SESSION 2014-15

DESERTATION REPORT

ON

"SUSTAINABLE CONSTRUCTION WITH FOAM CONCRETE AS A GREEN BUILDING MATERIAL"

This project report is submitted to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur in Partial fulfillment of the requirement for the degree of Master of Technology in structural engineering

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ABSTRACT

A green building is an environmentally sustainable building, designed, constructed andoperated to minimise the total environmental impacts. The Green Building Index (GBI) is recognized green rating tool for constructions to promote sustainability in the built environment and raise awareness among various groups in construction industry and the Public about environmental issues and our responsibility to the future generations. Carbon dioxide (CO2) is the primary greenhouse gas emitted through human activities. It is claimed that 5% of the world's carbon dioxide emission is attributed to cement industry, which is the vital constituent of concrete. Due to the significant contribution to the environmental pollution, there is a need for finding an optimal solution along with satisfying the civil construction needs. Apart from normal concrete bricks, Foam concrete is a new innovative technology for sustainable building and civil construction which fulfills the criteria of being a Green Material.

Foamed concrete has unique characteristics that can be exploited in civil engineering works.It requires no compaction, but will flow readily from an outlet to fill restricted and irregularcavities, and it can be pumped over significant distances and heights. Thus it could bethought of as a free-flowing, self-setting fill. This report provides a conspectus of foamedconcrete: covering its constituents, production, engineering properties and use.

Foamed concrete is simple to produce but, at present, there is a need to provide close controlduring its production and on-site supervision during its placement and curing. The need forsuch special requirements will reduce as industry becomes more familiar with the characterand behaviour of the material. This paper concludes that Foam Concrete can be an effective sustainable material for construction.

Keywords:Foam Concrete, Light Weight Concrete, Density, Strength, Specific Strength

CHAPTER 9
CONCLUSION

Based on the data obtained from experiment following conclusions can be drawn:

1) In first type M1, M2, M3 shows gradual increase in compressive strength, whereas M1 shows lowest & M3 shows highest compressive strength.
2) In second type M4, M5, M6 shows gradual increase in compressive strength, whereas M4 shows lowest & M6 shows highest compressive strength.
3) In third type M7, M8, M9 does show the same pattern. It means higher percentage of fly ash gives different result when 100% quarry dust is used.
4) When fly ash is used in different proportion it is observed that as percentage of fly ash is increase density is also increased.
5) Fly ash proportion is directly proportional to density.
6) For better mix fluidity is required otherwise aluminium powder may not mix properly & observed values does not give appropriate results.

Thus,

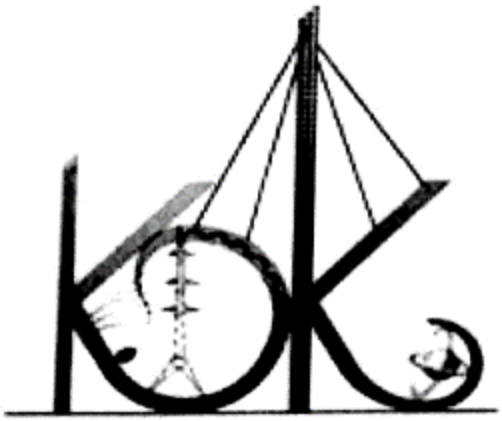
a) Compressive strength of mix M6 having 5.18 N/mm^2 is maximum as compared to other mixes.
b) Split tensile strength of mix M6 having 0.49 N/mm^2 is maximum as compared to other mixes.
c) Water absorption for mix with highest Fly ash & Quarry dust content is maximum. Mix M9 has highest water absorption of 17.2 %.
d) Foam concrete density for mix with highest Fly ash & Quarry dust content is maximum. Mix M9 has highest density of 1647.40 kg/m^3

Thus the experiment work clearly indicates sustainable construction featuring Foam Concrete as a Green Building material.

DISSERTATION REPORT
ON

"FINITE ELEMENT ANALYSIS OF PRESTRESSED CONCRETE BEAMS"

This project report is submitted to Rastrasant Tukadoji Maharaj Nagpur University in partial fulfilment of the requirement for the degree of Master of Technology in Structural Engineering.



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ABSTRACT

Several methods have been utilized to study the response of concrete structural components. Experimental based testing has been widely used as a means to analyze individual elements and the effects of concrete strength under loading. The use of finite element analysis to study these components has also been used.

This thesis is a study of prestressed concrete beams using finite element analysis to understand their stress distribution & load-deflection response. The parameters for the reinforced concrete model were then used to model a prestressed concrete beam. Characteristic points on the load-deformation response predicted using finite element analysis were compared to theoretical (hand-calculated) results.

Conclusions were then made as to the accuracy of using finite element modelling for analysis of prestressed concrete. The results compared well to hand calculated results.

CHAPTER NO 8

CONCLUSIONS

8.1 Conclusions

The following conclusions can be stated based on the evaluation of the analysis of the calibration model and the prestressed concrete beams.

(1) The Stresses in a continuum can be analysed properly using FEM with more number of elements.

(2) Failure modes of Prestressed concrete beams are analysed in a more precise manner by the use of Finite Element Analysis.

(3) Stresses at the mid span of finite element model are compared properly with the theoretical results.

(4) In planar analysis, shear deformations are neglected while in finite elemer analysis the deformations due to all effects are considered.

DISSERTATION REPORT

ON

"ANALYSIS OF MULTISTOREY BUILDING WITH FLOATING COLUMN AT VARRIOUS LOCATIONS"

This project report is submitted to Rashtrashant Tukdoji Maharaj Nagpur University in partial fulfillment of the requirements for the degree of Master of Technology in Structural Engineering

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(2014-2015)

ABSTRACT

The infrastructural boom during last decade as resulted in construction of many high rise structures in all mega cities Due to the existence of architect and structural designer have provided floating column in many location in structure. The building become vulnerable to earthquake hazard due to improper way of flow of earthquake force to ground due to discontinuity in the form of floating column brought into structure floating column provided at some location such as balcony result in close loop and redistribution of moment and forces may prove to be beneficial in restricting dimension of beam and column it may also help in achieving in desire economy

In this project analysis and design of building is done by introducing the floating column in different Locations , Also conclusion is carried out on the basis of following ways.

1. Analysis of effect of floating column at different locations for zone v .
2. There are 11 model studied for this work , First five of them are on location 1,and remaining five on location 2.

KEY WORDS - **Floating Columns, Seismic Zones, Critical Load Combinations, response spectrum**

SUMMARY

There are total 11 models discussed in this chapter. First five of them are on first location and remaining five on second location to determine the effect of floating columns following parameters like lateral displacement, axial force , shear force, torsion , bending moment are calculated and the results are compared with without floating column. Based on the result of different analysis for the first five models located in location 1 where first floating column is provided and same analysis for the other five models located in location 2, the following conclusion is drawn

CONCLUSION

The present study investigated the effect on structural response quantities of the building due to presence of floating column

1) It was observed that in building with floating column, there is an increase in lateral displacement about (5-10%) acts in x direction and about (3-8%) acts in z direction.

2) It was observed that in building with floating column there is an increase in Axial force about (16-20%) acts in x direction and about (13-17%) acts in z direction.

3) It was observed that in building with floating column there is an increase in shear force about (5-13%) acts in x direction and (5-15%) acts in z direction.

4) It was observed that in building with floating column there is an increase in Torsion about (3-9%) acts in x direction and (3-7%) acts in z direction.

5) It was observed that in building with floating column there is an increase i Bending moment about (23-32%) acts in x direction and (18-25%) acts in direction.

6) It was observed that in building with floating column there is a decrease in Ba shear along x direction and z direction.

DISSERTATION REPORT
ON

"AN EXPERIMENTAL INVESTIGATION FOR THE APPLICATION OF ZEOLITE AS A CONCRETE INGREDIENT"

This project report is submitted to Rastrasant Tukadoji Maharaj Nagpur University in partial fulfilment of the requirement for the degree of Master of Technology in Structural Engineering.

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ABSTRACT

Concrete plays the key role and a large quantum of concrete is being utilized in every construction activity. The history of cementing material is as old as the history of engineering construction. Some kind of cementing material was used by Egyptians, Romans, and Indians in their ancient construction. Pozzolans and supplementary cementitious materials (SCMs), either natural or artificial, are often used as a cement replacement or as an enhancement in concrete. There is a need of cost effective alternative and innovative green material. Study on the use of natural zeolite as Supplementary cementious material (SCMs) in concrete has been carried out in China and in other countries since early 1980. In this research; natural zeolite has been used as Supplementary cementious material (SCMs) in concrete. The presence of silicon dioxide in natural zeolite is expected to increase the concrete strength through reaction with the calcium hydroxide from the hydration of OPC.

When the zeolite is used at quantum of 10%, it increases the compressive strength of zeolite concrete but when it is used in excess of 10%, the compressive strength zeolite concrete decreases drastically.

Key Words: Concrete, Pozzolans, Supplementary cementious material (SCM), Natural zeolite (NZ)

CHAPTER 8

CONCLUSION & FUTURE SCOPE

On the basis of experimentation work carried out, the following conclusion are drawn:

1) The incorporation of natural zeolites in concrete tends to reduce the slump value of fresh concrete due to its cubical particle shape and rough surface. Hence the slump value gets decreses as the quantity of natural zeolite increases in the concrete mix
2) The workability of concrete is found in a permissible range (75mm) when zeolite is used in a quantum of 5%, 10% and 15% for making concrete
3) The generous effects on the durability might be attributed to the pozzolanic reactions Developed in the concrete mixtures incorporated zeolite as supplementary cementitious materials.
4) Concrete mixtures with replacement level up to 10% with zeolite (Z10) produced blended concrete with a similar strength compared to reference concrete at 28 days with a use of Portland cement.
5) The density of zeolite is more with reference to normal concrete
6) 7 days compressive strength of zeolite concrete is found to be 15% more when 10% cement replaced by zeolite in conventional concrete
7) 14 days compressive strength of zeolite concrete is found to be 5% more, when 15% cement replaced by zeolite in conventional concrete
8) 28 days compressive strength of concrete was found to be less when compared with conventional concrete
9) The flexural strength of concrete was found to be more at the age of 7, 14 and 28 days when compared with conventional concrete
10) The split tensile strength of zeolite concrete was found to be more up to 25% at the age of 28 days when compared with conventional concrete.

DISSERTATION REPORT

ON

"ANALYSIS OF MULTISTOREY BUILDING WITH FLOATING COLUMN AT VARRIOUS LOCATIONS"

This project report is submitted to Rashtrashant Tukdoji Maharaj Nagpur University in partial fulfillment of the requirements for the degree of Master of Technology in Structural Engineering

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ABSTRACT

The infrastructural boom during last decade as resulted in construction of many high rise structures in all mega cities Due to the existence of architect and structural designer have provided floating column in many location in structure. The building become vulnerable to earthquake hazard due to improper way of flow of earthquake force to ground due to discontinuity in the form of floating column brought into structure floating column provided at some location such as balcony result in close loop and redistribution of moment and forces may prove to be beneficial in restricting dimension of beam and column it may also help in achieving in desire economy

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Chapter 7

SUMMARY

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6) It was observed that in building with floating column there is a decrease in Base shear along x direction and z direction.

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COLLEGE OF ENGINEERING, NAGPUR

DEPARTMENT OF CIVIL ENGINEERING

SESSION 2014-2015

CERTIFICATE

This is certified that the project titled '**Eco-Sustainable Pervious Concrete Using Titanium Dioxide**' is project work done by **Mr. Ketan B. Jibhenkar** in partial fulfillment for the award of degree of **Master of Technology** in **Structural Engineering** from **Rashtrashant Tukdoji Maharaj Nagpur University, Nagpur.** This dissertation report fulfills the requirement related to the nature and standard of work for award of Master of Technology.

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ABSTRACT

Nowadays, the application of pervious concrete for the construction of pavements, car parking, driveways and walkthrough is becoming popular in many developed countries. Lack of relevant codal provisions citing the mix design of pervious concrete in the Indian Standards hinders the use of pervious concrete in India. Thus, it is necessary to develop material specification and mix proportions for pervious concrete by conducting tests and evaluating the performance. Pervious concrete can be a potential application for sustainable construction. It is one of the innovative techniques that can be used for ground water recharge since it can naturally filter water from rainfall or storm and reduce pollutant entering into streams, ponds and rivers. Concrete as a construction material with added self-cleaning characteristics along with the ability to remove pollutants is desirable. Photocatalysis has been applied over a decade to various materials to obtain a self-cleaning and depolluting effect in construction materials. It is a nanotechnology that could help mitigate air pollution and ultraviolet rays. Therefore, a pervious concrete with self-cleaning and air-purifying functionality is a promising technology that can be constructed using naturally air-cleaning agents such as photocatalyst titanium dioxide by using as partial replacement to cement.

This study reports an experimental investigation into the development of pervious concrete providing the optimal combination of strength and water permeability without using any admixtures. Research material Titanium dioxide **'Degussa Evonik Aeroxide P-25'** is provided by the **CSIR NEERI** institute for the experimental investigation and research work. This titanium dioxide is used as partial replacement to cement to study its behavior on mechanical properties of pervious concrete.Pervious concrete trial mixes with different size of aggregate, with and without fine aggregates were tested for its mechanical properties such as compressive strength, water permeability, porosity and density. Trial mix with optimum compressive strength along with sufficient permeability is selected as a basic experimental mix for investigating the effect of partial replacement of cement with titanium dioxide.

The highest compressive strength for pervious concrete is observed as 13.66 N/mm^2 and water permeability of 15.4 mm/sec is calculated for the experimental mix having 5% replacement of cement with titanium dioxide.

Keywords: Pervious Concrete, Titanium Dioxide, photocatalysis, Compressive strength, permeability.

CHAPTER 8
CONCLUSION

1. Pervious concrete is one of finest solution towards water logging problems especially when utilized for road pavements, parking and walk ways.
2. Size of coarse aggregate plays a vital role in development of pervious concrete with optimal compressive strength and water permeability.
3. Single size aggregates having size greater than 10mm shall be preferred for better water permeability. Due to use of such aggregates, greater porosity and void ratio of the pervious concrete can be achieved resulting into higher water permeability.
4. Compressive strength of pervious concrete increases and water permeability decreases with the increase of fine aggregate in pervious concrete.
5. Pervious concrete with maximum compressive strength can be obtained by combination of 20mm and 10mm aggregates or with single size 10mm aggregates along with use of fine aggregates in small quantity.
6. Water permeability is one of the important characteristics of pervious concrete and therefore the fine aggregate shall be used in pervious concrete within range of **2 to 4** percent by weight of coarse aggregates.
7. Addition of titanium dioxide as partial replacement to cement improves the compressive strength and splitting tensile strength of pervious concrete
8. Partial replacement of cement with titanium dioxide in the pervious concrete has no considerable adverse effect on water permeability of pervious concrete.
9. Partial replacement of cement with titanium dioxide in the range of **2.5** to **5** percent is favorable for pervious concrete.
10. Use of titanium dioxide more than 5 percent causes decrease in the compressive strength and splitting tensile strength of the pervious concrete.
11. Density of pervious concrete is less as compared to conventional concrete due to absence of fine aggregates.
12. Partial replacement of cement with titanium dioxide has no considerable effect on the density of pervious concrete.

DISSERTATION REPORT

ON

STRUCTURAL AUDIT OF EXISTING G+2 BUILDING

This project report is submitted to Rashtrashant Tukdoji Maharaj Nagpur University in partial fulfillment of the requirements for the degree of Master of Technology in Structural Engineering

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ABSTACT

The health examination of existing concrete buildings called as Structural Audit. The need of structural audit is for maintenance and repairs of existing structures whose life has exceeded the age of 30 years to avoid any mishaps and save valuable human life. The concrete is widely used as construction material being inexpensive, easy for construction, applications and because of it high strength-cost ratio. More than ever, the construction industry is concerned with improving the social, economic and environmental parameters of sustainability. There are many buildings during this period and earlier have reduced strength in due course of time because of structural deficiency, material deterioration, unexpected over loadings or physical damage. If, further use of such deteriorated structure is continued it may endanger the lives of occupants and surrounding habitation. There is demand of appropriate actions and measures for all such building structures to improve its performance and restore the desired functions of structures which may leads to increase its functional life. The periodical structural auditing and diagnosis for health of existing buildings is thus utmost important for finding the present serviceability and structural viability of structures. The structural audit must be carried out following auditing norms, methods of non-destructive testing and code provisions. The structural auditing will help to implement maintenance and repair work timely which leads to prolonged life of the building and safety of the occupants.

Keywords: Structural Audit; Non Destructive Testing; Analysis of Existing building

CHAPTER 10

CONCLUSION

- The Permissible Stresses as per IS 456:2000, Clause no B-2.1, table no. 21 for M15 grade concrete is -5 N/mm2.Structural Analysis of Existing Building block A building of KDKCE (which is without expansion joint), the maximum stress value at beam level was found to be -15.57 N/mm2. After making provision of Expansion joint, the maximum stress value at the same level was found to be -10.88 N/mm2.
- Structural Analysis of Existing Building block A building of KDKCE (which is without expansion joint), the maximum stress value at column level was found to be -3.75 N/mm2. After making provision of Expansion joint, the maximum stress value at the same level was found to be -2.5 N/mm2.
- Non Destructive Test was carried out at existing block A building, the ultrasonic Pulse Velocity test results indicates the maximum readings are in between 1.25 Km/Sec to 3.5 Km/ Sec. So the result is doubtful at many location (refer to IS 13311 (Part I) 1992 "Non -Destructive Testing of concrete methods of test).
- Rebound Hammer Test, Half Cell Potential and pH & carbonate test, the result values are more than the permissible values.
- Above study, experimental investigation and analysis shows that expansion joint is essential at a location where building changes its orientation.