SESSION 2016-17

DISSERTATION REPORT
ON

"DESIGN OF EARTHQUAKE RESISTANT MULTISTORIED RCC BUILDING ON A SLOPING GROUND"

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.

Submitted by
VRUSHALI S. KALSAIT
M-TECH
STRUCTURAL ENGINEERING

Guided by
Dr. Valsson Varghese
Prof. & HOD
CIVIL DEPARTMENT
K. D. K. College of Engineering

Department of Civil Engineering
Karmaveer Dadasaheb Kannamwar College of Engineering,
Great Nag Road, Nagpur - 440 009

(2014-2015)

ABSTRACT

In this paper is studied the structural analysis software 'STAAD Pro v8i' is used to study the effect of sloping ground on multistoried building performance during earthquake. The purpose of the paper is to perform linear static analysis of medium height RC buildings and investigate the changes in structural behavior due to consideration of sloping ground. This project report comprises of seismic analysis and design of a R.C. building with symmetrical plan. The structure should withstand the moderate earthquakes, which may be expected to occur during the service life of structure with damage within acceptable limits. Such earthquakes are characterized as Design Basis Earthquakes (DBE). The building is modeled as a 3D space frame with six degrees of freedom at each node using the software STAAD- PRO. Building (G+15) is analyzed using Response Spectrum method on 0°, 7.5°, 15°, 22° slope ground. The Response Spectrum as per IS 1893 (Part 1):2002 for medium soil is used. Comparison of results for (G+15) building is done for different slope and same soil condition. Analysis is performed for various load cases and combinations and the worst case is considered for the design of beams and columns. Reinforced concrete design is carried out as Per IS 456: 2000 and ductile detailing is done as per IS 13920: 1993. Various static checks are applied on the results.

CHAPTER 7

CONCLUSION

- Buildings resting on sloping ground have more lateral displacement compared to buildings on Plain ground.
- The presence of bracings in soft stories reduces the lateral displacement.
- The critical axial force in columns increases as slope increases.
- The critical bending moments is increased on 22° slope than 7.5° slope and 15° slope ground.
- Calculated frequency decreases as slope of ground increases.
- Calculated time period decreases as slope of ground increases.

- high quality of construction to be provided conforming to related IS codes such as IS 1893 , IS 13920 to ensure good performance during future earthquakes.
- To implement the design of building elements and joints between them in accordance with analysis .i.e. ductility design should be done.
- After designing, it is concluded that steel quantity on sloping ground is more than on plain ground for same cross section of column and beam.
- Thus cross section required more steel on sloping ground to make earthquake resistant structures.

DISSERTATION REPORT

on

"EFFECT OF ELEVATED TEMPERATURE ON CONCRETE WITH GROUND GRANULATED BLAST FURNACE SLAG AS A PARTIAL REPLACEMENT OF CEMENT"

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

Submitted by

Akshay J. Pawar

M-Tech (Structural Engineering)

Guide

Dr. Valsson Varghese

Professor and Head Of

Department Of Civil Engineering

KDK College, Nagpur

Co-Guide

Prof. V.D. Vaidya

Assistant Professor,

Department Of Civil Engineering

KDK College, Nagpur

Department of Civil Engineering

Karmaveer Dadasaheb Kannamwar College of Engineering,

Nagpur - 440009

2016-2017

ABSTRACT

Ground granulated blast furnace slag (GGBFS) has been widely utilized as ingredients in concrete due to the advantages of economic, technical and environmental benefits of this material. This paper deals with the effects of elevated temperatures on mechanical properties of concrete made with ground granulated blast furnace slag (GGBFS) with replacement ratios of 20%, 40% and 60% by weight of cement. The concrete specimens were subjected to different elevated temperatures ranging from 200°C to 1200°C. Afterward, the residual compressive strength, split tensile strength, flexural strength and the percentage reduction in weight of concrete were determined. For this purpose cube, cylindrical and beam Specimens of size (150 x 150 x 150 mm), (150 x 300 mm) and (100 x100 x500 mm) were made. This investigation developed some important data on the properties of concrete exposed to elevated temperatures. Test results shows that at elevated temperature 20% Ground granulated blast furnace slag +1% steel fibre found suitable combination as compared with the other combination.

Key words: Ground-Granulated Blast-Furnace Slag (GGBS or GGBFS), Steel fibre, Compressive strength, Split tensile strength, Flexural strength.

Chapter 9

CONCLUSION

Based on the limited experimental work carried out in this particular study,

The Following conclusions may be drawn out,

1. With the increasing temperature upto 1200°C, the compressive strength, Split tensile strength and flexural strength of concrete gets reduced, due to the hardening of cement paste caused by drying, due to which the bond of cementations materials was got loss.
2. At elevated temperature upto 1200°C, GB1 (20% Ground granulated blast furnace slag +1% steel fibre) concrete found suitable combination. In this the Increase in strength, which is due to the high reactivity of GGBS with cement and the filler effect of GGBS.
3. % Reduction in strength is more for GB3 (60% Ground granulated blast furnace slag +1% steel fibre) concrete as compared with other combinations, which is due to the slower reaction of GGBS at early ages.
4. % Reduction in weight is more for GB3 (60% Ground granulated blast furnace slag +1% steel fibre) concrete as compared with other combinations, which is mainly due to the evaporation of free water in concrete.
5. When the sample is heated between 300°C to 600°C the colour of concrete changes to red, due to siliceous aggregate present in concrete.
6. When the sample is heated between 600°C to 900°C the colour of concrete changes to whitish grey, due to the reaction of calcium carbonate in the calcinations process $CaCO_3$ which turns to lime and give pale shades of white and grey colour.
7. When the temperature range is between 900°C to 1200°C concrete shows light yellow colour is due to oxidation of mineral components.
8. Effect of elevated temperature can be observed on the surface of concrete in the form of deep cracks, which is due to the expansion of the concrete matrix.

DISSERTATION REPORT

ON

"EFFECT OF CALCITE AND FLY ASH ON SELF COMPACTING CONCRETE IN FRESH AND HARDENED STATE"

Submitted by

Asim Ejaz Sheikh

M-Tech. (Structural Engineering)

Dr. A.M. Badar **Professor & Vice-Principal** **Guide**	**Prof. S. R. Satone** **Assistant Professor** **Co-Guide**	**Er Vivek Naik** **Apple Chemi Pvt. Ltd,** **Co-Guide**
Dr. N. R. Dhamge **Professor** **M. Tech Coordinator**	**Dr. Valsson Varghese** **Professor** **Head of the Department**	**Dr. D. P. Singh** **Principal**

Department of Civil Engineering

Karmaveer Dadasaheb Kannamwar College of Engineering,

Great Nag Road, Nagpur - 440009

(2016-2017)

ABSTRACT

Self-compacting concrete, also called as self-consolidating concrete, is able to flow and reach every corner of formwork under its own weight and is deaerated almost completely while flowing in the formwork. It behaves like honeyand is cohesive enough to fill the spaces of almost any size and shape without segregation or bleeding. This makes Self Compacting Concrete particularly useful wherever placing is difficult, such as in congested reinforced concrete members or in complicated work forms. The objective of this proposed project is to study self-compacting concrete properties like flowing-ability, passing-ability, segregation by performing slump flow test, L box, J ring and compare the same with conventional concrete. And also to compare the Compressive Strength values of self-compacting and normal concrete specimens for 3 days, 7 days, and 28 days. And to study the effect of calcite, superplasticizer, VMA and fly ash on concrete. All SCC mixtures exhibited greater values in compressive strength after being tested, compared to normal concrete. The compressive strength of SCC is found to be higher than that of normal concrete. This was possible due to the use of mineral and chemical admixtures, which usually improve the bonding between aggregate and cement paste, thus increasing the strength of concrete.

Key word: - Calcite, Fly ash, Self-compacting concrete (SCC), Super-plasticizer.

CONCLUSION

As 4 different Self-Compacting Concrete mix design are prepared using calcite in 0%, 5%, 10%, 15% proportions, accordingly following points can be concluded:

- From an experimental investigation, it was found that with the increase in proportion of calcite, flowing ability decreases

- From an experimental investigation it was observed that the compressive strength of Mix 1 which contains 5% of calcite and 20% of fly ash gives better compressive strength as compare to other mixes.

- From an experimental investigation it was observed that the split tensile strength of Mix 3 which contains 15% of calcite and 20% of fly ash gives better split tensile strength as compare to other mixes.

- From an experimental investigation it was observed that the flexural strength of Mix 3 which contains 15% of calcite and 20% of fly ash gives better flexural strength as compare to other mixes.

- The present study of self-compacting concrete shows that the use of mineral and chemical admixture gives the better workability and strength. At the same time the use of fly ash reduces the cost of concrete considerably, it also reduces all type of pollution.

- The present study also promotes the use of fly ash, which is otherwise considered as waste material.

DISSERTATION REPORT

on

EFFECT OF SEISMIC FORCES ON TRANSMISSION LINE TOWER

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

Submitted by

PRACHI P. BAGMARE

M. Tech. (Structural Engineering)

Guide

Dr. N. R. DHAMGE

Professor,

C.E.D., K.D.K.C.E., Nagpur

Department of Civil Engineering

Karmaveer Dadasaheb Kannamwar College of Engineering,

Nagpur – 440009

2016-2017

ABSTRACT

In the present era, Transmission Line Tower plays a great role in human society. Due to earthquake the transmission line may collapse, and it will cause economic loss as well as the secondary disasters such as fire. Therefore it becomes very to analyse the tower for seismic forces.

In this study, an attempt is made that Transmission Line Tower is modelled using STAAD Pro. The towers are designed in two earthquake zones III & IV with three different soil conditions Hard, Medium & Soft. The towers are modelled using parameters such as constant height, base width, angle sections and variable parameters of bracing system, earthquake zones and soil type. The cable loads are calculated using PLS Tower software. After completing the analysis, the comparative study is done with respect to axial force, reactions & moments for all different towers.

Conclusions were drawn based on the results obtained from the different studies carried out.

CHAPTER 6
CONCLUSION

Conclusion in Seismic Analysis

1. The axial forces are same in Hard & Medium soil but increases in Soft soil because of the decrease in average response acceleration (Sa/g) .

   The Sa/g ratio changes with the soil type and in our study the Sa/g ratio is found minimum in soft soil, therefore the axial forces are maximum in soft soil.
2. Axial forces in members of cross braced tower increases in soft soil condition by 16.08 % in zone III and 23.18 % in zone IV as compared to the forces in hard and medium soil.
3. Reaction (Fy) and Moment (Mx & Mz) in supports of cross braced tower built in hard, medium and soft soil condition increases in Zone IV by 19.49% , 5.61% and 20.71% respectively as compared to zone III.
4. Axial forces in members of diagonally braced tower increases in soft soil condition by 15.96 % in zone III and 23.03 % in zone IV as compared to the forces in hard and medium soil.
5. Reaction (Fy) and Moment (Mx & Mz) in supports of diagonally braced tower built in hard, medium and soft soil condition increases in Zone IV by 19.23 % , 12.32 % and 17.36 % respectively as compared to zone III.
6. Axial forces in members of k braced tower in Hard, Medium and soft soil condition increases by 5.03 % in zone III as compared to the forces in zoneIV.
7. Reaction in supports of k braced tower in Hard, Medium and soft soil condition increases by 5.03 % in zone III as compared to the reactions in zoneIV.
8. Moment at the supports of k braced tower in Hard, Medium and soft soil condition increases by 5.61 % in zone III as compared to the moment in zoneIV.

DISSERTATION REPORT
ON

"USE OF FLY ASH, RICE HUSK ASH AND QUARRY DUST FOR MAKING GREEN CONCRETE"

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

Submitted by

Aishwarya Sangolkar
M-Tech (Structural Engineering)

Guide
Dr. A. M. Badar
Professor & Vice-Principal
K.D.K. College of Engineering

Co-Guide
Swapnil Satone
Assistant Professor
K.D.K. College of Engineering

DEPARTMENT OF CIVIL ENGINEERING
Karmaveer Dadasaheb Kannamwar College of Engineering,
Nagpur-440009

(2016-2017)

ABSTRACT

The utilization of supplementary cementitious materials is well accepted because of the several improvements possible in the concrete composites and due to the overall economy. The use of by-products is an environmental friendly method of disposal of large quantities of materials that would otherwise pollute land, water and air. This paper presents the experimental study to investigate the influence of partial replacement of cement by Fly Ash (FA) & Rise Husk Ash (RHA) and Natural sand with Quarry Dust (QS) on the concrete compressive strength, split tensile strength and flexural strength by better understanding of chemistry of constituents of the concrete mix. The use of by-products is an environmental friendly method of disposal of large quantities of materials that would otherwise pollute land, water and air. This study focuses on utilization of waste pozzolona products such as Fly Ash (FA) and Rice Husk Ash (RHA) as partial replacement to OPC and natural sand by Quarry Dust (QS) to produce blend concrete with an objective to increase the optimum percentage of replacement of pozzolona to OPC without affecting the concrete properties.

Keywords: Rise Husk Ash (RHA), Fly Ash (FA), Quarry Dust (QS), Compressive Strength, Split Tensile Strength and Flexural Strength.

CHAPTER 8

CONCLUSION

Based on the limited experimental work carried out in this particular study,

The Following conclusions may be drawn out

1) From experimental investigation, it was found that fly ash (40%) and rice husk ash (78.21%) contains high silica content, which is essential for pozzolonic reaction.

2) From experimental investigation, it was found that initial gain of strength of the concrete with fly ash and rice husk ash is less as compared to conventional concrete. It is because of pozzolonic action. Since the pozzolanic reaction is slow and depends on the calcium hydroxide availability, the strength gain takes longer time for the Fly ash concrete. The chemical reaction of the Portland cement is expressed as follows:

   Cement (C_3S,C_2S) + H_2O (H) → CSH-gel + $Ca(OH)_2$(CH)

   $Ca(OH)_2$(CH) + SiO_2(S) + H_2O(H) → CSH-gel

3) The slump value of the mix A_1, A_2, A_3 was found to be 66 mm,68 mm and 70 mm respectively. Workability of concrete decreases due to water absorption capacity of quarry dust.

4) From experimental investigation, it was found that the compressive strength of the concrete mix A_1 (70% cement,7.5% RHA,22.5% fly ash and 45% quarry dust and 55% sand) at 7 days was found to be 21.30 N/mm^2. It is within the permissible range value as per IS: 456-2000 for M30 grade of concrete.

5) The compressive strength of the concrete mix A_1 (70% cement,7.5% RHA, 22.5% fly ash, 45% quarry dust,55% sand) at 14 days was found to be 28.88 N/mm^2. It is within the permissible range value as per IS 456-2000 for M30

DISSERTATION REPORT

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Submitted by

Akshay J. Pawar

M-Tech (Structural Engineering)

Guide

Dr. Valsson Varghese

Professor and Head Of

Department Of Civil Engineering

KDK College, Nagpur

Co-Guide

Prof. V.D. Vaidya

Assistant Professor,

Department Of Civil Engineering

KDK College, Nagpur

Department of Civil Engineering

Karmaveer Dadasaheb Kannamwar College of Engineering,

ABSTRACT

Ground granulated blast furnace slag (GGBFS) has been widely utilized as ingredients in concrete due to the advantages of economic, technical and environmental benefits of this material. This paper deals with the effects of elevated temperatures on mechanical properties of concrete made with ground granulated blast furnace slag (GGBFS) with replacement ratios of 20%, 40% and 60% by weight of cement. The concrete specimens were subjected to different elevated temperatures ranging from 200°C to 1200°C. Afterward, the residual compressive strength, split tensile strength, flexural strength and the percentage reduction in weight of concrete were determined. For this purpose cube, cylindrical and beam Specimens of size (150 x 150 x 150 mm), (150 x 300 mm) and (100 x100 x500 mm) were made. This investigation developed some important data on the properties of concrete exposed to elevated temperatures. Test results shows that at elevated temperature 20% Ground granulated blast furnace slag +1% steel fibre found suitable combination as compared with the other combination.

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Chapter 9

CONCLUSION

Based on the limited experimental work carried out in this particular study,

The Following conclusions may be drawn out,

1. With the increasing temperature upto 1200°C, the compressive strength, Split tensile strength and flexural strength of concrete gets reduced, due to the hardening of cement paste caused by drying, due to which the bond of cementations materials was got loss.
2. At elevated temperature upto 1200°C, GB1 (20% Ground granulated blast furnace slag +1% steel fibre) concrete found suitable combination. In this the Increase in strength, which is due to the high reactivity of GGBS with cement and the filler effect of GGBS.
3. % Reduction in strength is more for GB3 (60% Ground granulated blast furnace slag +1% steel fibre) concrete as compared with other combinations, which is due to the slower reaction of GGBS at early ages.
4. % Reduction in weight is more for GB3 (60% Ground granulated blast furnace slag +1% steel fibre) concrete as compared with other combinations, which is mainly due to the evaporation of free water in concrete.
5. When the sample is heated between 300°C to 600°C the colour of concrete changes to red, due to siliceous aggregate present in concrete.
6. When the sample is heated between 600°C to 900°C the colour of concrete changes to whitish grey, due to the reaction of calcium carbonate in the calcinations process $CaCO_3$ which turns to lime and give pale shades of white and grey colour.
7. When the temperature range is between 900°C to 1200°C concrete shows light yellow colour is due to oxidation of mineral components.
8. Effect of elevated temperature can be observed on the surface of concrete in the form of deep cracks, which is due to the expansion of the concrete matrix.

DISSERTATION REPORT

on

USE OF MINERAL & CHEMICAL ADMIXTURE FOR MANUFACTURING OF SELF COMPACTING CONCRETE

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

Submitted by

NAYANTARA T. DHOKPANDE

M. Tech. (Structural Engineering)

Guide

Prof. S. R. Satone

Assistant Professor,

C.E.D., K.D.K.C.E., Nagpur

Co-Guide

Er. Vivek Naik

MD, Apple Chemi Pvt. Ltd.

Nagpur

Department of Civil Engineering

Karmaveer Dadasaheb Kannamwar College of Engineering,

Nagpur – 440009

2016-2017

ABSTRACT

Self compacting concrete (SCC) described a concrete with the ability to flow and compact under its own weight, without any compaction. It also known as Self-consolidating concrete or self levelling concrete. By use of SCC the manpower requirement reduced and it will overcome the difficult casting conditions. This paper presents the detail study of SCC developed by using mineral and chemical admixture. An experiment also gives the comparison of the SCC mixes in terms of their hardened concrete properties like Compressive Strengths, Split Tensile Strengths and Flexural Strengths. Also, the Fresh concrete properties such as Fill-Box test, J-ring test, L-box test, Slump test, T50 cm test and V-funnel test are included in the study. The age at loading of the concrete for 3, 7 and 28 days curing.

Index Terms—Self-compacting concrete (SCC), Fly ash, Super-plasticizer, Compressive Strength, Split Tensile strength, Flexural strength, Fresh Concrete.

CHAPTER 9

CONCLUSION

- Fly ash contains amount 40% silica content which is most essential of mineral admixture.

- The workability of SCC was found at 0.38 water-cement ratio due to the use of superplasticizer i.e. 0.90% dose by mass of cementitious material.

- From the present experimental study it is observed that the flow properties of SCC are achieved in all the mixes as per the acceptance criteria of EFNARC-2005 for SCC.

- From an experimental investigation it was observed that the compressive strength of Mix C which contains 20% of fly ash gives better compressive strength as compare to other mixes.

- From an experimental investigation it was observed that the split tensile strength of Mix C which contains 20% of fly ash gives better split tensile strength as compare to other mixes.

- From an experimental investigation it was observed that the flexural strength of Mix C which contains 20% of fly ash gives better flexural strength as compare to other mixes.

- The present study of self-compacting concrete shows that the use of mineral and chemical admixture gives the better workability and strength. At the same time the use of fly ash reduces the cost of concrete considerably, it also reduces all type of pollution.