INCLINED LINK AS SHEAR REINFORCEMENT IN
REINFORCED CONCRETE BEAM

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Specially dedicated to my parents and beloved wife.
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ABSTRACT

The sudden failure of reinforced concrete beams due to shear made it necessary to explore more effective ways to design these beams. The effects on the shear capacity of reinforced concrete beam were investigated with three different arrangements of shear reinforcement; vertical link, inclined link and inclined link with additional bar. The mode of failure was secured to allow for shear failure. All beams were casted with the same grade of concrete, provided with identical amount of main reinforcement, simply supported and tested under symmetrical two-point loads at shear span. The study shows that the contribution of inclined links to the shear capacity is significant and directly proportional to the amount and spacing of the shear reinforcement. The increase in the shear capacity ranged from 18% to 33% compared with the control beam. Ultimate shear resistance was also compared with the analytical calculation according to Eurocode 2 (EC 2) and American Concrete Institute (ACI). Performance of the beams in resisting shear is in the form of deflection, cracking, strains in the reinforcement, strains in concrete, and ultimate load. It may therefore be suggested that these types of shear reinforcement can be used to ease the congestion of links near the supports, thus, savings in the amount of steel bars.
ABSTRAK

Kegagalan secara tiba-tiba pada rasuk konkrit bertetulang disebabkan oleh ricih telah menimbulkan keperluan untuk menerokai kaedah yang lebih berkesan bagi merekabentuk rasuk-rasuk ini. Kesest keatas keupayaan ricih pada rasuk konkrit bertetulang dikaji dengan tiga jenis tetulang ricih; perangkai pugak, perangkai condong dan perangkai condong dengan bar tambahan. Mod kegagalan telah dikawal bagi membolehkan kegagalan ricih berlaku. Semua rasuk dibina dengan gred konkrit yang sama, dengan bilangan tetulang utama yang sama, disokong mudah, dan diuji di bawah dua titik beban yang simetri di rentangan ricih. Kajian ini menunjukkan bahawa sumbangan perangkai condong kepada keupayaan ricih adalah signifikan serta berkadar terus dengan jumlah dan jarak tetulang ricih. Peningkatan keupayaan ricih bagi rasuk yang diuji adalah antara 18% hingga 33% berbanding dengan rasuk kawalan. Rintangan ricih muktamad turut dibandingkan dengan pengiraan analitikal berdasarkan Eurocode 2 (EC 2) dan American Concrete Institute Code (ACI). Prestasi rasuk dalam menghalang ricih adalah dalam bentuk nilai pesongan, keretakan, keterikan dalam tetulang, keterikan dalam konkrit, dan beban muktamad. Oleh yang demikian, tetulang ricih jenis ini boleh dicadangkan bagi mengurangkan kesesakan perangkai ricih berhampiran penyokong rasuk, lantas menjimatkan bilangan bar keluli.