

## Architecturally Appealing Pre-engineered Steel Building



<b>Location</b>	: Kadmaiputtur, Chennai-Madurai Road, Tamil Nadu
<b>Country</b>	: India
<b>Client</b>	: CRYOLOR ASIA PACIFIC (P) LIMITED
<b>Products Used</b>	: ECOBUILD™ BUILDING SYSTEMS
<b>Project Details</b>	: 7,217 sq.mt
<b>Architects</b>	: Architects United, Pune

**Brief about the project:** The project involved providing complete pre-engineered steel building solution for Cryolor Asia Pacific (P) Limited, a French company manufacturing vessels for cryogenic gases. The scope of work for Tata BlueScope Building Solutions included design, manufacture, supply, project management and erection of the pre-engineered steel building by using the highest quality of materials and proven technology. On-time completion, aesthetically pleasing as well as a functionally superior solution coupled with economy, were the key requirements of Cryolor Asia Pacific (P) Limited.

### Solution Offered

For this challenging project, Tata BlueScope Building Solutions recommended ECOBUILD™ Building Systems, with TRIMDEK® 1015 roof which was fitted on convex and concave roof profile. The building thus designed has a bold architectural form exclusively designed for Cryolor Asia Pacific (P) Limited.

The solution proposed by Tata BlueScope Building Solutions provides superior functionalities that include different working heights of cranes, raw materials handling area, cable trays and mezzanine floor with higher loads for process requirements.

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## Building Description:

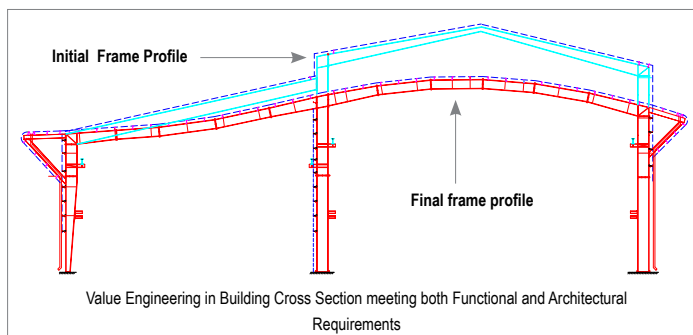
Building Name	Size in Meters	Total area in Sq.mt
Plant building for manufacturing cryogenic equipment's	50 m Width X 184 m Length X 16 m Height With 25 MT & 10 MT EOT Cranes	7217

## Applicable Standards of Practice:

- The loads have been applied on the structure in accordance with:
  - Metal Building Systems Manual 1996 by MBMA "Metal Building Manufacturer's Association".
  - IS-1893-2002 (Part -1) Indian Standard Criteria for Earthquake Resistant Design of Structures (Part-1 General Provisions and Buildings)
- Hot rolled sections and built up components have been designed in accordance with: AISC-1989, 9th Edition (Allowable Stress Design)
- Cold formed components have been designed in accordance with: AISI -1996 "American Iron and Steel Institute" (Allowable Stress Design)
- Welding has been applied in accordance with AWS D1.1.2006 "American Welding Society" Structural Welding Code - Steel Manual, 2000 Edition.
- Fabrication and Erection Tolerance applied in accordance with Metal Building Systems manual, 2006 by MBMA "Metal Building Manufacturer's Association".

## Design Basis:

**Lateral Stability:** The main frame rafters and exterior columns are connected to each other using moment type connections and hence the lateral stability of the building is provided through the frame action of the main rigid frames. Main frames are designed as two dimensional. Rigid frame columns along sidewalls are designed as fixed-based and the columns at interior locations are pinned-based. The frame is designed with segmental arch action in order to meet profile configuration.



**Longitudinal Stability:** Longitudinal stability of a building is provided through multi-tiered cross braced bays of the building in its roof, side walls and interior walls. The analysis and design has been carried out by MBS (Metal Building Software), USA.

## Key Challenges :

### Integration of structure and services to meet functional needs:

The pre-engineered steel building solution was customised taking into account following functional and operational needs:

Sr. No.	Key Needs	Innovative Solution
1.	Different working heights of cranes	Due to differential height of cranes in the adjacent width module, either the height could be increased or irregular profile of building width could be considered. The team instead suggested innovative profile of building which meets the functional as well as structural requirements. The solution proposed was also architecturally appealing.
2.	Raw material handling area with crane	Functional requirement was to have a crane to receive raw materials. The area can be enclosed at a later stage. Structurally, we proposed similar profile frame with the provision of fixing the roof sheeting at a later stage and with nearly the same amount of steel being used.
3.	Mezzanine Floor with Monorail Crane	Mezzanine floor roof was designed with same roof profile for architectural requirement and heavy storage loads on mezzanine floor. The structural members have been designed with monorail crane movement.
4.	Cable Tray Supporting Structure	Cable trays have been designed with cold form sections and have been factory made, instead of commonly used hot-rolled angles and channels.
5.	Maintaining suitable ambient temperature in Tropical weather	Use of Super Polynum Thermal Reflective Insulation in roof system.

### Favorable Environmental Impact:

- **Material Selection:** The building is made of Steel which is a 100% Recyclable material. The Building System is re-locatable and adaptable for reuse.
- **Sustainable Site:** 100% off site fabrication helps in maintaining the flora & fauna at site.
- **Energy Efficiency & Indoor Air Quality:** Use of Super Polynum Thermal Insulation, Skylight panels and Wind Driven Turbo Vents conserves electrical energy and enhances Indoor Air Quality.
- **Innovation in Design:** Value engineering in building design optimises usage of steel.

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**Convex and Concave Roof Profile:** The long straight lengths of unique TRIMDEK® 1015 panel is spring curved on site without the aid of additional mechanical curving equipment in order to match special shape of building profile

### Results:

1. The outcome is an eye-catching building on Chennai - Madurai road, in Tamil Nadu. The building is completed safely and meets the parameters for Green Buildings.
2. The bold curved profile of the structure is not only aesthetically unique, but also meets the rigid requirements of height put forth by process planner.
3. Innovative approach in structural design helped in weight reduction and cost optimisation of steel structure.

### Customer appreciation:



Award for Design Skills



An award for Design Skills, a commendation for turning a beautiful but difficult design into reality and creating a wonder in steel.