Eicher-Volvo Corporate Office, Gurgaon

steel gives freedom to keep interior design flexible

The Eicher-Volvo Corporate Office building has been designed for a LEED Platinum Rating. The building planning, design and implementation has incorporated all the sustainability and green building aspects. The building design and construction was based on assembling various industrialised and pre-fabricated structural systems, façade and cladding elements, flooring and partition elements, ceiling rafters and recycled wood panelling. Each of these systems and elements were selected by the Architect, Romi Khosla Architects after detailed analysis of their performance criterion and compliance to the Green building norms. The in-situ construction was minimised and the building demonstrated dry construction.

Design & Concept

The office building consists of two interlinked cubes, made almost entirely of steel and double glazed insulated glass. As one enters the main lobby, will see a 35 tonne spiral grand staircase going all the way up to the sixth floor. The staircase is not fixed to the walls, but 30mm cables help suspend the staircase from the roof and then again at each floor by a total of six beams and the bottom of the steps are lit with LED strips. All the joints, bolts, cables and beams are exposed.

Structural System

The Project Managers, RRA Consultants, planned the complex interface and the sequence of these elements. Based on this interface and sequencing, the delivery of the various systems and prefabricated components were scheduled. The structural system was based on steel construction and the superstructure floor plates were cast with a cycle time of seven days. The next objective was to get closure of the building envelope with aluminium glazing system. All the electrical, low voltage and HVAC low side services were distributed under floor and the same required careful sequencing with the floor insulation and false floor support system. The assimilation of these materials and systems into an integrated building required construction discipline, sequence and co-ordination between various agencies.

Steel's The Way Out

The conventional raw materials, brick and

ARCHITECT ROMI KHOSLA, *Principal,* Romi Khosla Architects

"Steel buildings are different creatures and cannot be compared to concrete buildings. They have much larger uninterrupted floor plates, speed of construction, 100 per cent recyclability for LEEDs rated green status, clean lines and a technology that is very advanced in terms of its design and performance. The Volvo-Eicher building named '96' is arguably the most advanced building of its kind in North India and it was possible to make it so because the owners had a vision to build for the coming century"

concrete, form a tiny fraction, only about 10 per cent. Steel accounts for the building's unique streamlined look. The building uses 1250 MT of structural steel, another 35 ton in central staircase, 215 tonnes supporting the external louvers and elsewhere, and 225 MT of reinforcement steel in its basement and floor slabs. The building also uses about 90,000 sq. ft. of corrugated deck sheet which weighs 135 MT. The whole building looks much thinner and visually lighter.

Besides its visual appeal, three of the most important reasons for choosing steel as the building material were:

a. Both fabrication and erection are faster if a building's columns and beams, its structural skeleton, are made of steel. Steel saves time that would otherwise be spent on casting with concrete and on shuttering. In fact, a steel deck below each floor acts as a kind of permanent shuttering and reinforcement for the building. Steel also saves a precious resource, water, as no curing is required
b. Steel gives the freedom to keep interior design flexible. Large expanse of uninterrupted space is available on each floor which can be used as per liking. There are very few walls around except for services shafts, toilets and lift cores
c. Steel is 100 per cent recyclable. The entire building could be dismantled and auctioned in the market

Building Geometrics

Each façade of the building (carefully arranged louvers) ensure that while we get light from outside, we don't get the sun's heat, which is deflected away. The steel frames that support the louvers are covered with old railway sleepers. The clay tiles are not stuck to the building walls but attached to the façade along hollow cavities, which help to insulate the building.

Not only are the windows double glazed and vacuum sealed to reduce heat intake to the absolute minimum, all the glass cabins and meeting rooms are also made with double glass. This is to ensure that you are insulated against the sounds from outside as well as inside interruptions or distractions. The louvers ensure that 75 per cent of the workspaces are lit by natural light. There is no false ceiling and the steel deck that supports the upper floor is fully visible. There is a false flooring which is used for air conditioning system; electrical and data cables as well as fire sprinkler systems.

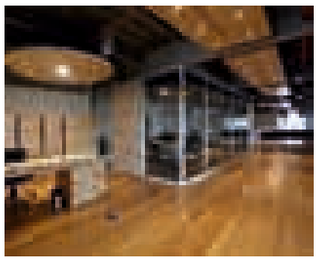
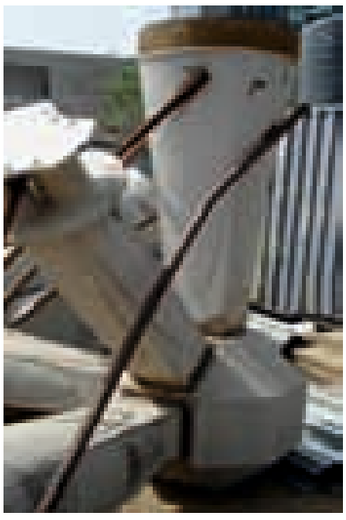
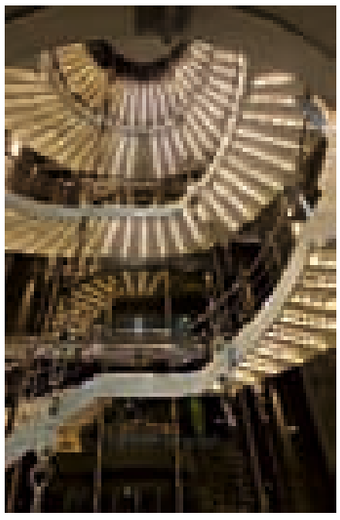
The building has been designed to reflect the transparency and openness. The building has two-tiered underground parking lot. There are eight discussions room for 4 & 6 seaters with 42" plasma screens as well as audio conferencing facilities. There is one discussion room for 8 seats. There are two large and comfortable board rooms with 14 seats and 18 seats. One large conference room with 45 seats. The Royal Enfield Café is an ideal place to have informal meetings.

The Integrated Building Management System (IBMS) has been set up at the ground floor for automated controls for power, air conditioning and water; it controls the elevators, fire detection systems, alarm systems, public address system and security measures like access control, electronic surveillance and perimeter control.

RAJESH RISHI, *Director,* RRA Project Management Pvt Ltd

"The construction of steel building was an exciting experience for our team. The building was an assembly of pre-fabricated structural, external façade and interior elements. The components were sourced from various manufacturers in India and abroad. The assimilation of these materials and systems into an integrated building required construction discipline, sequence and co-ordination between various agencies. The approval of shop drawings was done to ensure that all assemblies were properly planned and their interfaces were adequately detailed"



Green Features

a. Double Glazing:
   - 24mm thick Insulated (HS) Insulated glass unit for Vision with U-Value of 1.5 to 1.7 W/sq.m.k, SC of 0.3 to 0.45 & VLT- 67%. (6+12+6)
   - With 6mm heat resisting glass + 12mm Air gap + 6mm clear Toughened Glass

b. Steel structure as 100 per cent recyclable material

c. External louvers and wind screen to optimize the HVAC load

d. Appointment of third party for building commissioning which is mandatory for LEED certification

e. Work stations, storage cupboards, executive and coffee tables, rafters made of reclaimed timber section

f. Use of reclaimed timber section for wall paneling

g. Use of fly ash bricks

Energy Conservation Features:

Air conditioning and ventilation system design was well equipped with energy conservation features to reduce energy consumption and operating costs where economically feasible, generally as follows:

a. High COP (Low IKW / TR) Water chilling machines.

b. Variable speed secondary chilled water distribution system.

c. Energy efficient motors for AHU's and for large ventilation fan motors.

d. Use of individual and multiple air handling units which can be shut down during unoccupied or partially occupied periods through occupancy sensors.

e. Selection of highly efficient fans for air handling units and ventilation system.

f. Variable speed drive on all AHU's and large ventilation fans.

g. Car park exhaust system equipped with CO (Carbon Monoxide) sensors so that exhaust fans are operated as per permitted CO concentration levels.

h. Cooling tower selection for minimum drift and noise level; energy efficient motors with VFD.

i. Heat recovery wheels for pre cooling fresh air by using the waste exhaust air from toilet etc.

This ensures energy conservation in green buildings despite of higher fresh air intake i.e. in green buildings 30 per cent more fresh air needs to be supplied in all breathing zones to meet increased ventilation credit.

Building Structure

The site area is 1.0 acres located in the institutional area of Sector - 32, Gurgaon. The total built-up area is approximately one lakh sqft with two basements + Ground + six storeys. The building is designed completely in steel with an RCC deck slab. The building is designed to be a LEED rated building. The building is designed on the principle of stabilised cube which is diagonally braced. Due to the use of metal decking with concrete slab and steel beams, the formwork was eliminated and reinforcement was minimised. This significantly reduced the construction time of the project.

Structural Uniqueness

- Circular columns connected with nodes, horizontal member and diagonal bracings on all sides
- Cable suspended Circular staircase
- Louvers & walkways from second floor to terrace floor
- Screen walls from ground level to first floor

Structural Flooring Systems

Raised floor from Unitle made of steel cementitious infill with adequate fire properties, acoustic barrier and air leakage resistance. The system consists of panels supported by pedestals to achieve a floor height of 500mm from the existing floor level. The panels were of size 500 x 500mm and 30-37mm thick. Panels were made from steel. The bottom of the panel is embossed in hemispherical shape to give strength and flexural rigidity. The top sheet is plain and resistant welded at various locations. The entire panel is quoted with epoxy coating on the exposed surface. Pedestals were placed at 500mm distance in both directions to form a grid of 500 x 500 mm. Pedestal design confirms speedy assembly and removal for relocation and maintenance.

Challenges Faced

The building has unique features. The assembling of the building components were sequenced immaculately. The first challenge was the procurement and installation of all the structural steel components of the building, which was followed with the casting of the RCC slabs over the deck sheets. The entire structure was protected with two-hour fire protection. As the deck sheets were exposed as an interior element, these were to be protected at all stages of work. The building was then required to be enclosed with aluminium glazing in order to facilitate the work of engineering services and interiors. The Fire paint required protection against damage during the work of engineering services and interiors.

The co-ordination of the under floor insulation, under floor services viz. air ducts, electrical distribution, data and voice distribution with the false floor was a challenge requiring proper sequencing and protection of the various services. The extraction of construction dust and debris from under floors was important which required extensive house keeping operations.

The wet areas were placed on raised RCC false floor. All drainage services were routed through the space between structural slab and raised concrete floor. The water-proofing treatments were done at two levels and this process required extensive testing at each level. The junction of steel with concrete, interface of all fenestration systems, wood, stone and ceramic tile cladding systems with steel required extensive co-ordination. Similarly, there were expansion gaps in steel elements which required sealing with low modulus sealants. The weather sealing of a steel building was a challenge.

Steel Sections/Grades

- Circular Columns - CHS850*12
- Other Columns - UC356*393
  - Beams:
  - UB457*191*89
  - UB457*191*98
  - ISMB200
- Windscreen members - SHS91.5*5.4
- Louvers - RHS122*61*4.5
- Walkway - ISMC100

Client	Architect	PMC Consultant	Steel Fabricator	Steel tonnage	Awards
Eicher Motors	**Romi Khosla Architects**	**RRA Project Management Pvt Ltd**	**Geodesic Techniques**	**1650 MT**	**World Architecture Award Winner**