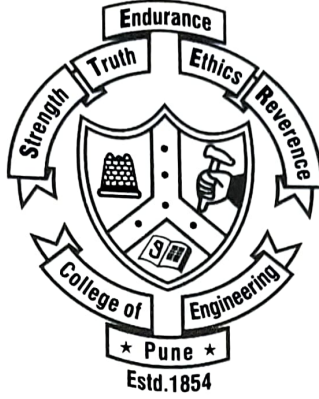



CERTIFICATE

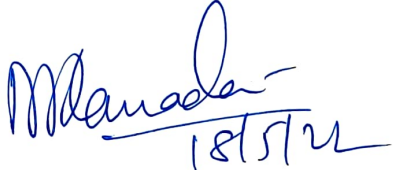


This is to certify that the report entitled ‘Sustainable Housing Bamboo Composite Structural Members’ is submitted in the partial fulfilment of the requirement for the project of Bachelor of Technology (Civil Engineering) of College of Engineering, Pune, affiliated to the Savitribai Phule Pune University.

Submitted by:

Shital S. Bansode 111601005
Sonali B. Khodke 111801029
Ruchira M. Mithey 111801073


Dr. I. P. Sonar,
Dept. of Civil Engg.,
College of Engineering, Pune.


Head of Department,
Dept. of Civil Engg.,
College of Engineering,
Pune.

Date: 6/5/2022
Place: Pune

ABSTRACT

Decent place for living is the third most basic need of a person after the needs of food and clothing. Owning a house ensures certain degree of economic as well as social security to a citizen. Providing a just sufficient shelter remains one of the most serious challenges India is facing today. The problem of inadequate housing is more acute in the rural areas where bulk of the BPL population lives. The work will focus on the requirements of housing in rural India, and most importantly the technological requirements for constructing low-cost sustainable houses. Proposed house is easy to construct, structurally lightweight, promote rapid construction compared to conventional houses.


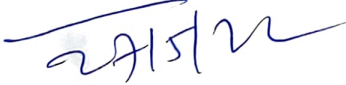
These types of houses are also useful in disaster prone areas like flood affected areas, earthquake affected areas, etc. where erection of temporary shelters in less time are one of the basic requirements. Development of such housing technology helps in reducing future demand of conventional materials and energy consumptions for the manufacturer, create scope for prefabricated building with more flexibility and construction techniques, create approach for local skill up gradation, value addition to local materials, encourage the use of local labour, setting up small scale industries in both rural and urban areas thereby creating opportunities for employment generation.


After fabrication and testing of wall panel on the lever-compression test set-up, it is concluded that the wall panel can be used as partition wall panel as well as load bearing wall. The bamboo composite house is practical application of these structural members.

COLLEGE OF ENGINEERING , PUNE
DEPARTMENT OF CIVIL ENGINEERING.

CERTIFICATE

This to certify that report entitled “**Design Of Office Building Using Light Gauge Section And Experiment On Truss Model Using Ultra-Thin Light Gauge Section**” which is being submitted here with for the award of the ‘Bachelor of Civil Engineering’ of COLLEGE OF ENGINEERING , PUNE is the result of the work and contribution by **Abhijit Wasu, Ajay Jadhav** and **Prathamesh Koravi** under my guidance. The work embodied in this report has not formed earlier for the basis of award of any degree to the best of knowledge and belief.


HOD 
Civil Engineering Department
College of Engineering, Pune

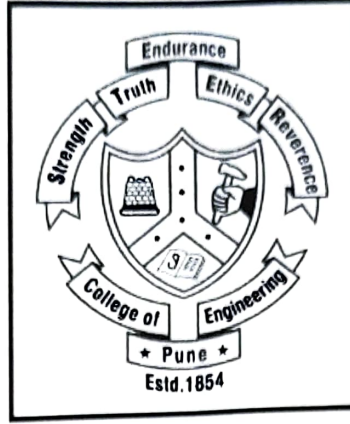

Dr.I.P.Sonar
Project Guide
Associate Professor
College of Engineering, Pune

ABSTRACT

Cold formed steel evolved as a building material in the 1930s and reached large scale usage only after the Second World War. In comparison with conventional steel construction, where standard hot rolled shapes are used, the cold formed light gauge steel structures are relatively new development. This paper presents a study on behavior and economical of cold formed steel (CFS) built up lipped channel section using IS code. This paper provides an experimental investigation on built up lipped channel section when used in truss. The sections used in truss specimens were brake pressed from high strength structural steel sheets. The experimental results are also verified by using STAAD Pro V8i Software. The members of truss experience mainly axial forces i.e., tension and compression. forces i.e., tension and compression. Theoretical data are calculated using Indian Standard code IS 801-1975 and the section properties of the specimens are obtained using IS 811-1975. The research project aims to provide an easy and economical solution for low scale construction works. The study reveals suitability of light gauge steel when used in truss.

Key Words : Light gauge steel, hot rolled shapes, cold formed steel, built up lipped channel section, STAAD Pro V8i, truss

CERTIFICATE



This is to certify that the report entitled “**Study of Self Compacting Concrete with Sawdust Ash as a Supplementary Cementitious Material**” submitted by **Nutan Tannir (111801059)**, **Aishwarya Hase (111801064)**, **Vaishnavi Karhale (111801096)**, in the partial fulfilment of the requirement for the award of degree of Bachelor of Technology with specialization in Civil Engineering at College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of the project work carried out by them under the supervision and guidance of Dr. R. R. Joshi.

Dr. R. R. Joshi

Professor and Guide

Department of Civil Engineering

Dr. M. S. Randive

Professor and Head

Department of Civil Engineering

Date: 17-5-22

Place : Pune

ABSTRACT

This report presents the Self Compacting Concrete (SCC), its significance and mix design procedure.

It is also focused on the significance of supplementary cementitious materials particularly the use of sawdust ash as a Pozzolan in the mix design of self compacting concrete so as to make the concrete more economical and environment friendly.

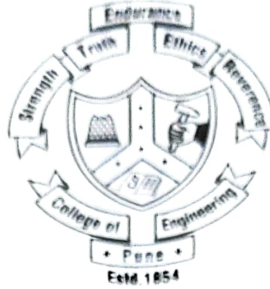
The physical properties and chemical composition of Saw Dust Ash (SDA) as well as the workability and compressive strength properties of the SCC produced by replacing 5%, 10%, 15% by weight of Ordinary Portland cement with SDA are observed.

Slump cone test is carried out on the fresh concrete and compressive strength and the split tensile strength test on hardened concrete are performed and found satisfactory though varying considerably. The concrete cubes are tested at the ages of 7, 14 days and the expected 28 days results are mentioned. From the result, the value obtained from the slump test for control mix corresponds to the desired slump range 550mm - 650mm. The slump, which decreases from the control sample but stays within the required range until 5% replacement of SDA.

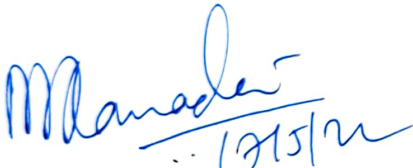
The compressive strength at 7 and 14 days give satisfactory results with 5% SDA mix having values close to the control mix. It is seen that the compressive strength decreases significantly at 10% and 15%. The split tensile test results of 5% are higher than those of the control mix.

Overall it is seen from this experimental work that the 5% ash replacement gives satisfactory results. The cost of the SawDust is found to be very low, as in the saw mill they are seen as waste and the only cost to encounter is in the transportation and the cost of labour required for its controlled burning and sieving process. Therefore, the replacement of Ordinary Portland Cement with SDA would be useful to reduce the cost.

CERTIFICATE



This to certify that the report entitled “Use of Jhama Brick Dust as an Alternative Material for Fine Aggregate in Concrete” submitted by Karjom Rikar (111801037), Debia Dina (111801068) and Kencisenuo Caryn Kire (111801027) in the partial fulfillment of the requirement for the award of Bachelor of Technology, Department of Civil Engineering of College of Engineering Pune, affiliated to the Savitri Phule Pune University, is a record of their own work.


17/5/22

Dr. M.S. Ranadive

Head of Department

Civil Engineering

College of Engineering Pune



Dr. R. R. Joshi

Project Guide

Civil Engineering Department

College of Engineering Pune

Date: ___/___/___

Place: College of Engineering Pune

Use of Jhama Bricks as an alternative for Fine Aggregate in Concrete

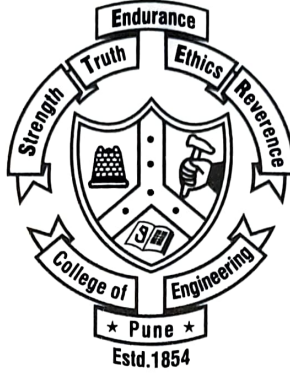
ABSTRACT

The concrete is very useful material, and it is not only used in the building construction work, but it is also useful for the construction of the bridges, roads, dams, and other important structures. The concrete is a composite material and conventional concrete is made of cement, fine aggregate, coarse aggregate, and water. The concrete can be used in any desired shapes, so it is versatile material in field of construction.

Since the use of concrete is very large and day by day the cost of the conventional material is also rising so it is advantageous to use the alternative materials for making the concrete. The alternative material can be used as partial or fully replacement of the conventional material.

In this project the Jhama Brick Dust is used as an alternative material for the fine aggregate. Here the Jhama Brick Dust is used as partial replacement of the sand from 0%, 20%, 25% and 30%. The various test is carried out such as Compressive Strength and Split Tensile Test at an age of 7 and 28 days of curing. The Grade of the concrete used is M25. The main purpose of this project work is to use the waste material for making of concrete.

CERTIFICATE



This is to certify that report entitled “**Water Balance of Sub-watershed of Waghur Basin**” is submitted in partial fulfilment of requirement for the project of Bachelor of Technology (Civil Engineering) of College of Engineering Pune, affiliated to Savitribai Phule Pune University.

Submitted by:

Mayur L. Ahire 141901001

Amey D. Zalte 141901008

Gaurav V. Khajekar 111801093

Dr. K. A. Patil

Guide and Professor
Civil Engineering Department
College of Engineering, Pune

Dr. M. S. Ranadive

Head of Department
Civil Engineering Department
College of Engineering, Pune

Date: 07/05/2022

Place: Pune

ABSTRACT

In the past few decades, there has been rising agricultural distress all over the country, especially in Maharashtra. One of the important reasons for this is climate change which is manifested in terms of uncertainty in rainfall and increasing dry-spells and flooding events. The water scarcity for Marathwada region, Maharashtra (India) occurs frequently after every year. Waghur Basin which is situated in Marathwada region received average annual rainfall of 614.21 mm according to past available data but still the zone faces the drought condition for occasionally.

A sub watershed of Waghur basin has been taken as a study area. A proper monitoring has been done to find out the water balance of the sub watershed. The water balance is an accounting of the inputs and outputs of water. The water balance of a place, whether it is an agricultural field, watershed, or continent, can be determined by calculating the input, output, and storage changes of water at the Earth's surface.

With the help of Arc-GIS thematic layer maps are prepared for computing the runoff as well as to define the slope of study area. The study considers the existing supply of stocks and future appropriation of these stocks. Water demand is calculated for human, livestock and irrigation.

The water accumulated in the study area is then compared with the demands in that area. And thus, the deficit area is identified. Suggestions are mentioned to tackle the deficiency and future scope for improvement has been highlighted.

DEPARTMENT OF CIVIL ENGINEERING
COLLEGE OF ENGINEERING, PUNE

CERTIFICATE

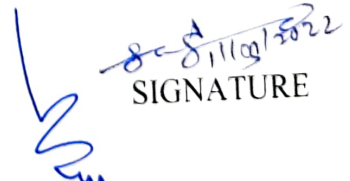
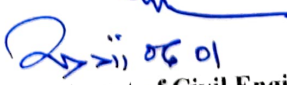
Certified that this project titled "CRITICAL FACTORS AFFECTING TOTAL QUALITY
MANAGEMENT IN INDIAN CONSTRUCTION INDUSTRY" has been successfully
completed by

Devayani Jahagirdar	111801052
Sanskruiti Gandhi	111801020
Suraj Kothawale	111801031

and is approved for the partial fulfillment of the requirements for the degree of "B. Tech Civil
Engineering".


SIGNATURE

Dr. N. A. Hedao
Project Guide
Department of Civil Engineering
College of Engineering, Pune
Shivajinagar, Pune – 5


SIGNATURE

Head
Department of Civil Engineering
College of Engineering, Pune
Shivajinagar, Pune – 5

Abstract

For any industry to flourish, quality is the backbone for ultimate customer satisfaction and delight. Indian construction companies are facing a huge amount of competition from their counterparts across the globe. The construction sector in India is facing a large problem of non-attainment of acceptable quality level owing to inefficient quality management systems adopted. Since construction projects are big budget endeavors, large amount of stakes are involved in them. In the quest of achieving project competitiveness, implementation of Total Quality Management system proves to be an effective tool to mitigate the problems, rather prevent them in the first place. Total Quality Management (TQM) is a philosophy based on the principle of continuous improvement throughout the project life-cycle.

The aim of this project is to identify the critical factors affecting the TQM in the construction sector in India and the measures adopted for the implementation of the same. It discusses the principles and investigates the potential benefits derived from implementing TQM and barriers faced during its extensive implementation in the industry. An overview of the implementation of TQM is discussed through a comprehensive case study based on a highly sophisticated project executed in Mumbai, by Larsen and Toubro, an Indian multinational conglomerate. It discusses the project sustainability measures adopted along with the quality assurance and quality control incorporated in its execution. Besides the case study, the project focuses on the TQM principles implemented on-site in the local construction projects being executed in the Pune city. The responses of a survey questionnaire are compiled and documents related to the project, especially the Detailed Project Report and tender documents are studied and evaluated. The design, plan, budget, materials and various other parameters are assessed and the project in its entirety is judged for the TQM implementation. This project also provides remedial measures for any shortcomings traced during the survey.

CERTIFICATE



This is to certify that the report entitled '**Parametric Study for Designing Preliminary Lining Thickness using MIDAS-GTX-NX**' submitted by **Poorva Moghekar(111801060)**, **Rutuja Reure(111801061)** and **Ashlesha Solanke(111801048)** in the partial fulfillment of the requirement for the award of degree of Bachelor of Technology(Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of her own work.

A handwritten signature in black ink, appearing to read 'M. Ranadive', with a horizontal line underneath.

Prof. Dr. M.S Ranadive
Guide and Head of the Department
Department of Civil Engineering
College of Engineering Pune

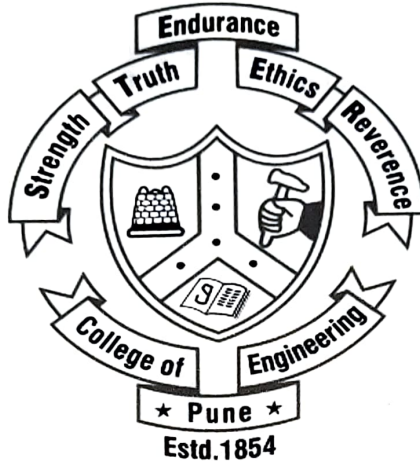
Date: 17/05/2022

Place: College of Engineering Pune

ABSTRACT

Increasing population and urbanization leads to traffic and space congestion issues. To ease out this complication, the scope of construction of tunnel infrastructure has risen from the last decade in urban areas. Recent advancement in tunneling using Tunnel Boring Machine (TBM) has proved to be more beneficial in working under complex and challenging geological conditions. While being safe and faster it provides a cost-effective solution for urban development. Besides these advantages, tunnel construction work has a severe impact on structures above and around the tunnel alignment. Therefore, the study of the ground-induced settlement of tunnels through various geological conditions and diameters has been an emerging topic for researchers. Previous research had concluded that tunnel diameter, critical depth to diameter (C/D) ratio, and ground strata have a critical impact on the face stability of the tunnel. This research work focuses on the face stability of tunnels in different sets of geological and geometrical parameters. Three-dimensional (3-D) finite element analysis method using Midas Gtx Nx was proposed in this work. Hoek and Brown failure criteria were applied while modelling. The parametric study had been done on the crown and on the invert to observe their displacement and stresses. This study concludes that tunnel diameter and geological parameters had a critical impact on tunnel face stability. Proper investigation of these parameters is essential in the pre-planning phase of tunnel construction to prove its benefits for society.

CERTIFICATE



This is to certify that the report entitled 'Design of conventional STP and its comparison with new technology' submitted by Mr. Rhythm Sharma (111801072), Mr. Tejas Chikhalikar (111801091) and Mr. Talib Hussain Lone (111801049), in the partial fulfillment of the requirement for the award of degree of Bachelor of Technology with specialization in Civil Engineering of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of his own work.

Prof. Dr. Rupa Dalvi
Guide

Department of Civil Engineering
College of Engineering Pune.

Prof. Dr. M. S. Ranadive
Head

Department of Civil Engineering
College of Engineering Pune.

Date: 10/05/22
Place: Pune

Abstract:

Nowadays many water resources are polluted by different sources including household and agricultural waste and industrial processes. Public concern over the environmental impact of wastewater pollution has increased. Several conventional wastewater treatment techniques, i.e., activated sludge, have been applied to remove the pollution, however there are still some limitations, especially that of high operation costs. The use of new techniques as a sewage treatment process is receiving increased interest due to its low operation and maintenance costs. In addition, it is easy-to-obtained, with good effectiveness and ability for degrading contaminants. This study includes the comparison between conventional method (ASP) and new technologies like Duckweed Ponds, Constructed Wetlands, BIOFOR Technology, Sequential Batch Reactor and Membrane Technology. Comparison is done on the basis of requirement of land, capital cost, operation and maintenance cost, energy input etc. On the basis of the availability of the above factors, the applicability and suitability of different techniques is discussed.

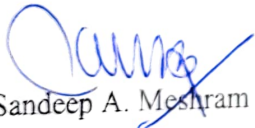
In this project, the conventional sewage treatment plant consisting of Activated Sludge Process (ASP) is designed for a discharge of 40 MLD.

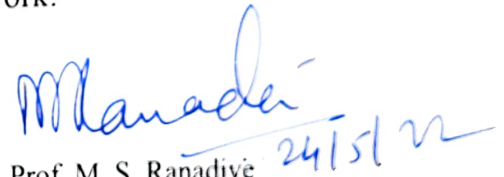
This study also includes site visit of Kasarwadi Sewage Treatment Plant Phase 2 of 40 MLD consisting of ASP. The dimensions of various components and design related data is also discussed.

CERTIFICATE



This is to certify that the report entitled '**Comparative Study of Major Metro Projects in India**' submitted by Samadhan Sonawane (111801038), Mustafa Shaikh (111801035) and Piyush Bamane (111801095) in the partial fulfillment of the requirement for the award of degree of Bachelor of Technology (Department of Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of their own work.


Dr. Sandeep A. Meshram
Project Guide
Civil Engineering Department
College of Engineering Pune


Prof. M. S. Ranadive
Professor and Head of Department
Civil Engineering Department
College of Engineering Pune

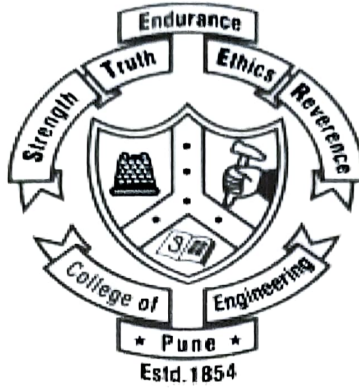
ABSTRACT

In the field of Civil Engineering, designing and completing a successful and impactful project involves understanding the aim and objective of the project in advance. The objective of the project influences everything from the system and technology selection, environmental and social impact, cost estimation, and feasibility to the design considerations we take. Therefore, evaluation of the engineering and social characteristics of a project is essential.

Throughout the design and construction phase, Engineers are asked to apply their knowledge and come up with creative ways to carry out projects with minimum losses and delays. This process continues for some time after the project is completed. Often, temporary and permanent solutions for such projects are designed with these assessments of similar or comparable projects which are largely based on previous data and surveys. In cases of projects being carried out in newer locations, existing data can be adapted and adjusted to suit the current conditions. Although existing data and statistics can be used to predict the kind of challenges engineers will face, following the correct procedure and guidelines ensures us the highest success and safe completion without any accidents and delays.

The main objective of this project work is to **study and compare the metro projects of the Delhi Metro, the Mumbai Metro, the Pune Metro, and the Bangalore Metro**. The basis of our discussion is the need to study various parameters like the need of a robust mass transport system, the social impact through experience of travellers and citizens, the economic benefits and feasibility, implementation models and funding, the monetization, the safety of travellers, Engineering Geological considerations, Geotechnical considerations, planning and execution of the technology used during construction, so on and so forth.

CERTIFICATE




This is to certify that the report entitled '**SUSTAINABLE SANITATION**' is submitted in the partial fulfillment of the requirement for the project of Bachelor of Technology (Civil Engineering) of College of Engineering, Pune, affiliated to the Savitribai Phule Pune University.

Submitted by:

KUNAL CHAMARGORE 111801056

ANIKET PAWAR 111801041

ROHAN JONDHALE 111801025


Dr. M.U. Khebragade

Project Guide

Department of Civil Engineering


Dr. B. M. Dawari,

Professor and Head of Department

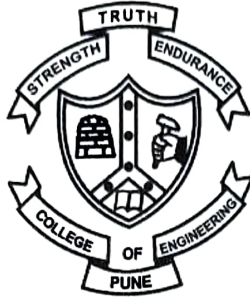
College of Engineering, Pune

ABSTRACT

Sustainable Sanitation refers to a sanitation system which is economically viable, socially acceptable, technically and institutionally appropriate, and it should also protect the environment and natural resources. Global sanitation coverage rose from 49 per cent in 1990 to 58 percent in 2002. Still, some 2.6 billion people – half of the developing world live without improved sanitation. Most parts of rural India do not have a proper sanitation system as most of the people still defecate in the open space, most of the villages lack waste disposal and drainage systems and many in the villages are ignorant about the consequences of poor sanitation and unhygienic conditions. As a result, many people suffer and even die of diseases caused by unhealthy practices of personal and environmental hygiene. The major challenges faced for rural sanitation are lack of funds and lack of awareness among the rural people. Sustainable sanitation can be improved by spreading more awareness among people and to develop or to make arrangements of proper sanitation facilities in their areas.

Safe and appropriate disposal of human wastes is a basic requirement for sanitation and public health protection. For proper sanitation, effective treatment methods to ensure complete destruction of pathogens in excreta prior to disposal and reuse is a must. Conventional wastewater collection system, as found in modern cities, is often not feasible to be operated in small and rural communities, because of its prohibitively high cost. In developing countries, where poor water supply conditions exist, conventional systems are technically not feasible.

CERTIFICATE



This is to certify that the report entitled "Conversion of Organic waste into energy" submitted by **Rutwik Zaritaklikar, Nikhil Pawar and Tushar Patil** in the partial fulfilment of the requirement for the award of degree of Bachelor of Technology (Civil Engineering) of College of Engineering Pune affiliated to the Savitribai Phule Pune University, is a record of their own work.

Kamala Tripathi
13-05-22

Dr. K. K. Tripathi
Guide
Department of Civil Engineering
College of Engineering, Pune

M. S. Ranadive
20/5/22

Dr. M. S. Ranadive
Head of Department
Department of Civil Engineering
College of Engineering, Pune

Date: **9th May, 2022**
Place: **College of Engineering Pune**

1.0 ABSTRACT

Organic waste majorly food waste represents a significantly fraction of municipal solid waste. Proper management and recycling of huge volumes of organic waste are required to reduce its environmental burdens and to minimize risks to human health. Food waste is indeed an untapped resource with great potential for energy production. Utilization of food waste for energy conversion currently represents a challenge due to various reasons. These include its inherent heterogeneously variable compositions, high moisture contents and low calorific value, which constitute an impediment for the development of robust, large scale, and efficient industrial processes. Although a considerable amount of research has been carried out on the conversion of organic waste to renewable energy, there is a lack of comprehensive and systematic reviews of the published literature. The present review synthesizes the current knowledge available in the use of technologies for organic waste to-energy conversion involving biological (e.g. anaerobic digestion and fermentation), thermal and thermochemical technologies (e.g. incineration, pyrolysis, gasification and hydrothermal oxidation). The competitive advantages of these technologies as well as the challenges associated with them are discussed. In addition, the future directions for more effective utilization of organic waste for renewable energy generation are suggested from an interdisciplinary perspective.

There are 2 main objectives of this study being carried out; Firstly to determine whether food wastes (canteen and cafeterias wastes) can produce methane gas (biogas) that can generate heat and electricity and secondly to establish how much methane gas (biogas) can be produced with the certain amount of the feedstock. It should be pointed out that this MBPP can generate 600kW electricity per day as this system can generate electricity about 25kW/h. The methane produced per day is approximately 180 cubic meters. The higher the wastes, the higher the amount of methane gas produced. The cow dung is used to increase the bacteria in the tank; the methane gas production will be higher if the bacteria breed.

CERTIFICATE



This is to certify that the project review report entitled "Study of wastewater management system for Ichalkaranji city using soft computing tools" submitted by Tanmay Mandarekar (111801033), Rohit Ghodake (111801081), Shubham Khamkar (111801088) in the fulfilment of the requirement for the award of degree of Bachelor of Technology (Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of his own work.

Dr.R.K. Suryawanshi

Professor Emeritus and Project Guide,
Department of Civil Engineering
College of Engineering, Pune.

Dr.M.S.Ranadive

Professor and Head of Department,
Department of Civil Engineering, Pune
College of Engineering, Pune.

Date: 12/5/2022
Place : College of Engineering , Pune

ABSTRACT

Ichalkaranji is a rapidly growing city in all aspects. Population is being crossed 4,80,000-mark, exhausted urbanization, and tremendous numbers of industries. Though many industries are being developed in the city, attention is to be given to Textile industries which is Ichalkaranji known for. As first factor considered, population of city will cross 5 lakh mark in nearer future. This will result in huge amount of domestic sewage production. Existing Sewage treatment plant(20MLD) is not sufficient even on today's date. So, analysing existing sewage management system for Ichalkaranji city and pointing some measures like installation of new STP or cleaning the streams is necessary and this paper aims to do the same. The city is famous for cloth making processes which produce toxic chemicals, effluents and many materials unsuitable for public health. So Common Effluent Treatment Plant (CETP) of capacity 12 MLD has been installed precisely for textile industries. CETP is under private authority and have adequate capacity. All unit are working neatly.

Considering population of the city in 2051, new Sewage Treatment Plant is to be constructed. SewerGEMS is a soft computing tool used for analysis and designing of sewer network. It is software working on machine learning and can easily calculate capacity of sewer pipelines all over the city. Existing sewer network is drawn on the software and compared with new proposed system. Many streams acting as tributary of Panchganga River are polluted and water in them directly goes into the river. Kala nala is one the most severe of them. It contains dangerous toxic materials. So, this paper consists of one action plan for prevention of pollution of Kala nala and rejuvenate it. Deepening of the nala, installing loose boulder structures and dressing the stream surface are some remedial measures found. A system is created from new STP to River through Kala nala which will eliminate problem of treated water of STP as well as dilute toxic concentration. In short, this report emphasis on sustainable sewage management system for Ichalkaranji city.

CERTIFICATE



This is to certify that the project entitled “Green Building : Materials , AI and IoT” submitted by Raj Uday Mahajan (111801094) , Pareshkumar Shantaram Salunkhe (111801076) and Nishant Vijay Kadam (111801098) in the partial fulfilment of Bachelor of Technology in Civil Engineering of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of his own work.

Dr. Sukhanand S. Bhosale
(Guide)
Department of Civil Engineering
College of Engineering, Pune

Dr. M. S. Ranadive
(Head of the Department)
Department of Civil Engineering
College of Engineering, Pune

Date: May 9, 2022

Place: Pune

Abstract

Green construction entails making the most efficient use of resources at all phases of development of a project. By putting together, a system of components and materials that function together, the goal is to establish an energy-efficient, collaborative environment and construction that saves water and has a minimal carbon footprint with that economical aspect also takes into account. Main focus of this is to widen the scope of use of materials in 3R's that is Reduce, Reuse, Recycle.

The architecture, engineering, and construction (AEC) industry has significant problems in terms of sustainability and efficiency. Artificial intelligence in green building (AI-in-GB) is an effective method for improving the sector's sustainability and efficiency. The Internet of Things (IoT), which can gather and monitor a significant quantity of data on many aspects of a building and transmit it to the (Building Management System) BMS's processor, offers a new way to integrate intelligence into the BMS for monitoring and reducing costs by regulating a building's energy use. This study also explored criteria consist in National Rating System like GRIHA, LEED etc ,which help to increase area of Artificial Intelligence, Internet of Things (IOT) etc.

Case study which is the main part of this project indicates that there is scope for improving use of artificial intelligence and machine learning in actual practices of construction and maintenance of green building. Cost efficiency of use of this technology's in green buildings is also higher in long term.

Green building structures are dynamic in nature and it adapt to the changing requirements and lifestyles of its inhabitants. Green buildings pay off more than they cost to create, making them a worthwhile investment compared to conventional buildings using normal construction sites and materials

CERTIFICATE



This is to certify that the report entitled 'Determination of shear resistance of bamboo fiber reinforced concrete' is submitted in the partial fulfilment of the requirement for the project of Bachelor of Technology (Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune University.

Submitted By:

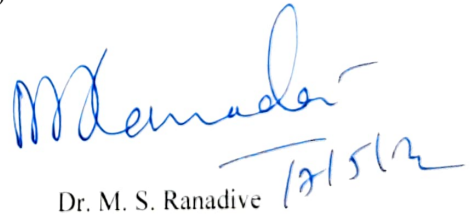
Tanvi .S. Salve	111801044
Shivani .D. Farakte	111801062
Sakshi .R. Deshmukh	111801083



Dr. I. P. Sonar

Guide

Civil Engineering Department
College of Engineering Pune



Dr. M. S. Ranadive

Head of the Department
Civil Engineering Department
College of Engineering Pune

Date: 6/5/2022.

Place: Pune.

ABSTRACT

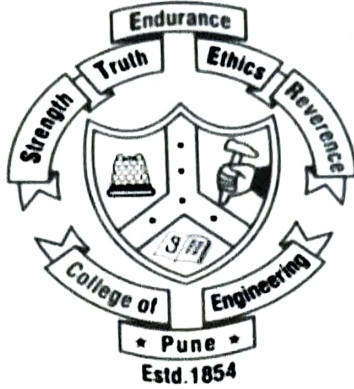
A comparative study of the experimental results of the conventional concrete with variable percentage of natural fiber with Concrete. For the construction work concrete is used as the basic materials. The concrete is strong in compression but fragile in the tensile strength. Traditionally steel is used as reinforcement in concrete. But because of cost and availability, replacement of steel with some other suitable materials as reinforcement is now a major concern. Since bamboo is a natural, cheap and also readily available material, it can be a substitute of steel in reinforcing of concrete. It has become involved in making concrete using natural materials. Bamboo fiber with high tensile strength is expected to contribute significantly to quick growth, large growth distribution and low-cost earthquake-resistant construction and seismic retrofit skill. This thesis explores the mechanical properties of reinforced concrete made of bamboo fiber.

PHASE 1. In order to study the basic concrete properties such as compressive strength, shear strength, this research was carried out to by adding 0%,1%, 2% and 3% of fiber content by weight of cement in concrete and finally the results were compared with conventional concrete and bamboo fiber concrete.

PHASE 2. Practically we don't use unreinforced concrete for construction work. Hence, we have used singly bamboo reinforced concrete using bamboo splints along with adding 0%,1%, 2% and 3% fiber content by weight of cement in concrete along with bamboo splints and finally the results were compared with conventional concrete and bamboo fiber concrete.

The compressive strength and shear strength of bamboo fiber reinforced concrete have been tested for the various proportion of bamboo fiber concrete. The outcomes obtained specifies the strength of bamboo fiber reinforced concrete that increases with an addition of fiber up to 2% and slightly decreases after that. For singly bamboo reinforced concrete beam, the load carrying capacity increased about 1.5 times than that of plain concrete beam having same dimensions. The results were showed that bamboo fiber can reduce crack-width and deflection of concrete and increase beam post-cracking load-carrying capacity. The amount of fiber has effect on workability and quality of concrete. However, bamboo fiber can prevent the growth and propagation of cracks.

CERTIFICATE



This is to certify that the report entitled 'Seismic Analysis of Piping system' submitted by Prajakta Deshpande (111801018), Mrunal Tayade (111801071) and Piyusha Patil (111801084) in the partial fulfilment of the requirement for the award of degree of Bachelor of Technology (Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of his own work.

Dr.(Mrs.) V.B. Dawari
Guide
Civil Engineering Department
College of Engineering Pune
Date: 17/05/2022

Dr.M.S.Ranadive
Head of the Department
Civil Engineering Department
College of Engineering Pune

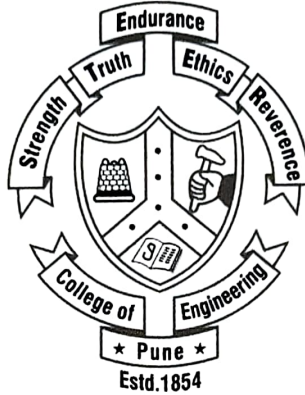
ABSTRACT

Piping systems are considered the lifelines of industrial units (e.g., chemical and petrochemical industries) and utilities like thermal and nuclear power plants, as they comprise important components of these installations. A pipe can be defined as a tube made of metal, plastic, wood, concrete, or fiberglass. Pipes are used to carry liquids, gases, slurries, or fine particles. A piping system is generally considered to include the complete interconnection of pipes, including in-line components such as pipe fittings and flanges. Pumps, heat exchangers, valves, and tanks are also considered part of the piping system. Piping systems are the arteries of our industrial processes and the contribution of piping systems is essential in an industrialized society. In a modern city they transport water from the sources of water supply to the points of distribution; convey waste from residential and commercial buildings and other civic facilities to the treatment facility or the point of discharge.

Piping systems undergo major structural failure due to earthquakes. Thus, they need to be designed considering normal loads and accidental loads such as extreme wind and earthquakes. Improper design may lead to failure and affect the safety, non-availability of the plant, and loss of economy. To achieve this, significant efforts during the design phase are spent to ensure that the piping should behave as designed and the vibrations in the piping systems or equipment remain within permissible levels. The Finite Element Method (FEM) is a numerical technique to find approximate solutions to partial differential equations. The finite element method emerged as a reliable tool for finding solutions to many structural problems. Software such as ANSYS and Abacus are generally used for the design and analysis of pipes.

We aim to study the various types of Piping systems, IS 1893 Part 7, and understand the static and dynamic analysis using ANSYS Workbench 2020 R1. Comparing varied parameters like material, thickness, and pressure in the piping system will provide us with optimum solutions to various industrial piping problems arising due to seismic effects. The results are compared and inferences regarding the accuracy, suitability, and feasibility would be provided.

CERTIFICATE



This is to certify that the report entitled 'STRUCTURAL HEALTH MONITORING USING - NON DESTRUCTIVE TESTING OF CONCRETE' submitted by Atharva Deshpande(111801017), Ashim Koul (111801055) in the partial fulfillment of the requirement for the award of degree of Bachelor of Technology (Department of Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of their own work.

Prof. Dipali Patil (Project Guide)
Civil Engineering
College of Engineering Pune

Head of the Department
Civil Engineering
College of Engineering Pune

Date: 11th May ,2022

Place: COEP

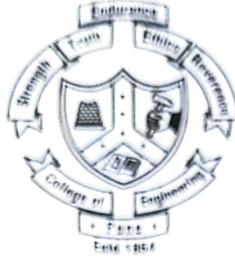
STRUCTURAL HEALTH MONITORING USING- NON DESTRUCTIVE TESTING OF CONCRETE

Abstract

This report reviews the most common non-destructive testing (NDT) methods of concrete structures as utilized by the structural engineering industry. The fundamentals of NDT methods are explored in regards to their potential, limitations, inspection techniques and interpretations. The factors that influence the success of NDT methods are discussed and ways to mediate their influence are recommended. Reference is made to standard guidelines for the application and interpretation of the discussed NDT methods. NDT of concrete was found to be gaining increasing acceptance as a means of evaluating the strength, uniformity, durability and other properties of existing concrete structures. Perceptions of NDT inadequacy were attributable to lack of understanding construction materials and NDT methods themselves. The intent of this report is to address these concerns by identifying and describing the most common successful methods of NDT as applied to concrete structures. The prevalent practical uses of NDT have been implemented to provide a clearer outlook on the procedures involved and the results obtained. The various methods of retrofitting that follow NDT testing have been reviewed with multiple case studies. It is better practice that NDT engineers have the knowledge and training of various NDT methods available for testing a parameter, to select better technique from the available methods according to the condition of structures. Use of different methods for evaluating a single parameter increases the accuracy and also validates the results. Combining the results of various NDT methods for assessing the quality of structures has been required for better results; this aspect has been discussed in the present paper. This paper also presents brief literature review of the recent NDT tests performed on concrete structures, followed by a table describing advantages, limitations, and principle of several NDT methods, and also present status and future aspects of NDT methods have been discussed followed by a table presenting various codes describing these methods.

KEYWORDS-Testing, Constraints, Homogeneity, Durability, Accuracy

CERTIFICATE



This is to certify that the thesis/dissertation/report entitled 'Rooftop Rainwater Harvesting in Rural Parts of India' submitted by Authors Abhijeet Annaldas (111801012), Sumit Shinde (111801047), Sangramsingh Chavan (111801099), in the partial fulfilment of the requirement for the award of the degree of Bachelor of Technology with specialization in Civil Engineering of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of his own work.

Katara
17/05/22

Name of the Guide

Dr. Vasudha Katara

Name of the Department CIVIL

College of Engineering Pune

Date: 6th May 2022

Place: Shivajinagar, Pune

Manada
18/5/22

Name of the Head of Department

Dr. M.S. Ranadive

Name of the Department CIVIL

College of Engineering Pune

Abstract

Time is not far when water scarcity in rural India will be at its peak. Uncertain rainfall, unawareness about groundwater recharge will be the causes. But very old and conventional method "Rainwater harvesting" (main objective of this method is to retain maximum possible amount of runoff generated from its catchment area) is going to be crucial to overcome these problems. Among different types of focus was on Rooftop Rainwater Harvesting and its impact on people's lives in summer.

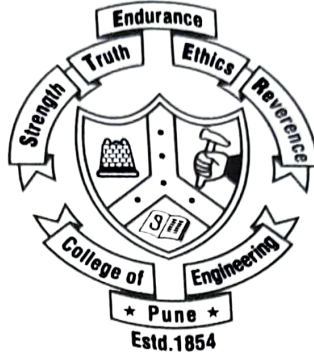
Previous on-field works done in this village [Daregaon - District Nanded, state Maharashtra] improved moisture content of soil and water level in farm wells. So, now it has become very positive environment among villagers about rainwater harvesting's importance. After doing analysis of different existing methods, model is designed for this village. Topography of village played crucial role in designing this harvesting system.

First step was studying literature related to Rooftop Rain Water Harvesting (RRWH) in different rural parts of India. After that surveying of village topography, available water sources, rainfall data, annual income, daily water requirement etc. was done. That helped to understand ground-level water problem. Next step was to use contour pattern of village to lay pipeline network. That network consisted of main pipeline and sub pipeline. Google images and Arc GIS Version 9.3 is used for roof type survey and contouring for site selection. Calculations showed that 6985000 litres of water requirement of villagers in summer months is fulfilled after successful implementation of plan.

Underground tanks are designed to store rainwater during rainfall in monsoon season. Sand filters are installed near collecting facility ensuring water being collected in tank is of daily usage quality. Time to time quality checking of water followed with disinfection by chlorine is proposed. Land reimbursement plan is proposed to make people stakeholder of this project. It is expected that successful implementation of this project will eradicate water scarcity and remove social imbalance in society.

KEYWORDS: Rainwater harvesting, Scarcity, Topography, Runoff.

CERTIFICATE



This is to certify that the report entitled 'PLASTIC FORMWORK : An Alternative solution to conventional formwork' submitted by Nivas Kolape (111801053), Vedant Birari (111801067) , Sarvadnya Mahajan (111801086) in the fulfilment of the requirement for the award of degree of Bachelor of Technology (Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of their own work.



Dr. G.S. Vyas
Guide
Civil Engineering Department
College of Engineering, Pune



Dr. M.S. Ranadive
Head of the Department
Civil Engineering Department
College of Engineering, Pune

Date: 10/05/2022

Place: Pune

ABSTRACT

Formwork is the term given to either temporary or permanent molds into which concrete or similar materials are poured. In the context of concrete construction, the false work supports the shuttering molds. According to the time passing timber, steel, aluminium formwork system is used but some disadvantages over plastic formwork. The construction of formwork takes time and involves the expenditure up-to 20 to 25% of the cost of the structure or even more. The design of these temporary structures is made to economic expenditure. Formwork systems are among the key factors determining the success of a construction project in terms of speed, quality, cost and safety of the works. Nowadays, most projects are required by the client to complete in the shortest time possible to minimize costs with safety. The competition in the Indian formwork market is getting more intense by the day with the arrival of new players and technologies. Plastic formwork systems have been creating a buzz in recent times with their advantages including flexibility, durability and cost-effectiveness.

Keywords: Cost-Effectiveness, Durability, Plastic Formwork, Temporary

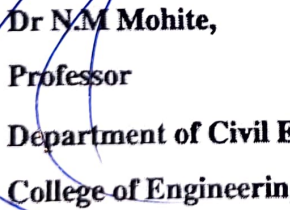
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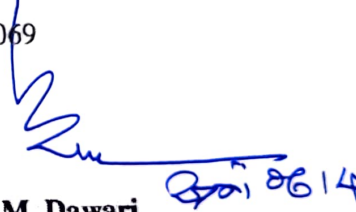


This is to certify that the report entitled '**Design of Urban Drainage Network** is submitted in the partial fulfilment of the requirement for the project of Bachelor of Technology (Civil Engineering) of College of Engineering, Pune, affiliated to the Savitribai Phule Pune University.

Submitted By:

Parth Godse	111801077
Tanmay Bachchuwar	111801090
Mayank Barai	111801069


Dr N.M Mohite,
Professor
Department of Civil Engg,
College of Engineering, Pune


Dr. B. M. Dawari,
Head of the Department
Department of Civil Engg,
College of Engineering, Pune

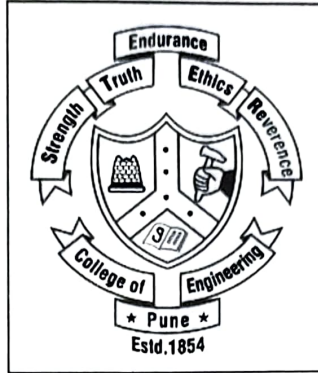
Date: /05/2022

Place: Pune

ABSTRACT

This study implements Storm Water Management Model (SWMM) to explore and study the catchment area of Nagpur, India. Education, employment, development and numerous other reasons have necessitated urbanisation. As far as the planning and execution for progressive environment is concerned urbanisation is inevitable. It brings about the infrastructural projects such as roads, pavements, buildings etc. Although it has a prominent role in development, certain drawbacks are also produced. Infiltration and imperviousness are the significant causes of flooding due to urbanisation. This Case study is used to assess infiltration using Curve number method and flow routing analysis using Dynamic wave method. The aim of this study is to check the runoff from a single rainfall event and to evaluate the accuracy of the drainage system. The drainage line and sub-catchments are defined using percentage of imperviousness and further divided according to elevation. The catchment is divided in to 10 small sub catchments, 12 conduits, with 13 junction nodes. Increase in the population, improper planning of urban infrastructure and paved surface are the main causes of urban floods. The inefficient drainage system leads to the problems of water logging in the area as a consequence of which the transportation issues and other environmental hazards are introduced. Hence, the design of best suited drainage network and its performance analysis is crucial. Methodology begins with the preparation of map compatible for the use of SWMM. Next step is to obtain various hydrologic data for this analysis such as slope, characteristic width, percentage of imperviousness, elevation etc. and defining sub-catchment, conduits, junctions, and rain gauge with input data. Eventually runoff, water elevation profile in conduits and critical locations of surcharging are obtained. In this study, we studied the application of Google Earth and SWMM in urban drainage design. Entire task was distributed in sub categories to achieve different objectives. We got an idea of the preparation that needs to be done to devise a drainage network that safely discharges the water to outlet point. Overall, we realized that such type of a complex problem can be divided into simpler and smaller chunks and combined as a complete solution to generate required results. It is concluded that our designed drainage system is efficient as the surface runoff error is 0.53% and flow routing error is 0.01% which are within permissible limits. Hence the peak runoff and corresponding volume is safely discharged outside of catchment. Drainage system is an important parameter of a well-planned sustainable development of urban areas, this project is expensive and may become uneconomical and inefficient if the features of area are not studied properly. This inaccuracy can be reduced if the terrain parameters such as elevation and lengths of conduits are measured with precision and best possible route is traced with SWMM. So, the application of SWMM should be taken into consideration in present as well as future.

CERTIFICATE



This is to certify that project report entitled “ **Design of Water Treatment Plant & Emerging Technologies** ” submitted by Prajwal Jaybahay (111801024), Gaurav Khadgi (111801028), Om Adchule (111801074) is a record of bonafide work carried out by them, under my guidance, at College of Engineering, Pune in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Civil Engineering from Savitribai Phule Pune University .

Dr. S. M. Nawghare
Project Guide
Civil Engineering Department
College of Engineering, Pune

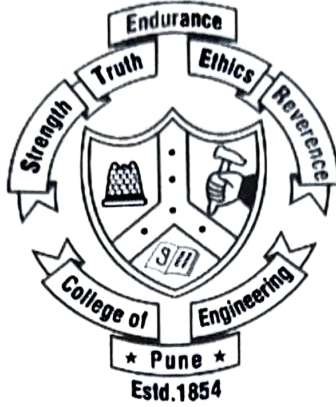
Dr. M.S. Ranadive
Head of Department
Civil Engineering Department
College of Engineering, Pune

ABSTRACT


Water, indubiously, is a fundamental human need. Providing secure and ok portions of the identical for all rural and concrete communities, is possibly one of the maximum critical undertakings, for the general public works department. Indeed, the nicely deliberate water delivery scheme, is a high and important detail of a country's social infrastructure as in this peg hangs the fitness and health of its people.

The population in India is possibly to be Hundred crores through the flip of this century, with an envisioned 40% of the city populace. This goes on to mention that a huge call for water delivery; for Domestic, Industrial, Firefighting, Public uses, etc.; should be according to the growing populace. Hence, identity of assets of water delivery, their conservation and highest quality usage is of paramount importance. The water provided ought to be 'Potable' and 'Wholesome'. Absolute natural water is in no way located in nature, however always includes positive suspended, colloidal, and dissolved impurities (natural and inorganic in nature, usually referred to as solids), in various stages of concentration, relying upon the source. Hence remedy of water to mitigate and lor absolute elimination of those impurities (which can be; solids, pathogenic microorganisms, smell and flavor generators, poisonous substances, etc.) end up indispensable. Untreated or improperly handled water, which will become undeserving for meant use, proves to be damaging for life.

CERTIFICATE



This is to certify that the report entitled '**Use of particle packing model to develop sustainable concrete with complete replacement of fine aggregate with industrial by-products**' submitted by Vaibhav Narwade, Krunal Shrirao, Anand Mohan Babu in the partial fulfilment of the requirement for the award of the degree of Bachelor of Technology (Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune University, is a record of their own work.

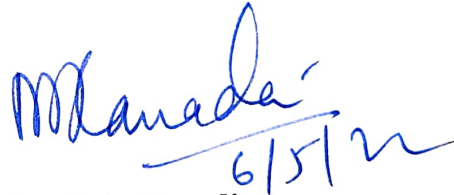
 06/05/22

Dr. Sharan Kumar Goudar

Guide

Department Civil Engineering

College of Engineering Pune

 6/5/22

Dr. M. S. Ranadive

Head of the Department

Department of Civil Engineering

College of Engineering Pune

Date:

Place: College of Engineering Pune

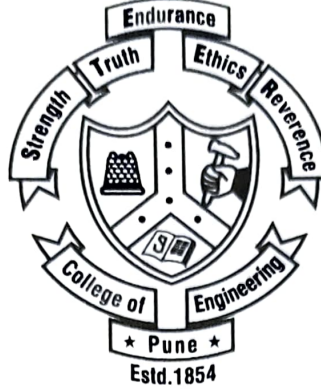
ABSTRACT

There is much research on replacing the river sand fine aggregate with industrial by-products but in this project, we will be using various materials instead of any one or two by-products, and our analysis will be based on the particle packing density method to ensure the validity of mix instead of experiment with large number cube casting for every trial ratio. We will be finding the best ratios that can give the desired result and then experiment with that proportions. In this project, we will try to replace river sand as fine aggregate in concrete with industrial by-products. Here, we will try to replace 100% river sand using copper slag, iron slag, quarry dust, and manufactured sand. We will use different mixed proportions of these by-products to replace river sand without affecting the particle packing density of concrete formed by natural river sand. Moreover, we will be aiming for 100% particle packing, i.e. to match the curve with the ideal curve of the ANDREASSEN modified model of the particle packing density of concrete.

For the experiment and analysis process, we will be using software “EMMA mix analyser” which is based on ANDREASSEN MODIFIED MODEL to compare particle packing with a modern ADREASSEN model graph. We will first compare the M20 and M25 grade concrete designed using IS CODE method as per IS 10262:2009. It is found there that particle packing density increases with an increase in concrete compressive strength and this is one factor that can be used to mix design methods for concrete with improved compressive strength in the same grade. We will replace the river sand (fine aggregate) with quarry dust (0-50%) , copper slag(0-50%), iron slag(0-50%), and manufactured sand (0-50%) for M20 grade concrete . It is found to be one of best proportion from other various combinations to caste concrete cubes with very less deviation to particle packing ideal curve of ANDREASSEN modified model.

This type of replacement and design is based on physical properties of materials like their size distribution, bulk density, and specific gravity; and overlook the chemical reactions of the material which may become the cause of the difference between the theoretical estimate and practical value.


CERTIFICATE

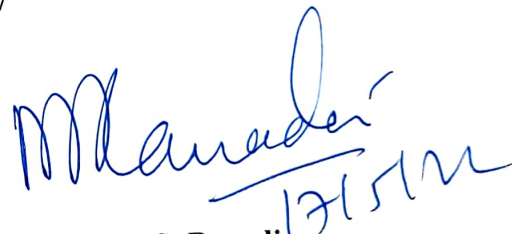


This is to certify that the report entitled 'Circular Economy For Water- Case Study Pune City' is submitted in the partial fulfilment of the requirement for the project of Bachelor of Technology (Civil Engineering) of College of Engineering, Pune, affiliated to the Savitribai Phule Pune University.

Submitted by:

Arti V. Ghongade 141901002
Shivanjali A. Jadhav 141901003
Saloni G. Wagh 141901007


Dr. P.A. Sadgir,
Professor
Dept. of Civil Engg.,
College of Engineering, Pune.


Dr. M. S. Ranadive,
Head of Department,
Dept. of Civil Engg.,
College of Engineering,

Date: 7/05/2022
Place: Pune

ABSTRACT

Water is one of the essential source of human survival and well beings in today's world and also plays an important role in many sectors of the economy. The whole world runs on water but unfortunately, due to natural depletion of water and the linear use removal system, the world has to face water crises throughout the globe. The earth is covered with 70% of water but the reality is that we have very less amount of potable and fresh water.

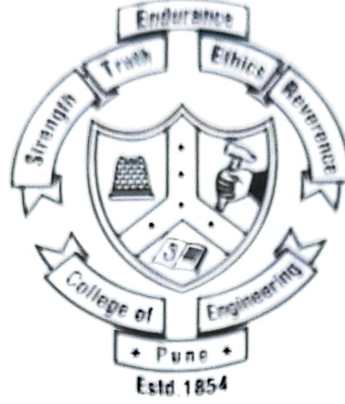
The potentials of reusing the treated wastewater has not yet been exploited to many areas. Considering the water scarcity in arid and semi-arid regions, transition to a circular economy can create a significant synergies for wide adoption of water reuse as an alternative water supply. By recycling and reusing of the wastewater, circular economy will enhance more to improve water supply by managing the wastewater better. Using the circular economy principles we can transform towards a better world and reduce water crises.

Water quality refers to the chemical, physical and biological characteristics of water. River water quality is highly variable by nature due to environmental conditions such as basin lithology, vegetation and climate. Rivers flowing in Pune district have now earned the dubious distinction of being the most polluted in the state. Builders and local residents have turned the river into a dumping site. During the past few years, industrial units in the vicinity of Pune have been dumping untreated waste into the river, destroying the quality of water. Assessment can be done by testing the parameters such as Temperature, pH, Turbidity, TSS, DO, BOD, etc

In present study, our main objective is to analyse the water quality selected regions of Mula-Mutha river. For this purpose, the data from Pune Municipal corporation (PMC) is collected and the details provided by them is followed. Khadakwasla dam is selected as Source of water for water distribution network. The total live storage of dam is around 30 TMC. The total water supplied to the city is around 14.5 TMC (1250 MLD). This project includes tests for selected water quality parameters.

Key words: Water Quality, Assessment, Mutha River, Pune City

CERTIFICATE



This is to certify that the report entitled '**Breach Analysis of Gangapur Dam**' is submitted in the partial fulfilment of the requirement for the project of Bachelor of Technology (Civil Engineering) of College of Engineering, Pune, affiliated to the Savitribai Phule Pune University.

Submitted by:

Yogesh D. Lilake	141901004
Sagar D. Pawar	141901005
Mayuri P. Sakhare	141901006

A. D. Thube
6/7/10/5/2022
Dr. (Mrs.) A. D. Thube,
Guide And Asso. Professor
Dept. of Civil Engg.,
College of Engineering,
Pune.

M. S. Ranadive
17/5/22
Dr. M. S. Ranadive,
Head of Department,
Dept. of Civil Engg.,
College of Engineering,
Pune.

Date: / /2022

Place: Pune

ABSTRACT

Earthen dams are the most ancient type of embankments, as they can be built with the natural materials with a minimum of processing and primitive equipment. However, studies shows that earthen dams are more susceptible to failure as compared to rigid gravity dams or arch dams.

A dam breach is a catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release of water. Therefore, Dam breach geometry prediction is crucial in dam break studies. The characteristics of flood hydrographs resulting from a dam breach essentially depend on the breach geometry and the required time for breach formation. To investigate the impact of breach parameters on maximum breaching outflows, five breach prediction approaches were implemented to calculate the breach parameters and breach formation time, these are obtained from widely used empirical approaches. These methods are based on statistical analysis of data derived from documented dam failures, which give reasonable predicted values compared to actual observed values.

This study focuses on Gangapur Dam of Nashik district; thereby the study is carried out by calculate breach parameters which are then used in HEC-RAS software for dam breach analysis and accordingly flood routing and effects of this breach on downstream side were developed based on simulation model. Also, Inundation map was prepared in ArcGIS software for preparation of Emergency Action Plan (EAP).

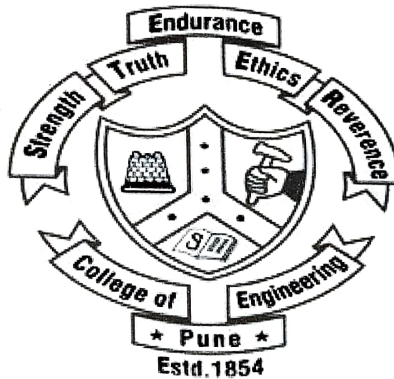
The EAP specifies actions the owner should take to moderate or alleviate the problems at the dam site as well as in the areas downstream of the dam and also states what actions shall be taken for successful evacuation. In EAP evacuation routes are marked and shown in evacuation route map for whole flood prone area of downstream of Gangapur Dam prepared using the results HEC-RAS study and Inundation maps obtained.


COLLEGE OF ENGINEERING PUNE

DEPARTMENT OF CIVIL ENGINEERING

CERTIFICATE

This is to certify that the Final Year B.Tech. Civil Engineering project report entitled "Analysis and Design of Different Types of Slabs" submitted by the students Madhulika Mendhe (111801057), Omkar Gorde (111801075), Sanyukta Rekhe (111801043) in the partial fulfilment of the requirement for the award of Bachelor of Technology (Civil Engineering) of College of Engineering Pune, affiliated to the Savitribai Phule Pune university, is a record of their own work and is prepared within rules and regulations of College of Engineering Pune.




 : 10/05/22

Prof. Ashish R. Akhare

Guide

Date:

Place:


Prof. Dr. P. A. Sadgir

Head

Professor & Head

Department of Civil Engineering
College of Engineering Pune

Analysis and Design of Different Types of Slabs

ABSTRACT

The report consists of a detailed comparative study of four different slabs that is Flat slab, RCC slab, PSC slab, Waffled slab and E-Tabs software work. Following is the overview introduction of all four slabs and software.

The flat plate is a two-way reinforced concrete framing system utilizing a slab of uniform thickness, the simplest of structural shapes. The flat slab is a two-way reinforced structural system that includes either drop panels or column capitals at columns to resist heavier loads and thus permit longer spans.

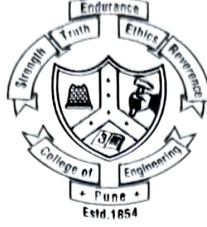
Reinforced Cement Concrete (RCC) is a composite building material consisting of structural concrete reinforced with a reinforcing material like steel. The most common reinforcement used is steel, due to its complimentary properties and it is called steel reinforced cement concrete or simply Reinforced Cement Concrete. Steel bars embedded in concrete are called as 'reinforcing bars or reinforcement'.

Prestressing the concrete is one of the methods of utilizing entire concrete. The principle of prestressed concrete is to introduce calculated compressive stresses in the zones wherever tensile stresses are expected in the concrete structural elements. When such structural element is used stresses developed due to loading has to first nullify these compressive stresses before introducing tensile stress in concrete. Thus, in prestressed concrete entire concrete is utilized to resist the load.

Waffle slab or ribbed slab is a structural component which is plain on its top and contains grid like system on its bottom surface. The top of ribbed slab is normally thin and the bottom grid lines are generally ribs which are laid perpendicular to each other with equal depth. Waffle slab has two directional reinforcements.

ETABS is an engineering software product that caters to multi-story building analysis and design. Modelling tools and templates, code-based load prescriptions, analysis methods and solution techniques, all coordinate with the grid-like geometry unique to this class of structure. Basic or advanced systems under static or dynamic conditions may be evaluated using ETABS. For a sophisticated assessment of seismic performance, modal and direct-integration time-history analyses may couple with P-Delta and Large Displacement effects.

CERTIFICATE



This to certify that the report entitled

“An Experimental Investigation of Bubbled RC Beam”

Submitted by

1. Akshay Sawant (MIS-111801045)
2. Piyush Gaikwad (MIS-111801078)
3. Sangram Kharade (MIS-111801097)

In the partial fulfillment of the requirement for the award of degree of Bachelor of Technology (Civil Engineering) of College of Engineering Pune, affiliated to Savitribai Phule Pune University, is a record of their own work

Prof. Yashaswini LomtePatil
Project Guide
Assistant professor
Civil Engineering Department
College of Engineering, Pune

Dr. M.S. Ranadive
Head of Department
Civil Engineering Department
College of Engineering, Pune

ABSTRACT

In building constructions, the beam is a very important structural member to carry load of the slab. Bubble beam is a method of virtually eliminating all concrete from the middle of a Beam, which is not performing any structural function, thereby dramatically reducing structural dead load. Bubble beam is a beam whose core is replaced with Spherical balls that can be of various sizes and shapes. Usually the Bubble Deck system combines the benefits of factory manufactured elements in controlled conditions along with on-site completion. Some of its major benefits are lower total cost, reduced material use, enhanced structural efficiency, decreased construction time, and is a green technology. In this project the in-effective concrete in the Centre of the beam is replaced with High density polyethylene hollow spheres, using M25 grade of concrete no of beams with and without spherical bubbles were casted to compare weight and flexural strength