

ASTER PUBLIC SCHOOL, Greater Noida

Aster public school is the extension of proposed school building located at Greater Noida, Uttar Pradesh. The proposed building is Basement + G + 5 structure with the provision of auditorium at the top. The proposed built-up area is approximately 70000 sq. ft. This school will offer high quality education, with modern technology and amenities with good infrastructure. It is a typical rectangular building having symmetrical plan. The structure is envisaged as a steel-concrete hybrid structure with substructure foundation & retaining walls in concrete and super structure in structural steel with all columns in steel right from base.



Unanimously Steel

Structural steel was the unanimous choice; Being light weight and high strength material, structural steel offers great degree of flexibility and sturdy behaviour.

Structural Geometrical Features and structural System

The primary frame of the building comprises of special moment resisting steel beam-columns frame with cross bracings in vertical plane at suitable locations and also some portal bracings are provided at basement level to resist all the lateral forces. The floor system comprises of steel beam and joist with concrete slab over profiled metal deck sheet. The composite action of steel and concrete is utilized to optimize beam design. Composite design helps in reducing the size of section, controlling deflection and achieving economy. Shear studs are placed

at top of steel sections to transfer the shear force from slab to achieve composite behaviour.

The total design lateral forces are resisted by the column-beam frames and bracings in proportion to their lateral stiffness at all the floor levels. Hollow tubular sections are preferred for cross bracings due to slenderness benefits resulting from higher radius of gyration. Moment resisting connections are considered for column-beam junction for rigid and stable behaviour.

Steel columns are analysed as fixed base over foundation along with retaining wall running along the periphery of the building. Through rigorous analysis and design iterations, the structural stability was ensured while satisfying the budgetary constraints as well as time constraints.

Analysis

For analysis Staad. Pro software was used. In which 3D model was made and analysis were done with different load combination to achieve the section sizes of beams & columns, this model also helps to observe the behaviour of building by which we can change our design aspects and quality of structure. In the model all secondary beams were simply supported i.e, beams were released at on main beams and joist were also simply supported and were released at secondary beams. Due to joist the floor load is considered as one way loading, in which load is transferred from joist to secondary beam then secondary beams to main beams then to columns.

Salient Features

- Rectangular shaped plan: symmetrical in mass and stiffness.
- 15m clear span Auditorium on top.
- Building located in earthquake zone-IV with IF=1.5
- Composite design of beams and RC slab with proper shear studs anchorage.
- Use of light weight hollow precast concrete masonry blocks.



Challenges

There were quite a few complexities involved while designing this project. The locations of bracings were carefully chosen to satisfy design requirement for lateral forces due to Wind & Earthquake and aesthetics & functional requirement of building. The connection design of tubular columns & I beams was formulated such that its easy and fast for erection and does not need any cutting of sections. The gap between existing block and extension was detailed such that it allows movement between two blocks but keeps both block structurally disconnected. An auditorium of 15m clear span is planned at the top floor and building is designed to accommodate same.

FAST FACTS

Client: Aster Public School Noida
 Structural Consultant: Skeleton Consultants Pvt. Ltd.
 Structural Steel: Approx. 350 T
 Status: Complete
 Structural Working Team: Er. Nitesh Agrawal, Er. Sameem Ansari, Mr. Joby Joseph.

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Skeleton Consultants Pvt. Ltd.

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