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FINITE ELEMENT ANALYSIS OF L-SHAPE BUILDING AND ITS SEISMIC BEHAVIOUR VARIATIONS IN E-TABS

Dr. Vijayakumar Y.M.[1], Dr. Meena Y R[2] ,Sonia B M[3], Dr.C.P.Ramesh[4]

Vijay.kumarym@gmail.com
Meenagowda80@gmail.com
soniamgowda98@gmail.com
cp.ramesh@jainuniversity.ac.in
1,3,Department of Civil Engineering
Adichunchanagiri Institute of Technology
Chikkamagaluru, India-577102
2,4, *Department of Civil Engineering*
Faculty of Engineering and Technology, Jain University
Kanakapura-562112

Abstract - ETABS is the structural software which is mostly used to analyze steel and concrete structures, low and high rise buildings, portal frames and skyscraper structures. In this project we had studied structural behavior of L-shaped commercial multi-Storey building (college building) of G+5 on etabs. Here, structural analysis of the building was carried using equivalence static or linear static analysis method as per IS1893:2002. In this method the design base shear is computed for the whole building, and then it is distributed along the height of the building. This method defines that a series of forces acting on a structure to represent the effect of earthquake ground motion. In this project we had compared the result obtained from the etabs software with the manual calculations and concluded that the percentage of error between both the results or within the permissible limit. Here, the longer beam span shows more deflection so secondary beams can be considered to avoid more deflections. It shows that masonry infill walls will help in increasing the strength, stiffness and ductility of the structure.

Keywords - E-TABS, Stiffness, Ductility, Seismic Analysis, Workability, Finite Element Method.

INTRODUCTION

Structural analysis is a branch in which the effects of the different structural components on the order of prediction of the behavior of the structures. Every structure is made liable to one or both category of loads, the different load types are the permanent load, imposed load, seismic load and wind load. ETABS (extended 3D analysis of building systems) is a software that integrates all major static, dynamic, linear and non-linear analysis. The main intension of the software is to design multi-Storey buildings in the process of the system. The effectual design and assembling of earthquake-resistant structure are critical throughout the world.

Basically, buildings nowadays are of two types of building systems,

a) Load bearing masonry building
b) Framed buildings

❖ *Seismic zones:*

In 1984 the zone map was revised based on previous earthquakes and the characteristics of regional tectonic movements. The different shades of red color is coded in the below figure which shows the 4 distinct seismic zones.

i. Zone 2: Least active seismic zone
ii. Zone 3: Moderate seismic zone
iii. Zone 4: High seismic zone
iv. Zone 5: Highest seismic zone

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Dr. C. T. JAYADEVA
Principal B.E.,M.Tech.,Ph.D.
Adichunchanagiri Institute of Technology
CHIKKAMAGALURU-577102

Dr. M. RAME GOWDA
B.E.,M.Tech.(IIT-B).,Ph.D.(NITK)
Professor and Head
Department of Civil Engineering
Adichunchanagiri Institute of Technology
CHIKKAMAGALURU-577102

Advancements In Effective Black Cotton Soil Stabilization: A Review

Goutham D.R.[1], A.J.Krishnaiah[2], Pranathi B.[3]

[1]Goutham D.R.,
Research Scholar,
Department of Civil Engineering,
Malnad College of Engineering,
(Affiliated to Visvesvaraya Technological University, Belgaum)
Hassan, Karnataka, India
goutham.dr03@gmail.com

[2]A.J.Krishnaiah,
Professor & HOD,
Department of Civil Engineering,
Malnad College of Engineering,,
(Affiliated to Visvesvaraya Technological University, Belgaum)
Hassan, Karnataka, India
ajkmce@gmail.com

[3]Pranathi B.,
Post Graduate Student,
Department of Civil Engineering,
Adichunchanagiri Institute of Technology,
(Affiliated to Visvesvaraya Technological University, Belgaum)
Chikkamagalur, Karnataka, India
pranathi.dedeepya@gmail.com

Abstract*: Soil stabilization has become the main concern to develop promising structures by strengthening the characteristics of weak soil. This can be achieved by incorporating many stabilization techniques like sand cushions, CNS layer method, columns, vibrations, and chemical methods. This review is based on a study of different soil stabilizing procedures and their effectiveness in altering and intensifying the features like Optimum Moisture Content (OMC), California Bearing Ratio (CBR), Maximum Dry Density (MDD), Unconfined Compressive Strength (UCS) and shrinkage behavior, etc., of feeble soil as it covers the greatest land area in India.

Keywords: **Black cotton soil, Engineering properties, Soil stabilization**

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I. INTRODUCTION

Various kinds of soils are present in India. In which black cotton soil (BCS) or expansive soil is one of the main forms of soil, which has covered the greatest land area of about 300000km^2. They are found in the region of Deccan Plateau and Malwa Plateau. These soils are very important to develop huge structures like bridges, high rise buildings, dams, airfield pavements etc.

These black cotton soils are popularly called expansive soils because they show problematic behaviour of swelling and shrinkage, when they are dried which is highly undesirable for construction purposes. As a result, it throws an adverse effect on strength and mechanical properties. So to overcome these problems, black cotton soil needs to be stabilized, and then it becomes suitable for use in the construction of buildings and other important structures. There are several techniques such as sand cushions in which the thin layer of soil is replaced by a cushion bed, vibration method, sand columns method in which sand columns are used to replace the soil (dry soil), stone columns (same as sand columns), CNS layer techniques in which the upper layer of expansive soil that is black cotton soil is replaced with CNS (cohesive non-swelling soil) and by adding chemicals like fly ash, lime, cement, and bitumen. So after stabilization of BCS, some of the basic soil properties were improved and altered to attain an effective result of BCS.

Dr. M. RAME GOWDA
B.E.,M.Tech.(IIT-B).,Ph.D.(NITK)
Professor and Head
Department of Civil Engineering
Adichunchanagiri Institute of Technology
CHIKKAMAGALURU-577102

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Investigation on Stabilization of Black Cotton Soil Using Waste Paper Sludge Ash as Additive

Abhinag[1], Indra Kumar B[2], Jayachandra[3], Sanjith J[4], B M Kiran[5]

[1]Assistant Professor, Department of Civil Engineering, Adichunchanagiri Institute of Technology, Chikkamagaluru, Karnataka, India
abhinagckm@gmail.com
[2]UG Student, Department of Civil Engineering, Adichunchanagiri Institute of Technology, Chikkamagaluru, Karnataka, India.
inderkumarb@gmail.com
[3]Assistant Professor, School of Civil Engineering, REVA UNIVERSITY, Rukmini Knowledge park Kattigenahalli Yelahanka, Bengaluru-560064, Karnataka, India.
Jayachandrajc65@gmail.com
[4]Assistant Professor, Department of Civil Engineering, Adichunchanagiri Institute of Technology, Chikkamagaluru, Karnataka, India
sanjugou@gmail.com
[5]Associate professor, Department of Civil Engineering, Adichunchanagiri Institute of Technology, Chikkamagaluru, Karnataka, India
kirangowda.82@gmail.com

Abstract:

Soil stabilization is one of the highly concentrated areas of pavement construction on black cotton (BC) soil. In the present investigation, the BC soil was considered and an effort was made to determine the optimum dosage stabilizer. In this study, an innovative industrial waste which is one of sources of environmental pollution and degradation i.e., Waste Paper Sludge Ash (WPSA) was utilized and added as a stabilizer and its efficiency of stabilizing the black cotton soil was investigated. The percentages of WPSA incorporated were 3%, 6%, 9% and 12% respectively. From the detailed investigation on various soil characteristic properties like Atterberg limits, Compaction test, Unconfined compressive test and CBR test, WPSA content of 9% was found to be optimum and thus this innovative material may be recommended for BC soil stabilization in resulting cost effective and environmental friendly outcome.

Keywords: *Black cotton soil, California Bearing Ratio, Stabilization, Unconfined compressive strength, WPSA*

Dr. M. RAME GOWDA
B.E; M.Tech(UVCE),Ph.D(NITK)
Professor and Head
Department of Civil Engineering
Adichunchanagiri Institute of Technology
CHIKKAMAGALURU-577102

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Strength and Durability Behaviour of Fly Ash Based Geopolymer Concrete in Structural Applications

Prashant Sunagar[1*], Sumalatha J[1], Mahesh Kumar C L[2], Shwetha K G[2], Sanjith J[3] and Kiran B M[3]

[1]Department of Civil Engineering, M S Ramaiah Institute of Technology, Bangalore, India

[2]Department of Civil Engineering, Nitte Meenakshi Institute of Technology, Yelahanka, Bengaluru, India

[3]Department of Civil Engineering, Adichunchanagiri Institute of Technology, Chikkamagaluru, India

*Corresponding author. Email: prashant.sjce@gmail.com

Abstract

The cement production which causes environmental pollution cannot be eliminated completely but its use can be reduced by utilizing other cementing materials. The production of Geopolymer with fly ash consume less energy and this technology has the ability to minimize the emissions by 80%. For the present work, a Geopolymer prepared from low-calcium fly ash is used in place of cement to produce M60 concrete. The experimental program consists of three main stages. In the first stage, mix design was done to prepare M60 concrete for both conventional and Geopolymer concretes. In the second stage, strength parameters of the concretes were assessed by testing cubes (for evaluating the compressive strength), prisms (for flexural strength) and cylinders (for split tensile strength) using those two concrete types. In the third stage, durability study was conducted on both conventional and fly ash based Geopolymer concretes. From this study it was observed that the Geopolymer concrete with fly ash showed higher compressive strength and lower tensile strength when compared with normal concrete of same grade. The durability properties of the Geopolymer concrete showed good resistance to acid, sulphate, sea water and corrosion.

Keywords: Geopolymer concrete, Materials, Mix design, Mechanical properties, Durability

Introduction

The environmental pollution due to construction activities needs to be treated as a serious issue and efforts need to be put towards reducing the utilization of pollution causing materials in construction(Dharek et al., 2018)Since the utilization of concrete and the pollution caused by cement production are increasing alarmingly, it is necessary to identify new alternate materials to cement which provides the required strength and durability to the concrete members (Dharek et al., 2020). Though it is difficult to completely eliminate the utilization of cement, many researchers put their efforts to reduce the quantity of cement in concrete and replacing it with new materials (Dharek et al., 2022). The various alternate materials used were fly ash, rice husk ash, slag, sludge, silica fume, Ground Granulated Blast Furnace Slag (GGBS), polymers (Sumalatha et al., 2020; Dharek et al., 2021).

In 1979, Professor Joseph Davidovits found that binders could be created by a polymeric reaction of pozzolanic materials and can be prepared from industrial by-products such as fly ash, blast furnace slag and rice husk ash and he named the new material as Geopolymer. Among various binders, Geopolymer has gained more importance in the past few years due to its adequate strength and durability characteristics when compared with normal concrete (Davidovits, 1991; Davidovits et al., 1999; Duxson et al., 2007; Provis and Van Deventer, 2009; Li et al., 2010; Komnitsas, 2011). The strength of Geopolymer concrete was studied by Jamkar et al., 2013, Vora and Dave, 2013, Shaikh and Vimonsatit, 2015, Reddy et al., 2016 and Dao et al., 2019. The durability studies on Geopolymer concrete were also conducted by many researchers (Law et al., 2015; Ganesan et al., 2015; Luhar et al., 2019; Cheema et al., 2009; Kabir et al., 2019).

Dr. M. RAME GOWDA
B.E.,M.Tech,(IIT-R).,Ph.D.(NITK)
Professor and Head
Department of Civil Engineering
Adichunchanagiri Institute of Technology
CHIKKAMAGALURU-577102

Design of Water Treatment Plant for Chikkamagaluru Town

Shruthi C G[1] Sathisha N.S[2] Suhas M H[3] Samartha Gowda G S[4] Pooja B T[5]
[1]Assistant Professor [2]Professor and Head of Dept. [3,4,5]Students
[1,2,3,4,5]Department of Civil Engineering
[1,3,4,5]Adichunchanagiri Institute of Technology, Chikkamagaluru, India [2]GEC,K.R, PETE, India

Abstract— In our present study an attempt is carried out to design a water treatment plant for Chikkamagaluru town Water available on the surface of earth as various sources contains lots of impurities in it which has to be brought to the permissible standards prior to its distribution, the objective is attained by subjecting water to various treatments in water treatment plant. After performing water quality analysis collected from Yagachi reservoir and using population data of chikkamagaluru town the various water treatment units like Reservoir Intake, Cascade Aerator, Circular Sedimentation Tank, Clariflocculator and Rapid Sand Filter, Disinfection unit have been designed.

Keywords: Water Treatment Plant, chikkamagaluru town

I. INTRODUCTION

Water is one of the essential requirements for life on our planet. All living beings need water for their survival. Absolute pure water is never found in nature, but invariably contains certain suspended, colloidal and dissolved impurities (organic and inorganic in nature, generally called solids) in varying degree of concentration depending on the source.

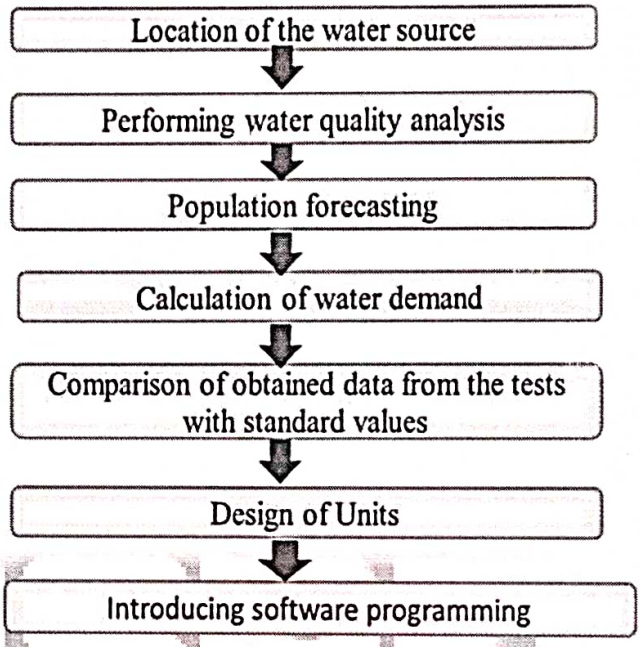
Under normal conditions, the domestic consumption of water in India is about 135 LPCD. But due to the high population of India, which is likely to be 133.92 crores as on 2017, with an estimated 40% of urban population, the intended supply of water could not be met. So identification of sources of water supply, their conservation and optimum utilization is of paramount importance. The water supplied should be 'potable' and 'wholesome'. Hence, treatment of water to mitigate and or absolute removal of these impurities become indispensable. Untreated or improperly treated water becomes unfit for intended use proves to be detrimental for life.

Water treatment is any process that improves the quality of water to make it more acceptable for a specific end-use.

The end use may be drinking, industrial water supply, irrigation, river flow maintenance, water recreation or many other uses, including being safely returned to the environment. Water treatment removes contaminants and undesirable components, or reduces their concentration so that the water becomes fit for its desired end-use.

The designed water treatment plant has Yagachi dam as the basic source of water which is at a distance of 27.9 km from Chikkamagaluru town. Yagachi reservoir has been built with a capacity of 3.603tmc. The type of treatment to be given depends on the given quality of water available and the quality of water to be served. However such an extensive survey being not possible in the designed water treatment plant. It is assumed that all kinds of treatment processes are necessary.

II. METHODOLOGY



III. WATER QUALITY ANALYSIS

To ascertain the treatment required for the water in a region, proper testing of the water samples collected from the area should be conducted. This is to ensure the safety of public health and utility. It therefore becomes imperative upon the planners and designers of the public water supply schemes, to thoroughly check, analyse and treat the raw water available. The water present in the intake is of low quality. Therefore water is tested to get details about their chemical properties. Drinking water should satisfy the specified limits recommended by IS code

TESTS	RESULTS	PERMISSIBLE LIMITS as per WHO Standards
Dissolved oxygen	10.34 mg/L	5 mg/L
Acidity	Nil	------
Alkalinity	82 mg/L	200-600 mg/L
pH	7.6	6.5-8.5
Nitrate	0.2 mg/L	45 mg/L
Iron	0.29 mg/L	0.3-1 mg/L
Turbidity	Nil	1-5NTU
Total Hardness	262 mg/L	150-300 mg/L
Chlorides	18.49 mg/L	250-1000 mg/L
Sulphates	14 mg/L	250-400
BOD	Nil	30 mg/L
E-Coli	Nil	0/ 100ml

Dr. M. RAMA GOWDA
B.E.,M.Tech.(IIT-B).,Ph.D.(NITK)
Professor and Head
Department of Civil Engineering
Adichunchanagiri Institute of Technology
CHIKKAMAGALURU-577102

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