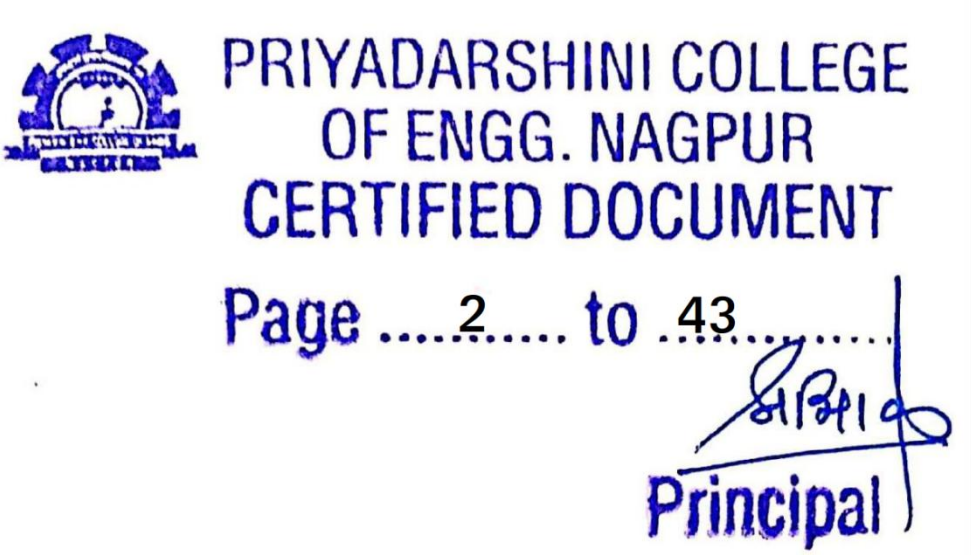
Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI COLLEGE OF ENGINEERING
(Recognised by A.I.C.T.E., New Delhi & Govt. of Maharashtra, Affiliated to R.T.M.Nagpur University)
Near CRPF Campus, Hingna Road, Nagpur-440 019, Maharashtra (India)
Phone : 07104 – 236381, 237307, Fax : 07104 – 237681,
email : principal.pce.ngp@gmail.com, www.pcenagpur.edu.in

1.3.2 Average percentage of courses that include experiential learning through project work/field work/internship during last five years



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1.3.2 Average percentage of courses that include experiential learning through project work/field work/internship during last five years

BE –CIVIL ENGINEERING SESSION 2016-2017

Sr. No	Name of the course that include experiential learning through Project work/ Internship	Subject Code	Domain	Page No
1	Concrete Technology	BECVE305T/P	Construction Technology, and Management	3-10
2	Surveying – I	BECVE 404T/P		
3	Building Construction &Material	BECVE 405T/P		
4	Surveying-II	BECVE602T/P		
5	Building Design and Drawing	BECVE604P		
6	Estimating and Costing	BECVE702T/P		
7	Construction Management and Law	BECVE704T		
8	Engineering Geology	BECVE304T/P	Geotechnical Engineering and Geology	11-19
9	Geotechnical Engineering-I	BECVE 402T/P		
10	Geotechnical Engineering -II	BECVE504T		
11	Environmental Engineering – I	BECVE303T/P	Environmental Engineering, Hydraulics and Water Resources Engineering	20-26
12	Fluid Mechanics -I	BECVE503T/P		
13	Hydrology &Water Resources (HWR)	BECVE505T		
14	Fluid Mechanics -II	BECVE603T/P		
15	Environmental Engineering-II	BECVE605T		
16	Elective -I : Air Pollution And Solid Waste Management	BECVE703T		
17	Irrigation Engineering	BECVE801T		
18	Elective - III :Water and Waste Water Treatment	BECVE803T		
19	Strength of Materials	BECVE302T/P	Structural Engineering	27-34
20	Structural Analysis – I	BECVE 401T/P		
21	Structural Analysis -II	BECVE501T/P		
22	Reinforced Cement Concrete (RCC) Structures	BECVE502T/P		
23	Steel Structures	BECVE601T/P		
24	Advanced Concrete Structures	BECVE701T/P		
25	Elective -I : Earthquake Resistant	BECVE703T		

	Design of Structure			
26	Elective - III : Advanced Reinforced Cement Concrete Design	BECVE803T/P		
27	Transportation Engineering – I	BECVE 403T/P	Transportation Engineering	
28	Transportation Engineering - II	BECVE705T		
29	Elective - II : Pavement Analysis And Design	BECVE802T		
30	Applied Mathematics-III	BECVE301	Other	**35-42**
31	Communicative English &Technical Writing	BECVE506P		
32	Site Visit &Mini Project	BECVE606P		
33	Industrial Case Study and Project Seminar	BECVE706P		
34	Construction Economics and Finance	BECVE804T		
35	Project	BECVE805P		

Domain 1: Construction Technology and Management

Sr. No	Name of the course that include experiential learning through Project work/ Internship	Subject Code	Domain
1	Concrete Technology	BECVE305T/P	Construction Technology and Management
2	Surveying – I	BECVE 404T/P	
3	Building Construction &Material	BECVE 405T/P	
4	Surveying-II	BECVE602T/P	
5	Building Design and Drawing	BECVE604P	
6	Estimating and Costing	BECVE702T/P	
7	Construction Management and Law	BECVE704T	

BECVE 305T CONCRETE TECHNOLOGY

Objectives:

- To prepare the students to understand constituents of concrete and their effect on qualityof concrete.
- The course will prepare students to apply basic rules for manufacture of plastic concreteand its mechanization.
- To prepare students to apply various methods for testing of plastic and hard concrete.
- To prepare students to analyse behavior of concrete structure under different environmental conditions.
- The course will prepare students to analyse and design various basic concrete buildingcomponents.

Outcomes:

- The students would be able to check and recommend different constituent of concrete.
- The students would be able to control method of manufacture of concrete.
- The students would be able to test strength and quality of plastic and set concrete.
- The students would have the understanding of application admixture and its effect on properties of concrete.
- The students would be able to understand the effect of process of manufacturing on different properties of concrete.
- The students would be able to understand various environmental factors which affect durability of concrete, analyse cause of deterioration of concrete components and to suggest various preventive measures to it.
- The students would be able to test various strength of concrete by destructive and nondestructive testing methods.

Syllabus:

Unit – I Cement

Chemistry of Cement, Main constituents of cement Hydration of cement, Water required, Physical properties and testing of cement, Soundness test. Hardening and compressive strength Grades and different types of cements. Ordinary Portland cement, Rapid Hardening Cement, B.B. Blast furnace slag cement, Low heat Portland cement, Portland pozzolones cement, Portland flyash cement, Sulphate resisting cement. Field test,

Aggregates : Sources of aggregates, classification and nomenclature. Coarse and fine aggregate, normal weight (light and heavy weight aggregates). Aggregate characteristics and their significance in strength, workability, placement and compaCtion of concrete. Sampling. Particle shape and texture, Bond of aggregate, size & grading of aggregate strength of aggregates Mechanical properties and test- Specific gravity, Bulk density, porosity absorption of aggregates, moisture content of aggregate, bulking of sand abrasion test, impact value. Sieve analysis Deleterious substances in aggregates, organic impurities class and other fine material etc.

Water : Quality of water for concrete mixing, suitability.

Unit – II

Fresh concrete : Batching, Mechanical mixers, automatic batching and mixing plants. Efficiency of mixing. Workability Measurement – Slump cont test, compacting factor test, flow table, Vee-Bee consistometer, Factor affecting workability, setting time. W/C Law Significance of w/c ratio cohesiveness.Segregation, bleeding, voids, permeability. Hot weather concreting. Underwater concreting, Conveyance of concrete, Placing of concrete. Compaction-vibrators. Curing of concrete Significance, methods of curing, Temperature effect on during & strength gain. IS code on curing.Maturity of concrete.

Unit - III

Strength of concrete-

Gain of strength, Wet ratio, Factor affecting compressive strength w/c ratio. Type of cement, air entrainment, aggregates, mixing water, Admixtures, curing conditions. Tensile and flexural strength. Relation between cracking in compression. Impact strength fatigue strength. Shear strength, Bond between concrete & reinforcement. Modulus of elasticity, Poison's ratio.

Testing of Hardnessof Concrete: Compression test-cube strength & cylinder strength their relation, effect of aspect ratio on strength. Flexural strength of concrete, Determination of tensile strength. Indirect tension test.Splitting test.Abrasion resistance.Accelerated curing test.

Unit – IV

Mix Design – Process, Statistical relation between mean & characteristic strength, Variance, Standard deviation. Factor affection mix properties. Grading of aggregate, aggregate/ cement ration etc. Degree of quality control. Design mix by Road note no. 4 (BS). IS:10262:2009.

Additives and Admixtures: Types of admixtures, Natural products-DietomaceousearthBy products- Pozzolones. Fly ash, silica fume, rice husk ash, , G.G. blast furnace slag. Admixturers-air encraining, water reducing, acceletors, retarders, plasticizers & Super plasticizers, permeability reducing,surface harderners.Corrosion inhibitors & water proofing agents.

Unit – V

Special concrete : Self compacting concrete, High performance concrete, fiber reinforced & polymer concrete, Ferro cement, Shortcrete pumped concrete, Free flow concrete.

Shrinkage-Early volume changes, drying shrinkage, mechanism of shrinkage.Factor affecting shrinkage. Influence of curing & storage conditions. Differential shrinkage.Carbonation shrinkage.Creep-Factors influencing.Relation between creep & time, nature of creep, effect of creep.

Unit – VI

Durability of concrete-significance water as an agent of deterioration. Permeability of concrete, Efflorescence.Distress in concrete structures and its causes, cuses of deterioration of concrete.

Cracks in concrete: Causes, types, prevention, repairs of craqcks – materials and methodsNon Destructive tests.

PHYSICAL, CHEMICAL AND MECHANICAL TEST OF COAL BOTTOM ASH & WASTE FOUNDRY SAND AND ITS EFFECT ON DURABILITY OF CONCRETE

A Project Work Submitted in partial fulfillment of the requirement for the award of the Degree of

BACHELOR OF ENGINEERING
IN
CIVIL ENGINEERING

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY
NAGPUR

Submitted by:-

NEHA KAMBLE
NAVED QURESHI
ASHIL KHAN

PALLAVI SINGH
MUKUL KUMAR
DILESH WADHAIKAR

Under the guidance of:-

Prof. Ms. V. A. Ganvir
Asst. Professor

(Civil Department)

-

DEPARTMENT OF CIVIL ENGINEERING
PRIYADARSHINI COLLEGE OF ENGINEERING NAGPUR

2016-17

I

PRIYADARSHINI COLLEGE OF ENGINEERING
NAGPUR

CERTIFICATE

This is to certify that the work presented in this project entitled has been completed by, **"PHYSICAL, CHEMICAL AND MECHANICAL TEST OF COAL BOTTOM ASH & WASTE FOUNDRY SAND AND ITS EFFECT ON DURABILITY OF CONCRETE" , Neha Kamble, Pallavi Singh, Naved Qureshi, Mukul Kumar, Ashil Khan, Dilesh Wadhaikar** students of B.E. (Civil Engineering) of this institution in satisfactory manner and in partial fulfilment of the requirements for the award of the degree of Bachelor of Engineering in Civil Engineering of the Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur during the year 2016 – 2017.

Prof. Ms. V. A. Ganvir
Asst. Professor
PCE, Nagpur

Dr. S. A. Dhale
H.O.D., Civil Dept.,
PCE, Nagpur

Dr. M. P. Singh
Principal
PCE, Nagpur

ABSTRACT

Generation of Coal Bottom Ash and Waste Foundry Sand are the waste products of improper combustion of coal in furnace or boilers and of metal casting industries, causing environmental problems because of its improper disposal. Thus, their usage in building materials, construction and in other fields is essential for reduction of environmental problems. This research represents the result of an experimental investigation of physical, chemical and mechanical properties of coal bottom ash (CBA) obtained from Koradi thermal power plant station and waste foundry sand (WFS) obtained from Jaiswal Neco industry MIDC- Hingna. And its effect on durability of concrete.

The experimental investigation carried out on a concrete containing CBA and WFS in the proportion of 10% & 6% respectively by weight for M20 grade. Materials were procured, tested and compared with conventional concrete in terms of durability. These tests were carried out on standard cubes of 150x150x150 mm for 28 days to determine the durability of concrete. Through the experiment we concluded that CBA and WFS can be partially replaced for 10% and 6% respectively. This research work is concerned with determination of physical, chemical, and mechanical properties of CBA and WFS and optimum percentage of the partial replacement by replacing cement and sand respectively.

Keywords- CBA, WFS, Physical Properties, Chemical, Mechanical, Durability

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

1.1 PREAMBLE

Various industries produce numerous solid waste materials. The disposal of these solid waste materials is an environment hazard for the surrounding living beings. Cachim et al. (2014) observed that because of increasing environmental concerns and sustainable issues, the utilization of solid waste materials is the need of us. The productive use of solid waste materials is the best way to alleviate the problems associated with their disposal. The construction industry has enormous potential for the use of solid waste materials as construction material. Based upon their properties, the solid waste materials can either be used as supplementary cementitious materials or as replacement of fine/coarse aggregate in concrete or mortars. Based on the research reports some solid waste materials such as fly ash, silica fume, coal bottom ash, waste foundry sand, etc have been put in use in manufacturing of either cement, sand or concrete.

In India, about 67% of electricity requirements are fulfilled by the coal fired thermal power plants (CEA, 2012). Electricity demand in the country is increasing every year. At present, the country is facing average energy shortage of 6.7% at national level but the southern part of the country experience 26.7% energy shortage (CEA, 2012). To fill up the existing gap between demand and supply of power and to meet the increasing energy requirements, coal fired thermal power plants are being set up in large number in the country. Coal fired thermal power plants produce large volumes of fly ash and coal bottom ash. Till now, it is treated as solid waste material and is disposed off on open land.

As per Central Electricity Authority, India, report (2014), about 57.63% of coal ash produced by coal fired thermal power plants is used in cement production and in manufacturing of bricks and tiles, construction of ash dykes and reclamation of low lying areas. Fly ash is used as raw material in manufacturing of cement and bricks. However, coal bottom ash is not used in any form. The enormous quantity of coal bottom ash is getting accumulated near the power plant sites. The dumped coal bottom ash on open land is posing environmental hazards to the surrounding community and ecosystem.

Domain 2: Geotechnical Engineering and Geology

Sr. No	Name of the course that include experiential learning through Project work/ Internship	Subject Code	Domain
1	Engineering Geology	BECVE304T/P	Geotechnical Engineering and Geology
2	Geotechnical Engineering-I	BECVE 402T/P	
3	Geotechnical Engineering -II	BECVE504T	

BECVE 402 T GEOTECHNICAL ENGINEERING-I

Objectives:

- To impart knowledge about origin and classification of soils.
- To impart knowledge about index properties and their determination.
- To impart knowledge about engineering properties and their determination.
- To impart knowledge about stress distribution in soil mass.

Outcomes:

- Students would be able to determine the index and engineering properties of the soil.
- Students would be able to determine the suitability of foundation for a particular type of soil.
- Students will be able to classify the soils.
- Students would be able to evaluate the stresses in the soil mass.

Syllabus :

Unit I

- Introduction : Formation of soil, residual & transported soil, major deposits found in India, soils generally used in practice such as sand, gravel, organic soil, clay, Betonies, , black cotton soil etc. Introduction to clay mineralogy.
- Phases of soil: Various soil weight & volume inter-relationship. Density index, methods of determining in situ density.

Unit II

Index Properties & Their Determination, Water content, specific gravity, sieve analysis, particle size distribution curve, sedimentation analysis, Differential and free swell value, Consistency of soil, Atterberge's limits . Classification of Soil : Particle size classification, Textual classification, Unified & I.S. classification system, field identification of Expansive soil, Swelling pressure.

Unit III

- Permeability: Darcy's law & its validity, Discharge & seepage velocity, factors affecting permeability, Determination of coefficients of permeability by Laboratory and field methods, permeability of stratified soil.
- Seepage : Seepage pressure, quick sand condition, characteristics & uses of flownets, Preliminary problems of discharge estimation in homogeneous soils, Effective, Neutral and total stresses in soil mass.

Unit IV

- Stress Distribution : Stress distribution in soil Mass, Boussinesque equation, point load and uniformly distributed load over rectangular & circular areas, Use of Newmarks charts.

Unit V

- Consolidation : Compression of laterally confined soil, Terzaghis 1-D consolidation theory (formation of Differential equation), Determination of coefficient of consolidation, Degree of consolidation. Determination of preconsolidation pressure, Settlement, Rate of settlement.
- Compaction : Mechanism of compaction, factors affecting compaction, standard & modified proctor Tests, field compaction equipments, quality control, Advance compaction Techniques, Nuclear density meter.

Unit VI

- Shear Strength : Introduction, Mohr Coulombs theory, Drainage condition, Measurement of shear strength by direct shear test, triaxial test, unconfined compression test, vane shear test, sensitivity.

GEOTECHNICAL ENGINEERING-II

BECVE504T **Evaluation Scheme: (80/20)**

(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

- Use the knowledge of different soil exploration techniques to ascertain the properties ofsoil
- To analyze the stability of natural slopes, safety & sustainability of the slopes, design ofretaining structures, reinforced earth walls, etc.
- Practice Ground Improvement Techniques.
- Design the shallow & deep foundation.

Unit- I: GEOTECHNICAL EXPLORATION

Importance and objective of field exploration , geophysical methods and its limitations, methods of subsurface exploration, methods of boring, number, location and depth of boring, types of soilsamples and samplers, principles of design of samplers, collection & shipments of samples, boring and sampling record.

Unit- II: STABILITY OF SLOPES

Causes and types of slope failure, stability analysis of infinite slopes, Taylor's stability numbers & stability charts, stability analysis of finite slope for purely C- soils and C - soils, center of critical slip circle, (Swedish circle method), slices method for homogeneous C - soil slopes with pore pressure consideration, Friction circle method, method of improving stability of slopes;types, selection and design of graded filters.

Unit- III: LATERAL EARTH PRESSURE

Earth pressure at rest, active and passive pressure; general & local states of plastic equilibrium insoil. Rankine's and Coulomb's theories of earth pressure. Effects of surcharge & submergence. Determination of Active earth pressure through graphical construction; Rebhann's and Culman's method

Unit- IV: GROUND IMPROVEMENT

Need of ground improvement, ground improvement techniques, stabilization using lime, cement & flyash; prealoading concept, vibrocompaction/flotation, concept of sand drains, stone columns, encased stone column, concept of NPVD (natural prefabricated vertical drain) and PPVD (polymer prefabricated vertical drain). Basic concept of reinforced soil, different types of Geo-synthetics, Geo-synthetic application and functions in civil engineering

Unit- V: SHALLOW FOUNDATION

Bearing capacity of soil: Factor affecting bearing capacity, Terzaghis theory, its validity and limitation, types of shear failure in foundation soil, effect of

water table on bearing capacity, (introduction to IS method, factor affecting bearing capacity, field determination of bearing capacity through plate load test and standard penetration test,)

Settlement of shallow foundation: Causes of settlement, elastic and consolidation settlement, differential settlement, control of excessive settlement. (Standard penetration test, corrections for N - values to obtain design soil parameters**.)**

Unit- VI: PILE FOUNDATION

Classification of piles, constructional features of cast- in – situ & pre cast concrete piles. Pile driving methods, effect of pile driving on ground. Pile capacity by static formula & dynamic formulae, pile load test, group action of piles, spacing of piles in group, settlement of group of pile (pile group,) negative skin friction and its effect on pile capacity, general features of under reamed piles.

STABILIZATION OF BLACK COTTON SOIL USING RICE HUSK ASH AND VARIOUS ADMIXTURES

A thesis submitted in partial fulfilment of the requirements

For the award of the degree of

Bachelor of Engineering

in

Civil Engineering

By

AKSHAY WANI

ABDUL ZEESHAN

GAURAV KALAMBE

VAISHNAVI WADHAI

AKSHAY BHAJIPALE

CHETNA CHARDE

NEHAL ROY

Under the guidance of

Prof. Vishal S. Ghutke

Assistant Professor & Guide

Civil Engineering

DEPARTMENT OF CIVIL ENGINEERING

PRIYADARSHINI COLLEGE OF ENGINEERING

NAGPUR - 440019

2016-2017

PRIYADARSHINI COLLEGE OF ENGINEERING
NAGPUR

CERTIFICATE

This is to certify that the work presented in this thesis entitled "**STABILIZATION OF BLACK COTTON SOIL USING RICE HUSK ASH AND VARIOUS ADMIXTURES**" has been completed by

AKSHAY WANI

ABDUL ZEESHAN

GAURAV KALAMBE

VAISHNAVI WADHAI

AKSHAY BHAJIPALE

CHETNA CHARDE

NEHAL ROY

Students of B.E. (Civil Engineering) of this institute in satisfactory manner and in partial fulfilment of the requirement for the degree of Bachelor of Engineering in Civil Engineering of the Nagpur University.

Prof. Vishal S. Ghutke
Assistant Professor & Guide
Civil Engineering

Dr. S.A. Dhale
Professor & H.O.D

Dr. M. P. Singh
Principal, P.C.E, Nagpur-19

ABSTRACT

This paper present an experimental investigation, carried out to study the effects of Rice Husk Ash and Fly Ash on Index Properties and Engineering Properties of Black Cotton Soil. Black Cotton Soil mixed with Rice Husk Ash in 6%, 12%, 18%, 24%, and 30% and with Fly Ash in 8%, 16%, 24% and 32% ratio by weight of dry soil as per relevant IS code of practice and tests for Index properties and Engineering Properties are carried out. The results showed a marked change in Index Properties and Engineering Properties of soil sample. The Liquid Limit decrease from 70% to 40% with increase in Rice Husk Ash from 6% to30% and decreases from 50% to 46% with increase in Fly Ash from 8% to 32% whereas Plastic Limit decrease from 43.45% to 40% with increase in Rice Husk Ash and decrease from 35.56% to 30.34% with increase in Fly Ash. The Liquid Limit of soil+12%RHA+ %FA decreases from 60% to 42% with increase in FA from 8% to 32%. The Plastic limit of soil+ 12%RHA+%FA decreases from 40.3% to 26.4% with increase in FA from 8% to 32%. Also Maximum Dry Density is decreased from 2.72 g/cc to 2.29 g/cc and Optimum Moisture Content is increased from 10% to 14.28% with increase in Rice Husk Ash. Maximum Dry Density is increased from 2.53 g/cc to 2.76 g/cc and Optimum Moisture Content is decreased from 20% to 12.5% with increase in Fly Ash. Maximum dry density of combination soil+12%RHA+%FA increased from 2.47g/cc to2.58g/cc and optimum moisture content decreases from 17.64% to12.5%. Maximum dry density of combination soil+12%RHA+%CCF increased from 2.55g/cc to2.72g/cc and optimum moisture content decreases from 17.64% to10.5%. The Unconfined Compressive Strength increased from 0.857 kg/cm^2 to 1.76 kg/cm^2 with increase in RHA up to 12%. Unconfined Compressive Strength increased from 1.106kg/cm^2 to 2.40kg/cm^2 with increase in FA up to 24% for combination of soil+12%RHA+%FA. Unconfined Compressive Strength increased from 2.23kg/cm^2 to 4.47kg/cm^2 with increase in CCF up to 1.2%% for combination of soil+ 12%RHA+ %CCF. The improvement in Index and engineering properties of soil reveals that Rice Husk Ash, Fly ash & Coconut Coir Fiber is an important material to stabilize the Black Cotton Soil and make suitable for construction purpose.

Keywords: - Black Cotton Soil, Coconut Coir Fiber, Rice Husk Ash, Fly Ash, Soil Stabilization, Index Properties, Engineering Properties, UCS.

1.1 GENERAL

In India Black cotton soil covers about 20% area of land. Black cotton soils is one of the problematic soils that has great tendency for Shrinking or swelling due to change of water content. Clays exhibit generally undesirable engineering properties. They tend to have low shear strengths and to lose shear strength further upon wetting or other physical disturbances. They can be plastic and compressible and they expand when wetted and shrink when dried. Some types expand and shrink greatly upon wetting and drying – a very undesirable feature. Cohesive soils can creep over time under constant load, especially when the shear stress is approaching its shear strength, making them prone to sliding. They develop large lateral pressures. They tend to have low resilient modulus values. For these reasons, clays are generally poor materials for foundations. Because of its peculiar cyclic swell shrink behaviour, these soils increase in volume when comes in contact with water and decrease in volume when water is evaporates out. Due to this tendency the deformation of soil cannot be predicted. This produces differential settlement and movement in soil and hence in structure which is usually in an uneven manner and is of such magnitude which creates severs damage to structures constructed on the soil. This inadequate natural stability of Black cotton soil needs to be improved to make them suitable for construction .using some sort of stabilization method. Many stabilization techniques are in practice for improving the characteristics of black cotton soil. Stabilizers such as lime, fly ash, rice husk ash, cement, silica fumes etc. are used to enhance properties of black cotton soil. The selection and the amount of stabilizers to be used depend mainly on the mineralogical composition of soil.

1.2 What is Black Cotton Soil?

Rich proportion of Montmorillonite is found in Black cotton soil from mineralogical analysis. High percentage of Montmorillonite renders high degree of expansiveness. These property results cracks in soil without any warning. These cracks may sometimes extent to severe limit like ½" wide and 12" deep. So building to be founded on this soil may suffer severe damage with the change of atmospheric conditions.

Domain 3: Environmental Engineering, Hydraulics and Water Resources Engineering

Sr. No	Name of the course that include experiential learning through Project work/ Internship	Subject Code	Domain
1	Environmental Engineering – I	BECVE303T/P	Environmental Engineering, Hydraulics and Water Resources Engineering
2	Fluid Mechanics -I	BECVE503T/P	
3	Hydrology &Water Resources (HWR)	BECVE505T	
4	Fluid Mechanics -II	BECVE603T/P	
5	Environmental Engineering-II	BECVE605T	
6	Elective -I : Air Pollution And Solid Waste Management	BECVE703T	
7	Irrigation Engineering	BECVE801T	
8	Elective - III :Water and Waste Water Treatment	BECVE803T	

ENVIRONMENTAL ENGINEERING-II

BECVE605T **Evaluation Scheme: (80/20)**

(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs.**

COURSE OUTCOMES: The students shall be able to

- Use the concept related to water & its quality, sewage, sewer, storm water, etc in its hydraulic design
- Apply the knowledge of different components of sewer in construction, testing & maintenance of sewers,
- To test the sample of waste water in the laboratory for physical & chemical characteristics.
- Take-up functional planning, layout and design of water treatment plant components.
- Take-up functional planning, layout and design of sewage treatment plant components.
- Plan for rural sanitation provisions, perform functional design of septic tank,
- Analyze the industrial waste water for its treatment units.
- Make use of knowledge & effect of air pollution, solid waste in planning for its prevention and control.

Unit-I

General Aspects of Environmental Engineering – Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water, Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.)

Unit - II

Construction of sewer - Shoring, Trenching and laying to grade. Sewer materials, Sewer Appurtenances - manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation: House plumbing systems, sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps. Sewage pumping - location of pumping station and types of pumps. Sewer testing and maintenance.

Unit - III

Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, Sewage treatment flow sheet, site selection for sewage treatment plant. Preliminary and primary treatment - Screens, Grit chambers, oil & grease removal. Primary settling tank (including simple design)

Unit- IV

Secondary treatment - Principle of Biological Treatment Activated sludge process, trickling filter, (Indian Standard for disposal), Methods of disposal, Sewage farming, self purification of stream (Streeter

Phelp's equation, Oxygen sag curve). Recycle & reuse of sewage (Zero discharge concept). Sludge digestion, sludge drying beds.

Unit - V

Rural sanitation; Pit privy, aqua privy, bio-gas recovery Septic tank including soak pit, including design problem (as per relevant I.S. Code) Sullage collection and disposal

Industrial Waste Water Treatment - Significance of Industrial Waste Water Treatment, important physical and chemical parameters, unit operations and processes (flow equalization, neutralization, adsorption, chemical and biological treatment (in brief)

Unit VI

Air pollution and solid waste: Sources, classification, Effects, prevention and control. Introduction to carbon credit system and climate change

WASTEWATER TREATMENT BY ADSORPTION USING ACTIVATED CARBON

A project report submitted in partial fulfillment of

The requirement for degree of

BACHELOR OF ENGINEERING IN

CIVIL ENGINEERING

Submitted by

ARKAPRABHA TRIPATHI	**HARSHIL BISAN**
ROHIT CHETNANI	**SACHIN KHEOLE**
NAMRATA NILGAOKAR	**SUPRIYA AMBADE**

Under the guidance of

Prof. VIKASH AGRAWAL

[B.E, M.Tech (Environmental Engg.)]

Co-Guidance of

Prof. JAYSHRI KANFADE (Department of Chemistry)

DEPARTMENT OF CIVIL ENGINEERING

PRIYADARSHINI COLLEGE OF ENGINEERING

NAGPUR - 440019

2016-2017

PRIYADARSHINI COLLEGE OF ENGINEERING

NAGPUR

CERTIFICATE

This is to certify that the work presented in this thesis entitled "WASTEWATER TREATMENT BY ADSORPTION USING ACTIVATED CARBON" has been completed by:-

ARKAPRABHA TRIPATHI	HARSHIL BISAN
ROHIT CHETNANI	SACHIN KHEOLE
NAMRATA NILGAOKAR	SUPRIYA AMBADE

Students of B.E. (Civil engineering) of this institute in satisfactory manner and in partial fulfilment of the requirement for the degree of Bachelor of Engineering in Civil engineering of the Nagpur University.

Prof. Vikash Agrawal

(Guide)

Department of Civil Engineering

22/03/2017

Dr. S.A. Dhale

(Professor& H.O.D.)

Department of Civil Engineering

Prof. Jayshri Khanfade

(Co-Guide)

Department of Chemistry

Dr. M. P. Singh

Principal

P.C.E, Nagpur-19

ABSTRACT

Wastewater is a water containing wastes from residential, commercial and industrial processes. These wastewater contain many harmful impurities. If wastewater is not properly treated, then the environment and human health can be negatively impacted. These impacts can include harm to the aquatic life when disposing it into the rivers. For deciding the line of its treatment and its disposal, it is essential to know its characteristics. The important characteristics are BOD, COD, pH and turbidity. Thus activated carbon has been used as adsorbent for treating the wastewater. It is collected from 'Bhandewadi" (Wastewater Treatment Plant, Nagpur), immediately after bringing the wastewater initial parameters like BOD, COD, pH and Turbidity were tested. After putting the wastewater sample at 2%, 4%, 5% and 6% of Activated Carbon for 7 and 14 days. The result shows that COD, pH, turbidity decreases for all the percentages of activated carbon with respect to the initial results for 7 and 14days respectively. But BOD decreases at initial percentage but increases abruptly at 6%. Thus from all the results at every percentage we conclude that 4% of activated carbon gives efficient removal.

CHAPTER – 1

INTRODUCTION

1.1 General

Wastewater, also written as waste water, is any water that has been adversely affected in quality by anthropogenic influence. Wastewater can originate from a combination of domestic, industrial, commercial or agricultural activities, surface runoff or stormwater, and from sewer inflow or infiltration. Municipal wastewater (also called sewage) is usually conveyed in a combined sewer or sanitary sewer, and treated at a wastewater treatment plant. Treated wastewater is discharged into receiving water via an effluent pipe. Wastewaters generated in areas without access to centralized sewer systems rely on on-site wastewater systems. These typically comprise a septic tank, drain field, and optionally an on-site treatment unit. The management of wastewater belongs to the overarching term sanitation, just like the management of human excreta, solid waste and stormwater (drainage). Sewage is a type of wastewater that comprises domestic wastewater and is therefore contaminated with feces or urine from people's toilets, but the term sewage is also used to mean any type of wastewater. Sewerage is the physical infrastructure, including pipes, pumps, and screens, channels etc. used to convey sewage from its origin to the point of eventual treatment or disposal. We consider wastewater treatment as a water use because it is so interconnected with the other uses of water. Much of the water used by homes, industries, and businesses must be treated before it is released back to the environment. Wastewater is water containing wastes from residential, commercial, and industrial processes. Municipal wastewater contains sewage, gray water (e.g., water from sinks and showers), and sometimes industrial wastewater. Large industries, such as refineries, also generate wastewater. Wastewater requires treatment to remove pollutants prior to discharge.

1.2 Sources of wastewater

Wastewater can come from:

- Human excreta (feces and urine) often mixed with used toilet paper or wipes; this is known as blackwater if it is collected with flush toilets

Domain 4: Structural Engineering

Sr. No	Name of the course that include experiential learning through Project work/ Internship	Subject Code	Domain
1	Strength of Materials	BECVE302T/P	Structural Engineering
2	Structural Analysis – I	BECVE 401T/P	
3	Structural Analysis -II	BECVE501T/P	
4	Reinforced Cement Concrete (RCC) Structures	BECVE502T/P	
5	Steel Structures	BECVE601T/P	
6	Advanced Concrete Structures	BECVE701T/P	
7	Elective -I : Earthquake Resistant Design of Structure	BECVE703T	
8	Elective - III : Advanced Reinforced Cement Concrete Design	BECVE803T/P	

BECVE701T ADVANCED CONCRETE STRUCTURES

Evaluation Scheme: (80/20)
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**

COURSE OUTCOME: The Students will be able to

- Understand the behavior and failure modes different concrete members
- Analyze and apply the results in designing various concrete member of structure.
- Apply the knowledge & skills in practical problems
- Understand the relevant software and use the same in analysis & design of concrete members.

Unit – I

Design of circular water tank with roof slab/dome resting on ground by approximate methods/IS code method(by Working Stress Method).

Design of rectangular water tank with one-way roof slab resting on ground by approximate methods/ IS codemethod (by Working Stress Method).

Unit – II

Analysis and design of columns subjected to biaxial moments.

Design of long columns.Design of Isolated footing, for uniaxialmoment , For Square Rectangular & Circular.

Unit – III

Moment redistribution: Analysis and Design of fixed beam, propped cantilever, two-span symmetric continuousbeam.

Unit – IV (with LSM)

Design of RCC Cantilever and Counter-fort Retaining wall.

Unit - V

Analysis and design of portal frames (single bay single storey) hinged or fixed at base.

Design of hinge (designof Dog-legged and Open Well Staircase).

Unit – VI : Design of combined footing.

- **Rectangular footing ii)Strap beam footing iii)Trapezoidal footing iv)Raft footing**

BECVE703T ADVANCED TRAFFIC ENGINEERING (ELECTIVE-I)

Evaluation Scheme: (80/20) **Total Credits-4**
(L-3 Hrs/Week, T-1 Hrs/Week); **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

- Use the knowledge to carry out traffic studies and give solutions to planning of transportationsystem.
- Apply basic principles for the geometric design of roads and other traffic controlling devices
- To understand the parking systems, riding quality standards, traffic safety and accident studyand suggest the solutions to the practical problems.

Unit – I

Elements of Traffic Engineering : Road, Road user & Road Vehicle Characteristics, problems related to heterogeneous traffic.

Traffic Surveys and Data collection : Speed, journey time and delay studies, methods of measurement of spot speed, headway, gaps, volume / capacity surveys, speed, volume-density interrelations, measurements of running and journey speeds, origin-Destination surveys, necessity, survey methods, sample size, data analysis & Presentation. Highway capacity, level of service concepts.

Unit – II

Statistical methods : Binomial, Normal Poisson, Probability. distributions, Discrete and continuous, variable application to traffic flow, Test of significance – Chi-square & 'T' test, (Regression analysis)

Unit – III

Traffic Design : Hierarchy of urban roads and their standards, Diverging, merging crossing weaving maneuver's conflict points, types of road junctions ,channelization of traffic flow, traffic rotary design, Grade separated inter-sections, Drive ways, design of pedestrian facilities, Design criteria for separate cycle track, Exclusive Bus lane, (Bus stop locations and facilities.) introduction to Intelligent Transportsystem

Unit – IV

Traffic Control Devices : Traffic signs, road markings, traffic signals, design of signalized intersections & signaling systems,(Queuing)Theory, Traffic control aids,

and street furniture. Introduction to transport systems, Traffic controls for Expressway.

Unit – V

Traffic Safety, **Enforcement and Education :**

Elements responsible for accidents, situations in India, Collection and interpretation of accident data and recording in Standard form, Analysis of Accidents. Traffic regulation and E`s of traffic management, (vulnerable road user safety, Introduction to Regulation Act.)
Motor Vehicle Acts and Rules, traffic Education, traffic Controls on National Highways

Unit – VI Urban Traffic: Present traffic scenario. Urban transportation problems, mixed traffic flow, head and administrative set up of traffic cells at various levels, co-ordination with other transport modes.Parking : Parking surveys, on and off street parking, parking systems, parking demand, design of off- street parking lot, underground & multistoried parking.(Truck lay bye, bus lay bye, facilities to parking and way side amenities.

COMPARATIVE STUDY OF ANALYSIS AND DESIGN OF ELEVATED CIRCULAR WATER TANK FOR VARIOUS HEIGHTS

A project submitted in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

CIVIL ENGINEERING

Rashtrasant Tukodoji Maharaj Nagpur University, Nagpur

Submitted by-

1. Kaushik Das
2. Gaurav kumar Soni
3. Swapnil Pakhidde
4. Ashutosh Sahu
5. Kalyani Meshram

Under the guidance of

Dr. S.A. DHALE
H.O.D
Department of Civil Engg.
(Guide)

Prof. K.V.THAKARE
Asst. Professor
Department of Civil Engg.
(Co-Guide)

DEPARTMENT CIVIL ENGINEERING

PRIYADARSHINI COLLEGE OF ENGINEERINING

NAGPUR-440019

2016-2017

PRIYADARSHINI COLLEGE OF ENGINEERINING

NAGPUR

CERTIFICATE

This is to certify that the project entitled

COMPARATIVE STUDY OF ANALYSIS AND DESIGN OF ELEVATED CIRCULAR WATER FOR VARIOUS HEIGHTS

has been completed by

students of B.E (Civil Engineering) of this college, in satisfactory manner and in partial fulfillment of the requirement for the degree of bachelor of Engineering in Civil Engineering of the Rashtrasant Tukadoji Maharaj Nagpur University .

Dr. S.A. Dhale
H.O.D
Dept. of Civil Engg.
(Guide)

Prof. K.V. Thakare
Asst. Professor
Dept. of Civil Engg.
(Co-Guide)

Dr. S.A. Dhale
H.O.D
Dept. of Civil Engineering
PCE, Nagpur

Dr M.P. Singh
Principal
PCE Nagpur

ABSTRACT

Elevated water tanks are one of the most important lifeline structures in all regions. These structures have a large mass at the top of slender supporting structure, hence these structures are vulnerable to horizontal forces due to earthquake. Hence an attempt has been made to study the effect of variation in staging height on the seismic behavior of elevated circular water tank. Behavior of elevated circular water tank under earthquake loads has been studied as per IS 1893(Part2)1984,1893(Part1)2002 and IITK-GSDMA guidelines. Modeling and seismic analysis of elevated water tank is done for critical load combinations for seismic zone V by using software STAAD-PRO. In this study of seismic performance of elevated water tank for various heights, the effect of height of water tank on axial force, shear force, bending moment and node displacement have been presented with the help of analysis of 3 models for same dimensions and with different height of the supporting system. The results presented in this study will be useful for better understanding of the behavior of elevated circular water tank under earthquake load and safe design of such important structures.

1.1 INTRODUCTION

Elevated water tanks are critical and strategic structures and damage of these structures during earthquakes may endanger drinking water supply and substantial economical loss. Elevated water tanks consist of huge water mass at the top of a slender staging which are most critical consideration for the failure of the tank during earthquakes. As a result, strong lateral seismic motions may result in large tensile stresses on one side of the concrete shaft section which may eventually lead to severe cracking or even collapse of the supporting structure. Indian sub continent is highly vulnerable to natural disasters like earthquakes, draughts, floods, cyclones etc. According to seismic code IS:1893(Part1) 2002, more than 60% of India is prone to earthquakes. Hence, in view of this need, research activity has been primarily focused on understanding the seismic behavior of ground and elevated water tanks. There have been several studies in which the dynamic behavior of liquid storage tanks have been analyzed, however most of them have focused on ground level circular water tanks and a very few of them have concentrated upon behavior of elevated tanks. Elevated water tanks are heavy structures in which a greater portion of their weight is concentrated at an elevation much about the base. Critical parts of the system are columns and braces through which the loads are transmitted to the foundation. Past experiences revealed that elevated water tanks were heavily damaged or collapsed during earthquakes and this might be due to the lack of knowledge about the proper behavior of supporting system of the tank against dynamic effect. Hence it is very important to analyze such structures for various seismic parameters. Circular tanks have minimum surface area when compared to other shapes for a given capacity of the tank. Hence the quantity of material required for circular water tank is less than that required for other shapes. Hence, a circular water tank has been adopted in this study.

1.2 EARTHQUAKE DAMAGE TO ELEVATED WATER TANKS-

There are frequent reports regarding the damage to elevated liquid storage tanks due to previous earthquakes. Severe damage were observed in elevated water tanks during 1997 Jabalpur,2001 Bhuj and 1964 Alaska earthquakes. During the Bhuj earthquake , many elevated tanks suffered severe damage s in terms of flexural cracks near the base. The different patterns of failures observed in columns and braces of elevated water tanks during seismic failure are shear failure modes in beams, bending shear failure in beams , and axial failure in columns.

Domain 6: Other

Sr. No	Name of the course that include experiential learning through Project work/ Internship	Subject Code	Domain
1	Applied Mathematics-III	BECVE301	Other
2	Communicative English &Technical Writing	BECVE506P	
3	Site Visit &Mini Project	BECVE606P	
4	Industrial Case Study and Project Seminar	BECVE706P	
5	Construction Economics and Finance	BECVE804T	
6	Project	BECVE805P	

SITE VISITS & MINI PROJECT

BECVE606P **Evaluation Scheme: (25-Internal/25-External)**

(P-3 Hrs/Week); Total Credits-3

COURSE OUTCOMES: The students shall be able to

1. Get an idea of various project details such as contracts, layout, planning, drawing, estimates, Arbitration provision, licensee & licensor, architects, structural designer, etc
2. Get an idea of various construction equipment, manpower & techniques used at site, techniques of batching, mixing, transportation, and placement of different construction materials.
3. Get an overview on safety measures, basic amenities to provide, inventory control.
4. Write a legible, correct and technically sound report after the visit.
5. Ascertain the provisions and execution as per the working drawing.

Students should be taken for visit to various Civil Engineering construction sites such as R. C. C. Structures, Steel Structures, Bridges, culverts, Hydraulic Structures, water tanks, Roadwork, Railways, Water supply and Sanitary works, Geotechnical Exploration, Maintenance and Rehabilitation works, Irrigation systems, Formwork, Reconnaissance and Detailed Surveying & leveling etc.

- Minimum Five visits are expected.
- Students should submit a detailed report on the visit duly approved by the concerned teacher. **The Detailed Report should mainly consist of the following: -**
  - Name of Construction Site with address
  - Nature of construction work and various structural components

A

MINI PROJECT REPORT

ON

"TRAFFIC CONGESTION AND ITS DELAY COST"

Submitted for partial fulfillment of the requirements for award of Degree in

BACHELOR OF ENGINEERING

in

CIVIL ENGINEERING

of

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Submitted by

Student of 6th Semester

1) Pranjal Donge
2) Darshan Bisen
3) Karan Kingre
4) Pratik Surkar
5) Sajal Singh
6) Devendra Karlekar
7) Sandeep Tiwari

Under guidance of

Dr. S. A. Dhale

DEPARTMENT OF CIVIL ENGINEERING
PRIYADARSHINI COLLEGE OF ENGINEERING
Nagpur-19

2016-2017

PRIYADARSHINI COLLEGE OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING

CERTIFICATE

This is to certify that the mini project work entitled, as a"**Traffic congestion and its delay cost**" submitted by project group in partial fulfillment of the requirements for the award of the degree in Civil Engineering of Priyadarshini College Of Engineering, Nagpur is an authentic work carried out by them under my supervision and guidance in satisfactory manner.

To the best of my knowledge, the matter embodied in the thesis fulfills the requirements relating the nature and standard of work for award of degree in civil engineering.

Date:

Place: Nagpur

Dr. S. A. Dhale
HOD
Mini-Project Guide

Dr. S. A. Dhale
HOD
Dept. of civil Engg.

Introduction:

- Generally Traffic is defined as the movement of a person vehicles or any type of goods or person in between the site locations, and thus includes pedestrians and all types of vehicles mechanized, motorized or non-motorized.
- Nagpur is at present 3RD largest city in Maharashtra which faces traffic congestion problems mostly in the different road intersection due to rapid development of the infrastructure and increasing population. While the seven intersection the vehicles are stopping for their turn to clear the particular patch of road, on the signal point the vehicle traveler us to keep their vehicle engine on so that it leads to loss of fuel and they also keep unnecessary Thus it leads to delay in vehicle & noise pollution generally increased at the signal or seven intersections.
- In this Analysis respectively increase in demand for survey is to be taken for vehicle count and analysis is done to increase future development of Transport Network in Nagpur city.

PRIYADARSHINI COLLEGE OF ENGINEERING,NAGPUR

DEPARTMENT OF CIVIL ENGINEERING

SESSION 2016-2017

Industrial Case Study Report

On

SALAYA MATHURA PIPELINE PROJECT

Submitted by
Akash Kumar Pathak

7TH Semester (B.E)

Under the Project

Site Engg. -Sumit Saurav

CONSTRUCTION AND LAYING OF PIPELINE

COMPANY- JAY BHAVANI CONSTRUCTION

PRIYADARSHINI COLLEGE OF ENGINEERING
NAGPUR

CERTIFICATE

This is to certify that the training of "**INDUSTRIAL CASE STUDY**" has been completed by **Akash Kumar Pathak** student of B.E (civil engineering) of this institute in satisfactory manner and in partial fulfilment of the requirement for the degree of Bachelor of Engineering in civil engineering of the Nagpur University.

Prof. K.M Tajne
Civil Engineering

Dr. S.A.Dhale
H.O.D
Civil Engineering

INTRODUCTION

Station-In-Charge of WRPL Viramgam Pump Station; a Tankfarm-cum-Intermediate Pump Station Location of Largest Crude Oil Pipeline viz. Salaya-Mathura Pipeline; a 2000 km long cross country pipeline handling more than 22 MMTPA crude oil. Also, this pipeline location is also an T-Point cum Intermediate Pump Station of Product Pipeline.

WRPL Viramgam is only pipeline location of India which is T-Point location for both crude oil as well as product pipeline.

As Station-In-Charge responsible for operation of both crude oil pipeline as well as product line, maintenance of electrical infrastructure and equipment,corrosion control/ cathodic protection of about 330 km of pipeline, station facilities and storage tanks. This pipeline is mainly used for the transportation of crude petroleum oil.

The project is of IOCL further the project contract is taken by the company ESSAR Pvt.Ltd

Futher the contract is taken by Jay Bhavani Construction for 51 km of pipeline laying work.