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**STEEL
CONSTRUCTION
SUMMIT**

a new era in steel construction



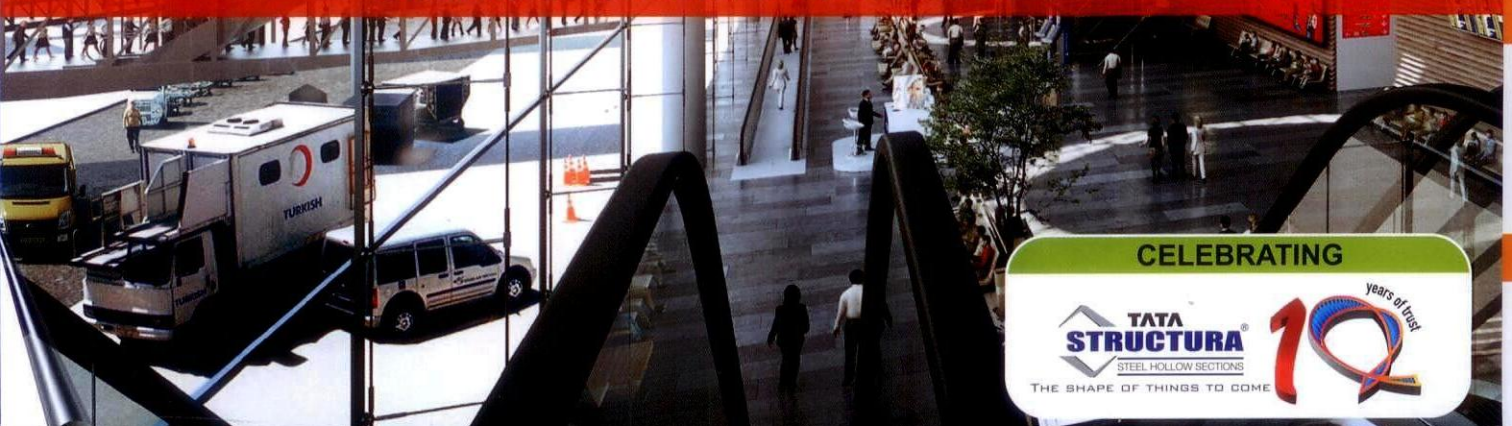
**STEEL DAY
MUMBAI
21 SEPTEMBER**

**STEEL
STRUCTURES
& METAL
BUILDINGS**

BUILD WITH STEEL



**'SMART' TO BECOME 'GENIUS'
USING STEEL SMARTLY**



CELEBRATING

**TATA
STRUCTURA**
STEEL HOLLOW SECTIONS

THE SHAPE OF THINGS TO COME

years of trust
100



GOA INTEGRATED TERMINAL BUILDING, DABOLIM

design formed by replicating a wave of the beach

Client
Airports Authority of India

Architecture and Engineering Services
Creative Group

Project Management Consultants
Airports Authority of India

At any point of time, the Airport Terminals have always been known for their modern design, magnificent form, bold architectural interpretation and flawless structure - but 'The Wave' redefines all these parameters of evaluating the quality of Airport Terminal Architecture.

Key Separators

The iconic stature, the bold and sleek form, the transparent façade, the vibrant interiors, the modern structure, the use of latest mechanical and electrical services and the cost effectiveness are few key features of this Goa Airport Terminal Building which separates it from any other contemporary airport terminal building.

The brief by the client was to create the facility as an Integrated International terminal within the Indian navy operational airport which has very limited city side land available, practically abetting on the main national highway. Due to less availability of city side land, the architects had to create the car parking in a multi level fashion.

Design Formation

The initial thought process of the architects while designing the terminal was to be able to glorify the culture and historical background of the city as well as the state for placing it as a tourist attraction. Being a city with multiple beaches and touching the Arabian Sea, the decision to replicate the 'wave' in the design was spontaneous. The wave represents aspirations- the aspirations of a nation which is quickly becoming a technological and economic giant in the global platform. The wave represents freedom- the freedom that Goa being a global tourist hub offers to the numerous tourists who come here for holiday and party from all across the world. The wave represents the ecstasy- the ecstasy which no individual visiting Goa can miss.

When asked, Prof. Charanjit S Shah, Principal, Creative Group described the form: "The terminal is formed with the oldest geometric shape - a circle. The terminal forms a semi circle resting on ground with a half arch emerging from the one end of the semi circle. The terminal form has been derived as

free flowing, symbolizing a wave representing the proximity of sea and beaches of Goa.

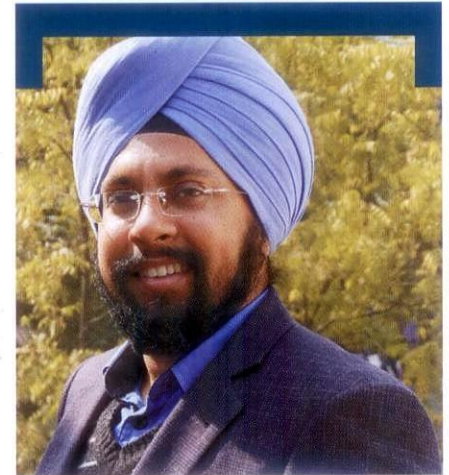
Being a major tourist hub and a holiday destination, every year a large number of tourists visit Goa and with each passing year this number is increasing, hence, a requirement of a new world class airport terminal with all modern facilities has long been felt and was acknowledged by Airports Authority of India when they invited bids for the designing of the new integrated terminal building at Goa Airport. This work was finally awarded to Creative Group in consortium with their global partners Fredric Schwartz Architects and Genslers.

Steel As Building Material

The new terminal building has to satisfy both aesthetical and functional requirements. Consequently, a large infrastructure project like an airport is looked upon as a large span column free structure to provide a panoramic view connecting the inside and outside spaces. Thus, steel is used as the dominant building material due to its versatility with which a designer can achieve the shape and size of large span structures with steel plates and portals.

The wave-like structure of the airport is in steel plate portal with a large cantilever of 14-m with steel louvers on the curb side. It also makes the interior spaces column free and spacious, as it can cover large spans. The building form developed is very simple and bold. It is free flowing and is curvilinear in one direction. The building envelope consists of long curved glass façade which gives the building the transparent and modern look with a solid roof with sleek skylights which is free flowing in form resembling a wave and hence the proximity to the sea.

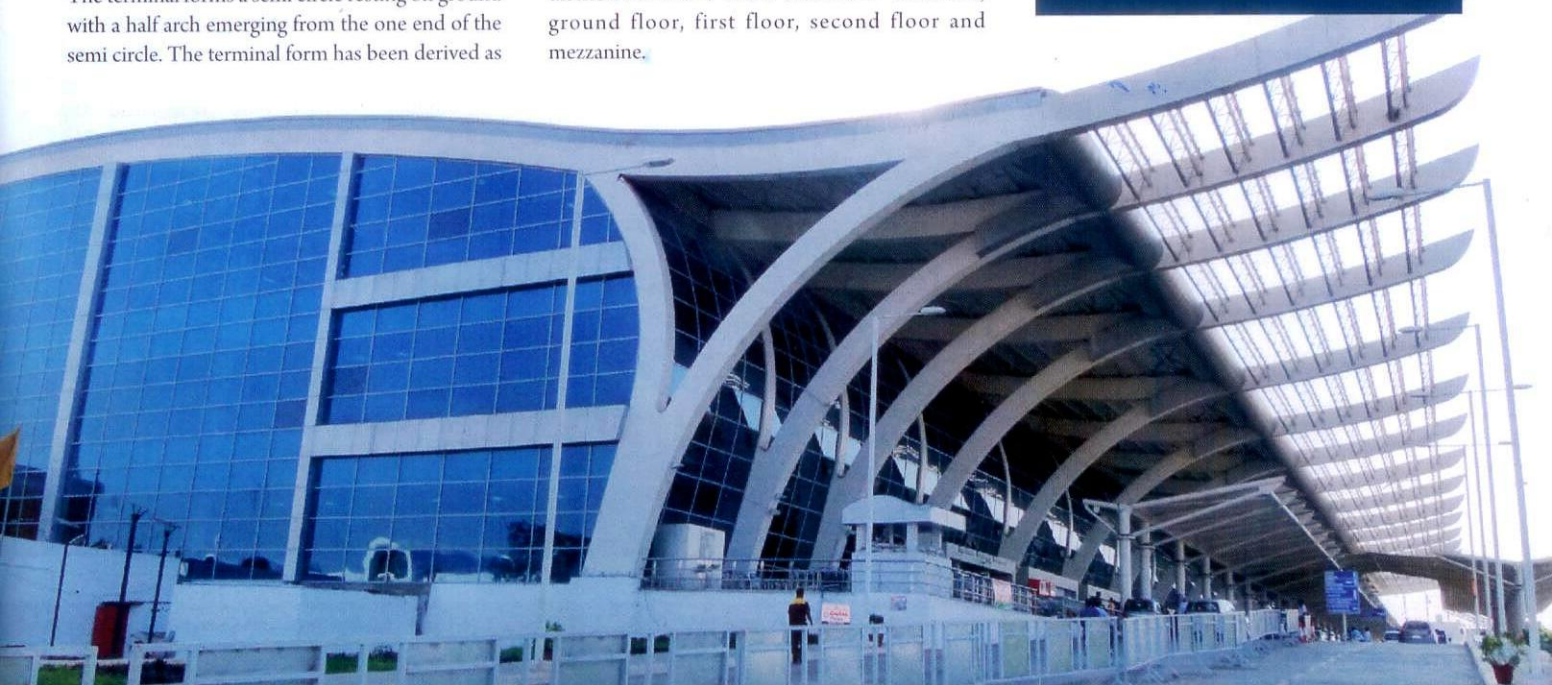
Apart from having an iconic form, this building also has to function as a terminal which makes the passengers comfortable and their basic function of boarding/ un-boarding the flight fast convenient and comfortable. Hence, the new terminal is distributed into 4 and a half levels- basement, ground floor, first floor, second floor and mezzanine.



GURPREET S SHAH

Principal Architect
Creative Group

The building's roof is designed with large overhang which covers the kerb, however, to achieve lightness, sun breaking louvers have been conceived on the kerb road ahead on the city side, thus, providing shade and comfort to the passengers. The building has long glass façade which gives the building transparent and modern look. A specially made double glass unit with protective film is specified for this terminal which provides much needed thermal and sound insulation. The use of steel in the main structure also enhances the modern image of the building.



MS Steel plate sections of YST 250 grade were used in creating the steel portal which were either TATA/Corus and are mostly readily available in the market. The technique used for erection was very simplistic as each portal has been fabricated and welded in segments of the site which were lifted by cranes. Proper precautions were taken to avoid deflection due to self load, wind and other constructional disturbances. The stability of the crane, its location and its movement are very important which was duly verified and designed as per the loading of the structure.

Architect Gurpreet S Shah, Principal Architect, Creative Group shared some interesting view points about this building. According to him, this building's roof is designed with large overhang which covers the kerb, however, to achieve lightness, sun breaking louvers have been conceived on the kerb road ahead on the city side, thus, providing shade and comfort to the passengers. The building has long glass facade which gives the building transparent and modern look. A specially made double glass unit with protective film is specified for this terminal which provides much needed thermal and sound insulation. The use of steel in the main structure also enhances the modern image of the building.

With their experience of using steel in all the airports designed by them, Creative Group architects feel that steel is the material of tomorrow and have a very bright future. Formerly, steel was mostly used on bridges, flyovers, stadiums and other such projects, but now, it has great opportunities in terms of being used in skyscrapers and multi storeyed buildings. The global technology has reached this part of the world and as professionals, the architects can visualize the endless uses of steel in creating a new and modern India.

Terminal Planning

The Basement floor caters to the need of service area comprising of In-line Baggage system, storage, Baggage break up and baggage make up areas. Ground floor furnishes integrated arrival hall with 64 check-in counters on one side and separate domestic and international departure hall on the other side which can be integrated when required. First floor have security check for international and domestic passengers on one side which can also be integrated to be used as domestic or international security check as required and other side caters to the immigration counters for arriving international passengers and concessionaries. This floor also has the Transit Lounge for Transit passengers.

The Second floor has security hold rooms & Airport Lounges for international and domestic

passengers & and lastly the Mezzanine above has the building service equipments like AHU units, cooling towers etc. This new integrated terminal building caters to both domestic and international passengers with a peak hour capacity of 2040 domestic and 800 international combined together into 2840 passengers.

This building caters to various challenges and has to provide solution to various existing problems. Goa being a tourist destination has seasonal crowd and at this time it has to cater to large number of chartered flights. Also being a naval base the civil flights are allowed to function at specific time slots only both during day and night time. Hence, the terminal is planned to have high flexibility in terms of integration of both international and domestic passengers as the passengers rush, increases considerably during peak hours.

The airport site is surrounded by the sea on one side and the main highway on the other hence the scope of expansion is also limited. As the site has its own limitations and a high floor area was desired, this terminal is designed to accommodate maximum built up area for limited ground coverage by introducing more floor slabs in the same volume. Hence, this building is more efficient in terms of the economics achieved as compared to any other contemporary airport. A Multi Level Car Parking is designed in six levels consisting of two basements to accommodate around 600 cars. This has significantly reduced the pressure on already constrained Site.

The building interior scheme is subtle as well as vibrant. Different types of specially designed glasses are used which gives vibrancy and holiday flavor to the building interiors. Many back lit double height feature walls strategically placed near the escalators and staircase creates the visual interest and guides the passengers to move in the certain path. As in this terminal the flow of passengers is designed vertically, these types of feature walls are essential for providing the visual cues for the passenger movement. The use of textured granite stone on the flooring reminds the passenger of the visual texture of the sea beaches. The use of Compact Laminated panels a recyclable green material is used as wall cladding which provides the visual softness to the interiors.

Project Cross-Roads

Talking about the various challenges the team faced during the project, Prabhpreet Shah, Executive Director, Creative Group asserted that though this



has been a very challenging project in respect of the site constraints and conditions, being a Brownfield development and also being managed and operated on the air side by the Indian navy, all these factors had actually led to many construction issues. They had to pass through many sensitive times and had to take various instant design changes so as to convince the Indian navy personnel and solve inter departmental issues. The end result is that Goa airport is a cost-effective terminal with very optimized project budget wherein it has been able to complete the facility of more than 1 lakh sq. mtrs. within a cost of INR 335 crores.

The building services are planned in a very sophisticated and intelligent manner. All service equipments for mechanical, electrical, plumbing etc are kept in the basement and their cooling towers (which requires open air) and AHU's are kept on the mezzanine floor at the top which is open to sky. Hence, lots of floor space are saved on main floors and is utilized to achieve higher usable floor area. The substation building is also located in the basement itself, hence achieving higher cost effectiveness.

This terminal building provides a visual delight to the passengers to create a strong first and last impression in the mind of the passengers flying in or out of the country. This building is sleek, modern, transparent and bold and portrays the image of a nation which is quickly becoming an economic and technological giant. In its vibrant interiors it will set the holiday and party mood right inside the terminal which is most apt for a place like Goa. Hence, next time when you visit Goa, this iconic building will welcome you and will set your mood for the various possibilities offered by this state for your entertainment and self discovery. ■

