. It is expected that the result of the study if implemented will certainly fulfill the dual objective of addressing the menace of water logging in the campus besides enriching the groundwater aquifer.

2.4 **Mwamila, Tulinave Burton, Zacharia Katambara, and Moo Young Han. "Strategies for household water supply improvement with rainwater harvesting."** ***Journal of Geoscience and Environment Protection*** **4, no. 09 (2016): 146.**There are significant household water supply challenges including quantity sufficiency and quality, which have economic and social implications. The challenges have remained despite the efforts of government establishing centralized or groundwater systems, and/or having individual crude systems. A Tanzanian rural household case study was considered by assessing the performance of a currently relied surface runoff collecting pond system for domestic purposes. A daily water balance model was applied with performance parameters, no water days (NWD) and rainwater usage (RUR). Rooftop runoff harvesting system was proposed as a water supply source in addition to the current one. In this paper The RWH technology strategies presented in this study.

2.5 **Raimondi, A., and G. Becciu. "Probabilistic design of multi-use rainwater tanks."** ***Procedia Engineering*** **70 (2014): 1391-1400.** In last decades the interest for the use of multi-use rainwater tanks is increased due to the great flexibility of operation modes they allow. They can have different configurations; often they are composed of different compartments each of them with a specific function. The coupling of a rainwater use tank with an infiltration basin allows to meet both the need of water saving and of local control of runoffs which would otherwise be handled by the urban drainage system. Rainwater collected from roof is generally not much polluted and can be used for different purposes representing, especially during dry periods, a precious source for water supply. A multi-use rainwater tank can satisfy these different requirements. On small scale, as in the case of multi-use rainwater tanks for buildings, the stochastic process of rainfall events should be closely considered, to make a reliable design of the facility. Although in literature several methods are proposed to take into account this process, mainly based on simulation techniques, the temporal interconnection among

events is often disregarded when direct approaches are considered. The use of analytical probabilistic approaches for the design of both infiltration basins and storage units in green buildings has been applied with good results by some authors (J.C.Y. Guo, 2001; Y. Guo, 2007). In this paper an analytical probabilistic approach to size multi-use rainwater tanks is proposed, aimed to find an optimal trade-off between the risk of water shortage and the risk of overflow.

2.6 **Badarnah, Lidia. "Water management lessons from nature for applications to buildings."** ***Procedia Engineering*** **145 (2016): 1432-1439**.Water management and regulation in buildings have been facing real challenges with the increasing environmental awareness during the last decades. Current concerns of shortage in water resources increase the demands to enhance water management strategies. In this respect, buildings should be able to gain, conserve, transport, and lose water adequately. Efficient water management solutions can be extracted from strategies found in nature. In this paper they classify a basic array of strategies for water management; discuss morphological features and active means; and list corresponding examples from nature, to facilitate the search for and the selection of strategies from the large database of nature, and inspire new design solutions. This literature review was carried out to source water management strategies found in nature. Special attention was given to organisms that live in deserts and employ unique strategies for adapting to extreme conditions, where they can obtain and conserve water, and prevent dehydration, among others. We find these organisms worth studying because of their extraordinary ability to manage water under water-scarce environments. This section classifies water management into four main functions: gain, transportation, conservation, and loss. One main objective of this paper is the systematic representation of the biophysical information for water management promoting the search for mechanisms to inspire new solutions for buildings. The relatively small amount of studies on biomimetic water management solutions for building applications has left a significant territory awaiting its grounds to be broken, and further research is required to test and validate the potential applications at the building scale.

2.7 **Campisano, A., D. Di Liberto, C. Modica, and S. Reitano. "Potential for peak flow reduction by rainwater harvesting tanks."** ***Procedia Engineering*** **89 (2014): 1507-1514.** The objective of the paper is to evaluate the potential of tank-based rainwater harvesting systems as source control methods to mitigate runoff flow peaks in urban areas. In the recent years, rainwater harvesting (RWH) is gaining increasing attention as a complementary supply source to save fresh water in urban areas. RWH systems normally make use of relatively small-size tanks to store rainwater collected over the building rooftop. Subject to basic treatment (normally filtration and/or chlorination), stored rainwater are locally used for both internal and external non-potable consumption (i.e. toilet flushing, garden irrigation, terrace cleaning, etc.). Rainwater tanks have been recognized also as a method to mitigate environmental impacts of urbanization on storm water drainage systems and receiving water bodies. It is then expected that very high time resolutions (in the order of the minute) are mandatory if the tank effect on the reduction of the storm water flow peak is explored. In that case, extended rainfall data sets

have to be treated and specific methods to disaggregate the household water demand data are to be used. Water balance simulations of rainwater tanks were carried out in this paper to explore the potential benefits of tank-based rainwater harvesting systems to reduce runoff flow peaks at the household scale. A specific procedure from the literature was also adopted to disaggregate available data from the daily time scale and to generate a synthetic series of toilet water demands for the one-year water balance simulation of the rainwater tank.

2.8 **Shaheed, Riffat, Wan Hanna Melini Wan Mohtar, and Ahmed El-Shafie. "Ensuring water security by utilizing roof-harvested rainwater and lake water treated with a low-cost integrated adsorption-filtration system."** ***Water Science and Engineering*****10, no. 2 (2017): 115-124.** Drinking water is supplied through a centralized water supply system and may not be accessed by communities in rural areas of Malaysia. This study investigated the performance of a low-cost, self-prepared combined activated carbon and sand filtration (CACSF) system for roof harvested rainwater and lake water for potable use. The most common sources of water used for drinking water supply and irrigation are surface water and ground water. Between the two only a small amount is accessible to humans, since most of the surface water is locked in glaciers, snow caps, and ice (Gleick and Palaniappan, 2010). The ecosystem is experiencing increasing pressure due to anthropogenic activities, such as urbanization, agriculture, industry, and infrastructure development. In general, this system performed satisfactorily and offers an attractive option to rural communities, or, during water crisis, a way of providing an alternative water source through the treatment of harvested rainwater (for short ADIs) and lake water. However, longer ADIs and abstraction of lake water require a greater height of activated carbon and sand layers (in the chambers) to ensure a higher quality of effluent.

3. METHODOLOGY

Rainwater Harvesting is a simple technique of catching and holding rainwater where its falls. Either, we can store it in tanks, or we can use it to recharge groundwater depending upon the situation.

3.1 STUDY AREAS

As discussed earlier in the section of introduction – importance of rainwater harvesting at PCCOER Ravet, we clearly came to know the all the advantages which we can draw out by implementing this small but highly efficient technique in the campus. Thus, to increase the potential, benefits of this system and draw maximum advantages from it, we need to have large rooftop areas which will be going to act as catchment areas. More the catchment areas more will be the surface runoff, and thus more will be the amount of harvested water.

The campus of Pimpri-Chinchwad College of Engineering and Research, Ravet (PCCOE&R) is situated at 18^0 38' 00'' N latitudes and 73 ^{0}44'41'' E longitudes and is located in the Paschim Maharashtra region of Maharashtra.

The campus of this institute is situated at the corner area of Pimpri-Chinchwad city. The institute surrounded by agriculture and residential area. The total strength of campus including students and staff peoples is more 1200. Thus, with this present strength and with the expansion, campus should also increase its facilities and maintenance requirements. Thus, water is most natural resource being always in high demands by human beings and is indispensable part of the life. Hence, keeping in view all the above problems and status of campus PCCOER, Ravet, administrative body focussed on water scarcity problem. Therefore, in this situation, rainwater harvesting system can be considered as a best solution for fighting against water scarcity in campus. [2]

3.2 DATA COLLECTION

The rooftop surface area is nothing but the catchment area which receives rainfall. Catchment areas of the educational building are measured. This measurement was done manually with the help of "measuring tape" which is the simplest technique known as, "tape survey". Before using the tape, tape was checked for any zero error and also length of the tape was also carefully checked for its accuracy. The total catchment area of the educational building is about 1946.54 square metre.

FIGURE 2: CATCHMENT AREA

3.3 MEASUREMENT OF CONSUMPTION OF RAINWATER:

Finally, we need to store the water which is obtained from the rooftop area of the buildings. The volume of tank which stores the harvested water will be directly proportional to the total volume of water harvested.

The consumption of water depends upon the number of consumers and their per head consumption of water.

For educational building the per head consumption of water is about 10 To 30 litre/head/day.

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And the number consumers of water in PCCOER campus are about 1500 including students of all branches, all technical and non-technical staff.

So, let us assume consumption of water per head is 10 litre/day.

Therefore, consumption of water of PCCOER campus = 1,500 X 10 = 15,000 litre/day

$= 15\ m^3/day$

Total water collected by RWH = 1951.19 m^3

Number of days harvested water can be use = 1951.19/15 = 130.07 days

= 4 months and 10 days

So, the water collected by RWH can full fill the 4 months and 10 days water requirement of campus.

3.4 COMPUTATION OF VOLUME OF RUNOFF PER YEAR

PCCOER campus has two buildings one for engineering and another for S. B. PATIL (11 & 12th). The total rooftop area of the PCCOER available for the rainwater harvesting is 1946.54m^2. The cumulative runoff that can be captured from the roof slab is calculated using tape survey. The cumulative rainfall runoff at the end of the year is calculated to be 1950.43m^3. The tank capacity can be estimated to be a lower value accounting for the continuous consumption going on during period of rainfall.

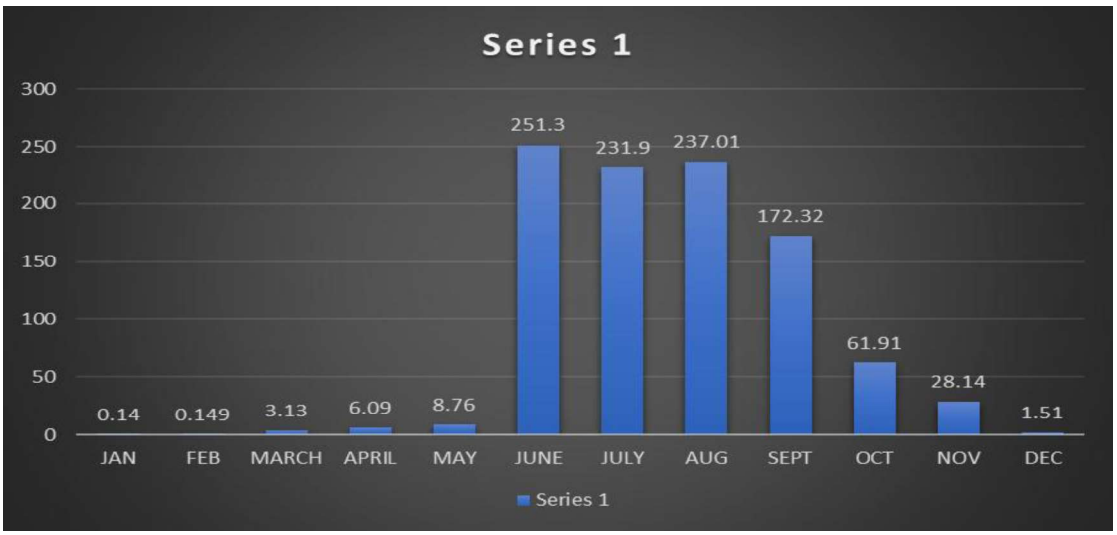

FIGURE 3: AMOUNT OF RAINFALL COLLECTED IN THROUGHOUT THE YEAR

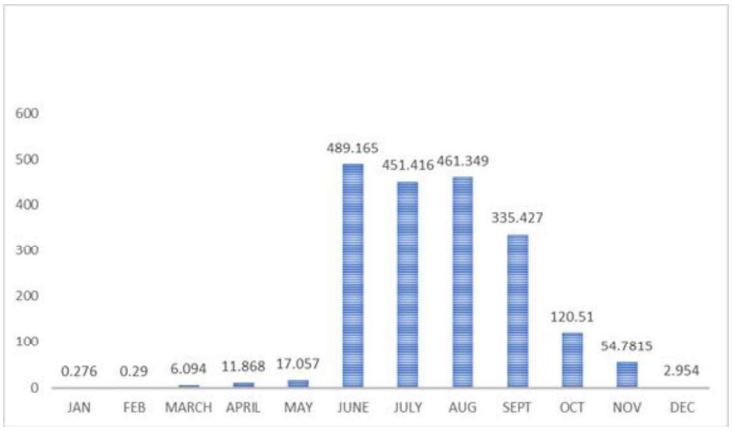

Figure 4: Volume of water Collected from Rainfall throughout the year (m^3)

3.5 TYPES OF TANK

Two types of tank can be used for storing of rainwater discharged from the roof - Lined Storage Tank and Unlined Natural Storage Tank

In lined storage tank, earth work excavation is done and underground RCC water storage tank is constructed which is completely covered from the top. The land above the tank can be used for serving as playground or parking slot, etc. In unlined natural storage tank, earth excavation is done, and all the water being allowed to fall directly in that pit and store it. In this method, we get two advantages. Firstly, our natural water gets recharged leads to augmentation of water level and ground condition, increasing prospects for better future cultivation and plantation. Secondly, underground water can be extracted anywhere within some limited areas from that pit and can be used to satisfy daily water demand.

Design of all the components of rainwater harvesting of tank size is 5 m x 2m x 2m is done.

3.6 ESTIMATION

Finally cost of entire project play a crucial role in any type of project. Before implementing the project, it is highly necessary for the engineers to check project, whether it is economical or not. Hence, the detail cost estimation should be done.

The tank shall be of R.C.C of 1:2:4 cement concrete with standard water proofing compound. Thickness of long wall and short wall of tank is about 170 mm. Roof covering slab shall be of thickness 150 mm and bottom slab should be of 300 mm. Quantity of steel required in water tank is about 2% of total volume of concrete.

Table 1 given below shows the detail cost estimation of constructing an underground tank of dimensions (5 x 2 x 2 m) at PCCOER campus:

Table 1

Sr. No.	Particular	Quantity	Rate	Cost (Rs.)
1	Earth work in excavation	25.33 m^3	130 Rs/m^3	3292.9
2	Water proofing	38 m^2	575 Rs/m^2	21,850
3	Cement concrete	9.52 m^3	2800 Rs/m^3	26,656
4	R.C.C. work	1494.64 kg	48 Rs/kg	71,742.72
			Total =	1,23,541.62
5	Contingency + work charge establishment	(3%+2% = 5%)	- -	6,177.08
6	Contractor profit	(10%)	- -	12,354.16
			Grand Total =	**1,42,072.86**

Total cost of piping material = Rs. 113724.

Therefore, total cost of rainwater harvesting system for our college is 255796.86 Rs.

4. CONCLUSION

This project dealt with all aspect of improving the water scarcity problem in PPCOER campus by implementing ancient old technique of rainwater Harvesting. Two alternatives have been suggested for tank design, which takes separate approaches towards the Storage of harvested rainwater. These results are given clearly in project. Hence from this result, we can draw out a conclusion that a huge amount of water got collected from the rooftop surface of all the entire building. And if, this project is being done seriously and implemented to the campus then it has a huge harvesting potential. This collection tank should have to build for the storage of 20 m^3 of water. Hence this project has huge capacity of getting rainwater and on proper storage, this tank can supply water for almost 4 months and 10 days to 1500 consumers having a consuming rate of 10liter/day as calculated previously. It is concluded that RCC tank which is to be constructed should be an underground one, so that upper surface of the tank can be utilized economically for any land purpose such as parking space or cycle stands or any such small structure. Cost analysis has been done for the tank. And it was concluded that cost of construction was not so high, if it is compared with problems which will be faced by the students and staffs inside the campus due to water scarcity. The other component of the harvesting systems such as pipping, chlorination and slow sand Filtration have also been reviewed and designed for PCCOER campus building in details. Hence it was finally concluded that implementation of RAINWATER HARVESTING PROJECT to the campus of PCCOER, Ravet will be the best approach to fight with future scenario of water scarcity in all aspects, whether it is from financial point of view or from

optimum utilization of land surface. Therefore, water is highly a precious natural resource which is always in high demand and thus, RAINWATER HARVESTING AT PCCOER campus is highly recommended.

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Behaviour of Geotextile in Flexible Pavement

Mayura M. Yeole[1], Twinkal P.Thakur[2], Yogita Gurav[3], Yash Agrawal[4]
[1,2,3,4] *Department of Civil Engineering, PCCOER*

***Abstract*- The paper discusses the problem of the soft soil and solution to overcome it. The use of geotextile as a reinforcement in soil in the emphasizing point of research which is been reflected into the paper. The test California bearing ratio been performed to check the behaviors of soil when induced/combined with geotextile. The result of such are been discussed below.**

***Index Terms*- OMC (optimum moisture content), MDD (maximum dry density), CBR (California bearing ratio).**

I. INTRODUCTION

As it is known that engineer faces the challenges while constructing structure on soft soil (black cotton soil). It may poses problem which includes low bearing capacity excessive settlement thus produces undulation on the road surface which causes failure leading to accident and losses in life of human being. In INDIA the black cotton soil spread over 5.46 lac sqkm i.e. 16.6% of the total area across the maharastra , telangana , Andra Pradesh, Gujarat and tamil nadu.

Due to such immense spread of black cotton soil in INDIA it becomes a crucial factor to be considered to avoid the losses of the life. Hence this can be achieved by improving structural stability of the soil it is done by homogenising the soil with such material which may impart in improving the property of the soil thus the material are geosynthetic it is defined as the planer product manufactured from polymeric material used with soil and rock as an integral part of the manmade project , structure this will be further divided into the geotextile, geogrid, geomembranes ,erosion control blanket and mat, geosynthetic liner geo net, geocomposite drainage material etc.

This paper thus discusses the use of geotextile material into soil; the result and the test carried out are discussed below.

II. TEST ANALYSIS ON THE SOIL WITH GEOTEXTILE

The modified proctor test has been performed on to the soil with and without geotextile for the reading of the OMC and MDD which are 14.35% for pure soil and 11.38 % for the soil with geotextile. Thus the reading obtained are been used in finalising the CBR test methodology. The test that where performed where for soaked condition that has been taken at different depth with different layer of the geotextile material. The position of the depth and layer are as below.

Srno	Depth in cm (from bottom)	Layer
1	12.5(only soil)	-
2	4.37	1
3	5.83	1
4	8.75and 12.55 from bottom	2
5	13.12 and 3.8 cm above ¾ th From bottom	2

III CBR TEST

It is the ratio of forces per unit area required to penetrate a soil mass with standard circular piston at the rate of 1.25mm/min to that required for the corresponding penetration of a standard material. Tests are performed out on natural or compacted soil in water soaked or unsoaked condition and the result so obtained are compared with the curve of standard test.

Mould specification of CBR;
Diameter of mould: 150mm
Height of mould: 175mm
Height of CBR soil specimen: 125mm

Formula:
CBR- (Test load)/(Standard load)*100
The following table thus provides the value of the CBR taken on the black cotton soil with us use of geotextile in one and in two layer that has been carried out at different depth.

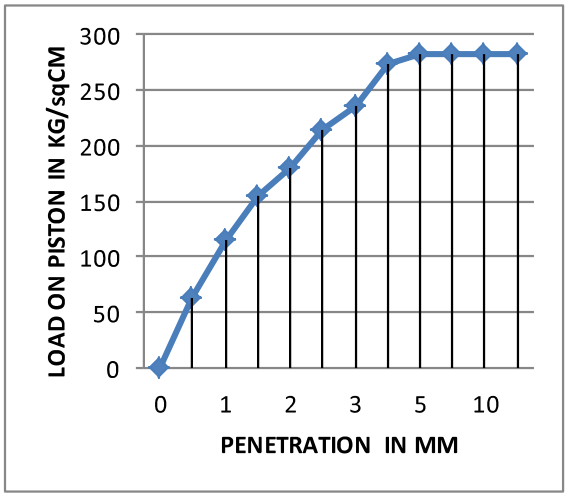
Table no.2

Geotextile position in cm from depth	Layer	CBR values in %
Only soil	-	6.8
4.37 cm from bottom	One	35.6
5.83 cm from bottom	One	17.1
8.75 and 12.55 cm from bottom	two	36.1
13.12 and 3.8 cm above ¾ th From bottom	two	31.3

GRAPHS FOR CBR TEST

TABLE NO.3

PENETRATION INMM	LOAD ON PISTON IN KG PER CMsq
0	0
0.50	62
1	115
1.50	155
2.0	180
2.50	214
3.0	235
4.0	274
5.0	282
7.50	282
10.0	282
12.50	282

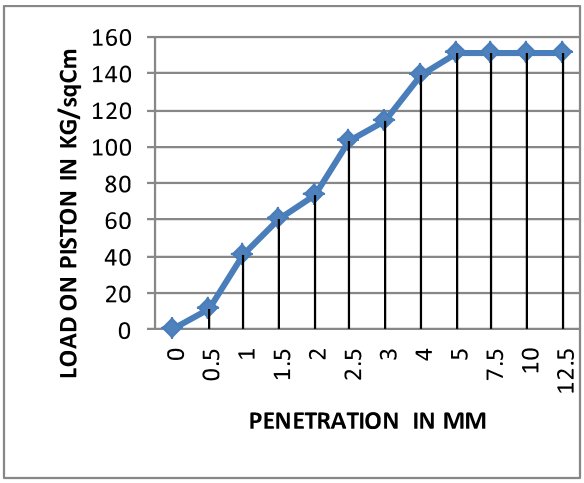


Graph for one layer at 0.25

The above graph represents that when one layer of geotextile used in soil at the depth of 0.25 provides gradual increase in the load on piston upto 4 cm after which the laod on piston is seen to be uniform at 282 kg/cm^2

TABLE NO.4

PENETRATION INMM	LOAD ON PISTON IN KG PER CMsq
0	0
0.50	11
1	41
1.50	60
2.0	74
2.50	103
3.0	114
4.0	139
5.0	151
7.50	151
10.0	151
12.50	151

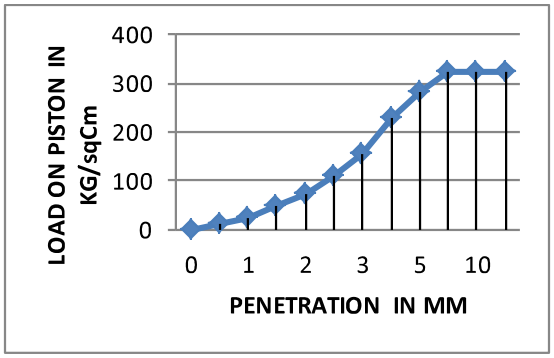


Graph for one layer depth 0.33

The above graph represents that when one layer of geotextile used in soil at the depth of 0.33 provides gradual increase in the load on piston upto 5 cm after which the laod on piston is seen to be uniform at 151 kg/cm^2

TABLE NO.5

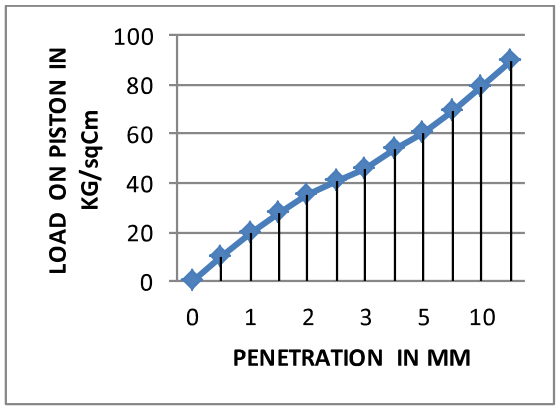
PENETRATION INMM	LOAD ON PISTON IN KG PER CMsq
0	0
0.50	12
1	25
1.50	48
2.0	74
2.50	102
3.0	154
4.0	230
5.0	282
7.50	323
10.0	323
12.50	323



Graph for 2 layer 0.75+ 3.8

TABLE NO.6

PENETRATION INMM	LOAD ON PISTON IN KG PER CMsq
0	0
0.50	10
1	20
1.50	28
2.0	35
2.50	41
3.0	46
4.0	54
5.0	60
7.50	69
10.0	79
12.50	90



Graph for pure soil

The above graph represents that when geotextile absent in soil the load of the piston is supposed to be gradually increasing ranging from 0 to 90 kg/cm^2

IV CONCLUSION

The graphs provided give the clear idea of the behaviour of geotextile material with respect to depth of the soil. However the piston load of 323 kg/cm^{2}and The CBR values of 36.1 % was found maximum at the depth of 8.75 and 12.55cm from bottom when two layer of geotextile were used respectively .The series of test has thus proved that as the depth of the geotextile increases the strength of the soil increases up to a certain limit after which it remains constant.

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“If you buy what you do not need, you will need what you cannot buy."

Mokshagundam Visvesvaraya