SECTION TWO

# BEAM REINFORCEMENT

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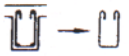
This Section provides guidelines on specifying prefabricated reinforcement link cages and capping links.

## 2.1 Design And Detailing Considerations

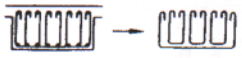
1. Annotation for beam link cage :-

| Link Type | Numbers of Link per Beam Cross-Section | Link Material | Link Diameter (mm) | - | Link Spacing, $S_v$ (mm) |
|---|---|---|---|---|---|
| S, L | n | R, T, D, H | 10, 13 | - | 75, 100, 125, 150, 200, 250, 300 |

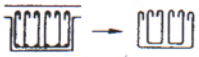
**For Specifying Beam Link Cage :-**

Example (1): S R 10 - 200 ====> detailed as 

consists of 1 number Open Link Cage of 10mm diameter Plain Mild Steel Bar at 200mm spacing.

Example (2): S 4 D 13 - 150 ====> detailed as 

consists of 4 number Open Link Cage of 13mm diameter Deformed Hard Drawn Wire at 150mm spacing.

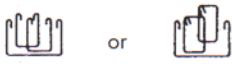
Example (3): S 3 H 13 - 250 ====> detailed as 

consists of 3 number Open Link Cage of 13mm diameter Plain Hard Drawn Wire at 250mm spacing.

Example (4): L 3 T 10 - 250 ====> detailed as 

consists of 3 number Close Link Cage of 10mm diameter Tempcore Deformed Bar at 250mm spacing.

Notes:

(1) Internal beam links shall not overlap each others ==> 

(2) Digit "1" between alphabets "S" and "R" in Example (1) above is omitted and is not required when specifying 1 number link per beam cross-section.

2. Annotation for beam capping link :-

| Open Link | Link Material | Link Diameter (mm) | - | Recommended Capping Link Spacing, $S_v$ (mm) |
|---|---|---|---|---|
| S | R, T, D, H | 10, 13 | - | 75, 100, 125, 150, 200, 250, 300 |

Example (1): S H 10 - 300

consists of 1 number top beam capping link of 10mm diameter Plain Hard Drawn Wire at 300mm spacing.

3. Legends :-
   (a) Prefix 'S' denotes open link cage (e.g. SR, ST, SD, SH)
   (b) Prefix 'L' denotes close link cage (e.g. LR, LT, LD, LH)
   (c) R' denotes links using Plan Mild Steel Bar ($f_{yv}$ = 250 N/mm$^2$)
   (d) T' denotes links using Tempcore Deformed Bar ($f_{yv}$ = 460 N/mm$^2$)
   (e) D' denotes links using Deformed Hard Drawn Wire ($f_{yv}$ = 485 N/mm$^2$)
   (f) H' denotes links using Plain Hard Drawn Wire ($f_{yv}$ = 485 N/mm$^2$)

4. Engineer shall avoid specifying link cage using Plain Mild Steel Bar, 'R' and Plain Hard Drawn Wire, 'H' to avoid confusion when applying.

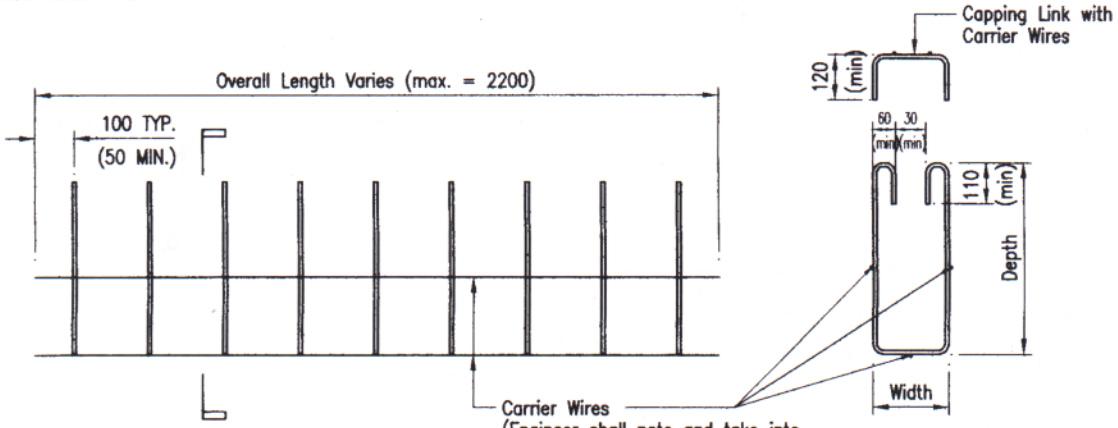
5. Engineer shall note and design accordingly the link cage when beam is subjected to torsion.

6. Conversion table of beam link cage for Plain Mild Steel Bar to other type of link material is shown in the Appendix.

7. When adopting for prefabricated reinforcement bars cage, engineer shall consider and liaise with fabricators, if necessary, to verify the feasible cage size, lapping and lifting requirements.

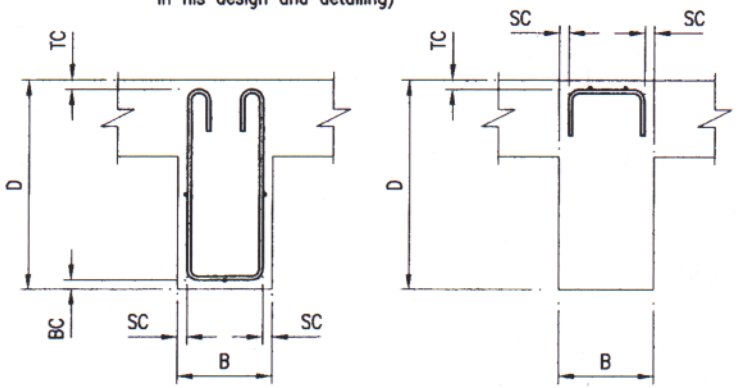
## 2.2 Illustration On Use Of Beam Cage

### BEAM OPEN STIRRUP CAGE AND CAPPING LINK



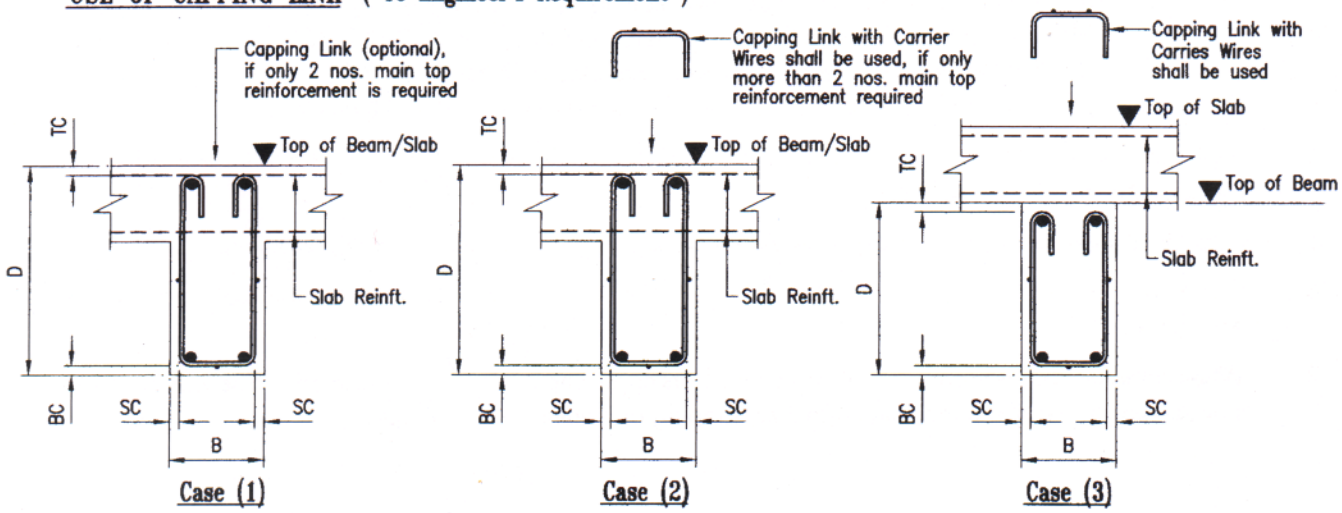

**Legend**

D = Beam Depth
B = Beam Width
TC = Top Cover
BC = Bottom Cover
SC = Side Cover = 25mm (minimum)
TC + BC = 85mm



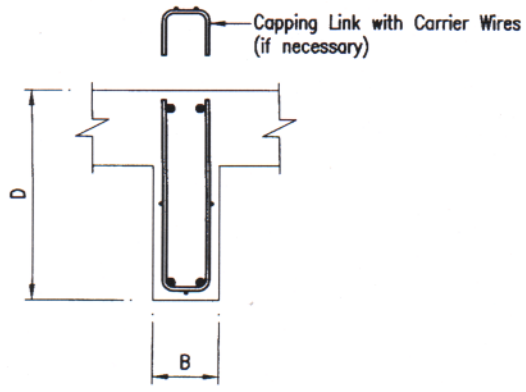

### POSITIONS OF CARRIER WIRES ( To verify with supplier )


### USE OF CAPPING LINK ( To Engineer's Requirement )

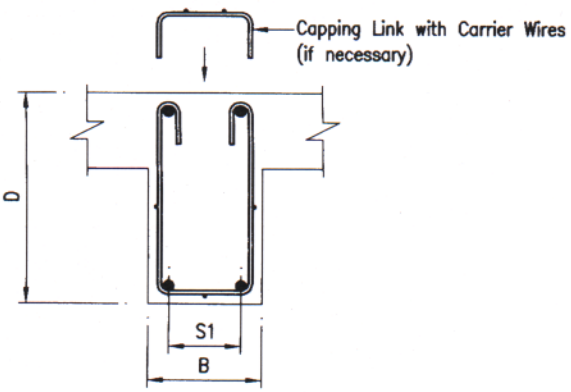


## EXAMPLES OF BEAM OPEN LINK AND CAPPING LINK

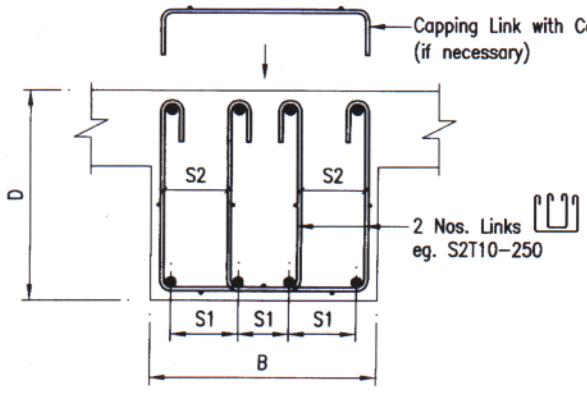
### Example '1' (For B < 200mm)



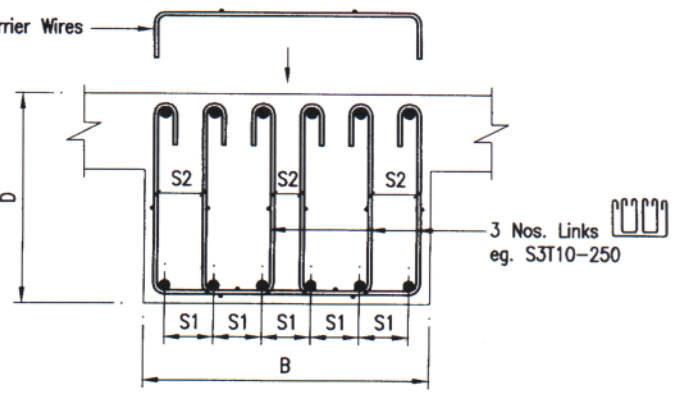

### Example '2' (For 200mm ≤ B < 400mm)



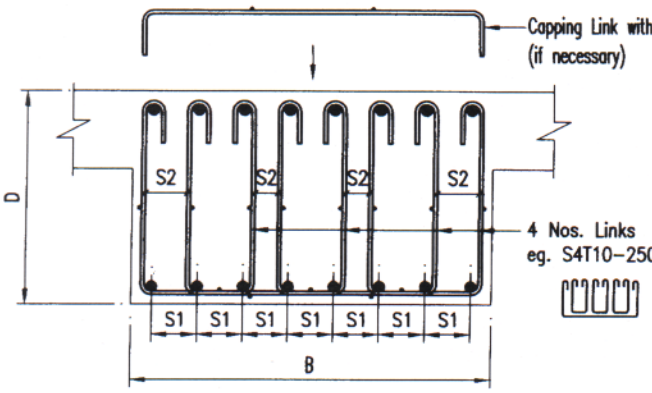

### Example '3' (For 400mm ≤ B < 600mm)



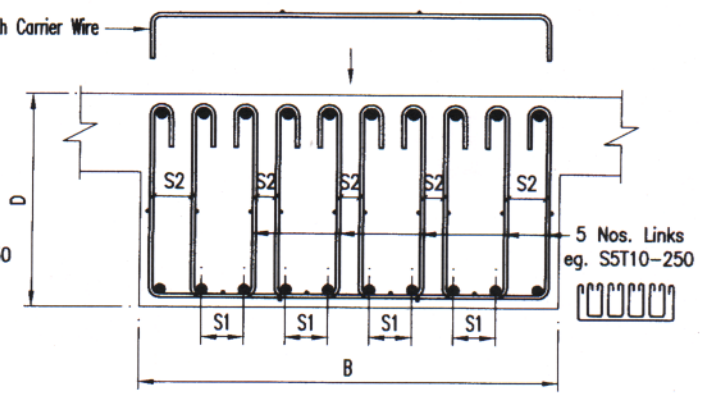

### Example '4' (For 600mm < B ≤ 750mm)




### Example '5' (For 750mm < B ≤ 950mm)




### Example '6' (For 950mm < B ≤ 1100mm)




**NOTE:** (1) Internal links shall not overlap as shown in the diagram.

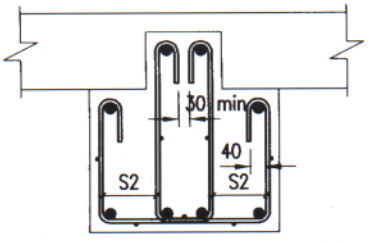
(2) Examples above indicate maximum numbers of link for a specific width of beam. Numbers of link required shall be determined by Engineer.

(3) Legend : S1 = Distance between tension bars shall not be greater than 160mm for zero percentage of moment distribution.

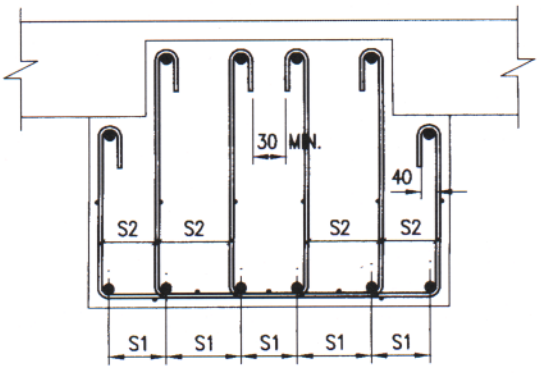
S2 = Maximum lateral spacing of link legs shall not more than effective beam depth.

## EXAMPLES OF BEAM OPEN LINK AND CAPPING LINKS SUPPORTING PRECAST SLABS

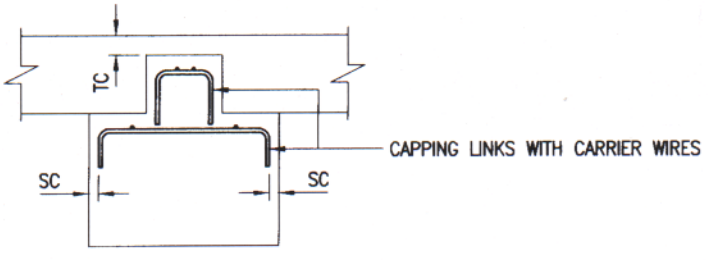
**Example '1' : Double Link Cage System**
**(For Narrow Beam)**




**Example '2' : Multiple Link Cage System**
**(For Wide Beam)**




**Example '3' : Capping Link Cage**

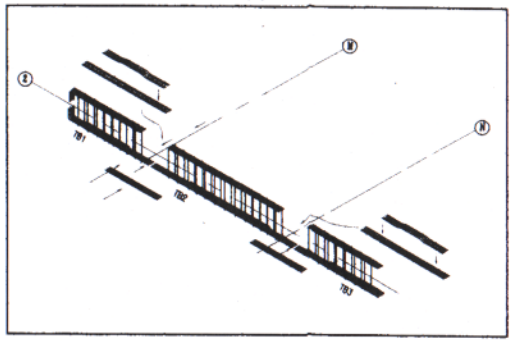



Legend : S1 = Distance between tension bars shall not be greater than 160mm for zero percentage of moment distribution.

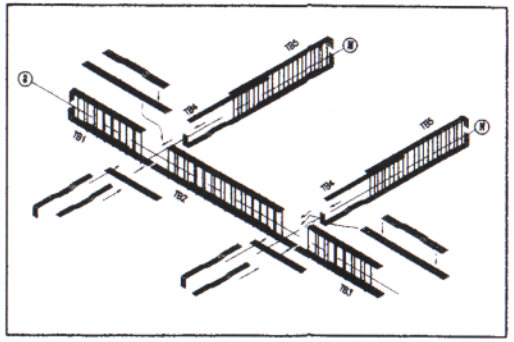
S2 = Maximum lateral spacing of link legs shall not more than effective beam depth.

## 2.3 Laying Sequence Of Prefabricated Beam Cage

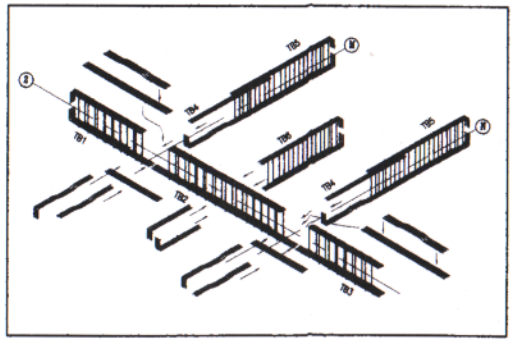
INSTALLATION SEQUENCE (1) : BEAMS TB1+TB2+TB3

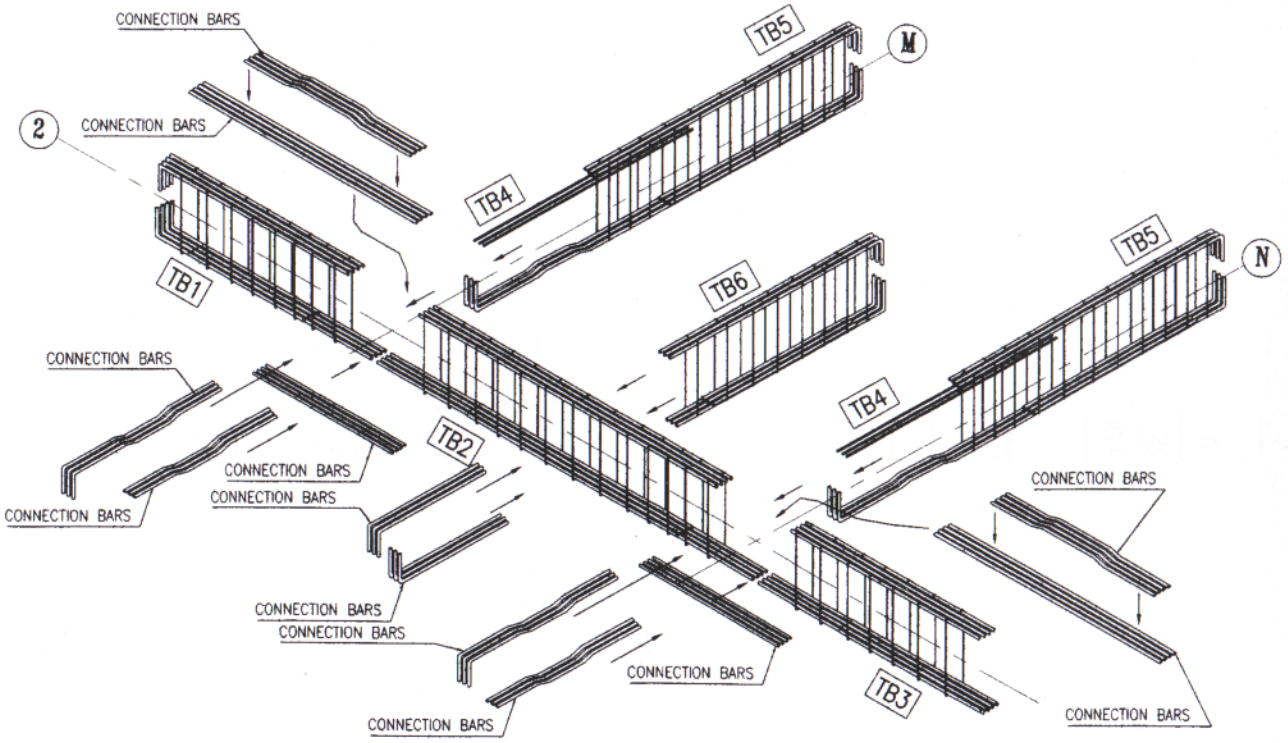


INSTALLATION SEQUENCE (2) : BEAMS TB4+TB5

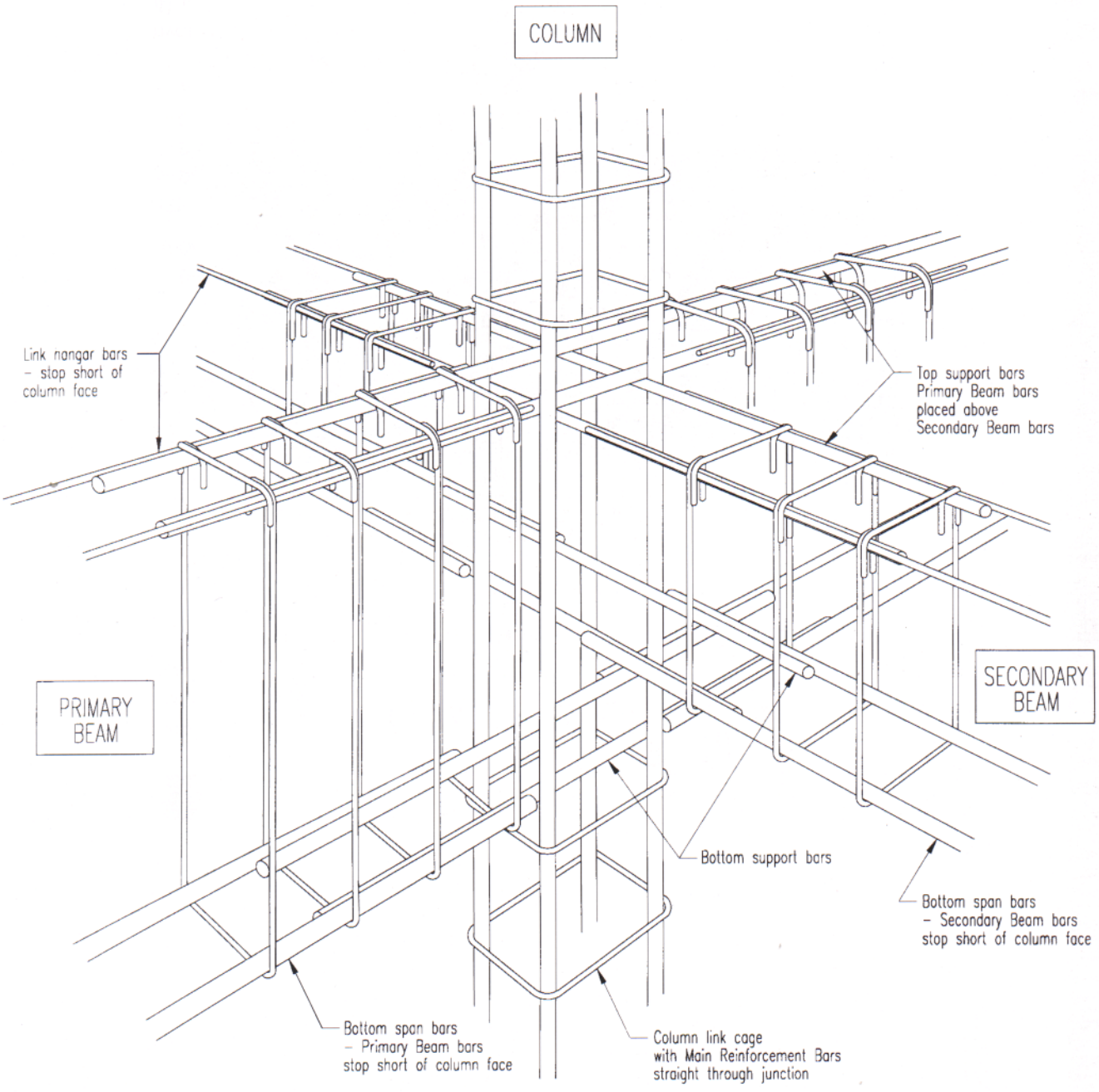


INSTALLATION SEQUENCE (3) : BEAM TB6





## 2.4 Bean-Column Intersection Detail




BEAM–COLUMN INTERSECTION DETAIL