

# NEW INTEGRATED TERMINAL BUILDING, SVIA

Creative Group designs unique double covered wings with reverse slopes

The capital city of Chhattisgarh gleams with pride on its new international airport - Swami Vivekananda Integrated Airport (SVIA) which has bagged the Best Airport of India Award by Ministry of Tourism, Govt. of India. Creative Group was awarded this project through a national design competition. The role of the design team was to provide comprehensive architecture and engineering consultancy service for the design of this New Integrated Terminal Building. The planning team envisioned to globalize the airport terminal, to not only create a world class terminal, but, also to direct and integrate the commercial built form into an environmentally sustainable abode. This sophisticated aero dynamic steel structure with large spans provides panoramic view within and outside the terminal building.

The terminal accommodates annually 8,17,600 domestic and international passengers. Segregating the arrival and departing spaces, the new bi-level terminal with an area of 18,500 sq. mtrs. houses two hardstand hold rooms and gates. However, the proposed expansion plan shall facilitate an area of 25,000 sq. mtrs. and four gates catering to the future expanding needs by 2015-2016. The terminal boasting state-of-the-art technology has 20 check-in counters, 3 escalators, 3 lifts, 2 x-ray luggage machines, 3 security check points and 3 baggage conveyor belts. It also has a provision of 15 immigration counters for prospective international flights. The city side development includes elaborate plans for areas specifically dedicated for hard green to a surface car park for 350 cars, 150 taxis, 10 buses, 10 VIP, at a distance of 100m from the terminal. The new terminal building is





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designed to accommodate 700 passengers, including 200 international fliers hourly.

#### **Courtyard Landscaped with Native Tribal Art**

The sunken landscaped courtyard encompassing a central garden forms an exceptionally delightful feature of the terminal structure. Adorned with an array of historic Bastar art sculptures, the architects patronized the age old regional art of Chhattisgarh, lending a sense of pride and individuality to the terminal. Visible from the mezzanine and security check areas, the courtyard serves to segregate the security areas and the hold spaces. This concept stems from the desire to augment the visual experience with refreshing areas and exclusivity.

At the ground level, the courtyards are sunk and with a curvilinear stream flowing from east to west through a patchwork of lush, colorful perennials. Vertical gardens and lush palm groves rise from this patchwork, delivering a diverse visual palette of flowering perennials and foliage to passengers. This courtyard

creates an intimate symbolic relationship with the terminal's form, delivering an enriching experience for the passengers, visitors, and employees.

#### **The Free Flowing 'AVIAN'**

The integrated terminal is an elegant modern structure defined by a high-tech aerodynamic building offering a smooth transition to its passengers from the flight to the city. "Steel realizes the ambitious airport design in double curvature. Its organic form deriving its genesis from an 'Avian', is conceived with a sliced dome at the centre and multiple wings elevating the roof profile towards the sky," says Ar. Gurpreet S Shah, Principal Architect, Creative Group. The slicing of the roof profile maximizes the daylight, while emitting light in the sky making it visible at night. The design of the terminal building, liaise emphasis on the vastness of spaces, the visual experience of the sky and the subtle landing on the ground with the terminal building as catalyst integrating all three. The internal planning of the terminal has resulted into an efficient organization of passenger circulation and security and enhances the



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A built form should not be treated as a dead mass of brick and concrete, but, as a living organism which breathes and is embodied with the natural environment. A mega building like an airport, being the gateway to the city, besides being symbolic, needs to be iconic, innovative, interwoven into sustainability, thus, creating eco-friendly green architecture







vibrancy of the spaces.

### Structurally Speaking

The structure of the Raipur airport has unique double covered wings with reverse slopes. Each complex steel fabrication is measured and fabricated through a computerized 3D wire diagram. The challenge was also to maintain the roofing profile alignment along the slope to avoid any leakages in the building. The iconic roof of the structure formulated is a result of the strenuous task requiring the design and assimilation of more than 1,45,000 tubular members. The curvilinear roof spanning 120 metre, boasting of a maximum clear span of 39 metres, flanking a 15 metre cantilever at airside, creates a unique floating effect. Each primary truss is supported by steel columns with flaring arms on each end having gained the name of 'Tree Columns'. These are spanned at an interval of 17 metres, supporting the tubular main secondary trusses.

The double-curved roof has consumed approximately 68 kg/square metre attributed due to unique curvature to achieve the iconic form and skylights, which is at par with the standards using tubular trusses. The skylights, thus, added to the savings on electricity consumption, as artificial lighting is not

required during day time. For the first time ever in airport designing, double skinned gutter has been introduced so as to avoid the condensation of the moisture in the terminal building.

The sleek conical RCC columns supporting conical base plate sprouting the steel members, leading to the primary truss please the eye as architectural and structural elements of expression. The unique intersection of secondary trusses from adjacent bays at different levels create the skylights, highlighting the geometry of the space frame, and further defines the structural framework permitting natural light to permeate into the terminal building depicting a constantly changing pattern of shadow and light.

Having used sandwiched layer of aluminum profiled Kalzip sheet roofing, the multi cellular insulated translucent polycarbonates panels of skylights accommodating a largely span spaced roofing system, the curb side canopy done with polycarbonate sheets and high performance tinted toughened glass lend an extremely symbolic and high-tech appearance to the built form. The rear side of the air-side corridor is designed to be evolved

from a 'spaceship' which is attained by using a louvered glass arrival tube connecting the aero bridges.

An amalgamation of intelligent use of materials and technology, the façade of the terminal, is adorned with structural glazing, resulting in an array of sleek bow trusses. Spanning 15 metres high and 180 metres long, the inclined glass façade, lends a unique translucent appearance, visually welcoming the passengers into this structural marvel. The specially designed hinged connection at the base allows constructability and takes care of the rotational moment generated due to wind.

### Challenges Galore

The most difficult challenge, being a complex geometrical structure, was faced during preparation of working, drawing and using computer technology through 3D wire diagram along with keeping accuracy of construction and finances. The design team proved that though the task was a difficult one, it was not entirely impossible to make complex double-curved structure roofing systems. "In today's global context, a single window approach looking beyond architecture adherence to time and financial management for overall viability of project is the key to success," explains Er. Prabhpreet S Shah, Executive Director, Creative Group.

### Steel Sculpting

The flexibility of steel allows to create a large open span structure with limited columns. The surreal form of the building was realized by the malleable nature of steel, making it





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“ Sustainable structures that are aesthetic marvels, have to overcome the challenges of geometrical complexities, with a blueprint that reflects an intelligent use of materials and technology. The Swami Vivekananda Integrated Airport, in this respect, is not just a pride of Chhattisgarh city, but, a world-class wonder that uses sophisticated aerodynamic steel structures to bring alive an exceptional design. The precise sculpting of steel for the terminal was made possible by superior ductile strength of Tata Structura hollow sections. We are proud to have accomplished a seamless integration of accuracy and green strategies through this project. SVIA has won the Best Airport of India Award by Ministry of Tourism, Government of India ”



possible to construct the exact computer engineered design. Integration of steel frames, reflective metal paneling, skylights and façade glass has enabled to achieve large wide open spaces with natural light in abundance. The architects' vision and creativity in double curves has been realized perfectly.

### Grades of Steel

Fe 500 grade mild steel has been used for R.C.C. work, whereas hollow M.S. pipe of YST 310 have been used for roof trusses, purlin and cleats. M.S. girders with fabricated sections have been used for staircase, lift wells, etc. Steel rail tower cranes along with other moveable cranes have been used for erection of various members involved in the project.

### Sustainability

Though the Raipur airport has a complex structure form, its placement and detailed architectural design is purely based on active and passive green strategies. Pioneers in designing sustainable airports, the architects have carefully planned and implemented various active and passive green measures, making use of the best available resources. Retention of storm water and rain water harvesting recharges ground water, to ensure judicious and energy efficient functioning of the terminal.

A high thermal mass structure, with highly insulated walls and roof, ensures the building is further cooled down and shaded with trees. The design maximizes daylight and minimize heat gain in the building by way of passive design. A double insulating glass unit, provided on the south-west, south-east and north-east not only ensures an insulated envelope, but, also preventing air leakages in the building. A natural glare-free light is emitted on the south-east and south-west façades. Provision of overhangs, roof projections and fins prohibit sun and glare penetration into the building. The 'Green Ground Parking' uses grass track pavers for car park area facilitating ground water recharge and reduces heat. The island effect creates a pleasant micro climate around the terminal building city side.

Achieving 43 per cent reduction in water consumption, the terminal building complies with the ECBC (Energy Conservation Building Codes) for attaining the energy savings. Abiding by the energy saving scheme, the airport terminal is equipped with T5 light fittings with automatic perimeter light sensing controls. All thermal insulants and refrigerants are endowed with substances with zero ozone depleting potential (ODP).

Simply choosing steel as a building material

enabled the architect to deliver unrivalled sustainability performance for life, and for all its subsequent lives. Its superior strength-to-weight ratio gave architects, complete flexibility to achieve their most ambitious design. By specifying steel for the building, zero waste generation was ensured. Choosing a steel-framed building is the simplest and most effective way to reduce waste. Steel permitted a quick development process and construction.

### Safety First

As the erection of steel was very complex, precision and accuracy were paramount. International standards of safety measures were adopted to ensure optimal management during the construction stage. The well-coordinated project management team can be credited with approval and subsequent execution of all mandatory tests and performances scheduling.

With Aviation Architecture soaring high, Creative Group continues to design and develop wonder gateways for the country. Mentioning some of many feathers in their cap - development of Chennai International Airport, Goa and Vadodara Airports, each with an identity of its own, showered with its energy-efficient concepts. ■

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