FLIPKART, BANGALORE

a provision to increase floor levels in future

There are overall twelve towers in the Flipkart Complex in Bangalore, and the number of stories in this compound vary from G+4 to G+11. The exterior form of most of the buildings is that of a rectangular tower. The basement comprises of two levels designed for parking of vehicles which is made of reinforced concrete. Steel composite column start from first floor level, whilst the composite floor system of the stories above first floor is composite floor slab system consisting of steel beam, metal decking, concrete topping and shear connector. Lateral resistance is provided by suitable bracing in exterior frames and shear walls at selected location adjoining lift and staircase.

The steel beams and column are made up of built-up section. One block has been covered by a steel roof truss system and it houses the auditorium. However, provision has been kept to remove roof system if required in the future and add two more floors. Steel-concrete composite systems have become quite popular in recent times because of their advantages against conventional construction.

Composite construction has the biggest advantages of combined action of steel and concrete in structural design as well as construction. This system results in speedy construction with a possibility of working on parallel front. Composite frames used for these buildings comprises of encased frame having square/rectangle section column laid out in grids as per architectural and structural needs. The composite floor system using corrugated steel deck sheet resting on primary and secondary steel beams.

Challenges

The construction is to be carried out in a record period of one and half years and the speed of designs for twelve towers also necessarily had to match the same. No expansion joint is provided in basement, thus, complete basement floor plate is connected with peripheral retaining walls, due to which lateral shear due to earth pressure is neutralized. This results for design of non tower and tower area earth pressure not to be considered in analysis. Back filing of earth behind retaining walls is to be done in controlled manner to achieve this aim.

Non tower area has been designed in such way that is isolated from tower area in structural behavior and this has been achieved by planning proper segments of construction of these two areas. Non tower casting and connection with

FACT FILE

Client: **Vikas Telecom Pvt. Ltd. (Group of Embassy)**
Contractor: **B. L. Kashyap & Sons Ltd.**
Architect: **RSP Design Consultants (I) Pvt. Ltd.**
Structural Consultant: **Construcutre Designs Pvt. Ltd.**
PMC: **Synergy Property Development**
Steel Tonnage: **8000MT**
Current Status: **Ongoing**

tower peripheral is done only after almost fully completing casting of tower area. To avoid shrinkage stresses in non tower slabs, compensatory strips has been provided.

To furnish a design for staircase which shall minimize on site construction time, it has been achieved by providing pre-cast stairway treads installed on steel stringer beams. Twelve different towers with different storey, different plans, it is almost twelve projects in single project.

Structural Framing

Primary frame of the building was typically 11mx11m grid with secondary beams located at approx. 3.7m spacing. The spacing of secondary beam closer was girded type/class of corrugated deck sheeting used. The floor plan layout of the building is such that it is optimally planned in both axes. A composite steel frame structural system has been proposed for superstructure and concrete flat slab system along with drop panels for ground floor and upper basement slab.

The structure is OMRF + Ductile Shear Wall or OMRF + Steel Bracing + Ductile Shear Wall Structure to control lateral forces/displacement within limits. Structural steel encased column shall be in high tensile steel with 450 MPa yield stress. Shear wall and column have self-compacting concrete with high grade concrete (M80/M60).

The following are the salient features of the project:

- Minimum numbers of shear wall as compared to its peers
- Large size grids with shallow steel beams
- Lateral frame resistance system as highlighted in structural frame system

Structural Uniqueness

- Economical design of steel
- Minimize number of shear wall to reduce construction time
- Pre-cast stairway

Carrying out the design activities and then taking it to exception stage was a task in itself. Simultaneously, for a complex of 12 buildings (out of which six are of multistoried category) is by itself on onerous task. The construction period was aimed at one and half year in which all the buildings were planned to be computed.

The complexity of the project increased further with the investment of number of agencies in design execution and supervision of the project which included the project consultant, project management consultant, main contractor, steel supplier and fabricator, proof checking consultant amongst others.

The coordination with so many agencies in such a short time while the construction, fabrication and erection are going on at fusion pace, clearly posed big challenge within itself which needed to be handled to the satisfaction of all concerned almost on a daily basis.

As usual, for such fast track building projects, during detailing stage several critical charges like freezing/shifting of location and sizes of overhead tanks, shifting of location of critical loaded areas like battery room, give a major headache to the structural designer, especially if enforced after the fabrication is going on in fall steam.

These changes introduced at a later stage posed big threat to the project schedule, and the onus fell on the structural designer to accommodate these and find an agreeable solution within the projected time and cost, due to cooperation from all parties. Nevertheless, with all the above challenges overall it has been an enjoyable and learning experience for the structural consultant. ■