Chapter 5 DESIGN CONCEPT FOR FLAT PLATE SYSTEM

5.1 STEEL/ CONCRETE COLUMN WITH FLAT PLATE SYSTEM

With increasing demand for flexibility in interior layout, the use of flat plate for landed houses is gaining much popularity amongst architects. The main and unique feature of this system is that it provides a way for the architect to achieve the concept of high and completely flat ceiling with no beam protrusion.

Some projects have reported an improvement in the construction speed and cost savings from using this system which requires only simple formwork. The use of flat plate appeals to designers particularly because design flexibility is possible through shifting of walls without the need for columns to be properly aligned. The services can be installed within or below the slab and there are flexibilities in relocating vertical small penetrations. The soffit is often flat and high ceiling height can be achieved.

The columns used in this system are either cast in-situ concrete columns or circular steel hollow sections. When the columns used are steel hollow sections with concrete in-fill, the desired finish with exposed steel can be easily achieved.

Flat plate system with circular steel column

5.2 CONNECTION AND DETAILING

The main consideration for steel column connection to flat plate is to ensure that the base plate for the steel columns are cast into the concrete flat plate. Hence the positioning and alignment of the base plates are of utmost importance.

If concrete in-fill and column bars are required within the steel hollow section, the starter bars for the columns have to be placed and fixed in position prior to casting of concrete flat plate (see figure 5.5 for base plate connection).

In the concrete column with flat plate design, the connection is more simplified without the need for base plate connection. In this case, reinforcement bars should be properly detailed between the columns and slabs. Punching shear checks are critical and vertical shear reinforcement should be detailed accordingly.

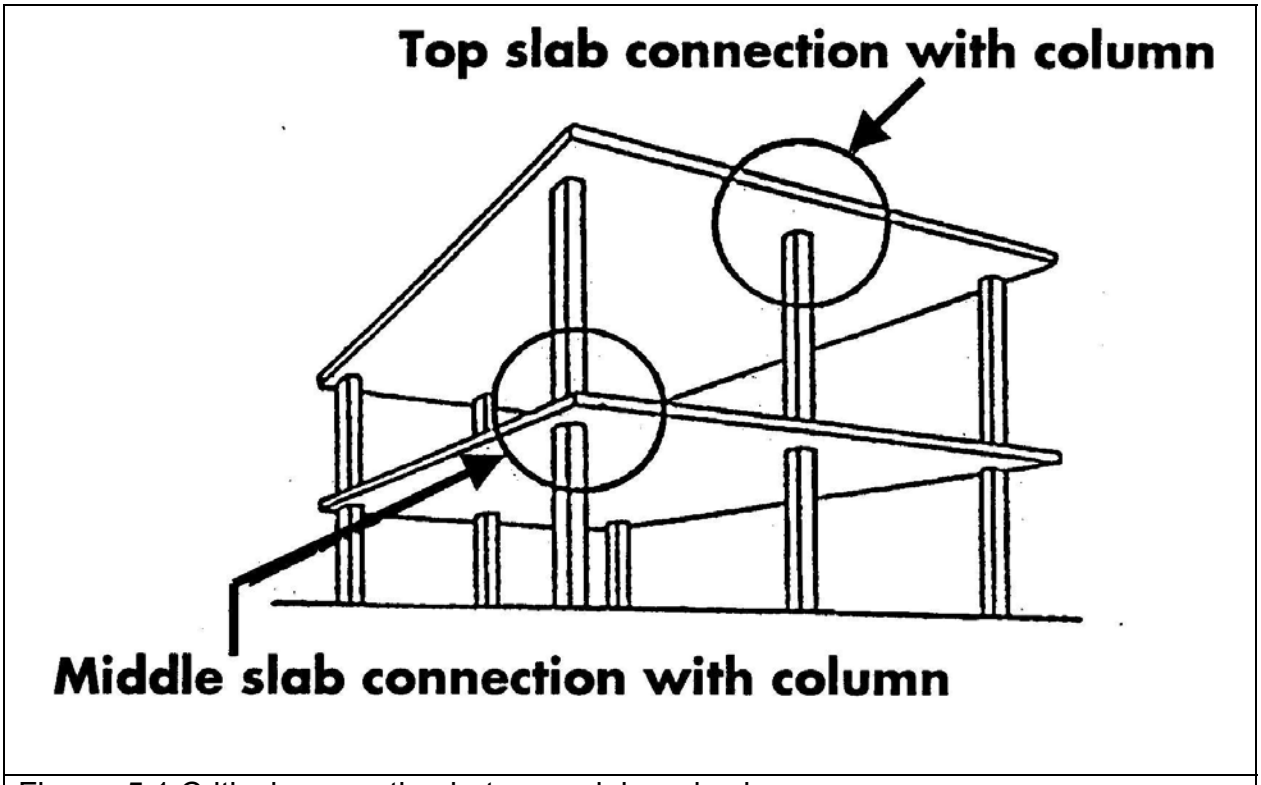

Figure 5.1 Critical connection between slab and columns

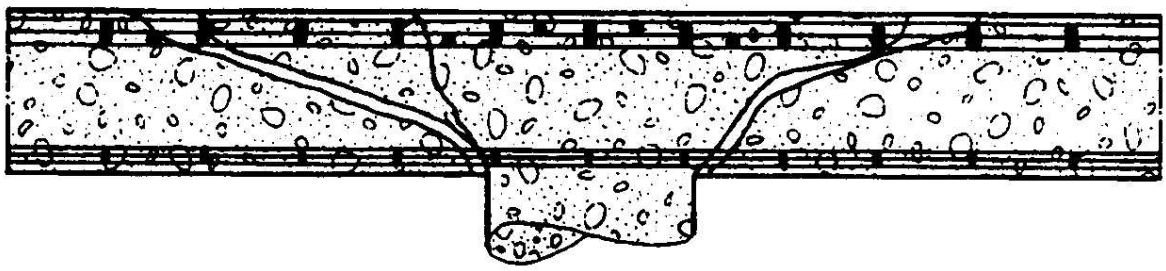

Figure 5.2 Typical shear failure near column. Proper detailing of shear reinforcement must be provided

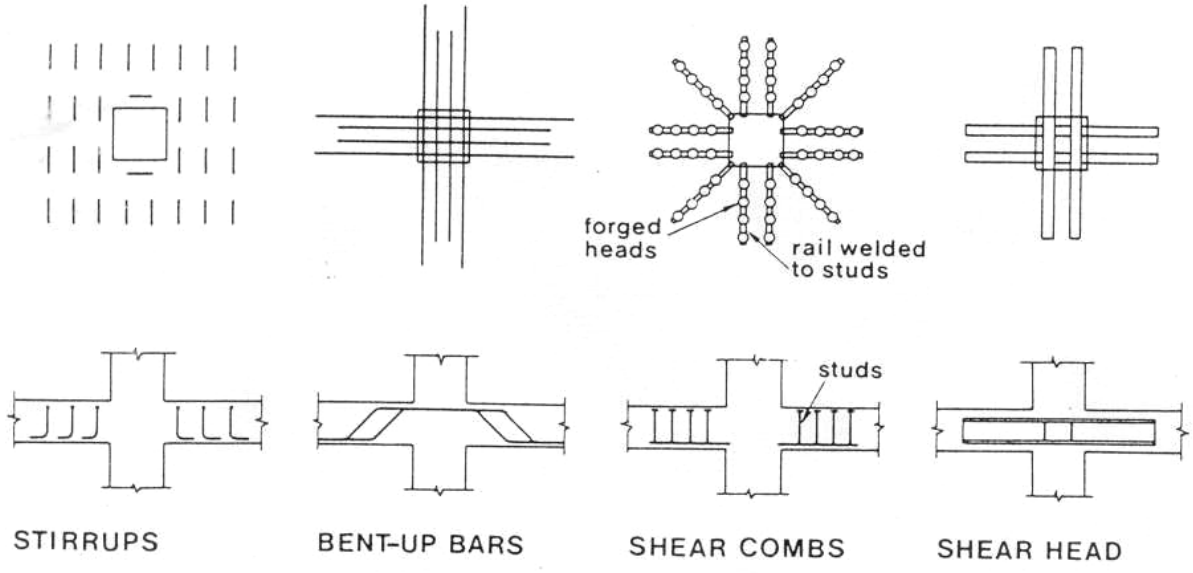

Figure 5.3 Examples of shear reinforcement

Alternatively, designers may introduce hidden beam within slab along column strip to cater for the shear stresses near column location.

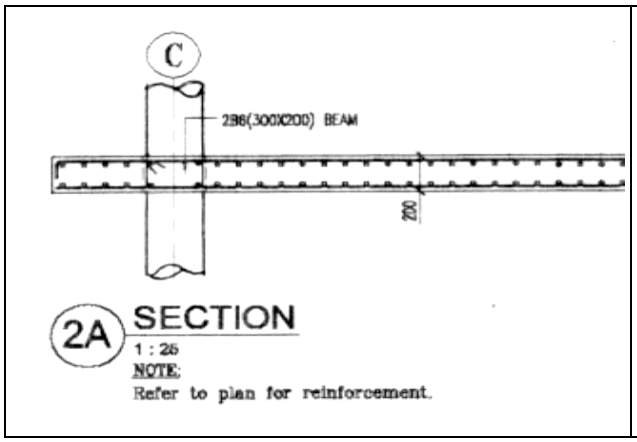

Figure 5.4 Hidden beam within column strip

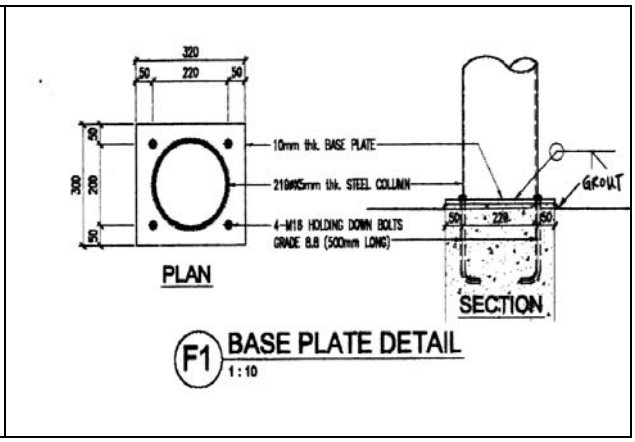

Figure 5.5 Base plate details for column

Figure 5.6 Semi-detached houses using flat plate with steel column (near completion)
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