FACT FILE

Client: **Phoenix Infocity**
Architect: **KGD – A Katerra Design Partner**
Steel Fabricator:
Kirby Building Systems & Structures India Pvt Ltd
PMC: **Turner and CBRE**
Steel Supplier: **JSW and Tata**
Civil Contractor: **Shapoorji**
Steel Tonnage: **6,600 MT (Approx.)**
Status: **Under Execution**

OPTIMUM DESIGN

Steel structures are at the start of their extensive use in construction industry for large office and small homes. End of 2019 and beginning of 2020, the spread of pandemic made a change in the requirement of offices and homes:

- off site construction – The construction industry wants a construction which shall be assured for timely construction and not affected by obstruction of any sense say it be environmental :natural misfortunes , biological: pandemic or errors of precision: errors at site, levels etc .
- Easy and quick at site, with less labour requirements - With the intended growth in the country, future is going to scarcity of construction labours and the buildings will require to be ready in a turnaround time.
- feasibility to make a change - Change is in terms of use of space or addition/ removal of partition or let it be an addition of a floor.
- Return on investment - Life-cycle costs encompass initial construction cost, routine maintenance, and any future restoration costs of a structure. Pandemic has created a requirement of offices which need to refurnish to fit the new normal – what about the investment return, the cost of construction need to be optimal and shall have as scrap value.

The look at is prefabricated steel structures for offices and for homes. Steel has an advantage over other types of structure in terms of reliability of material for any type of building because of its durability, ductility, high strength to weight ratio and dimensional stability.

PHOENIX H09 HYDERABAD

Phoenix H09-A lead Platinum rated building with the most durable construction material – Steel. It is an engineering right building with a strong Core and cost efficiently detailed and design composite beam frame. The building shape, the breadth to height aspect ratio make the building geometrically well-matched for steel structure

Rajpurohit Karansingh P
Associate Director – Structure
KGD – A Katerra Design Partner

Kirby Building Systems & Structures India Pvt Ltd was involved in Connection Design, Detailing, Manufacture, Supply and Construction of this High-Rise Building using Structural Steel works covering the superstructure part of the building.

UNIQUENESS OF STRUCTURE

The structural form contributes to the building character and identity while being efficient, cost effective and simple to construct. This Office Building located in the Hitech City – IT hub of Hyderabad is being developed to cater the requirements of IT companies within 2.65 acres allocated land area with 2 acres area covering the structure and development of 12.37 lacs square feet – 20 floor Structure consisting of Ground Podium and above 18 floors are Steel Structure.

Three sides of compound is shared with residential area and fourth side with another high rise IT facility. This jobsite is in a very confined space with challenges of neighbourhood residential building, site logistics and interfaces with various construction activities such as earthworks/ excavation, RCC works and Structural Steel works.

The building has car parking facility up to 6th stilt level and above 12 floors as Office Space. Total Height of the Structure above ground level is 71.962 meters with floor plate of 6,450 square meters.

The project is designed as Composite Steel Structure with Grid of 11 m x 9 m, concrete infilled box columns with optimized size i.e. up to Stilt Parking Area 1100 mm x 950 mm and above office floors columns of size 600 mm x 600 mm to maximise the floor carpet area.

The floor to floor height for parking area is 3300 mm and office area is 4150 mm. Fireproof paint used for columns is Vermiculite Coating and Intumescent Paint.

Composite Elements used : Composite slab-350 grade steel

Composite floor with profiled decking consists of following structure elements along with in situ concrete and steel beam

Profiled decking : Shear connectors

Reinforcement for shrinkage and temperature stress and top stress.

Connection between the structural steel elements are generally designed as simple i.e. not moment resisting. Shear stud connectors are weld through the sheeting on to the top of flange of beam and intended to transmit to horizontal shear between the steel section and the cast in situ concrete also to prevent vertical separation at the interface. Composite slab is designed for 2-hour fire rating.

Composite beam: built-up sections with Grade E450BR

The capacity of composite beam is calculated considering the effective breadth of concrete which in turn use transformed moment of inertia (m=Ec/Es), Steel beam is designed only for self-weight and construction load. Once it concreted it will take the full capacity load. Fire protection paint to be provided for all exposed surface of beam.

Composite column- Concrete filled tubes with concrete grade of M60, Structural steel of 450BR.

Steel column is designed to take a load of ten floors; once it is infilled with concrete it shall have full capacity of all above floors. The column will have all floors capacity due to steel section and reinforcement rebar in concrete.

ERECTION TECHNIQUES

- Total Project Management – Alignment of the Engineering, Production and Supply chain with site construction activity.
- Just in Time Philosophy – the production of the structural members was as per the construction plan and shipment of the same with continual monitoring.
- QA/QC techniques – with meticulous and methodological approach, quality checks were implemented at all the stages right from Raw Material to Finished Goods at plant with the client's QA/QC team involvement at every level for smooth execution of the project.
- Meticulous Logistics plan - Transportation of the steel structure elements within the highly congested area with vary narrow road to the project site.
- Use of special lifting tools to increase the execution such as remote ground release shackles, site developed multiple beams lifting tools, high speed bolting tools to achieve specified torque values.
- Use of noise reduction bolting torque machines to reduce the noise to 40 db without compromising on the bolting speed.
- Use of surveying tools like total stations and lasers for measurement accuracy and importantly the verticality of the structure to achieve the stability.

CHALLENGES

As height of building is a tall structure with a height of 78.53m and needed resistance for drift, this was done with the central core and 4 staircase cores in RCC. The next need was to avoid the shuttering /staging as much as possible to provide the speed of erection ,the solution was CFT. But the CFT with control on the weight of elements as to enhance the crane utilization, as the erection speed in steel structure is directly dependent of crane efficiency.

The erection was enhanced with use of mobile tower crane which were specially imported for the project, which helped the erection upto 45meters.The structure is designed with latest earthquake code and the National building code of 2016.

Built in one month and with the beauty to attract the people for use of steel structure. The structure is a composite structure with composite slab and beam. The building has a long cantilever. The big success is the structure is erected without use of crane and is done by restricting the weight of elements and using CFT in a rolled section only.

The use of stud gun for the shear connectors was also avoided as the quantity of studs are small.

The shear connectors were done by use of bolts welded to the beam. The building has entrance canopy of double height with the need of Y – column.

A residential building has a need of flexibility and need of columns to avoid offset in the rooms and good control on walking vibrations.

The fire resistance of the building engineered considering the fire load, concrete heat sink in CFT and with cement board encasements for beams.

The total fabrications were done at site itself and rolled sections made the fabrication process as just cutting activity on majority.

The connects in a residential building are preferred to be weld connects as a local fabricator is well equipped with small machinery and efficient and quick on it.

Uniqueness of the structure is it just had three type of structural members which had efficient control on the waste / spiced use of the members. ■