ACADEMIC YEAR (2022-2023)		
	J.K.K.MUNIRAJAH COLLEGE OF TECHNOLOGY,T.N.PALAYAM **Approved by AICTE , new Delhi And Affiliated to anna University , Chennai.**	**Metric No 1.3.2**

S.No	Name of the course	course code	programme offering	Experimental learning		Number of students
				project work	internship	
Program specific courses						
(2022-2023)Regulation-2017						
1	Soil Mechanics	CE8491	Civil Engineering			3
2	Design of Reinforced Cement Concrete Elements	CE8501	Civil Engineering	✓	✓	4
3	Water Supply Engineering	EN8491	Civil Engineering	✓		2
4	Foundation Engineering	CE8591	Civil Engineering	✓	✓	3
5	Estimation and Quantity Surveying	CE8701	Civil Engineering	✓	✓	4
6	Project Work	CE8811	Civil Engineering	✓	✓	4

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DEPARTMENT OF CIVIL ENGINEERING

2022-2023

S.NO	REGISTER NUMBER	STUDENT NAME	PROJECT CUM INTERNSHIP	INTERNSHIP
1	731219103002	ANILKUMAR BALDABOI	✓	✓
2	731219103003	DEBACHAND MUDULI	✓	✓
3	731220103001	DIVAKAR R		✓
4	731221103301	SUSITHRA S		✓

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DEPARTMENT OF CIVIL ENGINEERING

2022-2023

S.NO	Name Of the Course That Include Experiential Learning through Project/ Industrial Training / Industrial Visit
1	Soil Mechanics
2	Design of Reinforced Cement Concrete Elements
3	Water Supply Engineering
4	Foundation Engineering
5	Estimation and Quantity Surveying
6	Project

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PROJECT

CE8811	PROJECT WORK	L T P C 0 0 20 10

OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

STRATEGY:

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 300 PERIODS

OUTCOME:

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

CE8701 **ESTIMATION, COSTING AND VALUATION ENGINEERING** L T P C
3 0 0 3

OBJECTIVE:

- The students will acquire knowledge in estimation, tender practices, contract procedures,and valuation and will be able to prepare estimates, call for tenders and execute works.

UNIT I QUANTITY ESTIMATION 9

Philosophy - Purpose - Methods of estimation - Types of estimates - Approximate estimates - Detailed estimate - Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls - culverts (additional practice in class room using computer softwares)

UNIT II RATE ANALYSIS AND COSTING 9

Standard Data – Observed Data – Schedule of rates – Market rates – Standard Data for Man Hours and Machineries for common civil works – Rate Analysis for all Building works, canals, and Roads- Cost Estimates (additional practice in class room using Computer softwares) - (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper)

UNIT III SPECIFICATIONS, REPORTS AND TENDERS 9

Specifications - Detailed and general specifications – Constructions – Sources - Types of specifications - Principles for report preparation - report on estimate of residential building - Culvert - Roads - TTT Act 2000 - Tender notices - types - tender procedures - Drafting model tenders , E-tendering-Digital signature certificates- Encrypting -Decrypting - Reverse auctions.

UNIT IV CONTRACTS 9

Contract – Types of contracts – Formation of contract – Contract conditions – Contract for labour, material, design, construction - Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration and legal requirements.

UNIT V VALUATION 9

Definitions - Various types of valuations - Valuation methods - Necessity - Capitalised value - Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent – Mortgage – Lease

TOTAL: 45 PERIODS

OUTCOMES:

The student will be able to

- Estimate the quantities for buildings,
- Rate Analysis for all Building works, canals, and Roads and Cost Estimate.
- Understand types of specifications, principles for report preparation, tender notices types.
- Gain knowledge on types of contracts
- Evaluate valuation for building and land.

TEXTBOOKS:

1. B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors (P) Ltd, 2010.
2. B.S.Patil, 'Civil Engineering Contracts and Estimates', University Press, 2006
3. D.N. Banerjee, 'Principles and Practices of Valuation', V Edition, Eastern Law House,1998

REFERENCES:

1. Hand Book of Consolidated Data - 8/2000, Vol.1, TNPWD
2. Tamil Nadu Transparencies in Tenders Act, 1998
3. Arbitration and Conciliation Act, 1996
4. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April1996
5. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003

CE8591 **FOUNDATION ENGINEERING** L T P C

3 0 0 3

OBJECTIVE:

- To impart knowledge to plan and execute a detail site investigation programme, to select geotechnical design parameters and type of foundations. Also to familiarize the students for the geotechnical design of different type of foundations and retaining walls.

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Scope and objectives - Methods of exploration - Auguring and boring - Wash boring and rotary drilling - Depth and spacing of bore holes - Soil samples - Representative and undisturbed - Sampling methods - Split spoon sampler, Thin wall sampler, Stationary piston sampler - Penetration tests (SPT and SCPT) - Data interpretation - Strength parameters - Bore log report and Selection of foundation.

UNIT II SHALLOW FOUNDATION 9

Location and depth of foundation - Codal provisions - Bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - Factors affecting bearing capacity – Bearing capacity from in-situ tests (SPT, SCPT and plate load) - Allowable bearing pressure -Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits - Total and differential settlement - Allowable settlements - Codal provision - Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9

Types of Isolated footing, Combined footing, Mat foundation - Contact pressure and settlement distribution - Proportioning of foundations for conventional rigid behaviour - Minimum thickness for rigid behaviour - Applications - Compensated foundation - Codal provision

UNIT IV PILE FOUNDATION 9

Types of piles and their functions - Factors influencing the selection of pile - Carrying capacity of single pile in granular and cohesive soil - Static formula - Dynamic formulae (Engineering news and Hileys) - Capacity from insitu tests (SPT and SCPT) - Negative skin friction - Uplift capacity- Group capacity by different methods (Feld's rule, Converse - Labarra formula and block failure criterion) - Settlement of pile groups - Interpretation of pile load test (routine test only), Under reamed piles - Capacity under compression and uplift - Cohesive - expansive - non expansive -Cohesionless soils – Codal provisions.

UNIT V RETAINING WALLS 9

Plastic equilibrium in soils - Active and passive states - Rankine's theory - Cohesionless and cohesive soil - Coulomb's wedge theory - Condition for critical failure plane - Earth pressure on retaining walls of simple configurations - Culmann's Graphical method - Pressure on the wall due to line load - Stability analysis of retaining walls - Codal provisions.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

- Understand the site investigation, methods and sampling.
- Get knowledge on bearing capacity and testing methods.
- Design shallow footings.
- Determine the load carrying capacity, settlement of pile foundation.
- Determine the earth pressure on retaining walls and analysis for stability.

TEXTBOOKS:

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition 2017.

REFERENCES:

1. Braja M Das, "Principles of Foundation Engineering" (Eigth edition), Cengage Learning 2014.
2. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2014.
3. Joseph E bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition, 28th August 2015.
4. IS Code 6403 : 1981 (Reaffirmed 1997) "Bearing capacity of shallow foundation", Bureau of Indian Standards, New Delhi.

CE8501 DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS **L T P C**
3 2 0 4

OBJECTIVES:

- To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

UNIT I INTRODUCTION **9+6**

Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC -Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II DESIGN OF BEAMS **9+6**

Analysis and design of Flanged beams for – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour ofrectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shearand Torsion.

UNIT III DESIGN OF SLABS AND STAIRCASE **9+6**

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams- Two way slab- Desingn of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS **9+6**

Types of columns -Axially Loaded columns – Design of short Rectangula Square and circular columns - Design of Slender columns- Design for Uniaxial and Biaxial bending using Column Curves

UNIT V DESIGN OF FOOTINGS **9+6**

Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

TOTAL: 75 PERIODS

OUTCOMES:

Students will be able to

- Understand the various design methodologies for the design of RC elements.
- Know the analysis and design of flanged beams by limit state method and sign of beamsfor shear, bond and torsion.
- design the various types of slabs and staircase by limit state method.
- Design columns for axial, uniaxial and biaxial eccentric loadings.
- Design of footing by limit state method.

TEXT BOOKS:

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt.Ltd., New Delhi, 2002.
2. Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of IndiaPrivate Limited, New Delhi, 2006.
3. Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, NewDelhi, 2013.

REFERENCES:

1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd.,New Delhi, 2002
3. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw HillPublishing Company Ltd., 2009
4. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of ReinforcedConcrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.

CE8491 **SOIL MECHANICS** L T P C
3 0 0 3

OBJECTIVE:

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

History - formation and types of soil - composition - Index properties - clay mineralogy structural arrangement of grains - description - Classification - BIS - US - phase relationship - Compaction – theory – laboratory and field technology – field Compaction method – factors influencing compaction.

UNIT II EFFECTIVE STRESS AND PERMEABILITY 9

Soil - water - Static pressure in water - Effective stress concepts in soils - Capillary phenomena- – Permeability – Darcy's law – Determination of Permeability – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer - Factors influencing permeability of soils - Seepage - Two dimensional flow - Laplace's equation - Introduction to flow nets - Simple problems Sheet pile and wier.

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution in homogeneous and isotropic medium - Boussines of theory - (Point load, Line load and udl) Use of Newmarks influence chart -Components of settlement - Immediate and consolidation settlement - Factors influencing settlement - Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. – $\sqrt{t}$ and log t methods. e-log p relationship consolidation settlement N-C clays - O.C clays - Computation.

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesion less soils - Mohr-Coulomb failure theory - shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests - Pore pressure parameters – Factors influences shear strength of soil.

UNIT V SLOPE STABILITY 9

Infinite slopes and finite slopes – Friction circle method - Use of stability number -Guidelines forlocation of critical slope surface in cohesive and c - soil - Slope protection measures.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

- classify the soil and assess the engineering properties, based on index properties.
- Understand the stress concepts in soils
- Understand and identify the settlement in soils.
- Determine the shear strength of soil
- Analyze both finite and infinite slopes.

TEXTBOOKS:

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBSPublishers Distribution Ltd., New Delhi. 2014
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers andDistributors, New Delhi, 7th Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi,16th Edition, 2017.

REFERENCES:

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics".Prentice-Hall, 2006.
2. Coduto, D.P., "Geotechnical Engineering - Principles and Practices", Prentice Hall of IndiaPvt. Ltd. New Delhi, 2010.
3. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India PrivateLimited, 8th Edition, 2014.

EN8491 **WATER SUPPLY ENGINEERING** L T P C
3 0 0 3

OBJECTIVE:

- To equip the students with the principles and design of water treatment units anddistribution system.

UNIT I SOURCES OF WATER 9

Public water supply system - Planning, Objectives, Design period, Population forecasting; Water demand - Sources of water and their characteristics, Surface and Groundwater - Impounding Reservoir - Development and selection of source - Source Water quality - Characterization - Significance - Drinking Water quality standards.

UNIT II CONVEYANCE FROM THE SOURCE 9

Water supply - intake structures - Functions; Pipes and conduits for water - Pipe materials - Hydraulics of flow in pipes - Transmission main design - Laying, jointing and testing of pipes - appurtenances - Types and capacity of pumps - Selection of pumps and pipe materials.

UNIT III WATER TREATMENT 9

Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation -Clarifloccuator-Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management -Construction, Operation and Maintenance aspects.

UNIT IV ADVANCED WATER TREATMENT 9

Water softening - Desalination- R.O. Plant - demineralization - Adsorption - Ion exchange- Membrane Systems - RO Reject Management - Iron and Manganese removal - Defluoridation - Construction and Operation & Maintenance aspects - Recent advances - MBR process

UNIT V WATER DISTRIBUTION AND SUPPLY 9

Requirements of water distribution - Components - Selection of pipe material - Service reservoirs – Functions – Network design – Economics – Analysis of distribution networks -Computer applications – Appurtenances – Leak detection.
Principles of design of water supply in buildings – House service connection – Fixtures andfittings, systems of plumbing and types of plumbing.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing the course will have

- an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
- the knowledge in various unit operations and processes in water treatment
- an ability to design the various functional units in water treatment
- an understanding of water quality criteria and standards, and their relation to publichealth
- the ability to design and evaluate water supply project alternatives on basis of chosen criteria.

TEXTBOOKS:

1. Garg, S.K. Environmental Engineering, Vol.IKhanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.
3. Punmia, B.C.,Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2014.

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development,Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning,Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.

AN EXPERIMENTAL INVESTIGATION OF PARTIAL REPLACEMENT OF CEMENT WITH WASTE PAPER ASH

A PROJECT REPORT

Submitted By

ANIL KUMAR BALDABOI 731219103002

DEBACHAND MUDULI 731219103003

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

CIVIL ENGINEERING

JKK MUNIRAJAH COLLEGE OF TECHNOLOGY

TN-PALAYAM – 638 506

ANNA UNIVERSITY: CHENNAI 600 025

MAY - 2023

BONAFIDE CERTIFICATE

Certified that this project report is the titled **"EXPRIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF CEMENT WITH WASTE PAPER ASH"** is approved record of work done by **ANIL KUMAR BALDABOI (731219103002) & DEBACHAND MUDULI (731219103003)** impartial fulfillment for the award of **Bachelor of Civil Engineering** of Anna University, Chennai Technology during the year 2022 -2023.

18/5/23

SIGNATURE

Mrs.V. MOHANAPRIYA., M.E.,

SUPERVISOR

Department of Civil Engineering,

J K K Munirajah College of Technology

T.N. Palayam – 638506

18/5/23

SIGNATURE

Mrs.V. MOHANAPRIYA., M.E.,

HEAD OF THE DEPARTMENT

Department of Civil Engineering,

J K K Munirajah College of Technology

T.N. Palayam – 638506

Submitted for the project viva-voice examination held on 18/05/2023.....

18/5/23

INTERNAL EXAMINER

18/5/23

EXTERNAL EXAMINER

PRINCIPAL
JKK MUNIRAJAH COLLEGE
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ABSTRACT

This research investigates experimentally behavior of red mud with concrete. In this study, the cement replaced with various percentage of red mud in concrete and checked out various mechanical properties. Waste Paper Ash replace with cement and different percentages (25%, 50% and 75%) and also it effects on the strength and other properties of concrete. Thatis checked for different grades of concrete M25. The mechanical properties investigated in current study include compressive strength, split tensile strength, flexural strength and study on Waste Paper Ash. Waste Paper Ash, cement, industrial waste, mechanical properties of concrete

The compressive strength, flexural strength and split tensile strength of concrete curing and tested for (7, 14 & 28) days has been found to the replacements of concrete. The results show as effective for practical purpose.

CHAPTER-1
INTRODUCTION

1.1 GENERAL

Concrete is one of the most versatile and widely used building materials in the world construction industry. It is a composition of aggregates, a Portland or blended cement, water, and contains other cementitious materials and/or chemical admixtures. It contains some amount of entrapped air and purposely entrained air obtained by use of an admixture or air-entraining cement [1]. The annual production of concrete is rapidly increasing. This is because many developing countries are experiencing rapid urbanization and population growth, making the demand for housing and infrastructure development greater than ever before. Cement being the main binder in concrete, its production process is both uneconomical and environmental unfriendly. The production of 1 tonne of Portland cement requires 1.5 tonnes of raw material. According to Malhotra, (1988); and Swamy, (1998) the production process of Portland cement is highly energy intensive, consuming 4–7 MJ of fossil fuel energy per kg, [16, 17] and releases approximately 1 tonne of carbon dioxide for manufacture of each tonne of Portland cement. As a result, a requirement for economical and more environmental-friendly leads the way to search for supplementary cementing materials in concrete that can be used as replacement of the normal Portland cement. This can be done by two methods. The first method is using another binding material instead of cement which is not possible right now for unavailability of such a binding material and the second method is partial replacement of cement by appropriate material. The second method is quite simple because of lots of references are available as well as enough suitable materials are also available. The replacement of cement in concrete by various wastes creates a tremendous saving of energy, costs and also leads to important environmental benefits. As a result, the use of materials has become a common practice in the construction industry. Supplementary cementitious materials (SCMs) are being utilized as partial replacement of cement. In 2016, Savita D., et al., reviewed the cement replacement materials in concrete and concluded various materials as cement replacing materials. These materials are ceramic waste, paper pulp, Ground granulated

blast furnace slag, Silica fume, Hypo sludge, Fly ash, Paper sludge, Waste glass powder, Waste paper sludge ash [2]. According to Ali et al, (2013), more than 450 million tons of paper is produced worldwide per annual and it is expected that the demand for paper will reach 500 million tons per annual by the end of 2020 [10]. And also Asmare, (2015) in his study predicted that the demand of paper to be imported to Ethiopia by the year 2015/16 was 157,956.7 tons of paper and paper board. This demand of paper was increasing from year to year because of education expansion policies and overall economic development of the country [9]. As it was described by Oriyomi M. O., el at, Paper is an example of valuable materials that can be recycled [3]. Disposable paper available in abundance throughout the world is composed mainly of short, natural, cellulose fibers and is already used in many local raw materials. Waste paper arises from several sources such as newspapers, office and printing papers etc. The chemical composition of paper ash mainly contains SiO2 (60%), CaO (14%), Al2O3 (2.06%), and Fe2O3 (0.92%) which are the main essential compounds needed for cement hydration for strength development (Sumit, A. B., et al, 2013). Due to this pozollanic property, waste paper ash has a possibility to be used as partial replacement of cement in concrete production. So, this study was targeted at investigating the properties of concrete produced by using waste paper ash in order to ascertain their suitability to be used as a cement replacing material in concrete

CHAPTER 10
CONCLUSION

This work relates to the usage of the waste paper ash from office, a waste cheap aterial used in the concrete mixtures. The following conclusions were drawn based onthe ;perimental investigations carried and the results obtained from those tests, which are as ıllows:

a. The study concluded that compressive strength of the concrete improved by 4 to 10 % up to replacement level of waste paper ash with cement by 15 %.

b. It could be said that replacement of waste paper ash with cement improved the spilt tensile strength up to 4% for the replacement percentage of 15%.

c. The compressive strength results of cubes and split tensile strengths of cylinder show that the optimum percentage of replacement of waste paper ash with that of cement was 15%

d. The workability of concrete increases at all the percentage replacements containing 29% moisture content in waste paper ash.

e. The first crack load was 45 KN for both sample concrete beams with 0 % replacement of waste paper ash. The first crack load was 50 KN for both sample concrete beams with 5 % replacement of waste paper ash. The first crack load was 50 and 55 KN for sample concrete beams with 10 % replacement of waste paper ash. The first crack load was 60 KN for both sample concrete beams with 15 % replacement of waste paper ash. The first crack load was 40KN for both sample concrete beams with 20 % replacement of waste paper ash.

f. For higher replacement of waste paper ash in cement (greater than 15%) the compressive and split tensile strength decreases due to an increase of free water content in the mix.

Hence the mix proportion containing 15 % waste paper ash is the optimum mix that can beused for construction purposes.

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Date : 25.02.2023

INTERNSHIP CERTIFICATE

This is to certify that **DIVAKAR R** Third year in Civil Engineering Register no. 731219103001 student of J.K.K Munirajah College of Technology at T.N Palayam, Gobi(T.K), Erode (Dt) – 638506 has undergone the inplant training in our concern, work site From 06.02.2023 to 25.02.2023. His conduct and character was good during the training period.

For V-JAI BUILDER

Proprietor.

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Er.R.Vijay Hiroththik B.E (Civil)
vijayinmaxx@gmail.com

Date:25.02.2023

INTERNSHIP CERTIFICATE

This is to certify that **ANILKUMAR BALDABOI** Final year in Civil Engineering Register no. 731219103002 student of J.K.K Munirajah College of Technology at T.N Palayam, Gobi(T.K), Erode(Dt) – 638506 has undergone the inplant training in our concern, work site From 06.02.2023 to 25.02.2023. His conduct and character was good during the training period.

For V-JAI BUILDER

Proprietor.

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0.45

Date:25.02.2023

INTERNSHIP CERTIFICATE

This is to certify that **DEBACHAND MUDULI** Final year in Civil Engineering Register no. 731219103003 student of J.K.K Munirajah College of Technology at T.N Palayam, Gobi(T.K), Erode(Dt) – 638506 has undergone the inplant training in our concern, work site From 06.02.2023 to 25.02.2023. His conduct and character was good during the training period.

For V-JAI BUILDER

Proprietor.

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நிலவை வேண்டும் !

0.45

Date : 25.02.2023

INTERNSHIP CERTIFICATE

This is to certify that **SUSITHRA S** Second year in Civil Engineering Register no. 731219103001 student of J.K.K Munirajah College of Technology at T.N Palayam, Gobi(T.K), Erode (Dt) – 638506 has undergone the inplant training in our concern, work site From 06.02.2023 to 25.02.2023. Her conduct and character was good during the training period.

For V-JAI BUILDER

Proprietor.

PRINCIPAL
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