

HSS HELP STEEL CANOPIES SOAR

Overcoming Design Challenges at the World's Busiest Airport

Hartsfield-Jackson Atlanta International, the world's busiest airport, is in the midst of a \$6 billion, 20-year expansion and modernization program. A major part of that program is an overhaul of the Central Passenger Terminal Complex (CPTC), which serves as the airport's entrance and exit for all domestic traffic. As part of the CPTC updates, Atlanta commissioned architecture firm HOK to design a massive pair of canopies to stretch over curbside pickup and drop-off areas, protecting passengers from the elements and giving the airport a pair of iconic architectural pieces.

The Challenge

Building anything at the busiest airport in the world is bound to involve logistical challenges, but planners had a truly ambitious goal in mind for this project: Build two soaring canopies—864 feet long, 72 feet tall and 194 feet wide, arching over eight lanes of traffic each—without disrupting airport operations or the 275,000 passengers who pass through daily.

To accomplish this feat, designers had to figure out how to construct and install intricate steel diagrid lattices without closing traffic lanes or blocking airport entrances with construction work. Further, the new structures would have to be largely supported by existing construction, as installing extensive new supports or pilings would cause too much disruption to airport operations. That meant no new columns at the terminal curb and a limited ability to reinforce existing supports.

Modeling Minimizes Disruption

The first step was figuring out exactly how to design the lattice so it could be erected with as little disruption as possible. HOK's designers used HOK STREAM, a proprietary parametric modeling and optimization tool, to plan the lattice's structure, making the most of existing supports while minimizing the amount of retrofit work required. Additionally, analytic desktop models, wind tunnel testing and computational fluid dynamics were used to aid design, finding optimal structural load paths and planning for the large temperature variations between Atlanta's hot summers and cool winters.

Using these tools, designers were able to come up with a plan that would minimize required construction time and put two-thirds of the new load onto support piers that could be installed with minimal disruption, with the rest of the load carried by pre-existing columns.



Photo credit: Matt Breidenthal

Logistical Heavy Lifting

While every construction project has logistical components, the unique challenges facing the canopy designers meant logistics had to be top of mind from beginning to end. Major work was only possible during limited traffic shutdowns between 10:00 p.m. and 4:00 a.m. every day, so the steel had to be carefully fabricated to be rapidly erected in the available time.

To make the best use of the time they had, the team created a 4D schedule that mapped out precisely when and where each piece had to be installed, detailed in a comprehensive 500-page plan. And to make sure that plan went off without a hitch, fabricators started working a full year before construction began, custom-making the components of the lattice's 38 identical trusses out of more than 3,500 tons of domestic steel.

HSS Solve for Efficiency and Easy Erection

HSS from Atlas Tube helped designers find solutions to their logistical and structural challenges. Using 14", 18" and 20" HSS pipe for the trusses, fabricators were able to bend each section to precise tolerances and cut miters to exact specifications in order to minimize the time and material needed for on-site welding. The high strength-to-weight ratio of HSS helped as well, making it possible to design canopies strong enough to withstand structural and environmental forces with minimal new support.

“The project required high levels of quality control and precision in order to fabricate 38 effectively identical curved trusses to the necessary level of tolerance and erect them during tight overnight construction windows. Atlas Tube’s work was a key factor in the project’s success.”

Matt Breidenthal, SE, PE, LEED AP
Senior Principal and Engineering Practice Leader, HOK

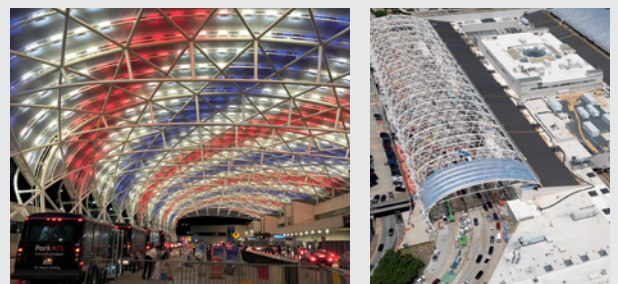


Photo credits: NSMS, David Camp, Multivista drone

By the Numbers

38 identical HSS Vierendeel trusses

19,776 square yards of lightweight ETFE panels

3,708 customizable LED light fixtures

Project Team

Project Owner: Hartsfield-Jackson Atlanta International Airport

Architects: HOK | CHASM Architecture LLC | Stanley Love-Stanley P.C.

Structural Engineer: HOK

Steel Fabricator and Detailer: Beck Steel

Benders and Rollers: Bendco | Chicago Metal Rolled Products

Steel Erector: Derr & Isbell Construction LLC

General Contractors: New South Construction | McCarthy | Synergy Construction

Supporting More Possibilities With Jumbo HSS

The canopies at Atlanta Hartsfield-Jackson use HSS tubes up to 20" OD, with walls up to 0.5" thick, giving them high strength at a lower weight than would be possible with other kinds of steel members, such as wide-flange sections.

Since construction was completed, Atlas Tube has expanded its range, rolling the world's largest HSS at a new mill in Blytheville, Arkansas. That means HSS up to 28" OD with walls up to 1" thick to help go bigger, taller and stronger while saving on weight. And because the new sizes are 100% domestic, builders can count on high quality and fast delivery.

An Award-winning Effort

Ultimately, all the planning paid off, and the second canopy was completed a month ahead of schedule in October 2019. By using high-efficiency HSS and

advanced computer modeling, the team was able to create a pair of iconic landmarks for Atlanta's gateway to the world without impeding the airport's efficiency. And the world has taken notice, with the canopies winning several awards, including the American Institute of Steel Construction's 2020 IDEAS² Award for Sculptures/Art Installations/Non-building Structures and an NCSEA Excellence in Structural Engineering Award in 2019.

**For more information, call 800.733.5683
or visit atlastube.com**

About Atlas Tube

Atlas Tube, a division of Zekelman Industries, produces a wide range of steel tubular products and is the leading provider of hollow structural sections (HSS) in North America. Other offerings include HSS Design Tools and straight-seam electric resistance weld (ERW) pipe piling.



1855 East 122nd Street
Chicago, IL 60633
P 800.733.5683
F 773.646.6128



200 Clark Street
Harrow, ON NOR 1G0
P 800.265.6912
F 519.738.3537

info@atlastube.com
atlastube.com

