Effect of Opening on Flat Slab Using Ansys.16

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Abstract- *Finite element formulation with the damaged plasticity model for concrete in is used to simulate the opening effect in reinforced concrete slabs without shear reinforcement. Nine edge slabcolumn connections, previously tested, are analyzed. The effect of the location and the size of the opening on the punching shear resistance is investigated. The numerical results from the finite element analyses (FEA) are in good agreement with the experimental results in terms of ultimate load and cracking; and confirm the accuracy of the proposed finite element model. The punching shear capacity of the tested specimens is calculated using the equations of ACI 318-14 and compared with the test and numerical results. Then, parametric investigation is presented on edge and interior specimens having openings with different sizes and located in different distances from the column. The results confirm that the punching shear resistance is decreased with an increase in opening size and with the decrease in opening distance from the column.*

I. INTRODUCTION

1.1 COMPOSITE MATERIAL OVERVIEW:-

Composite materials are those materials which are obtained by the combination two materials. One is the reinforcements and the other is the matrix. The reinforcements are responsible for carrying the loads and the stresses which the composite is subjected to. The work of the matrix if to distribute the force and stress uniformly among the reinforcement and binds the reinforcement. It also prevents the fibers from external damage. Composite materials are such that they inherit the superior qualities of the combining materials leaving behind the inferior qualities.

The properties which are impossible to be obtained from a single material can be obtained from a composite due to its heterogeneous nature. All the properties of the composites are the function of its constituent materials, their spatial distribution and particle interaction between them.

1.2 IMPORTANCE OF CUT-OUTS:-

Cut out is an integral part of almost every structural element including laminated composite plates. They are used in civil, mechanical, aerospace and automotive industry extensively. For various practical reasons we always need to provide cut out in these structures. Cut-outs serve the purpose of access vents for the mechanical and electrical systems such as passage of electrical wires, hydraulic lines etc. many times designers just use cut-outs of various shapes and size for quality control, to reduce the weight the weight of structures and also to alter the natural frequencies of structures to make them safe in case of hazardous vibrations. Cut-outs in structural members like plates tend to change its dynamic characteristics to some extent.

II. METHODOLOGY

2.1 NUMERICAL MODELLING IN ANSYS

For modeling of hyperbolic cooling tower surface elements are preferred in that particularly SHELL181, CONTA 174 and TARGE170 is used description of elements are as follows

SHELL181 Element Description:-

SHELL181 is suitable for analyzing thin to moderately-thick shell structures. It is a four-node element with six degrees of freedom at each node: translations in the x, y, and z directions, and rotations about the x, y, and z-axes. (If the membrane option is used, the element has translational degrees of freedom only). The degenerate triangular option should only be used as filler elements in mesh generation. SHELL181 is well-suited for linear, large rotation, and/or large strain nonlinear applications. Change in shell thickness is accounted for in nonlinear analyses. In the element domain, both full and reduced integration schemes are supported. SHELL181 accounts for follower (load stiffness) effects of distributed pressures. SHELL181 may be used for layered applications for modeling composite shells or sandwich construction. The accuracy in modeling composite shells is governed by the first-order shear-deformation theory (usually referred to as Mindlin Reissner shell theory).The element kinematics allow for finite membrane strains (stretching). However, the curvature changes within a time increment are assumed to be small.

The 3-D contact surface elements (CONTA173 and CONTA174) are associated with the 3-D target segment elements (TARGE170) via a shared real constant set. ANSYS looks for contact only between surfaces with the same real

constant set. For either rigid-flexible or flexible-flexible contact, one of the deformable surfaces must be represented by a contact surface.

If more than one target surface will make contact with the same boundary of solid elements, you must define several contact elements that share the same geometry but relate to separate targets (targets which have different real constant numbers), or you must combine two target surfaces into one (targets that share the same real constant numbers).

III. PROBLEM STATEMENT

Plate size: 6m X 2.5m
RCC thickness: 160mm
Epoxy Resin Thickness: 40mm
Boundary condition: 2 short edge fixed 2 long edge free

IV. ANSYSMODEL SOFTWARE

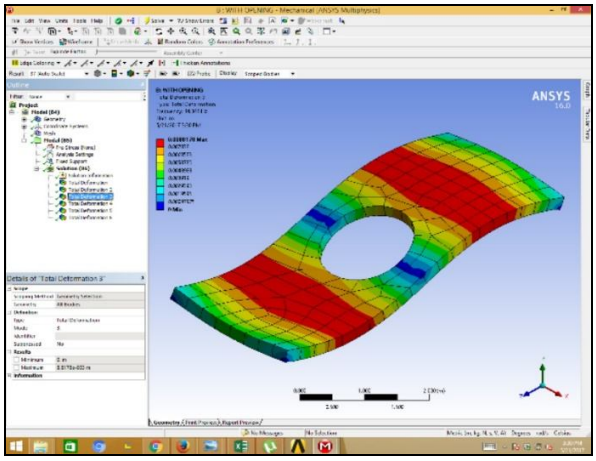


Fig4.1

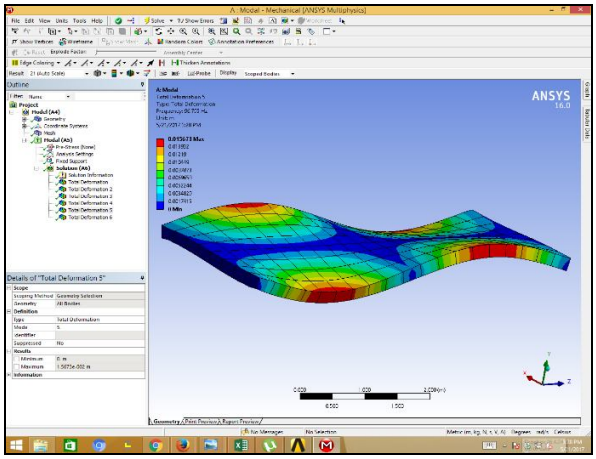


Fig4.2

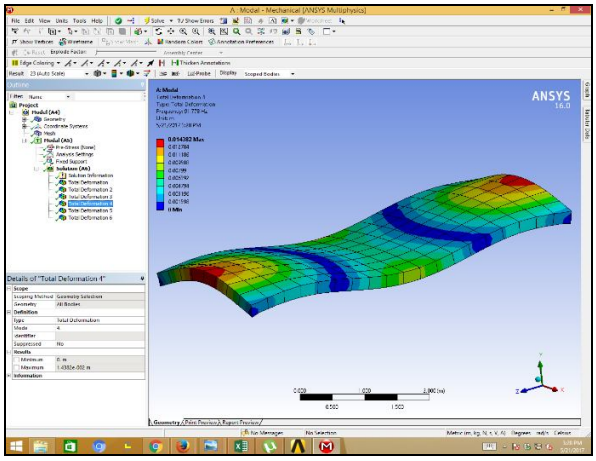


Fig 4.3

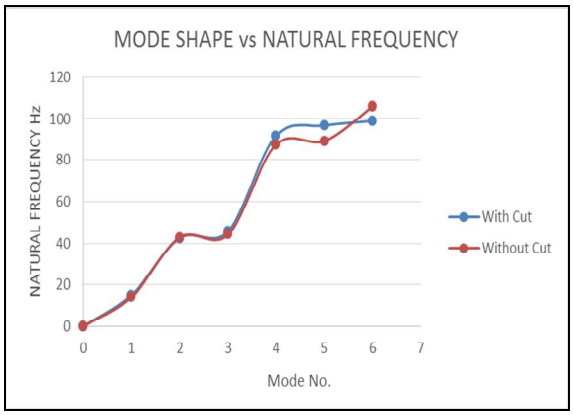
V. RESULT AND DISCUSSION

The results obtained are shown in table 1 and 2 respectively:

Table No: 5.1

NATURAL FREQUENCY Hz		
Mode	With Cut	Without Cut
0	0	0
1	15.104	14.114
2	42.601	42.962
3	45.896	44.344
4	91.778	87.505
5	96.795	89.258
6	99.052	105.73

Graphs obtained from above results are as follows



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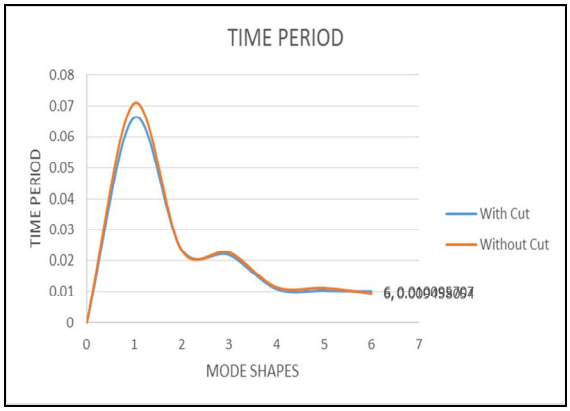

Graph no: 02

VI. CONCLUSION

In this paper the composite plate analysis is performed using FEA tool ANSYS using shell 181 and solid 186 element. The structural system is analyzed for different aspect ratio and size of opening following conclusions can be drawn for current model

- The time period of both plate was highest at mode no. 1 and nearly same in both cases
- The natural frequency is observed more in composite plate without opening model

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