SESSION 2012-13

PROJECT REPORT
on
"CONDITION ASSESSMENT & STRUCTURAL AUDIT OF FIRE DAMAGE STRUCTURE"

Submitted By

AASHISH YASHPAL SONI

for the Masters Degree of Structural Engineering

Co-Guide
Dr. D.P. Mase

Guide
Prof. R.V.R.K. PRASAD

Department of Civil Engineering
Karmaveer Dadasaheb Kannamwar College of Engineering,
Nagpur 440 009

(2012-2013)

ABSTRACT

Fire in the structure causes higher temperature at the concrete surface, which causes reduction in compressive strength, modulus of elasticity of concrete. The architectural and structural design of a building and construction has a significant effect on its fire safety standards. It is well understood that this form of construction has good inherent fire resistance but structural engineers do not traditionally consider fire as a load on a structural frame. Building fires have the potential to be high fatality fires, due to greater occupant numbers and more complex egress paths. The object is to save lives by preventing the spread of fire and to ensure that the structure does not collapse before it has been safely evacuated.

In the present work, effects of fire on concrete structures and technical requirements for the satisfactory investigation, assessment and repair of fire damaged reinforced concrete structures are studied. The majority of concrete structures are not destroyed in a fire or a thermal exposure, and so one of the major advantages of using concrete is that it can usually be easily repaired and reused afterwards. In fact, after a fire it is generally necessary to ascertain whether the residual safety level is still sufficient in spite of the mechanical decay of the materials. To this end, knowing the residual properties of the materials is important for future action to repair and retrofit the fire damaged structures. Different types of non-destructive evaluation of concrete like rebound hammer test, ultrasonic pulse velocity test, pH test and carbonation test have been performed to assess the condition of the existing building.

In this project, the fire damaged chemical plant at Yasho Industries at Vapi is analyzed. The reason of fire was short circuit. Because of presence of highly flammable petroleum, fire bridged unable to prevent building from fire. Due to fire, serious damages in the structure were observed like cracking, spalling and deformation of concrete members etc. This building is 10yrs old. The Built-up area at each floor is 5725 sq.ft. Total number of floors is (G+5).

CHAPTER 8

SUMMARY & CONCLUSION

8.1 Summary

This project presents a comprehensive design of six storey reinforced concrete fire damaged structure. The design is carried out to show the effects of fire on structural elements. The damages due fire on concrete structures at elevated temperature are determined. The present work deals with NDT on fire damaged structural elements. Determination of load & moment carrying capacity of structural elements & Methods of strengthening of fire damaged structure. The structural elements such as R.C.C. slabs, beams and columns are designed by conventional working stress method and limit state methods. From the NDT results, suitable type of jacketing is proposed for the fire damaged structure.

8.2 Conclusions

Based on the NDT results, Analysis & Design following conclusions are derived:

i. The original grade of concrete was 25N/mm^2. Due to fire, the strength of concrete is reduced to 15 N/mm^2.

ii. Deformation, cracking & spalling are observed in fire damaged structure. They are repaired by using epoxy bonding agents, Polymer concrete & cement grouting.

iii. Deflection of R.C.C. beam is observed 25-40 mm in ground & first floor beams having span 4 to 5m.

iv. Deflection of R.C.C. slabs is observed 10-20 mm in ground & first floor beams having span 2.5 to 3m.

v. Load carrying capacity of columns is reduced due to fire. They have strengthened by using R.C.C. & Steel Jacketing as discussed in chapter 7.

vi. Moment of resistance of beam is reduced due to fire. Hence Beams are strengthened by providing additional steel beam below concrete beam to increase the moment of resistance & control the deflection as discussed in chapter 7.

vii. Selection of type of jacketing is based on the cost of repaired material. For this fire damaged structure, R.C.C. jacketing is suitable & economical for columns.

THESIS REPORT

on

"COST EFFECTIVENESS OF BUILDING BY USING GRID PATTERNS OF FLOOR SLAB"

Submitted By

Mr. Lilesh P. Sakharwade

In partial fulfillment of requirement for the award of degree of the Master of Technology in Structural Engineering

Guide

Prof. R.V.R.K. Prasad

Department of Civil Engineering
Karmaveer Dadasaheb Kannamwar College of Engineering,
Nagpur 440 009
(2012-2013)

ABSTRACT

A grid is a planar structural system composed of continuous members that either intersect or cross each other. Grids are used to cover large column free areas and is subjected to loads applies normally to its plane. It is beneficial over normal beams as it has a better load dispersing mechanism and also this system reduces the normal span to depth ratio which helps in reducing the height of the building. As we know, the structural cost of work increases from time to time due to increase in material & labour cost, which ultimately lead to increase in the total cost of building. The structural cost of work is approximately 50% of the total cost of the building. So it is very essential to reduce the structural cost of building. It can be possible by providing safe & economical grid pattern of floors of building.

In the present M. Tech work, Structural Technique of Analysis and design (STAAD) software is used to analyze & design the floor by using the several grid patterns. Quantity of concrete and steel required for building is obtained and finally the total structural cost of building is found out for several grid patterns of floor slab. The aim of the project is determine the most economical grid pattern from the results obtained from STAAD software. Quantity of steel and concrete for different grid patterns are compared with the help of bar charts.

CHAPTER 7
SUMMARY & CONCLUSION

7.1 Summary

In the present study, an attempt is made to study the cost effectiveness of building by using nine grid patterns. The study has been divided into three main parts. First part included the static analysis of building. The results in form of S.F.D, B.M.D and deflection were obtained. A comparative table of these results for all the grids has also been presented. In the next section design of these grid patterns from the static results has also been discussed. In the third a cost comparison of the grid patterns has been discussed. The quantity of building materials such as concrete and steel is also evaluated. From the evaluated quantity of steel and concrete, the cost of each and every grid is presented. In the next section conclusions obtained from the study is presented.

7.2 Conclusions

The major conclusions drawn from the present study are as follows:

1. The **grid no 3** is the **most economical grid (considering column)** as the quantity of concrete required is 36.68m^3 which is less as compared to other grids. Moreover the quantity of steel required is 4.131 M.T. which is also the least as compared to other grids. Thus the cost of grid no. 3 is Rs.3, 100/- which is the least as compared to other grids.
2. The **grid no 2** is the second **most economical grid (considering column)** as the quantity of concrete required is 39.69m^3 and the quantity of steel required is 4.884 M.T.. Thus the cost of grid no. 2 is Rs.3, 511/- which is the second least as compared to other grids.
3. The **grid no.7** is the **most uneconomical grid (considering column)** as the quantity of concrete required is 52.48m^3 which is more as compared to other grids. Moreover the quantity of steel required is 9.452 M.T. which are also more as compared to other grids. Thus the cost of grid no. 3 is Rs.5, 779/- which is the most as compared to other grids.
4. The **grid no 3** is the **most economical grid (without considering column)** as the quantity of concrete required is 31.06m^3 which is less as compared to other grids. Moreover the quantity of steel required is 3.21 M.T. which is also the least