

11. Recommendations for Further Work

There is a clear need for further tests on monotonically loaded reinforced concrete beam-column connections. It is the author's opinion that further work should be carried out to determine the following :

- 11.1 ***The influence of column load.*** The literature review proved inconclusive on this issue. The majority of previous research agreed that initial joint cracking strength was enhanced by an increased column load. However, contradictory information exists regarding the influence of column load on the ultimate joint capacity.
- 11.2 ***The influence of joint aspect ratio.*** Test results have been presented within this investigation and also by Scott [8]. However, the available data on specimens with varying joint aspect ratio is limited.
- 11.3 ***Beam tension steel behaviour.*** Parker's [11] and Reys de Ortiz's [10] specimens were reasonably similar, however, Parker's specimens failed at a low joint shear strength. Suggestions have been made by Vollum [12] that this may have been due to Parker using large diameter bars at relatively large spacings.
- 11.4 ***Column longitudinal reinforcement.*** Previous research clearly indicated that the joint capacity at initial cracking was enhanced with an increasing percentage of column longitudinal reinforcement. However, equations presented in previous research do not take this into consideration
- 11.5 ***Joint shear strengthening techniques.*** A number of techniques were used within this investigation to strengthen the ultimate shear capacity of the joint. Further work is clearly needed to establish recommendations for the use of steel fibres and shear plates within beam-column connections.

- 11.6 *The influence of superplasticiser.* Test results within this investigation have shown that the ultimate joint capacity was increased by over 10% through the addition of superplasticiser to the concrete mix. This increase in strength was not in accordance with the respective concrete compressive or tensile strengths. As a result it may be inferred that the superplasticiser influenced the concrete-steel bond.
- 11.7 *Three-dimensional finite element analysis.* The author believes that a 3-D finite element package should be used to produce an improved beam-column connection model. The inability of a 2-D finite element package to model independent steel movement of rebars within the same concrete element provided limitations. For similar reasons a 3-D package may also improve the accuracy of modelling of joint tie positioning.