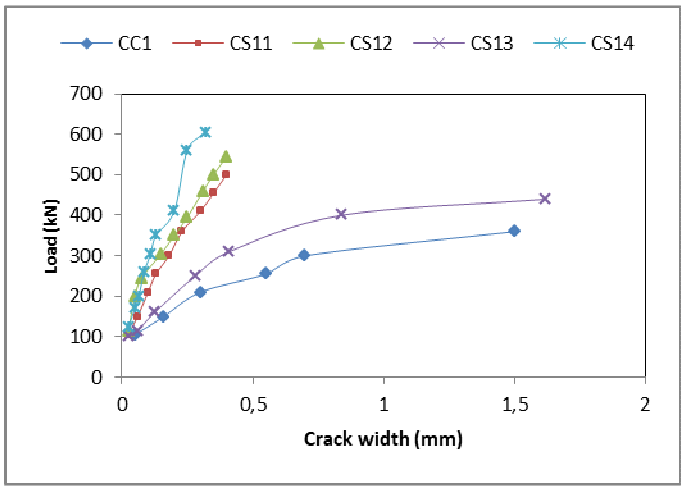
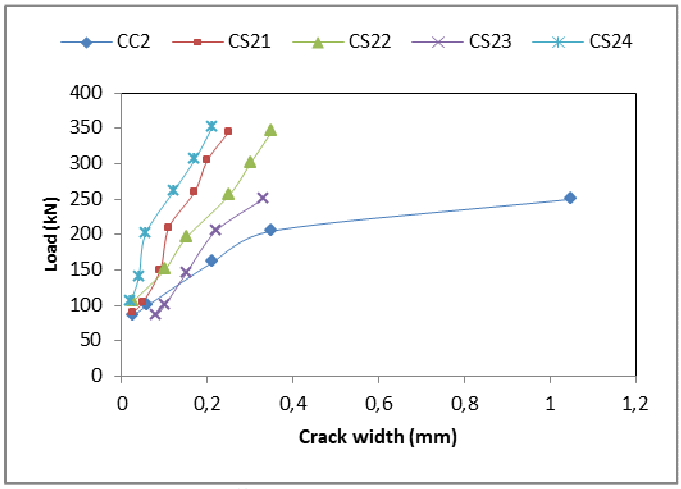


(a) effective depth/ span = 0.85



(b) effective depth/ span = 1.25

Fig. 8 Effect of strength configuration on development of crack width

IV. Conclusions

Shear span/ depth ratio (a/d) has a noticeable effect on RC corbels. Changing a/d from 1.25 to 0.85 results in a reduction in the crack and ultimate loads of 20% and 30% respectively. This effect is reduced when specimens are strengthened with NSM steel bar system, i.e., the effect of a/d is ranged by (9-16) % and (23-38)% respectively. The NSM steel bar system yielded a significant improvement in the ultimate load capacity of 57% and 41% for a/d of 0.85 and 1.25 respectively. Also, the results reveal that the "Upside down V-shaped" scheme is more efficient for small a/d values (a/d <1). Whereas, the configuration of installing horizontal bars is more convenient for large a/d values (a/d >1).

A gradual transition from direct shear to diagonal shear for unstrengthened specimens when adopting higher values of a/d. For strengthened specimens with a/d of 0.85 different failure modes can be seen depending on the configuration of strengthening. With a/d of 1.25, it is found that the general mode of failure, to be a bond failure. For unstrengthened specimens, a localization and smaller number of cracks near the column was recognized compared with the higher intensity of spread cracks for strengthened specimens.

Higher a/d value results in higher rate of crack widening for a specific load. Also, it is found that the best strengthening configuration in term of crack width development is that when the NSM steel bars be in tension (Upside down V-shaped). The ductility decreased with increasing a/d value (from 0.85-1.25). Also, the results revealed the strengthening leads to some elimination of ductility in value depending on the strengthening scheme.

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