Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte

Band: 999 (1997)

Artikel: Connections for ease of fabrication and erection with cold-formed steel permanent formwork

Autor: Murthy, V.V.V.S. / Chandrasekaran, M.N. / Jacob, George

DOI: https://doi.org/10.5169/seals-1102

Connections for Ease of Fabrication and Erection with Cold-Formed Steel Permanent Formwork

V.V.V.S. MURTHY
Senior Manager
NSL Ltd
Patancheru, India

M.N.CHANDRASEKARAN
General Manager
Contracts, NSL Ltd
Patancheru, India

George JACOB
Senior Manager
Execution, NSL Ltd
Patancheru, India

1.Steel - RCC Hybrid composite frame. (Figs. 1 & 2)

Buildings for Turbo-Generator of power plant, raw material crushing plant, and steel making plant are examples of heavy industrial structures suitable for this concept. Present example of T.G. Building has Corner angle protectors for R C Column with lacings and temporary shuttering panels, to act as column during construction phase. Pressure of wet concrete is also considered as a major load. Steel soffits of the beams with temporary side shuttering panels and deck slab together, act as floor grid system.

The channel cleat on the column carries the shear from beam(V_d) and the weld connections between the cleat and cloumn carry force (T_s) from beam soffit based on 50% of the design load of column, assuming mobilisation or weld forces after frictional bond and bearing failures of the embedded soffit. $T_s = V_d\ L_c/a$ (Where L_c is the shear span of the beam and 'a' is the lever arm). The force in the weld (P_w) = $2d_{pw}\ t\ F_{xx}$, where t is thickness of angle cleat. F_{xx} is weld strength. Force (T_s-P_w), is resisted by soffit anchorage into column. Anchorage frictional resistance (R_f) with coefficient of friction ($\mu = 0.57$), and for normal forces on the contact area (A_c) due to confinement pressure P_c of 0.722 N/Sqm, is given by $R_f = \mu\ P_c\ A_c$. Resistence due to vertical achorage(R_b) by bearing, $R_b = \sigma_b\ A_b$, where σ_b is ultimate bearing stress of concrete (1N/Sqmm). A_b is bearing area.

2. Frame with light guage steel-concrete composite(Figs. 2 to 5)

Multistoreyed residential and office Complex, Commercial and High-rise Parking Complex, School & Library buildings etc. are examples of this concept. For columns, loss of column flange area due to notch (for continuity of RCC between beam & column) is compensated by extra bar reinforcement, to prevent buckling of this zone. Transverse stirrup is replaced by diaphragm which also acts as stiffener to column envelop steel. Welding between the cleat and column is found to be critical, as one of the specimens failed in this area.

Contribution of tiffness of column element to joint-stiffness is a vital parameter for Euro-Code 3 based classification of beam-column joints. Continuity aspects like improved rotation capacity and ductility make these connections amenable to semi-rigid and rigid beam-column joints. Substitution reinforcement to permanent shuttering sectional area, provides continuty in beam-to-beam connections. Ease of handling, 30% increase in strength-to-weight ratio, simple connections and speedier construction are the merits of above two systems.

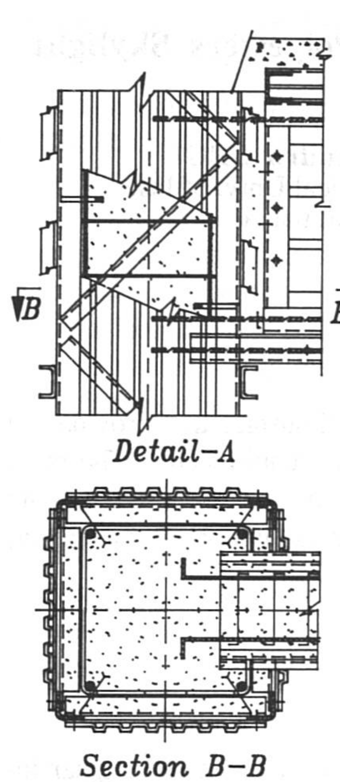

Fig.1 Beam-Column Joint

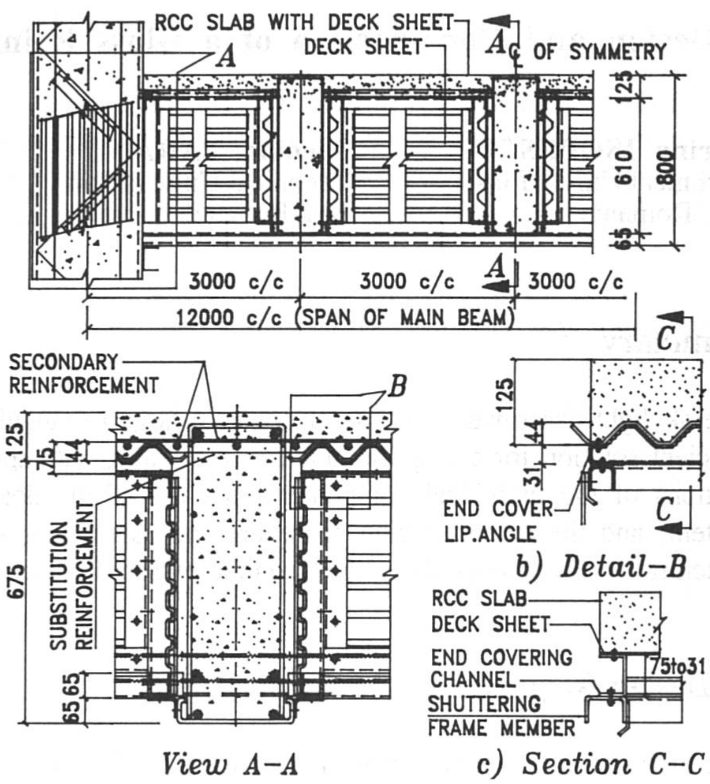

Fig.2 Composite Slab-Beam-Column system

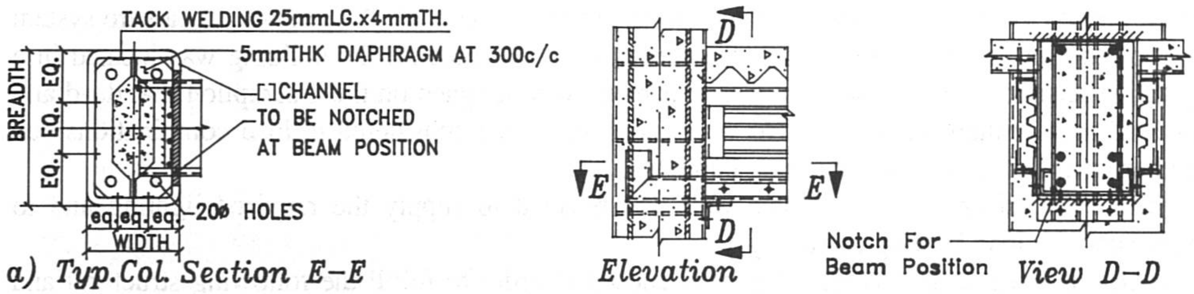

Fig.3 Beam-Column Connection With Concrete Filled Tubular Column

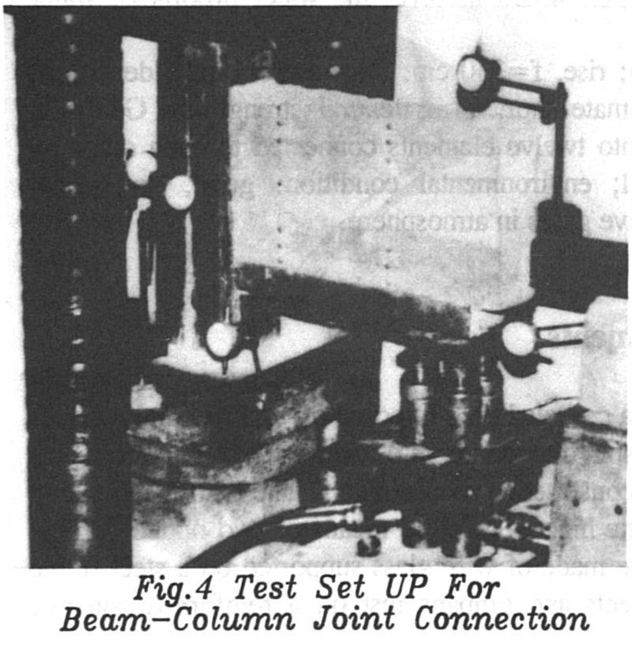

Fig.4 Test Set UP For Beam-Column Joint Connection

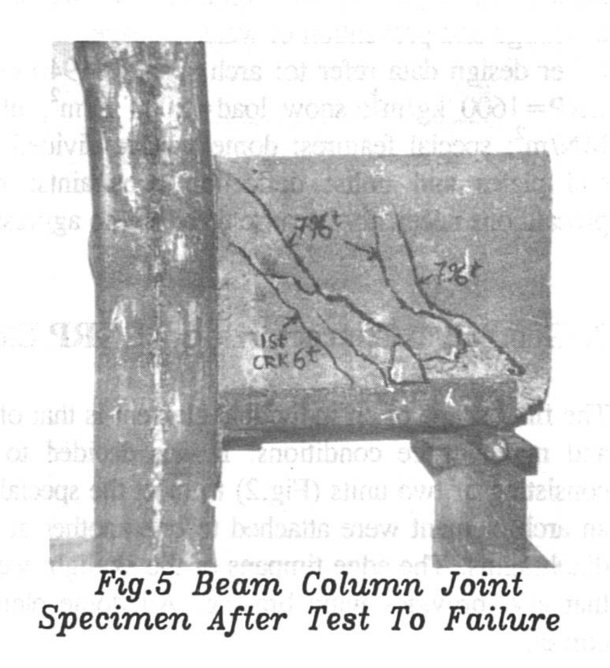

Fig.5 Beam Column Joint Specimen After Test To Failure