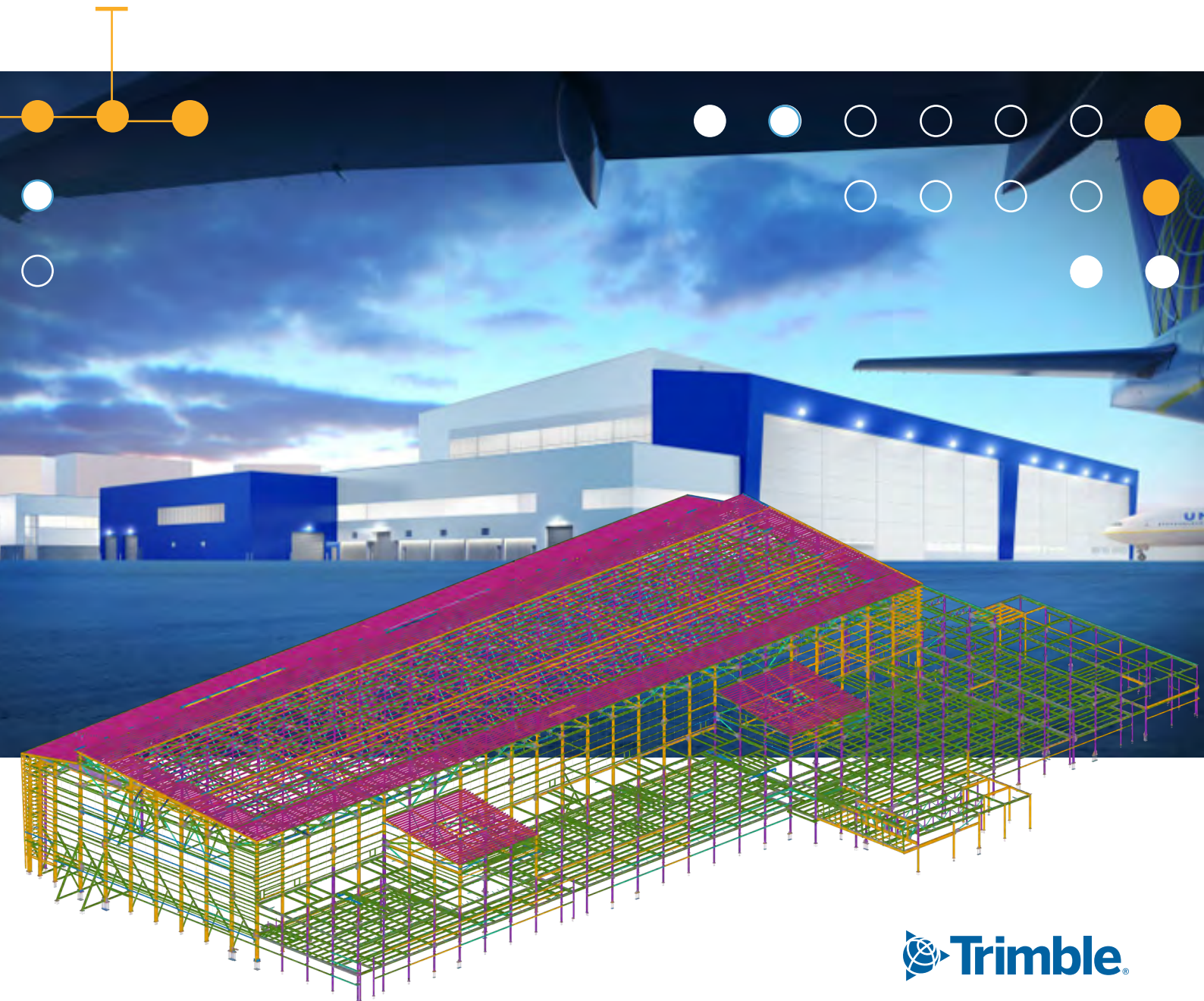




Customer reference

# Modeling & fabricating a massive, 295,000 sq. ft. East Hangar for United Airlines



# Company overview

SANRIA ENGINEERING is a technology-driven company whose principles are rooted in commitment, customer relationship and the most important project element “quality”. SANRIA utilizes Virtual Design & Construction (VDC) and BIM platforms (Tekla Structures) to perform connection design and structural steel detailing. Their other services include retrofit design & mapping, building as-built 3D models, estimation, material take-off and project management. SANRIA has executed several structural steel connection design and detailing projects with steel tonnages ranging from 500 tons to more than 40,000 tons and served a variety of industries such as Architectural, Commercial, Power, Chemicals & fertilizers, Oil & Gas and more.

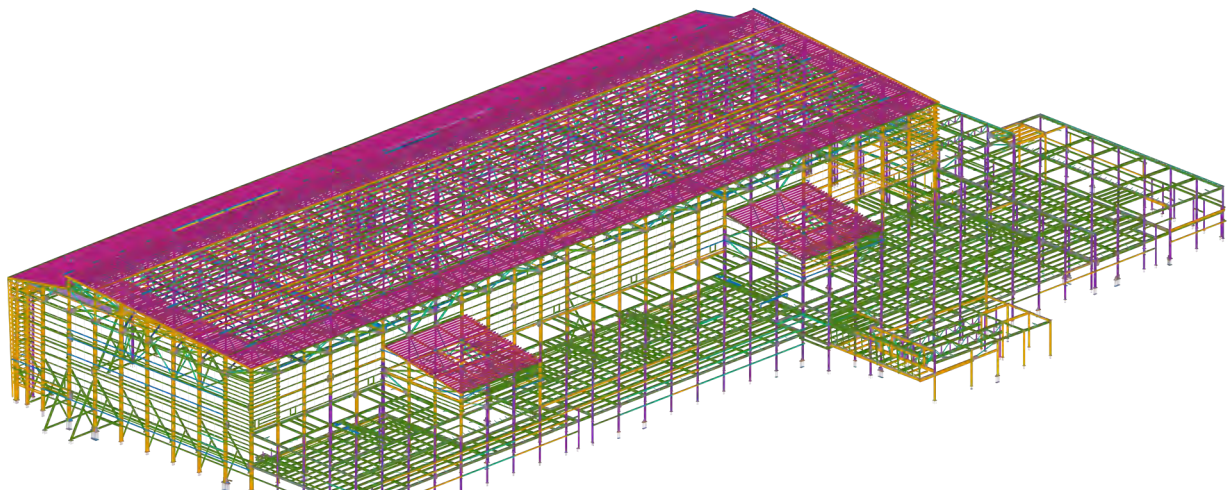


LOCATION:  
Mysuru, India

## Modeling & fabricating the United Airlines East Hangar

The project consisted of providing United Airlines with a flexible campus containing a line maintenance dual-access hangar with doors large enough for two wide-body planes side-by-side. It consists of 295,000 sq. ft. of maintenance space, which can accommodate multiple narrow-body and wide-body aircrafts ranging from A319 to B777/B787. A total of 6,400 tons of structural steel were used to bring this massive hangar to life. The contractor of this project is AECOM Hunt and, FSB and partner HNTB provided long-time client - United Airlines - with relocation, design, and construction services for a new line maintenance hangar and ground services equipment (GSE) complex. The Herrick Corporation is the structural steel fabricator and erector on this job.

Sanria Engineering’s responsibilities included preparation of structural steel 3D models, BIM, shop drawings, erection drawings, bolt drawings, CNC files, and laser files for automated fabrication. The steel quantity in the project was 6,400 tons.



“United Airlines East ACMX Hangar (UAEH) Project included various complex detailing elements that make this project stand out from a typical structure. Sanria Engineering did an exceptional job navigating through the complex elements to allow for the project to stay on schedule and to limit shop and field issues during construction. In addition to generating shop drawings for fabrication, Sanria Engineering also generated clear field assemble drawings for Qty 12 box truss assemblies and Qty 24 back span trusses (built onsite). When detailing the trusses, camber requirements were also integrated into the connections to allow for the bolt holes to align and to allow for ease of bolt installation during erection. This attention to detail proved to be invaluable in the field where ALL field bolts had to make before trusses were released from the crane. The attention to detail also extended to properly taking off the C girts and Z Purlins in the model and on the buy out sketches to allow for ease of purchase from our supplier. Sanria Engineering provided a thorough model and connection review to ensure all members are erectable. They incorporated design changes as soon as information was received to allow for more time for the shop to incorporate. I appreciated the effort and look forward to my next project with Sanria Engineering!”



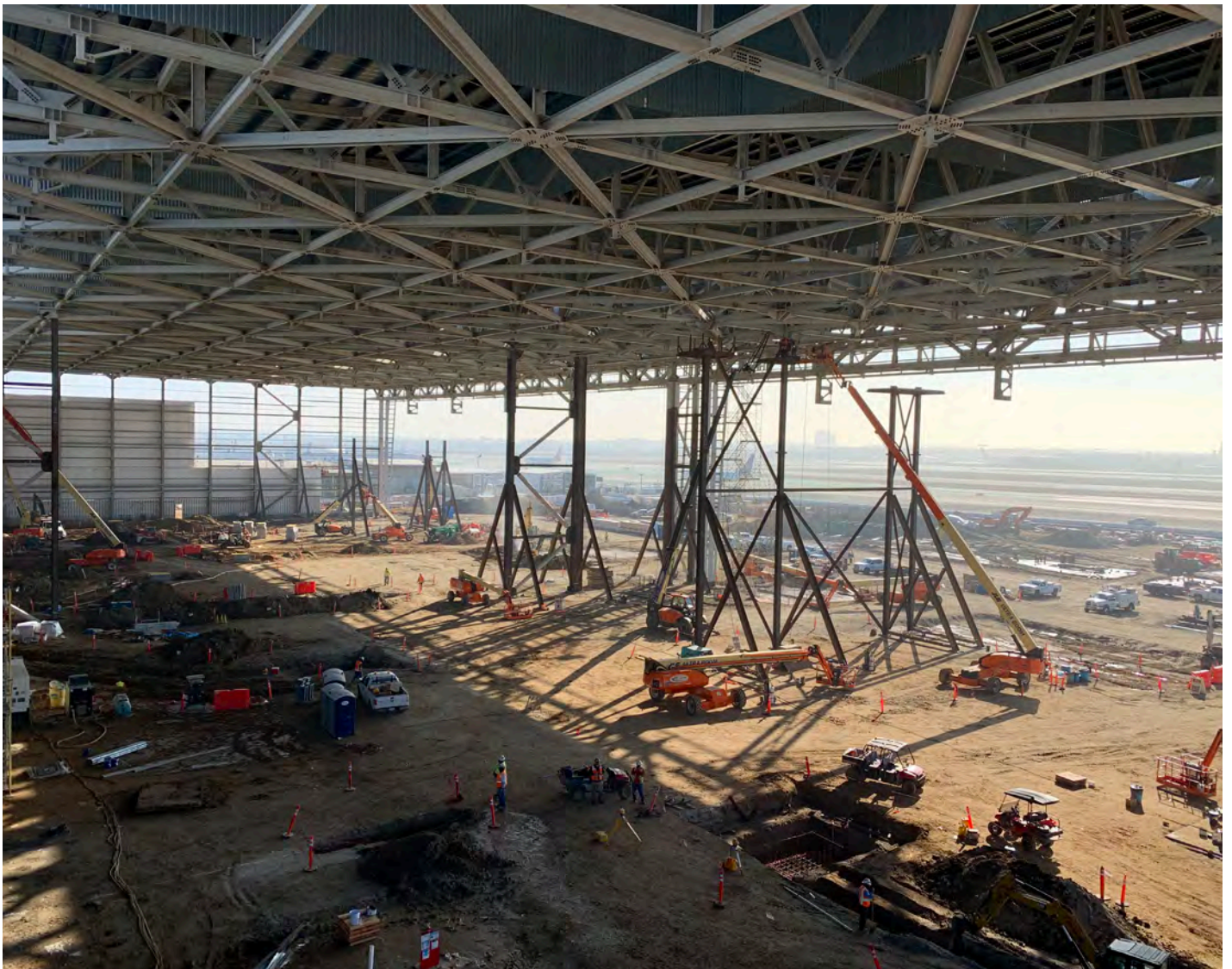
**- Mr. Fadi Al-banna, P.E., Project Manager, The Herrick Corporation**



“We were able to save time and cost significantly by avoiding many field/shop modifications at the high roof by identifying the problems as early as 5 - 6 months before the fabrication work took place. Modelling the box trusses was a difficult task. Tekla Structures helped the design team to resolve the complex connection issues at the box trusses and optimization of massive connections by proposing alternate solutions. Providing weekly BIM model to the contractor AECOM Hunt to ascertain weekly progress of the project and to coordinate with other vendors such as MEP, HVAC, electrical, plumbing, civil, joist, fire safety, deck supplier, etc. was a rigorous task. This integrated Tekla model helped in determining any inferences and helped the designer to fix any coordination problems related to multiple trades.”



**- Mr. Habeeb ur Rahman, Sr. Project Manager, SANRIA Engineering**



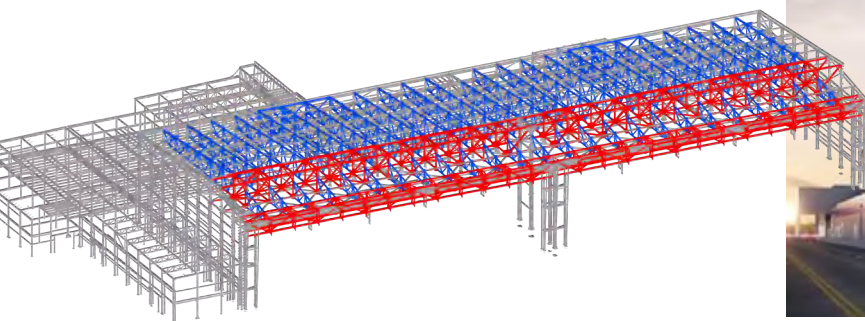
## Unique challenges of the Airline's hangar detailing job

- ▶ The roof is supported by 26 ft. tall box trusses over each hangar door, and the clear span is 300 ft. These box trusses are composed of two trusses linked together at the top and bottom and across web members. The truss members are composed of wide-flange ASTM A992 steel.
- ▶ Model was split into two parts for the project, one portion for Camber to cater to the camber requirements for the high roof box trusses and another one without Camber for low rise structure and high roof structure. Since the model was split into two, coordination between the two portions was critical and it needed verification of the connections whenever there was a change due to RFI responses or design revisions.
- ▶ Several nodes at the high roof structure had 5 to 8 members framing at one junction, which resulted in a lot of complexity in applying the connections. The project team had to verify the bolt installation, and tightening feasibility, welding access feasibility, and erection feasibility. Due to the connection complexity, all the connections were applied manually at these nodes.
- ▶ Dividing the job into multiple sequences based on fabrication and erection of the structure was another difficult task
- ▶ Identifying multiple paint finishes in the 3D model based on fireproofing, shop primer for structural steel and GA metal girts & purlins, intumescent fireproofing, and aesthetic importance of the structure
- ▶ Shoring steel supports and lifting requirements of the box trusses and line trusses at high roof, and coordination of lifting lug locations and erection sequencing with the construction engineer

## Tekla Structures for smooth, error-free structural steel detailing & fabrication

The project execution team at Sanria Engineering benefitted in the following ways, by using Tekla Structures for this airline hangar project,

- ▶ The solution enabled the high roof box trusses modeling in camber and coordinated the connections of associated framing in an un-cambered model to avoid the fabrication errors and field fit-up issues
- ▶ The project team was able to create box truss and line trusses field assembly drawings for easy installation in the field
- ▶ Further, Tekla enabled the coordination of lifting arrangements (lifting lug locations, bolt tightening methods, etc.) of box truss (12 segments) and line trusses (58 segments) to ease the heavy box truss lifting and erection in the air
- ▶ Tekla allowed the project team to generate several weight reports of box trusses and line trusses to ascertain the crane capacity and lifting tools
- ▶ It also helped the design team to resolve the complex connection issues at the box trusses and optimization of massive connections by proposing alternate solutions
- ▶ The project team utilized auto connections application to apply connections to straight portions
- ▶ To meet customer requirement, the project team also created customized cold rolled members (purlin, girts) using parametric profiles in Tekla





Educate

Design

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# Tekla software by Trimble

Transform the way you work with reliable, detailed, data-rich structural workflows for outstanding performance. Build your legacy with truly constructible BIM, and feel the power of Tekla at your fingertips.

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