FINITE ELEMENT ANALYSIS OF SIMPLY SUPPORTED DEEP BEAM USING ABAQUS

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Abstract- The analytical study of reinforced concrete simply supported deep beams subjected to two point loads was carried out using finite element method to study the behavior of deep beam by considering flexural behavior, ultimate strength, and deflection shape. The effective span to depth ratios of the deep beams considered were 1, the ABAQUS program is used to model the behaviour of reinforced concrete Deep T beams. The finite element model uses the concrete damaged plasticity approach. This model can help to confirm the theoretical calculations as well as to provide a valuable supplement to the laboratory investigations of behavior. For validation, a reinforced concrete beam was modelled that had been experimentally tested and reported in previous experimental research. The results have been compared with experimental values and shows good agreements.

Keywords- Finite Element Method (FEM), deep beam, ultimate strength flexural behavior

I. INTRODUCTION

Recently the use of Reinforced deep beam has become more prevalent. A simply supported beam is classified as deep when the ratio of its effective span to overall depth D is less than 2. Continuous beam are consider as deep when the ratio L/D is less than 2.5.The effective span is defined as the center to center distance between the supports or 1.15 times the clear span whichever is less. Deep beam often appear in form of transfer girders in high-rise building as well as pile caps, foundation walls, water tanks, bins, folded plate roof structures, floor diaphragms, shear walls & brackets or corbels.

Ray [1] was investigated the shear strength capacity of reinforced and prestressed concrete deep beams without opening, with and without web reinforcement. According to experimental results, Ray [2] has suggested an equation to estimate the shear strength of deep beams with shear reinforcement. It was concluded that the predicted results using the normal beam theory underestimated the ultimate load of deep beams. Kong et al. [3] tested 35 simply supported rectangular deep beams of the span to depth ratio ranging from 1 to 3 and shear span/depth ratios from 0.23 to 0.7. They studied the effects of seven different types of web reinforcement on deflections crack widths, crack patterns, failure modes. Existing methods of predicting Deep Beam behaviour involve either elastic theory or semi–empirical equation, neither of which is entirely satisfactory [4]. The basic assumption that plane sections remain plane after loading and that the material is homogeneous and elastic do not hold for deep beams. Finite element method (FEM) offers a powerful and general analytical tool for studying the behaviour of reinforced concrete deep beams ([5],[6]).

Theoretical analysis deep beam by using Finite Element Method (Abaqus software program V6.13). The FEM result will compare with experimental test results. Three model have been adopted in this study (DTV) Direct load on T beam with vertical reinforcement, (IT) indirect load on T beam without vertical reinforcement and (ITV) indirect load on T beam with vertical reinforcement [7].

II. MODEL GEOMETRY

The models adopted in this research according to the model investigated by [7]. Fig 1 shows the model loaded directly and indirectly

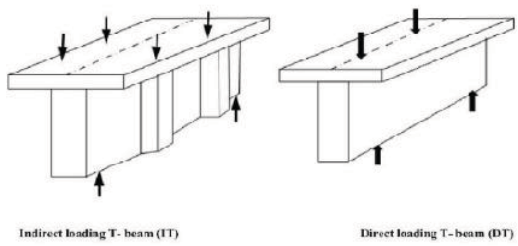

Fig 1 Direct and Indirect load method for T Beam

The Fig. 2and Fig.3 show the reinforcement details of analyzed beam of model DTV and IT.

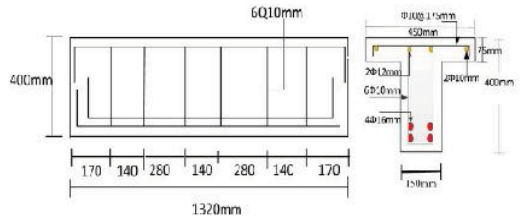

Fig. 2 DTV beam model

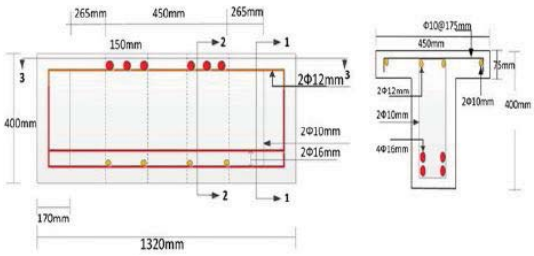

Fig. 3 IT Beam model