



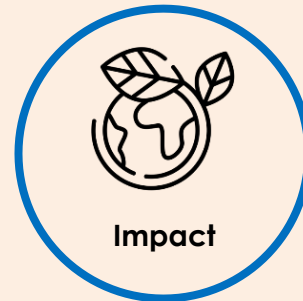
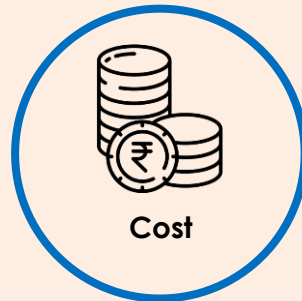
Shift to Greener, Faster and Economical Construction

A Revolution in Construction Industry



Revolutionizing Construction Industry

What matters today in construction industry ?

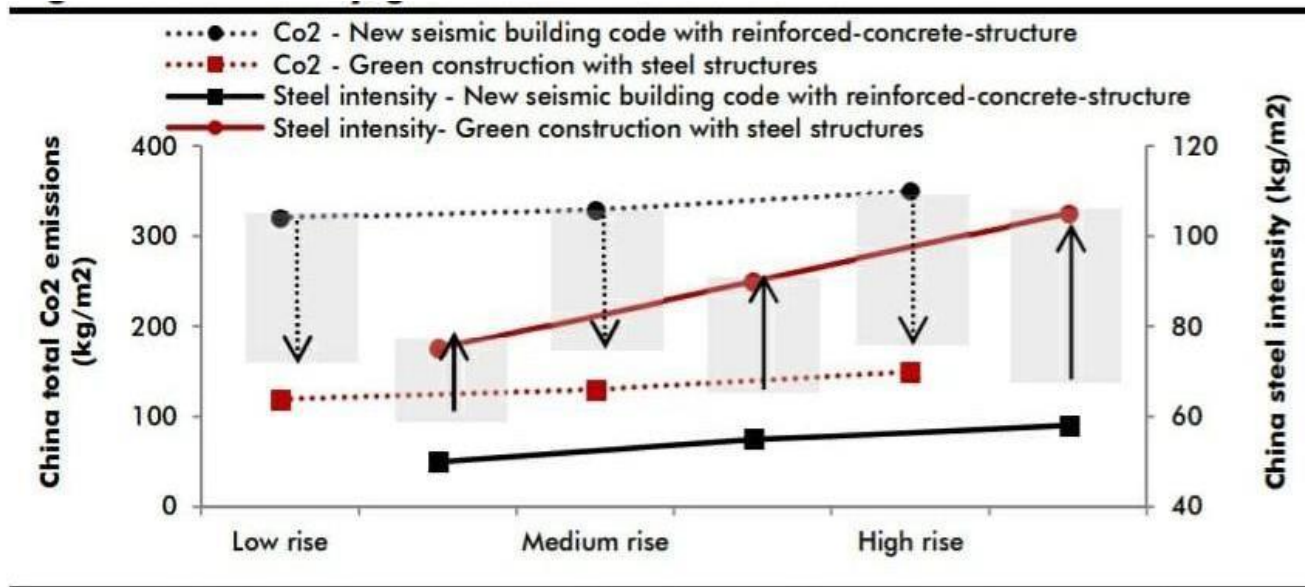


Tubular
construction is
the one way to
get all four

***BUILD BETTER
BUILD FASTER***

Steel Buildings = Decarbonization

Steel Structure vs RCC Structure



- Construction creates 30% of direct & indirect **Co2 emissions**
- **Structural steel reduces Carbon Emission by 60%**
- Infinitely **recyclable**
- **Easy** to pre-fabricate
- **High volume to weight ratio**
- Lighter & stronger structure allow **vertical space utilization**

Benefits of Steel Tubular Construction

Tubular vs Conventional Concrete/RCC



30-50% less construction time

Low Project Costs

2% additional carpet area

Lower finance cost

Advanced cash-flows

Better IRR

Environment Friendly

No Air Pollution

Water conservation

Recyclability

Superior Strength

Better Seismic Design

Tubular vs Conventional Built-up steel

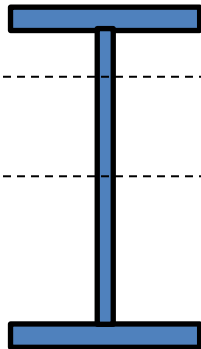
- 20% Faster Completion
 - Ease in fabrication/erection
 - 4-side welded I-sections increase time
- Lower Project Costs
 - 2% additional carpet area (no shuttering)
 - Real estate value of at least Rs 200-300/sq ft
 - 10% less steel consumption/optimized design
- Aesthetically better
- Larger span structures (up to 100 mtr)
- Extra clear height upto 3%

Area Utilization

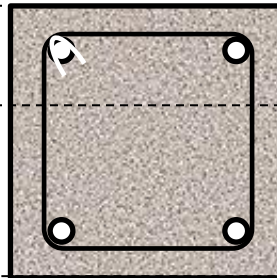
Consider a **short column** with a design compressive load of **4,000 kN**

($f_{ck} = 50 \text{ MPa}$ and $f_y = 350 \text{ MPa}$)

ISHB 450
Steel Column



360 x 360
RC
Column



230 x 230 x10
CFT column



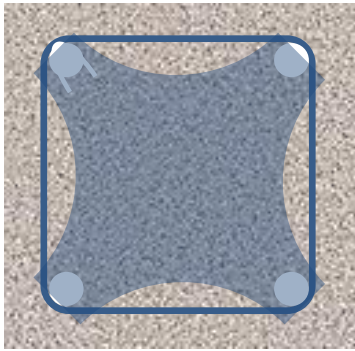
Area saving of
50-60% in
comparison to
structural steel or
RC.

Major space saving for compression dominated members

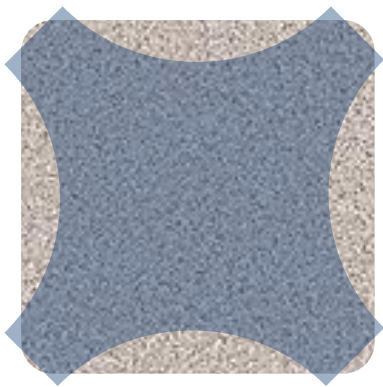
The drawings are to scale

Very Good Confinement of Concrete

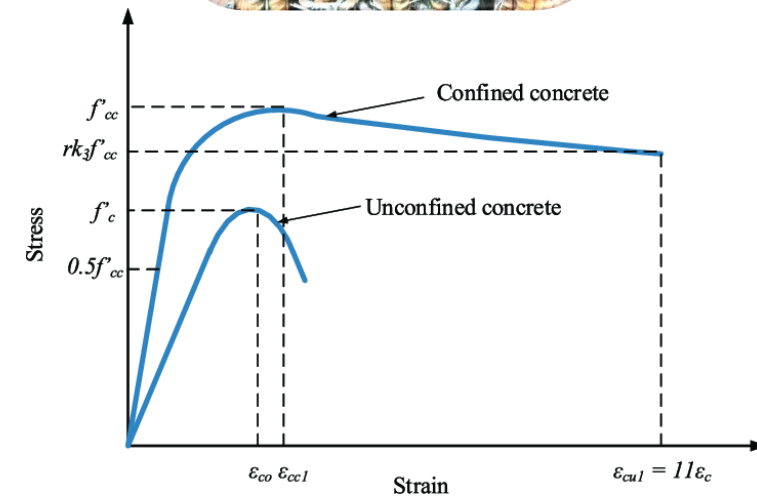
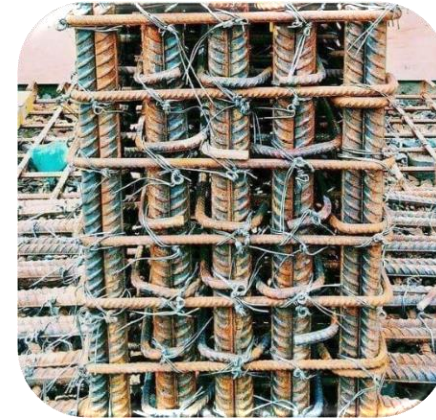
Concrete confined inside a hollow steel tube performs much better



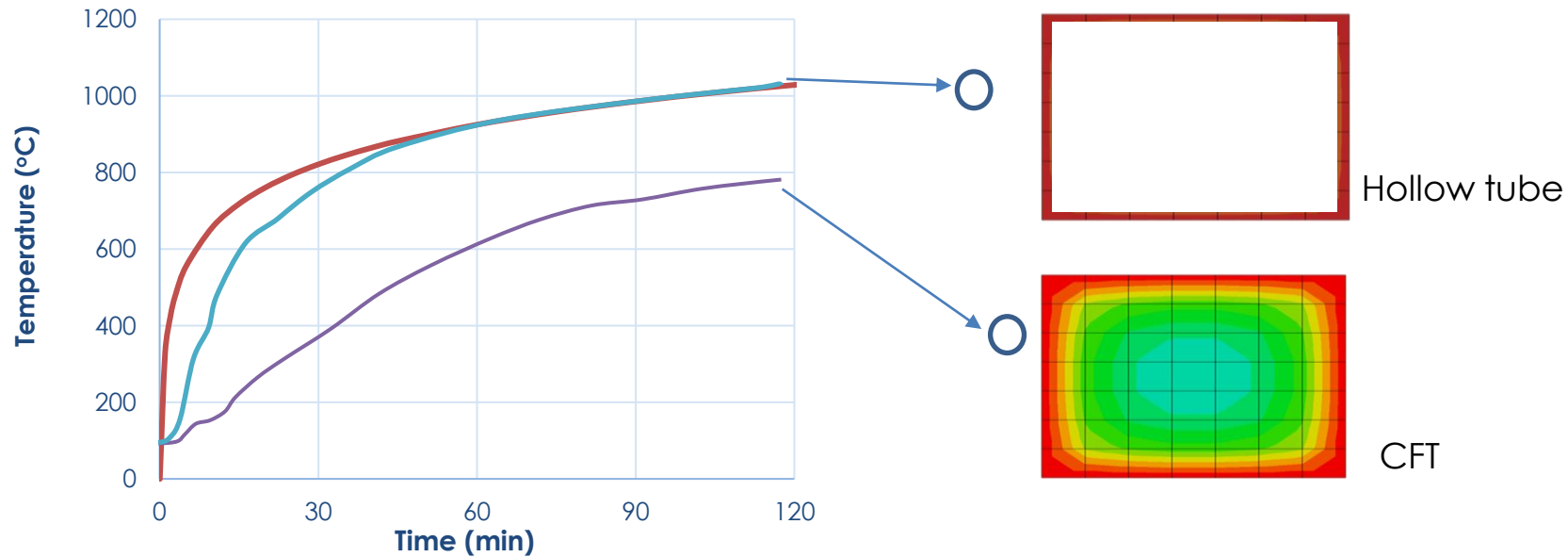
Only 40-60%
of the
concrete is
effectively
confined.



70-80% of the
concrete is
effectively
confined.



Fire Performance of Concrete Filled Tubes



Heat absorbed by core concrete thus Temperature increases slower

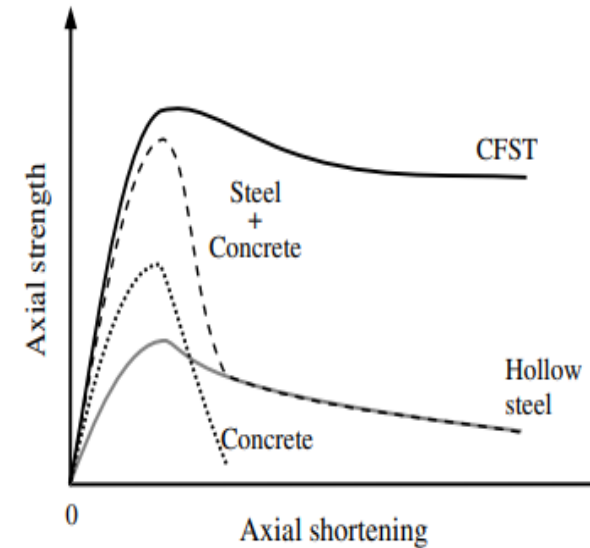
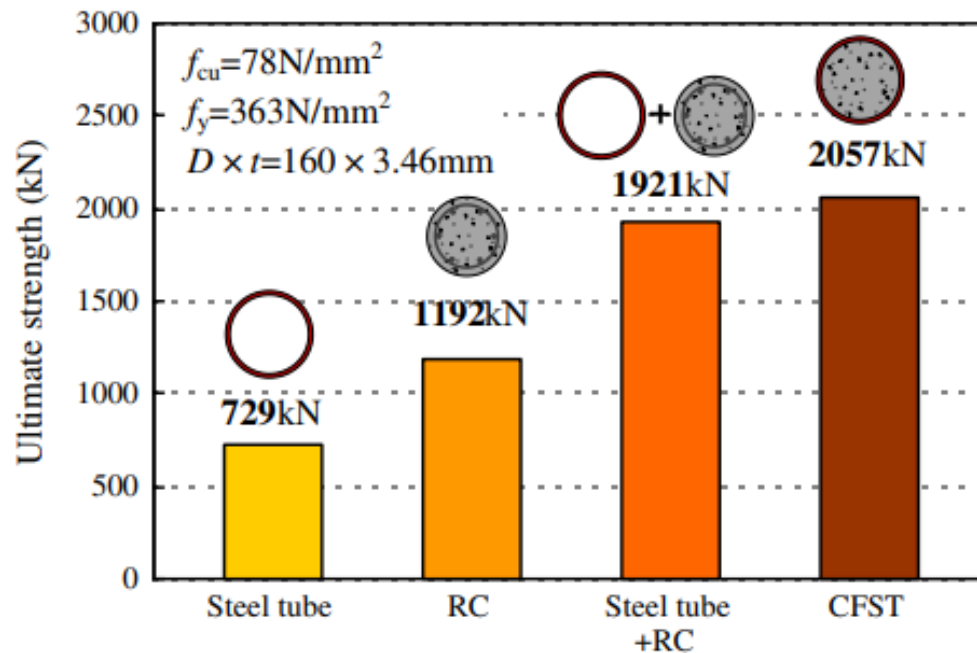
Outer tube provides confinement Preventing Core Concrete spalling

Heat gets transferred from the steel to concrete core which has lower thermal conductivity

- THE BIS CODES AND THE NBC DO NOT PROVIDE ANY GUIDELINES FOR CALCULATING THE FIRE RESISTANCE OF CFT COLUMNS
- AISC DESIGN GUIDE-19 CAN BE USED

Axial Compressive behaviour of CFT

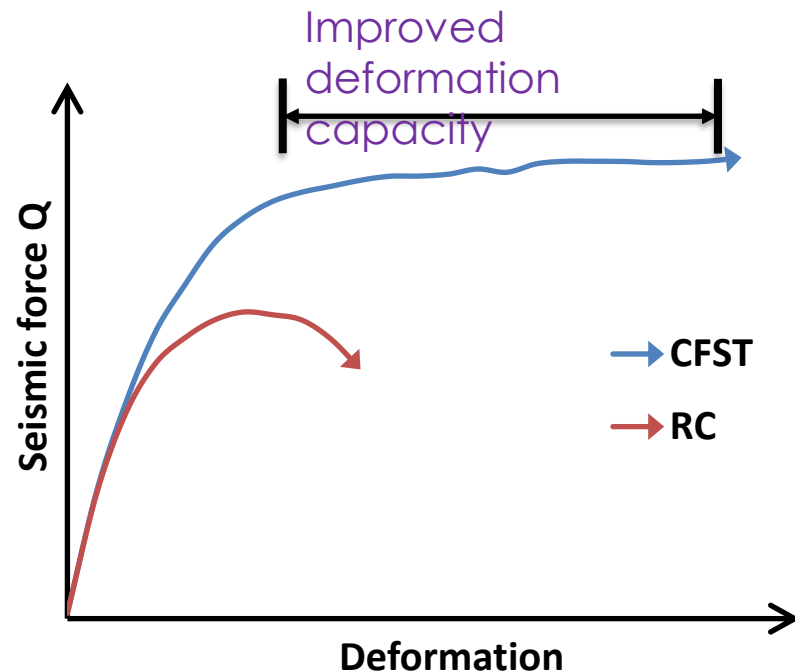
The ductility of the concrete-filled steel tube is significantly enhanced, when compared to those of the steel tube and the concrete alone.



Ref : L.-H. Han et al

Earthquake Resistant Behavior of CFT Column

- Under the action of the earthquake, the building with a concrete-filled steel structure will not result in brittle failure or collapse.
- It can meet the earthquake resistance demand of ***“being interstitial but collapse”***.



Under the action of a moving load or earthquake, the concrete-filled steel tube structure possesses good ductility and energy absorbing power, which is much stronger than that of the reinforced concrete structure.

Economical Benefits of CFST Structure

Analysis on building use Function

Column Section	Average RC column Section	Average CFST column Section
Centre and Side Column Section	0.49 m ²	0.28 m ²

Ref: *Jinming* Liu Et.al

Column Weight of CFT is 59% of RC

Weight of CFST structure is 40 % lighter than RCC building
(construction cost would be saved)

The cost of erecting & stripping of formwork can be saved

Myths

- Bolted connections are difficult in Tubular structure
- High raw material cost increases project cost
- Unavailability of bigger sizes in the market
- On Site Fabrication
- Architecturally Boring
- Wastage of costly tubes

Facts

- Bolted connections are as per code compliance
- Reduced consumption decreases project cost
- 500x500 - 600x400 - 1000x1000
- Zero On Site Welding
- Aesthetically Expressive
- Less than 1% wastage

Applications

Fleet Place house London, UK (2000)



- 8 Storey high concrete filled external
- CHS columns office block building.
- External diameter of CHS vary from 323.9 x 30mm to 323.9 x 16mm

China Zun (2011 – 2018)



- Height – 528m with 108 floor
- 8 concrete filled tube mega columns are located at the corners

6 Delhi Hospitals: Proof of Concept



Geeta Colony



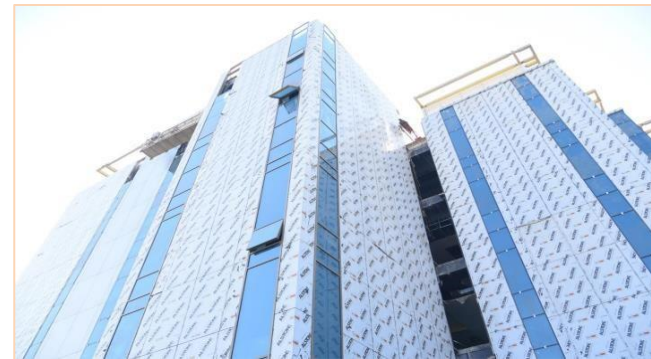
Sultanpuri



Shalimar Bagh



GTB Hospital



Sarita Vihar



Raghuvir Nagar

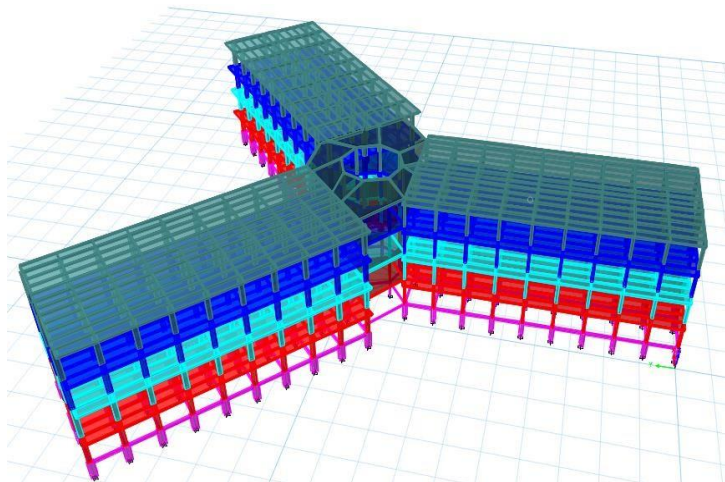
- Total 2mn Sq. ft built-up
- 18k ton Steel Tubes used
- Structural work completed in average 90 days

MES – Housing



Project Details

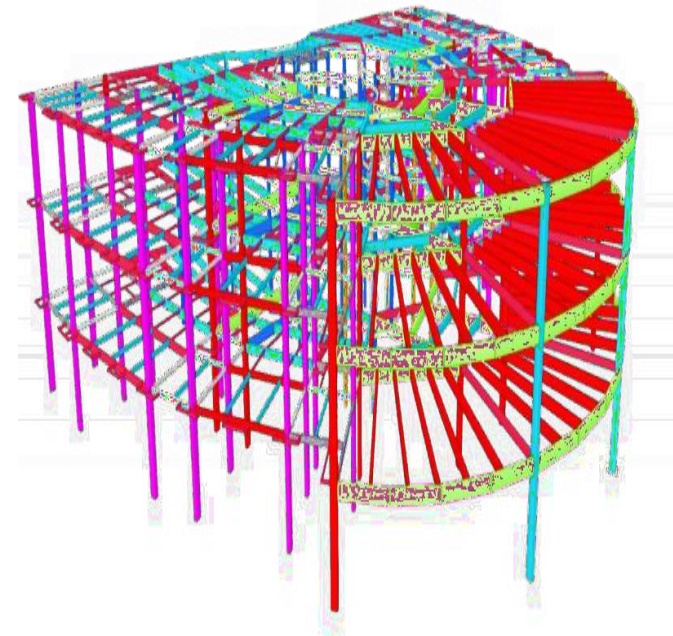
- | | |
|-----------------------|--------------|
| • Area of 1 Building | 90,000 Sqf |
| • Total Area | 2,70,000 Sqf |
| • No. of Buildings | 3 |
| • Floors Per Building | 4 (G+3) |
| • Steel Consumption | 4 Kg/sqf |
| • Total Steel Tonnage | 1000 MT |
| • Tender Estd. Value | 100 Cr |



GLA University, Greater Noida



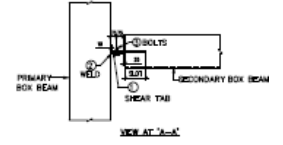
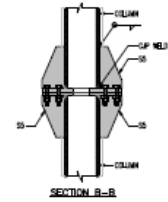
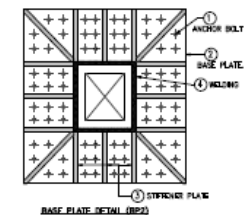
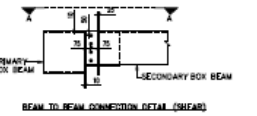
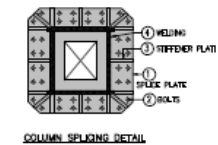
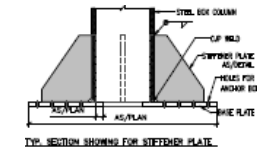
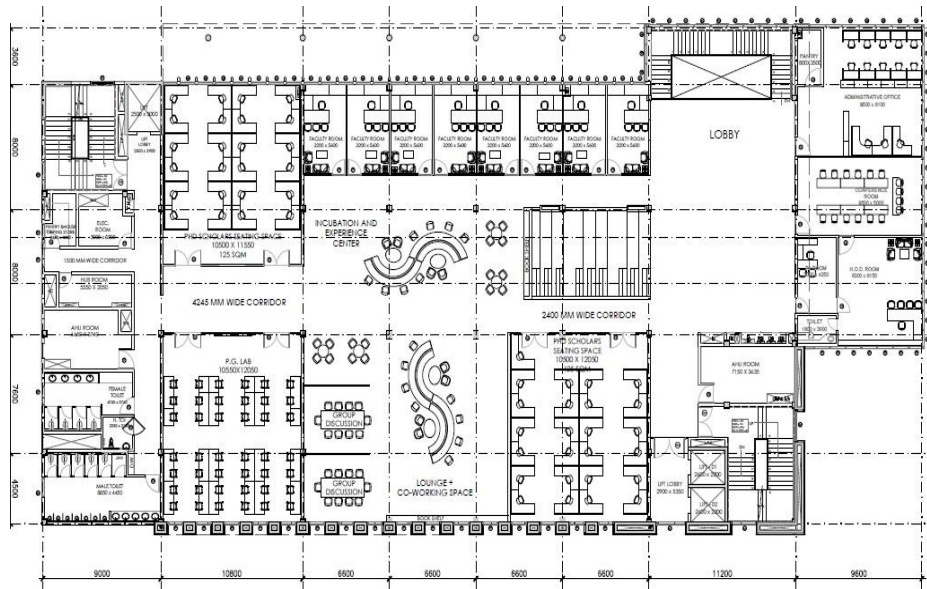
GLA UNIVERSITY, NOIDA
ADMIN BLOCK
AREA - 50,000 SQFT



IIT - Roorkee

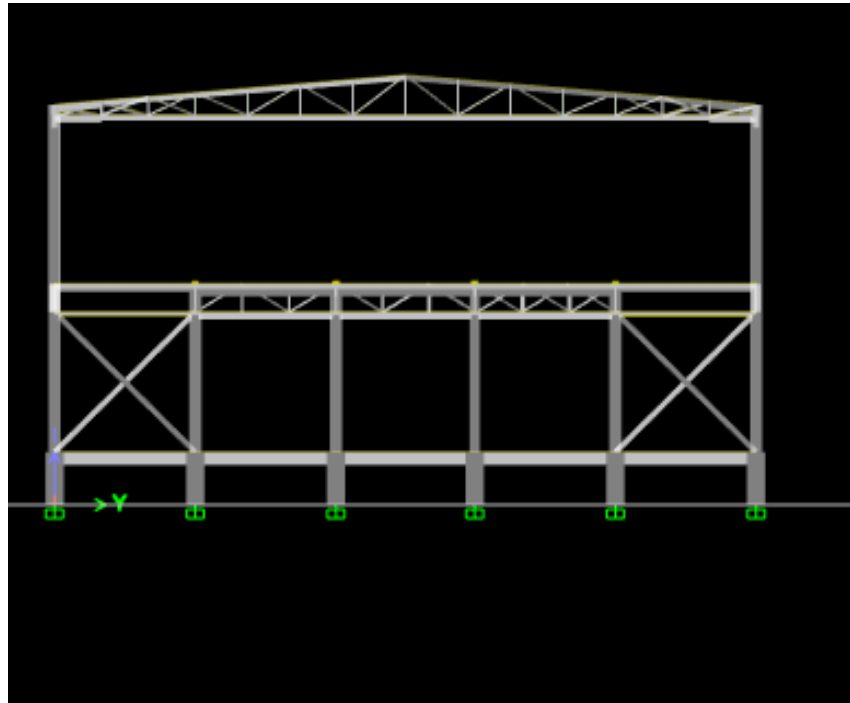
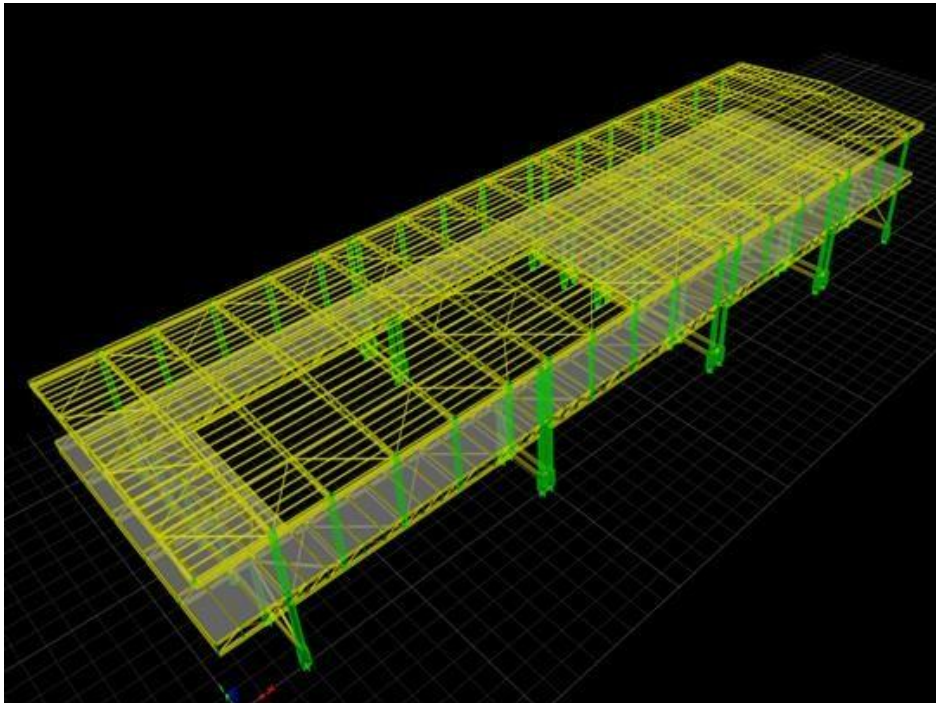
G + 3 Floors, Roorkee
Area 65,500 SQF

Tender – Drawings



Re-Development of Tirupati Railway Station

Area = 1,54,000
(Concourse + Roof)
Total Tonnage = 1477 MT



APL Apollo at a Glance

Plants **11 in India, 1 in UAE**

Market Share **55%**

INR 16,000 Crores, Turnover in FY22

3.6 Million Ton, Structural Steel Capacity

14 Brands, Four Product Categories



16
Patents



11
plants



1,500+
Products



2,124
Employees



800+
Distributors

Thank You

