STEEL

CASTINGS

and

Additive Manufacturing


CDP | Montreal, Canada

Contemporary Castings

- Used for special connections
- Used for standard connections
- Can be one-of large pieces formed with expendable molds (i.e. Structural)
- Can be smaller die cast pieces made in great quantity (i.e. glazing attachments)
- Can be solid or hollow depending on size and purpose
- Generally either NODES or END CONNECTORS

Use Steel Castings for

- Architecturally exposed structural steel particularly for HSS or timber connections
- Complex connections
  complex geometry; arduous loading; for increased connection stiffness
- Fatigue critical connections
- Functional applications
  to satisfy a need for special performance

Nodes


Young + Wright
University of Guelph | Canada
Casting and steel by Walters Inc.

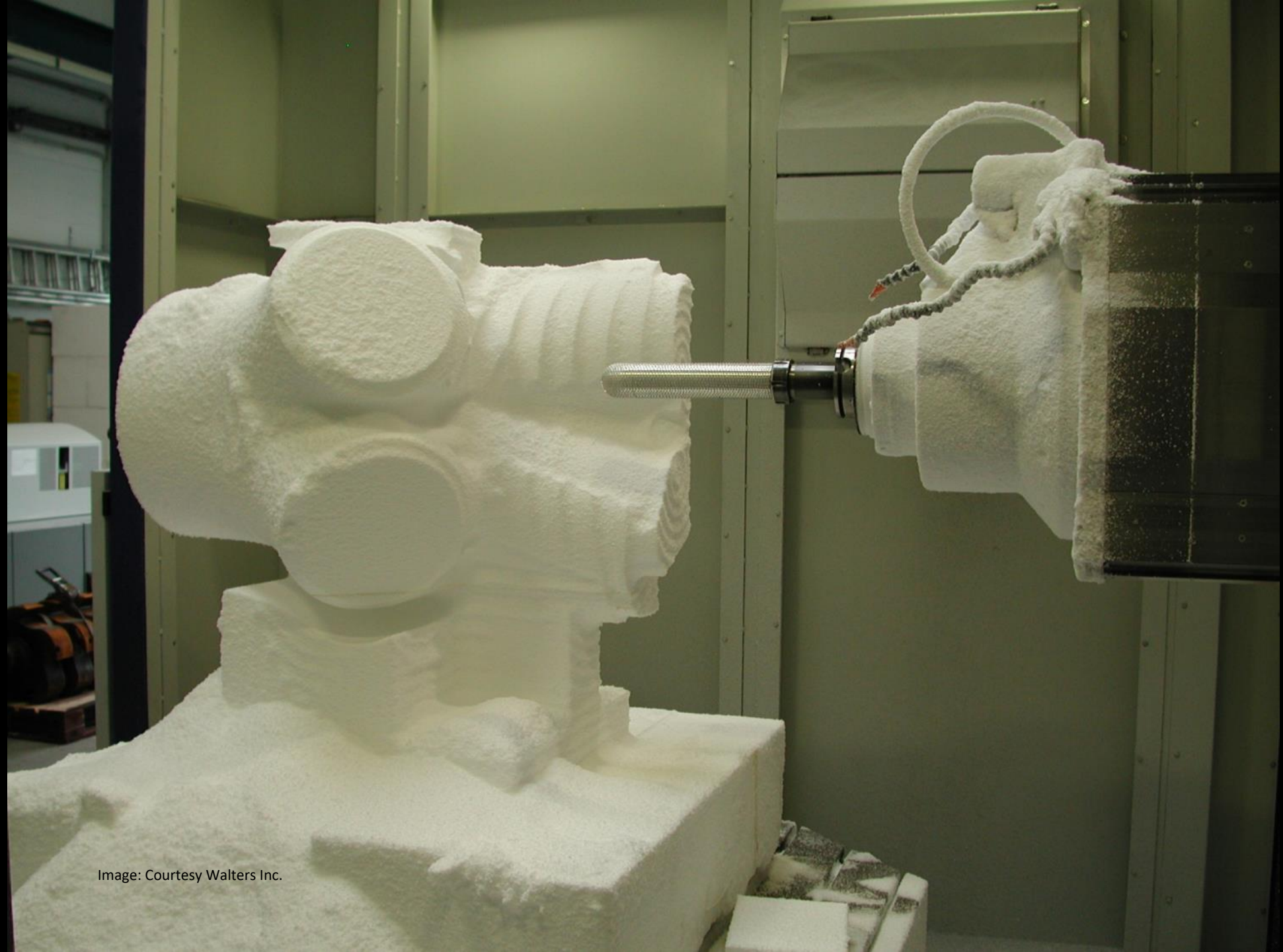
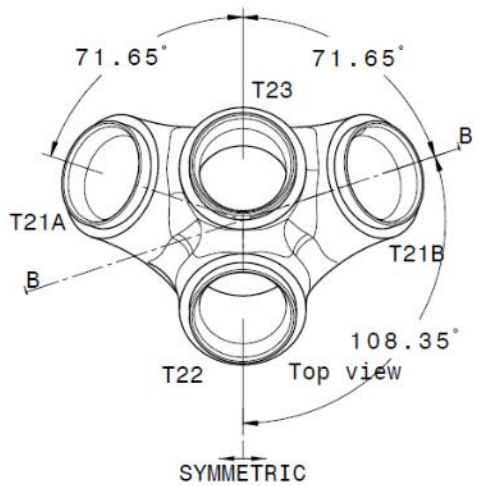
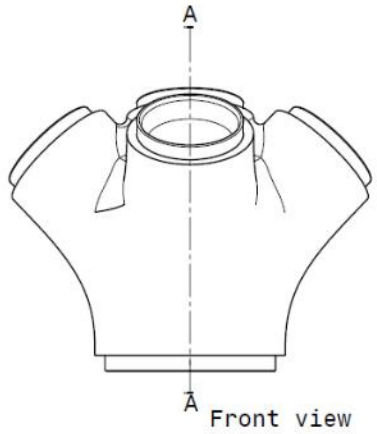
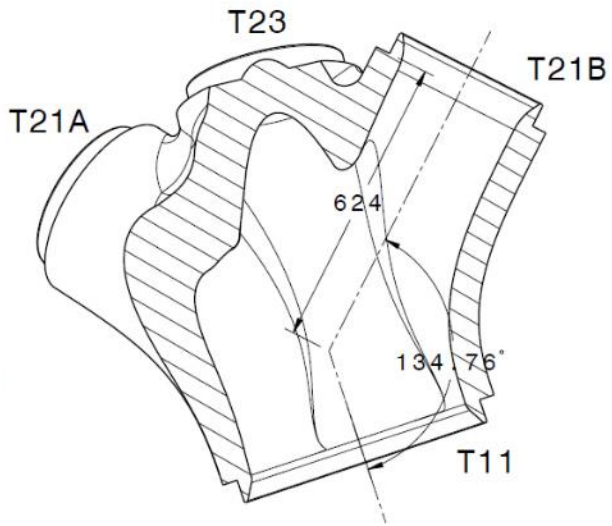


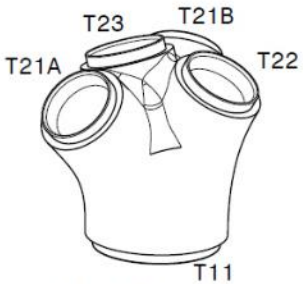
Image: Courtesy Walters Inc.



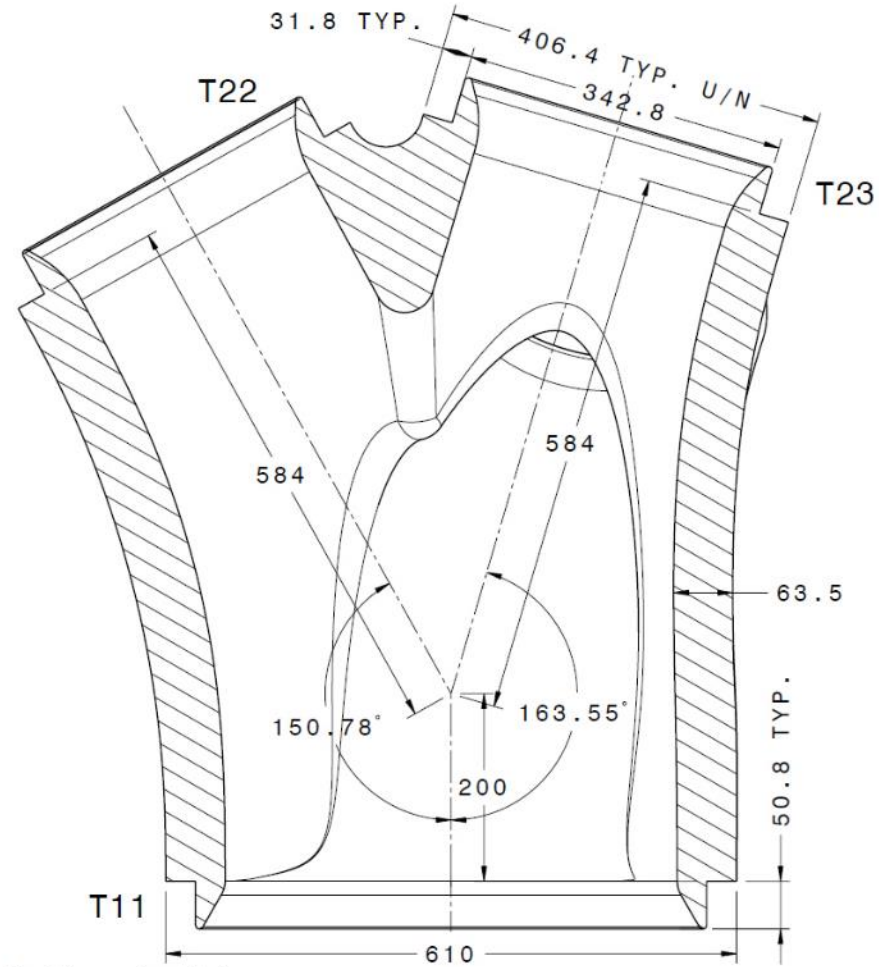




Section view B-B
Scale: 1:10

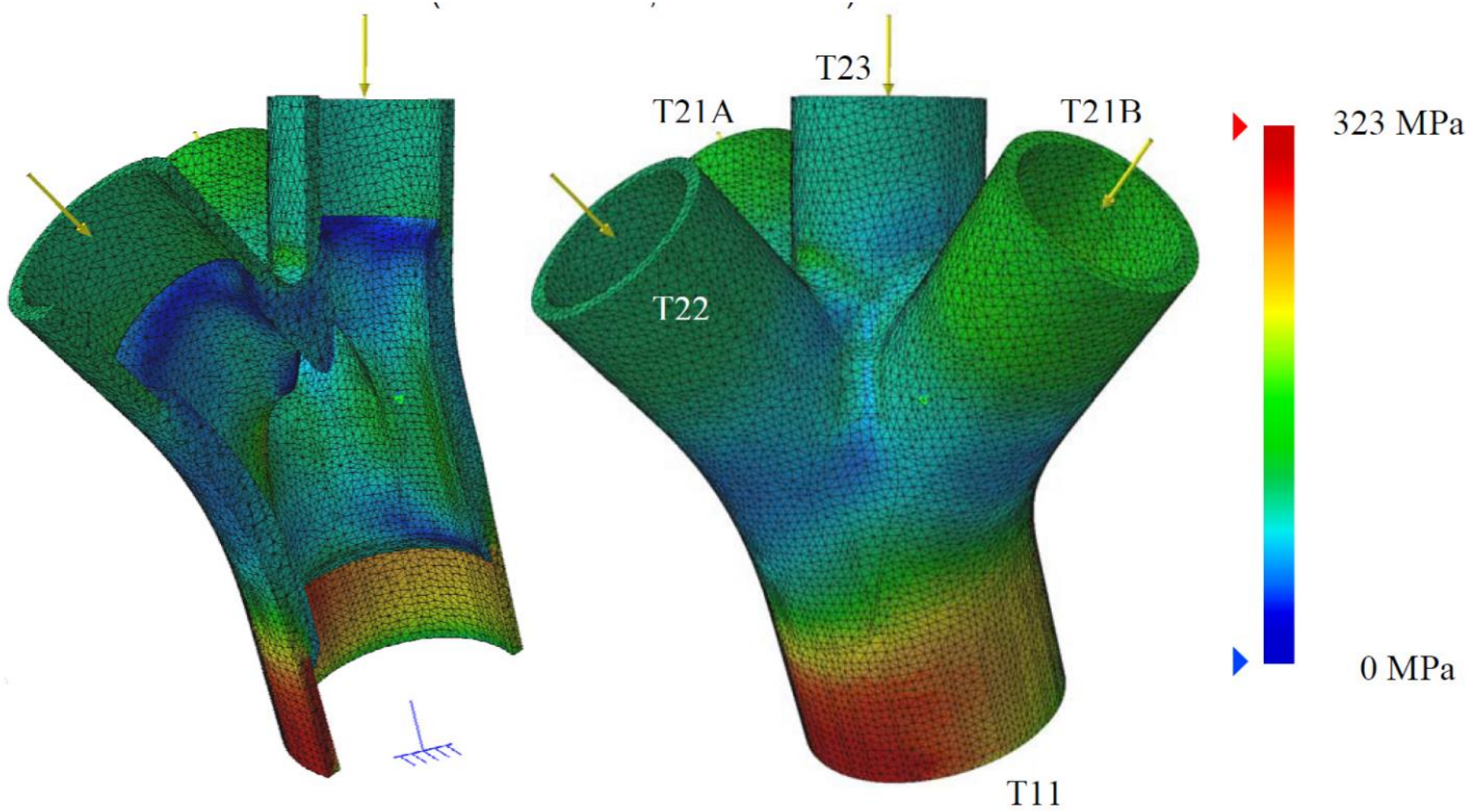


Isometric view



Section view A-A
Scale: 1:5

Dimensions are
in millimeters


T23
T21A
T21B
T22
T11
323 MPa
0 MPa

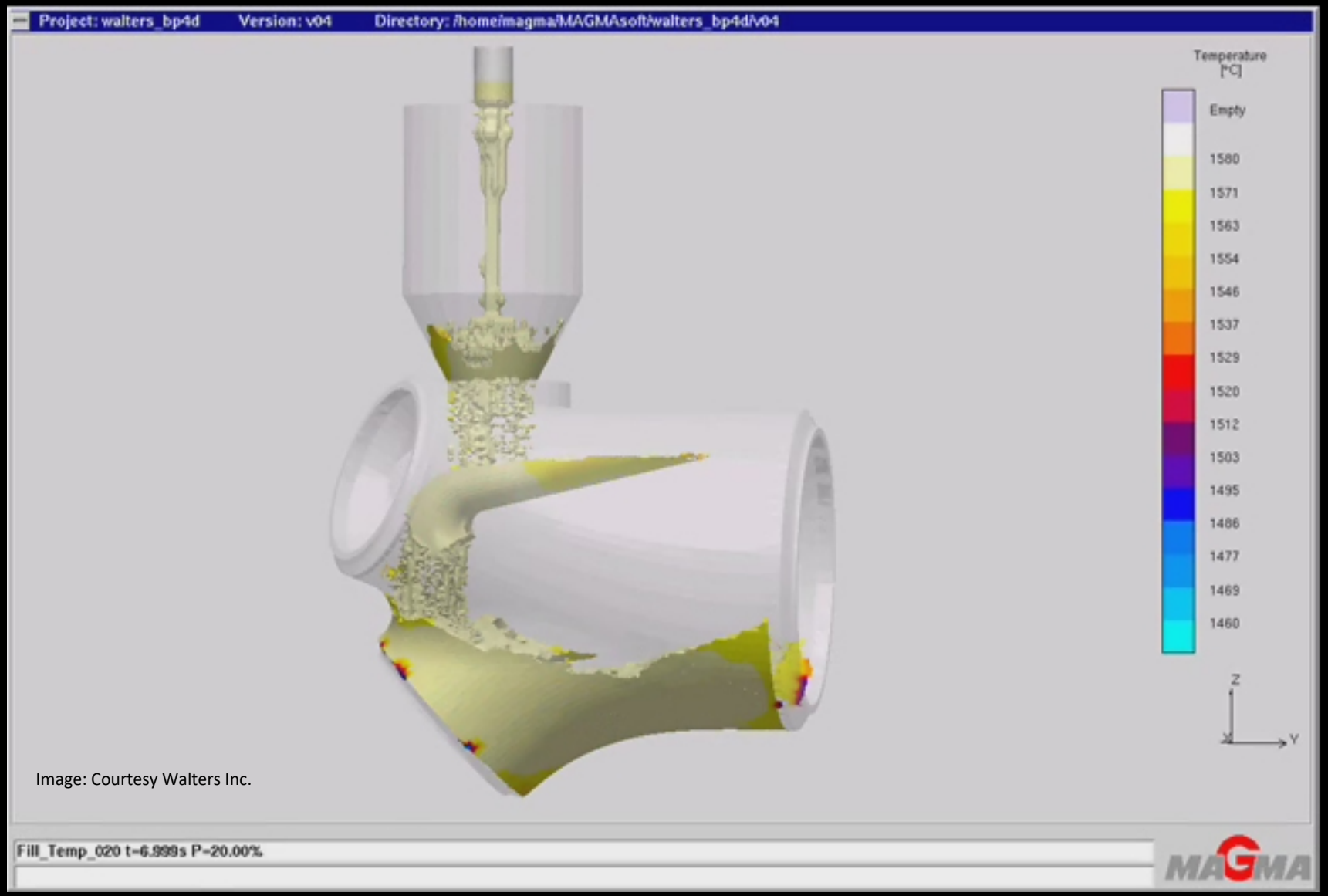


Image: Courtesy Walters Inc.

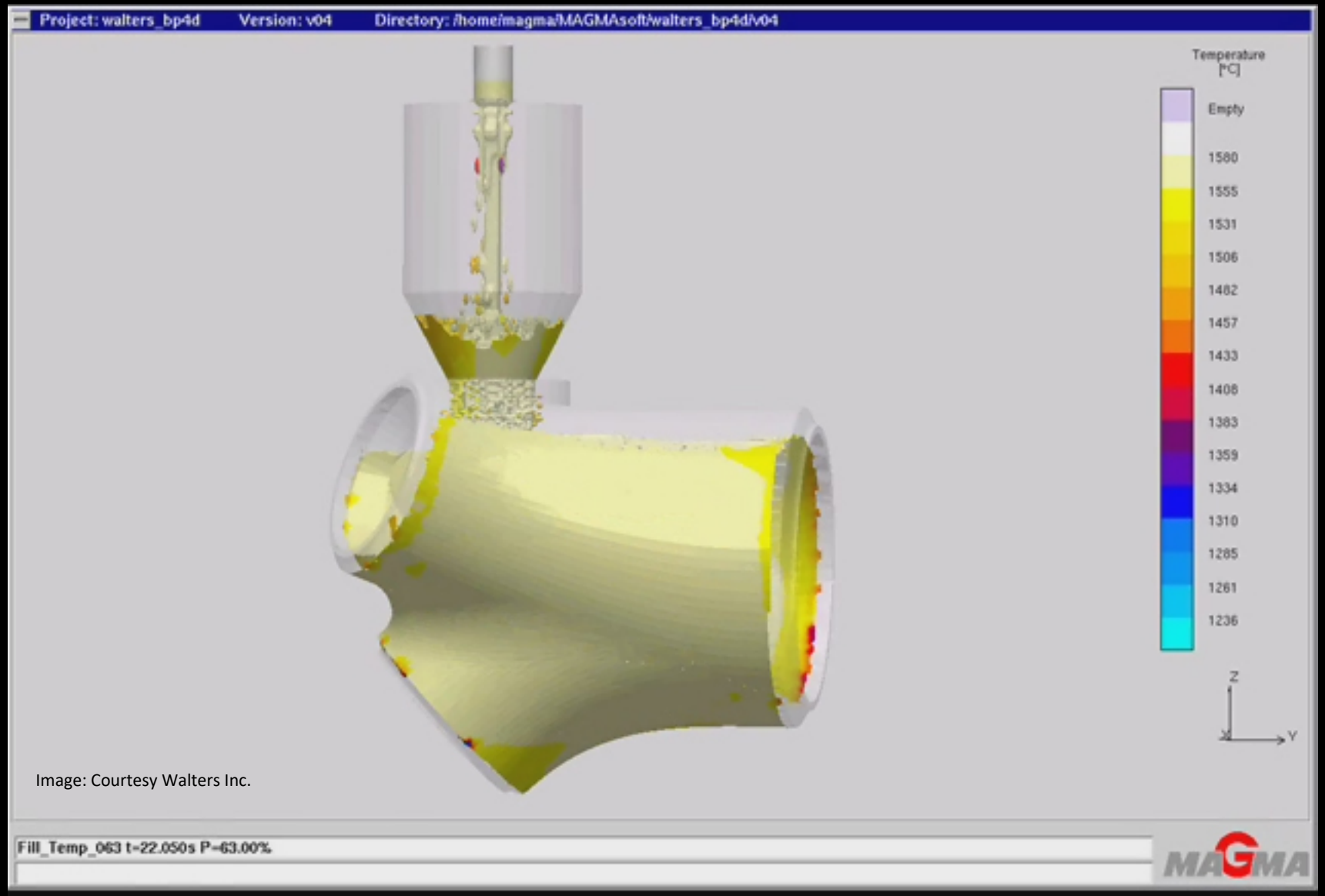


Image: Courtesy Walters Inc.

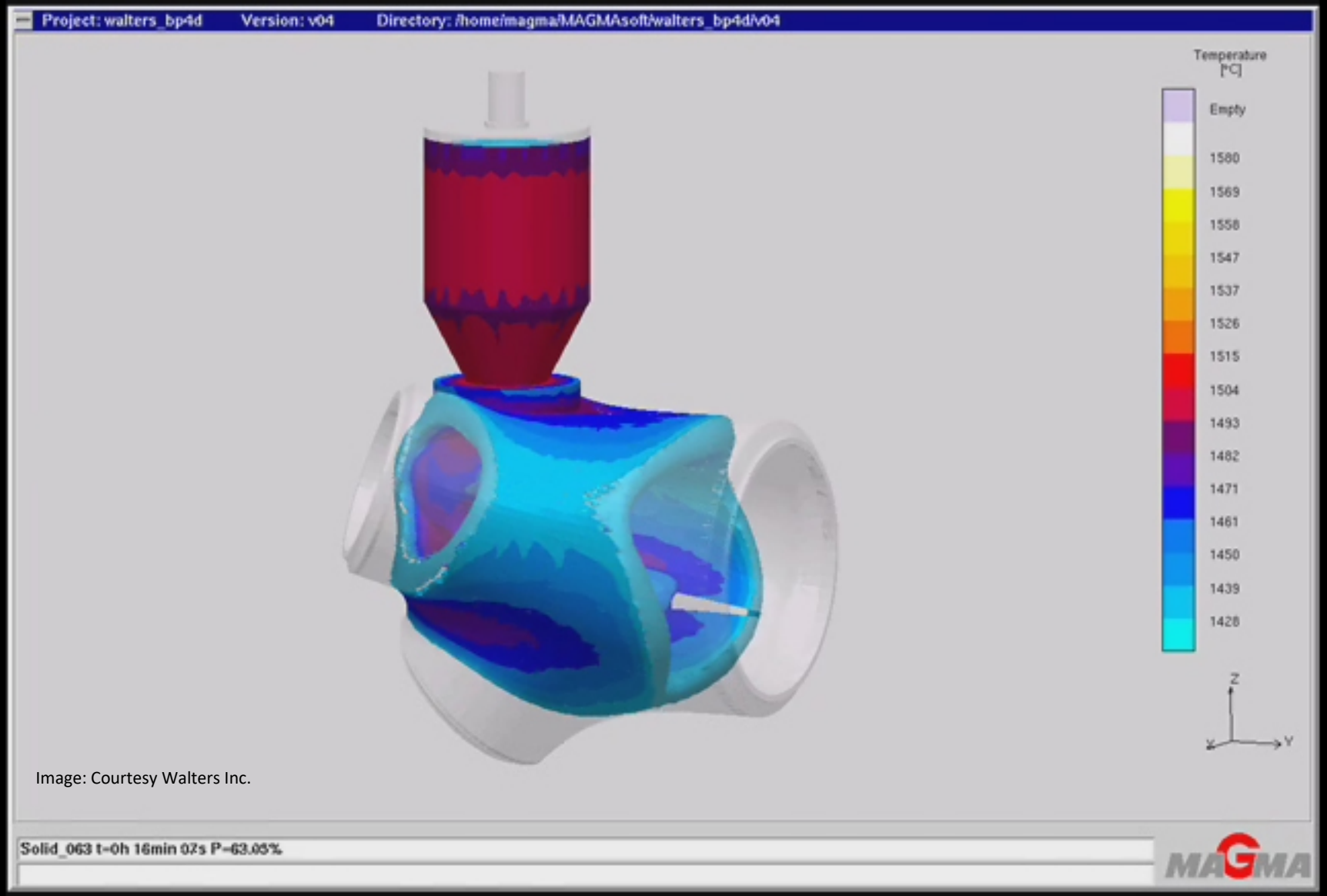


Image: Courtesy Walters Inc.

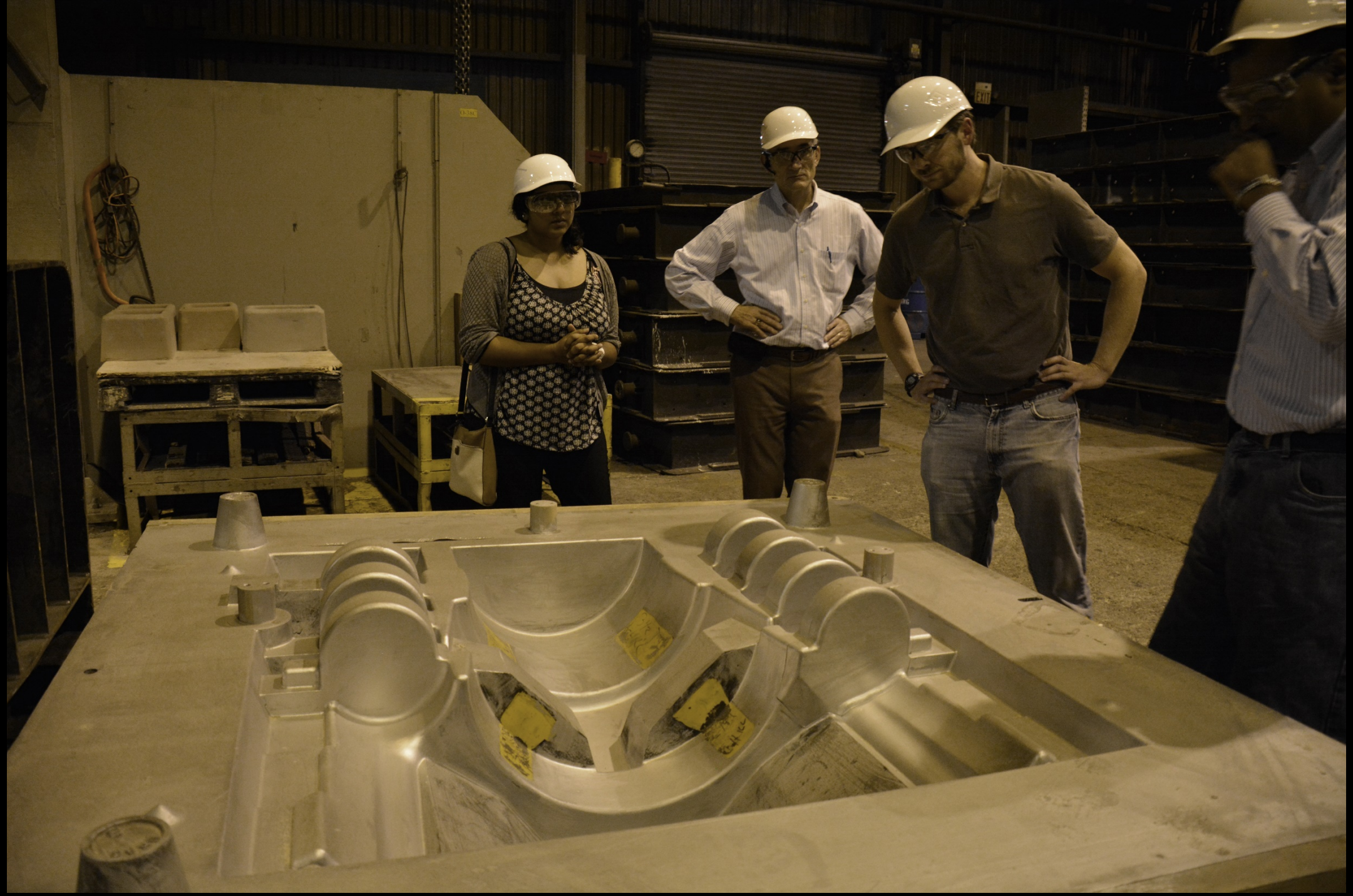
Image: Courtesy Walters Inc.

Image: Courtesy Walters Inc.

Upper end of branch is supported on a padded rest. A large steel scaffold was created to shore the project as not to damage the steel.

Notice that the physical connection is about 12” away from the main trunk, shifting the connection away from the point of highest stress in the connection.


Snorkel


EXIT


Por FAVOR
GACIAS
CAST CONNEX
HSC 168
ROM
8620
#76

Gerkan Marg & Partners

Hauptbahnhof Station | Berlin, Germany

TGV Station | Paris, France

Munich Olympic Stadium | Munich, Germany

John McAslan and Partners

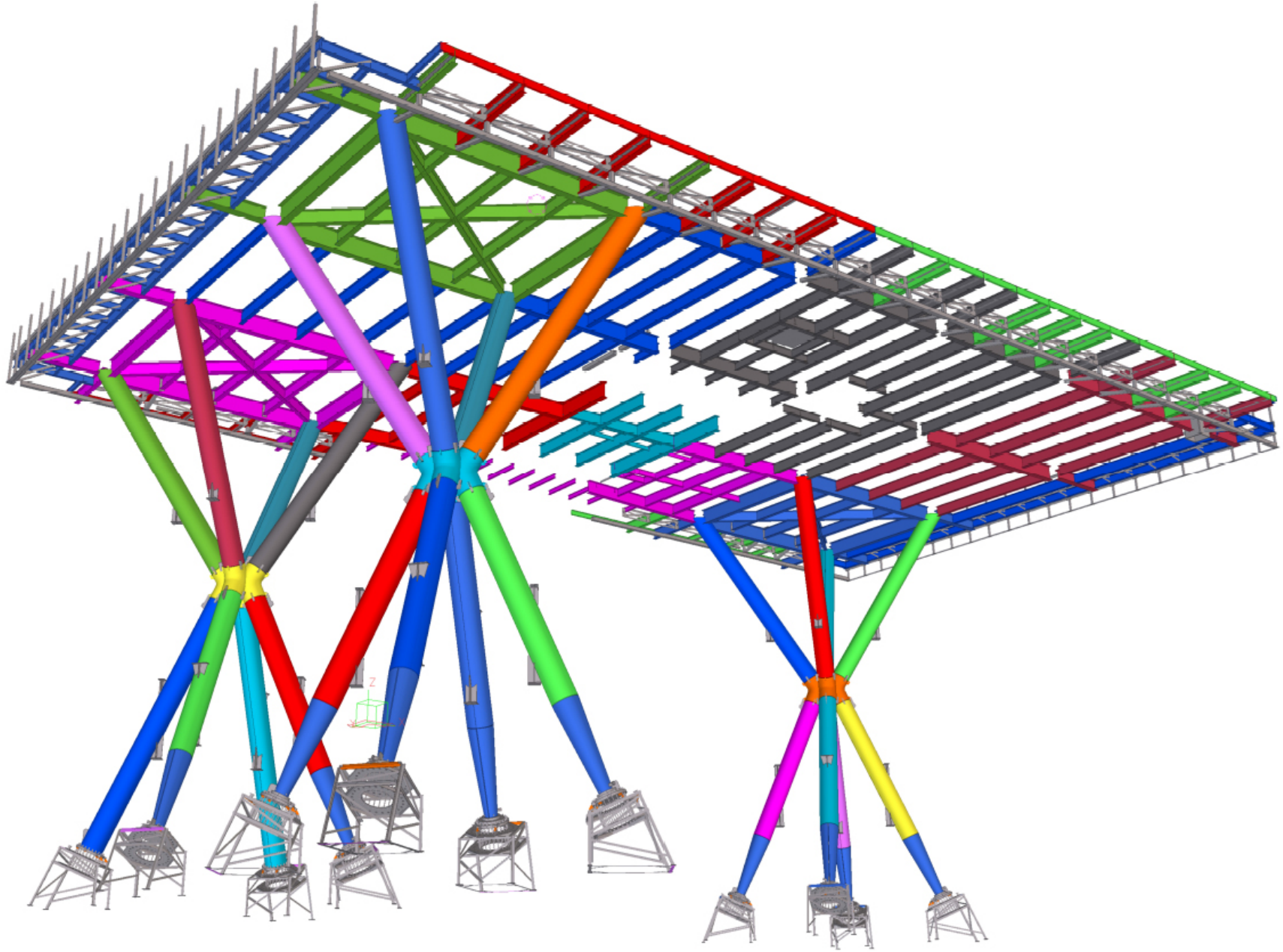
Kings Cross Station | London, UK

Yaz Hotel | Abu Dhabi, UAE

Charlotte International Airport | Charlotte, NC

Osaka, Japan


&Co Architects
QRC | Toronto, Canada



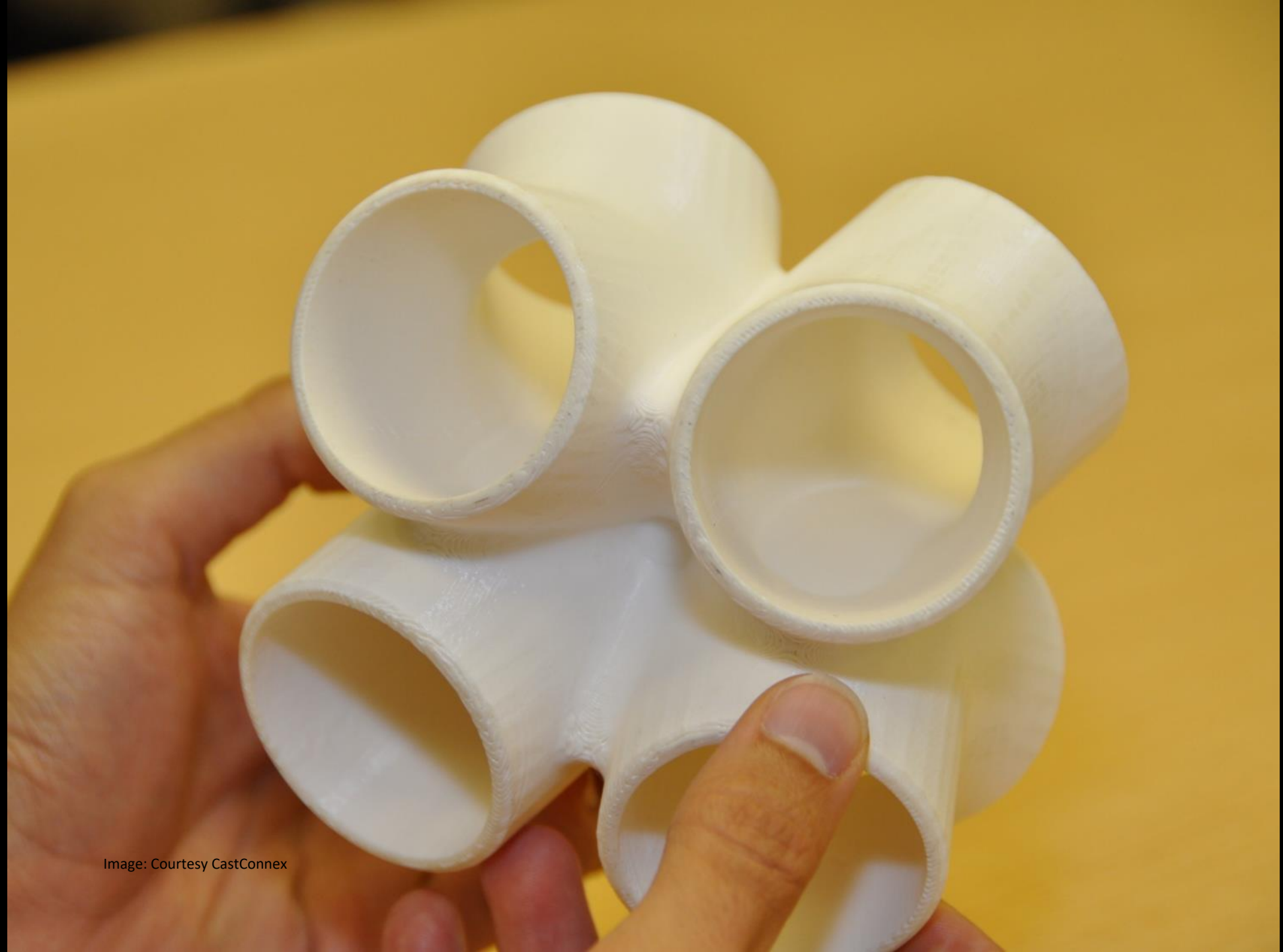


Image: Courtesy CastConnex

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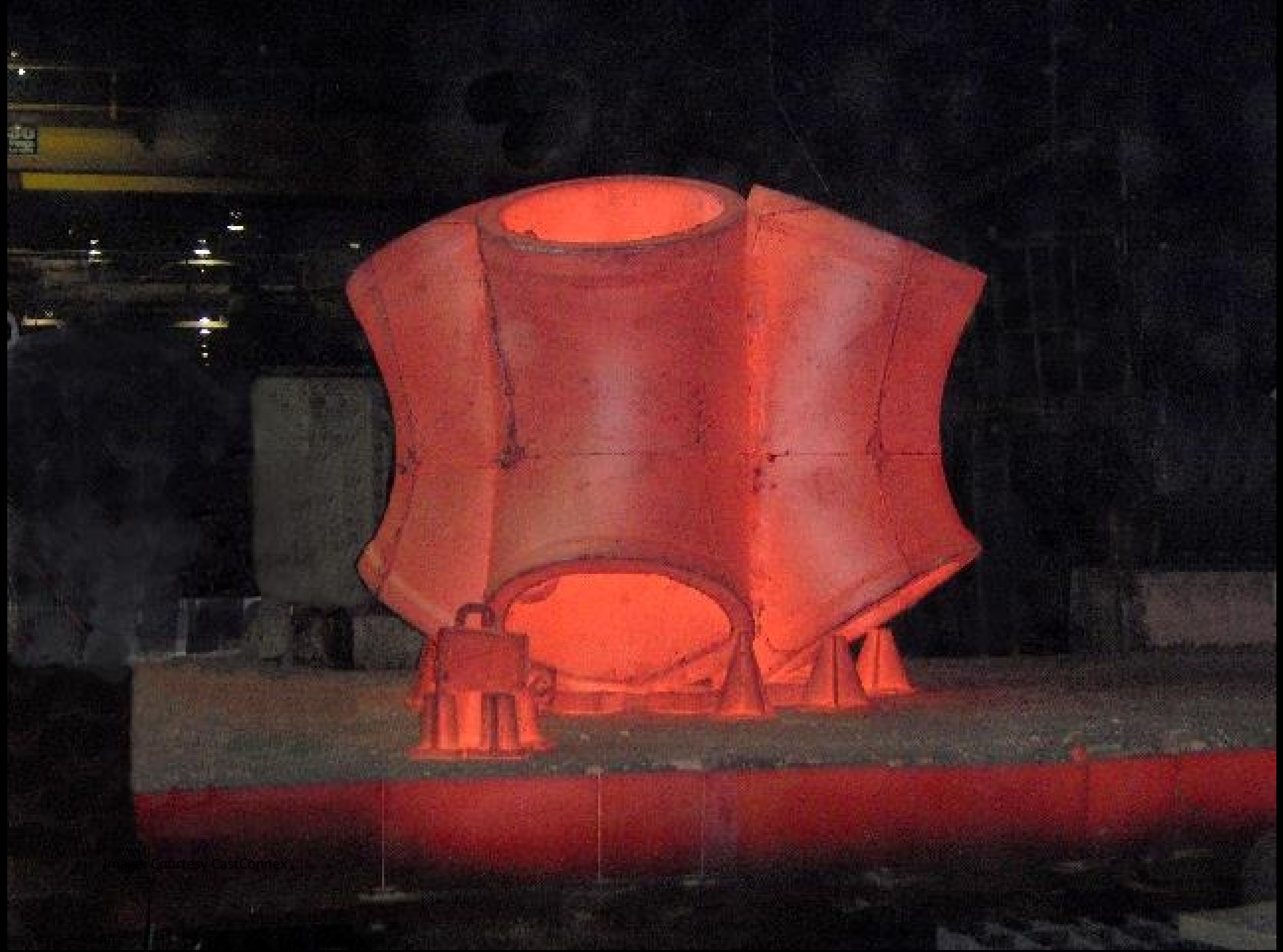
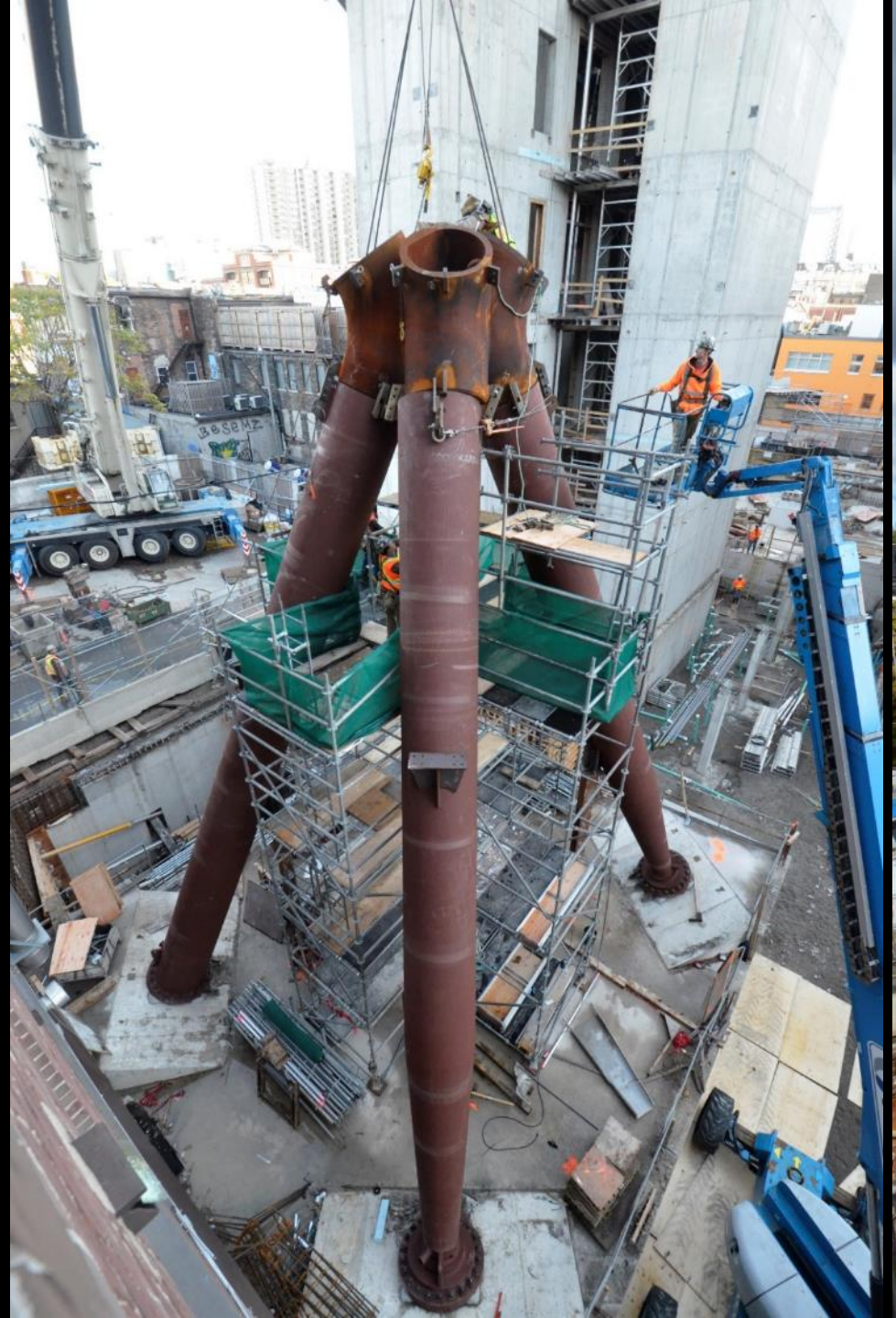


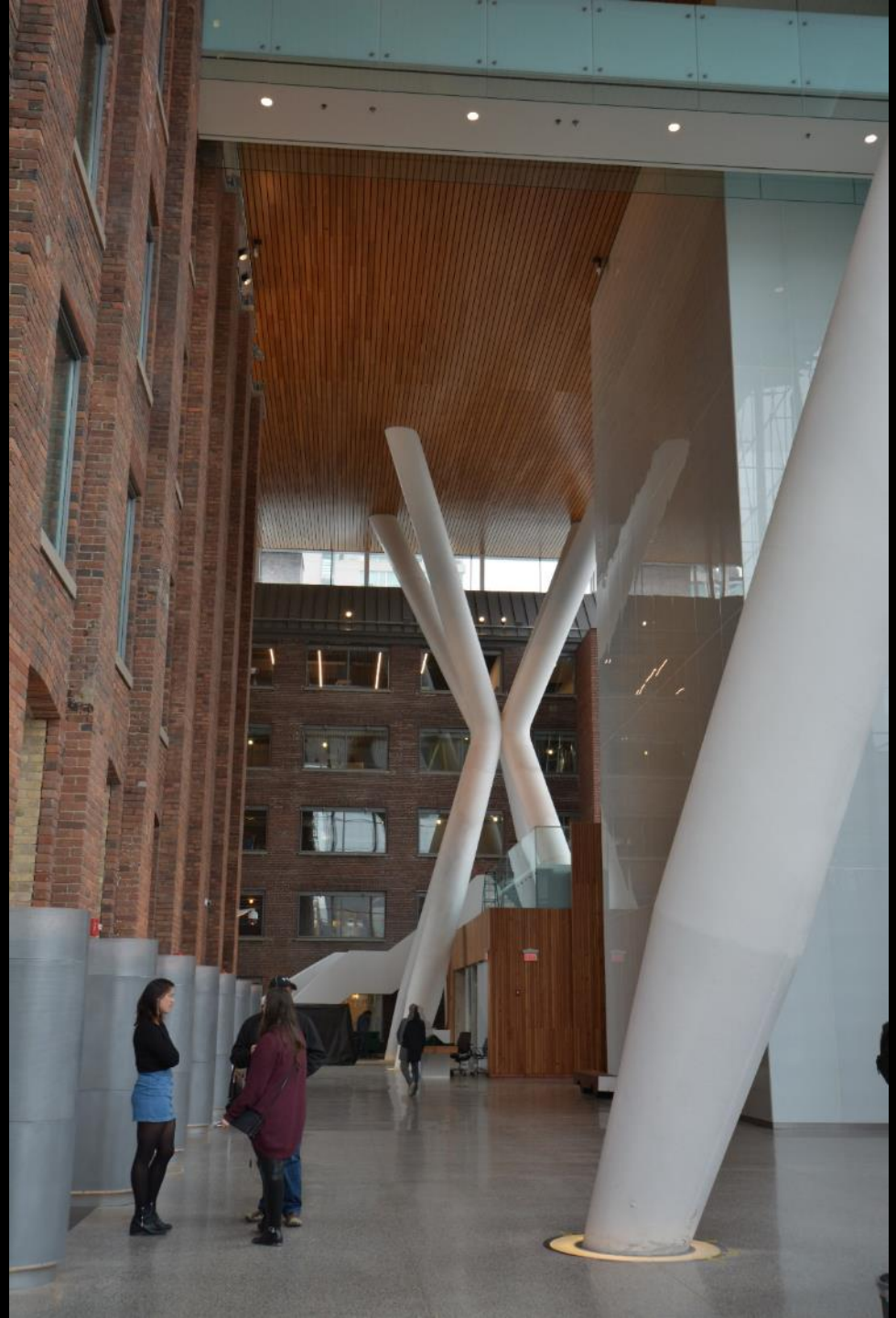
Image Courtesy CastConnex

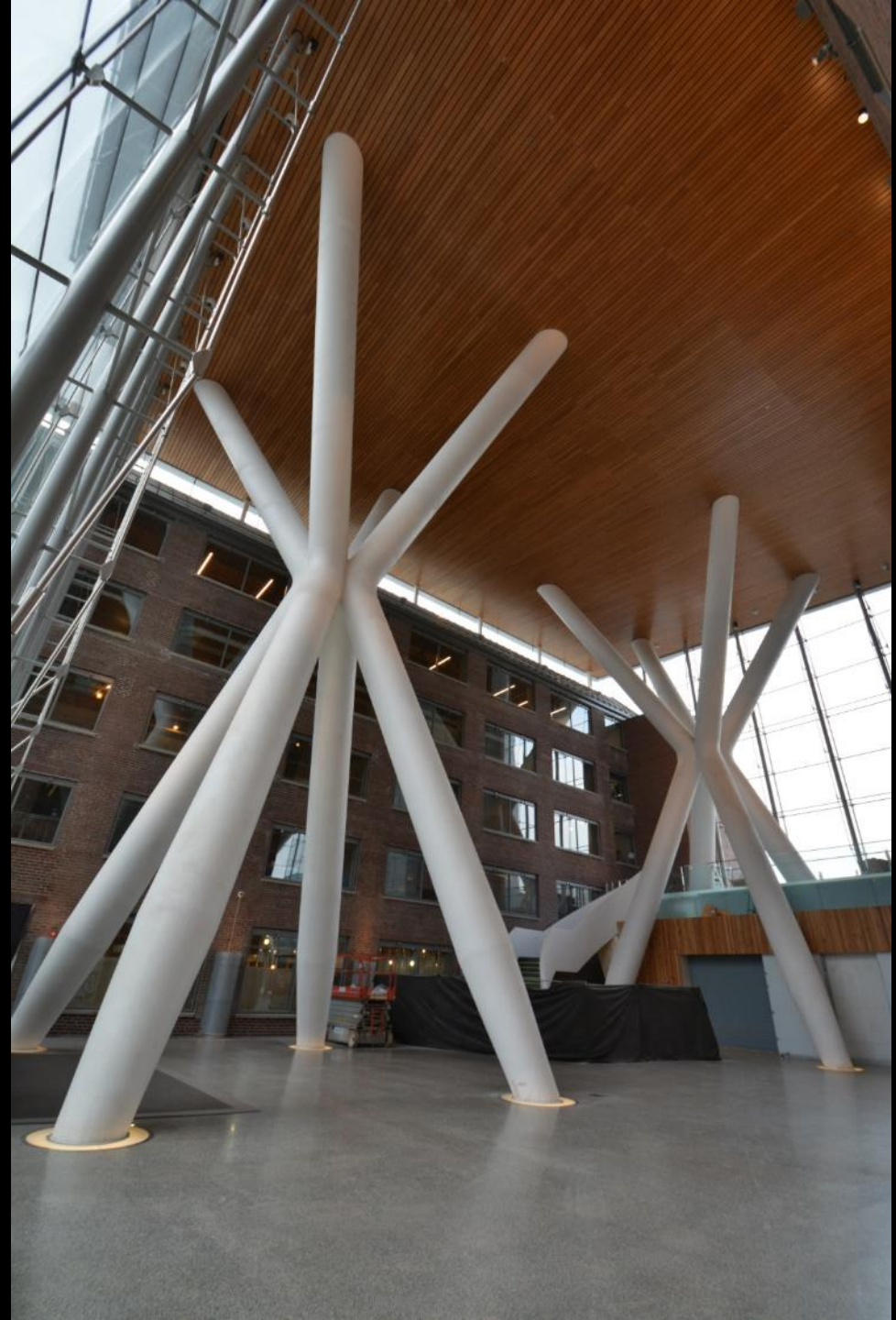

1
10 TON
12' B
9366


DANGER
EASTERN




VERDA
THIS IS LONDON





Rosales + Partners

Esplanade Pedestrian Bridge

Image: Courtesy CastConnex

Image: Courtesy CastConnex

Image: Courtesy CastConnex


30K 100 PSI
SCREW JACKS

Pin Connectors

Image: Courtesy CastConnex

Image: Courtesy CastConnex

Renzo Piano

Whitney Art Museum | New York City

Image: Courtesy CastConnex

Brisbane International Airport | Brisbane, Australia


PHILIPS

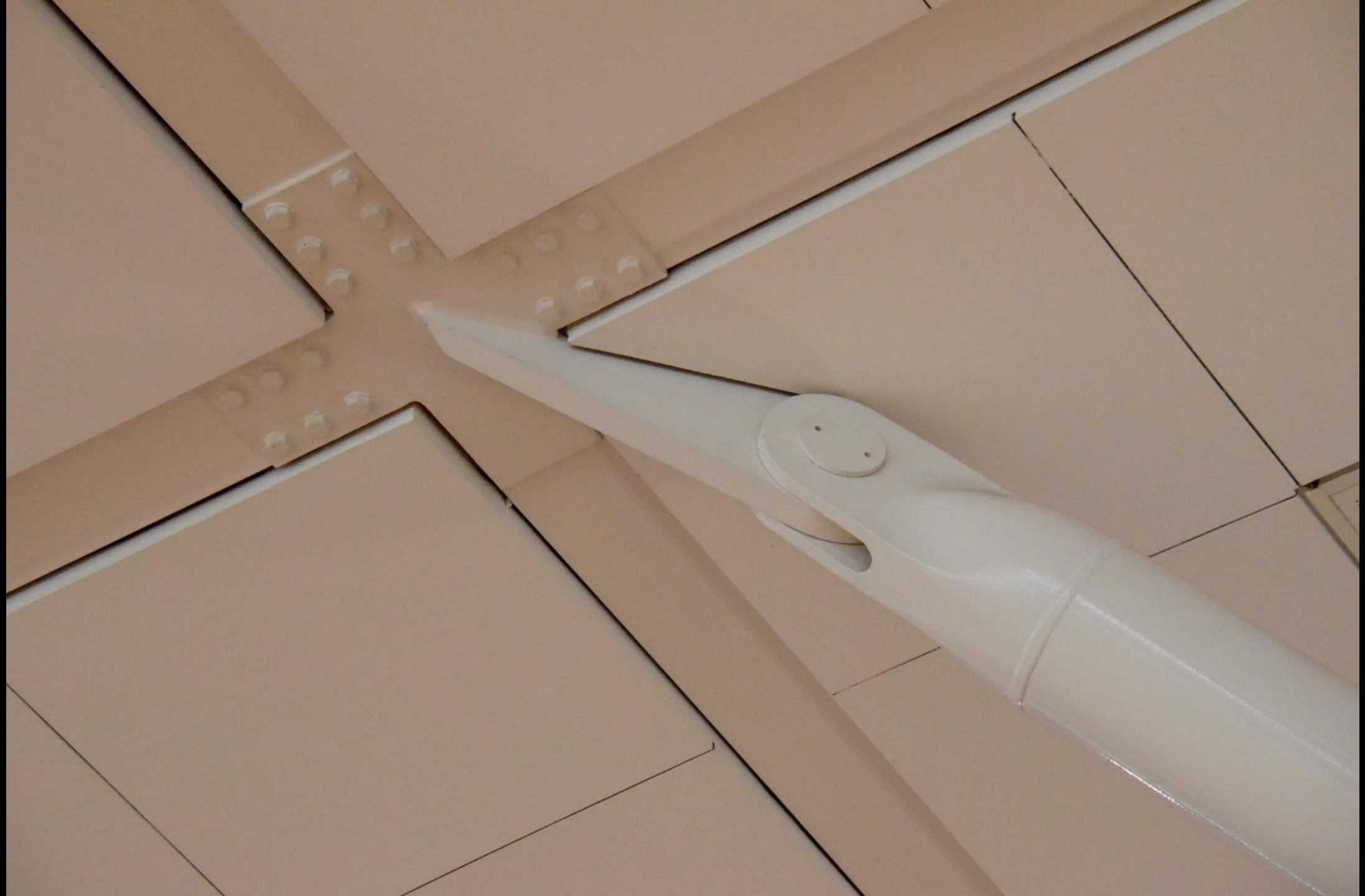


Image: Courtesy CastConnex

Image: Courtesy Jonathan Edelman

Image: Courtesy CastConnex

Amherst Press and Skybox

Image: Courtesy CastConnex

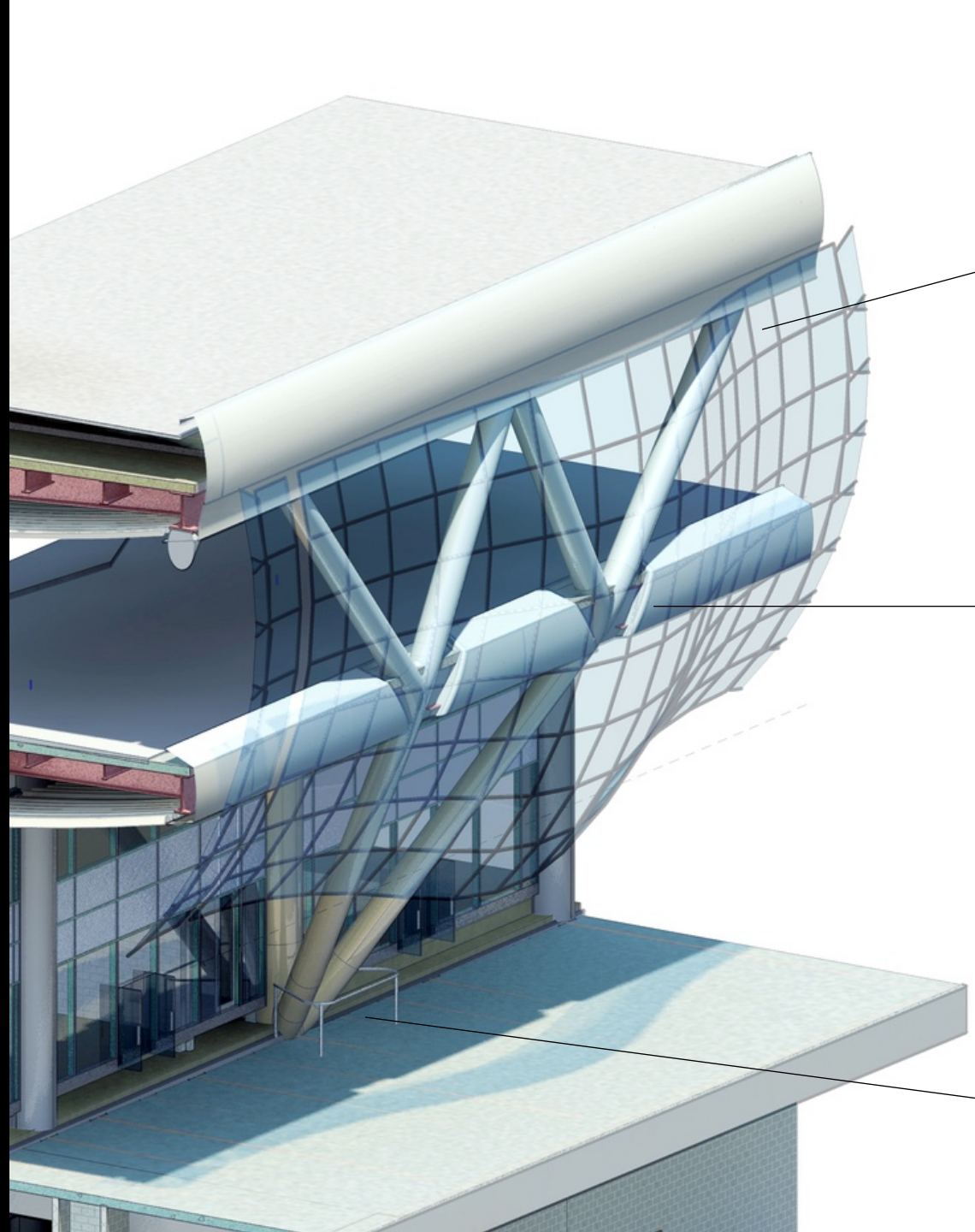
Image: Courtesy CastConnex

Pelli Clarke Pelli Architects

Transbay Center | San Francisco

Image: Courtesy CastConnex

Image: Courtesy CastConnex



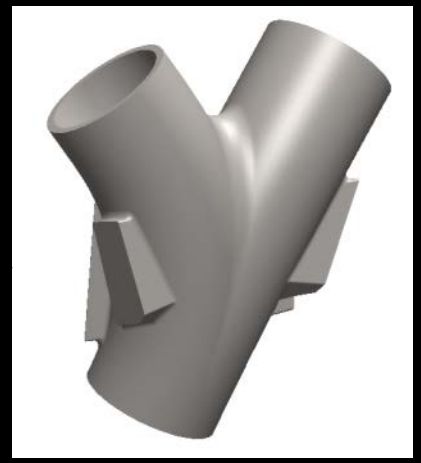


Image: Courtesy CastConnex

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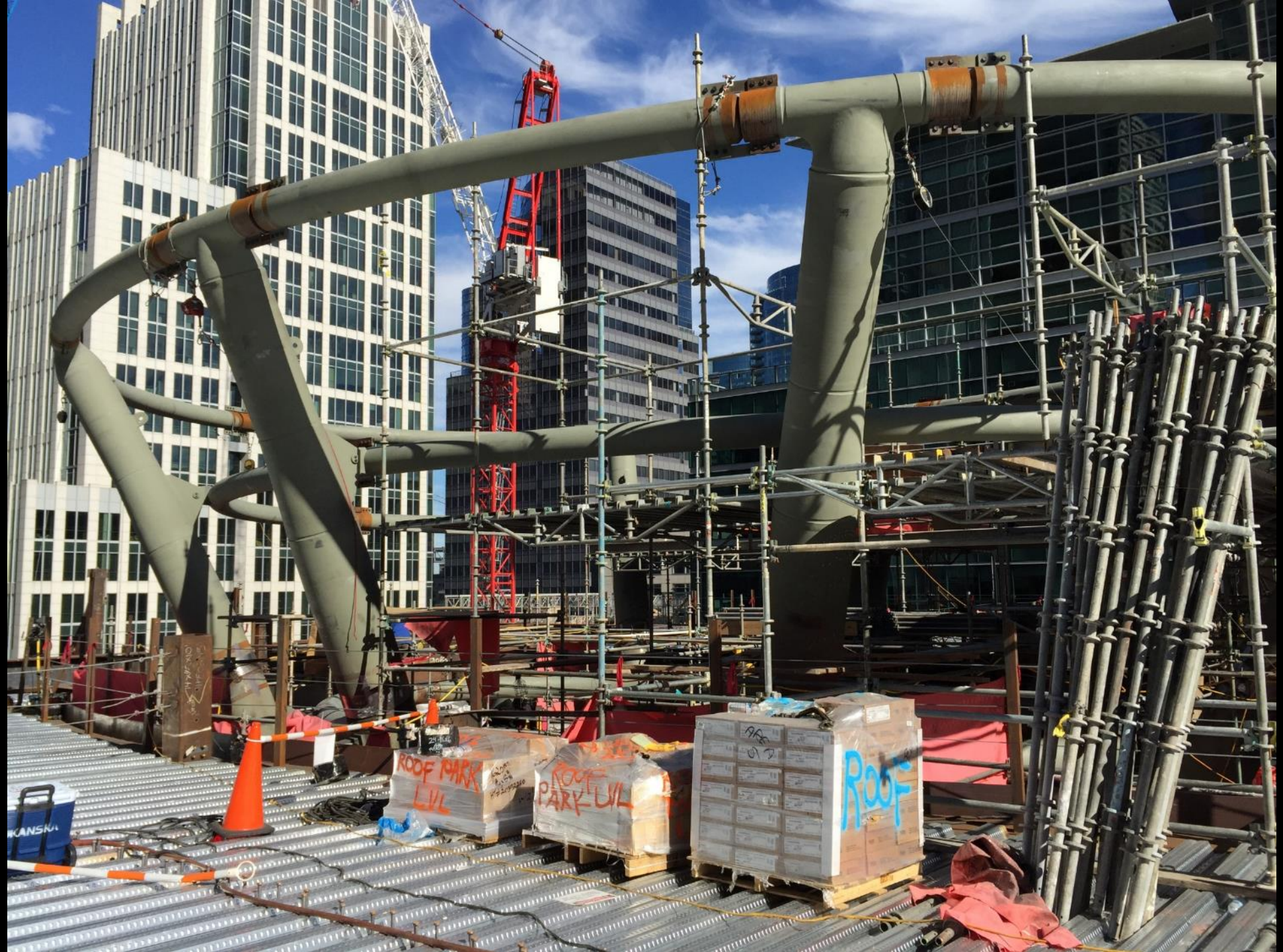
ROOF PARK LVL
ROOF PARK LVL
ROOF


Splice moved away from
point of load transfer.


9082

56
H05
4-02

SOM

Image: Courtesy SOM

University of Connecticut Innovation Partnership Building

Image: Courtesy CastConnex

Image: Courtesy CastConnex

University of Massachusetts-Amherst (Integrated) Design Building

Image: Alexa Schreyer


Image: Courtesy CastConnex

Image: Courtesy CastConnex

Photo: Alexa Schreyer

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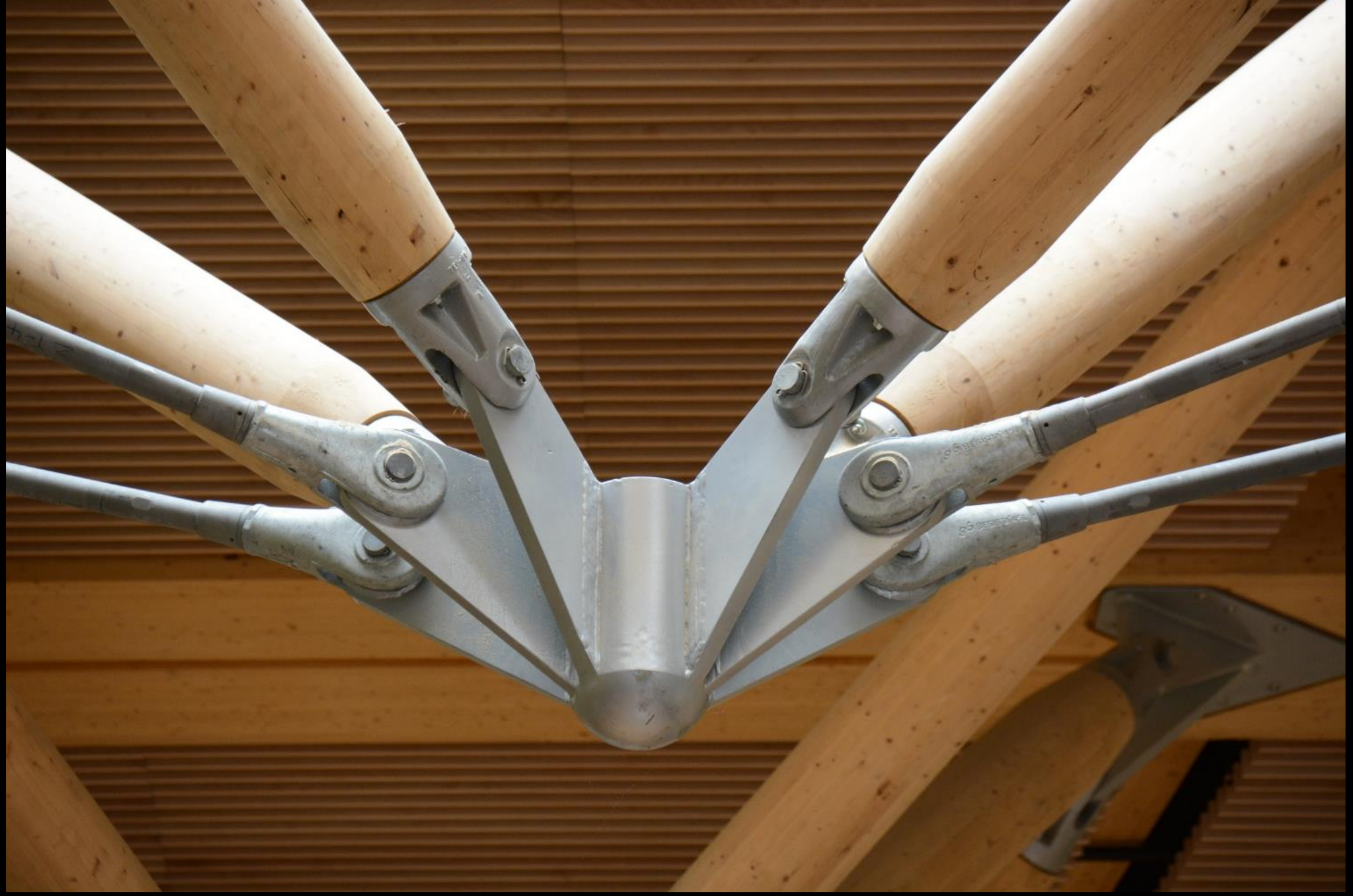
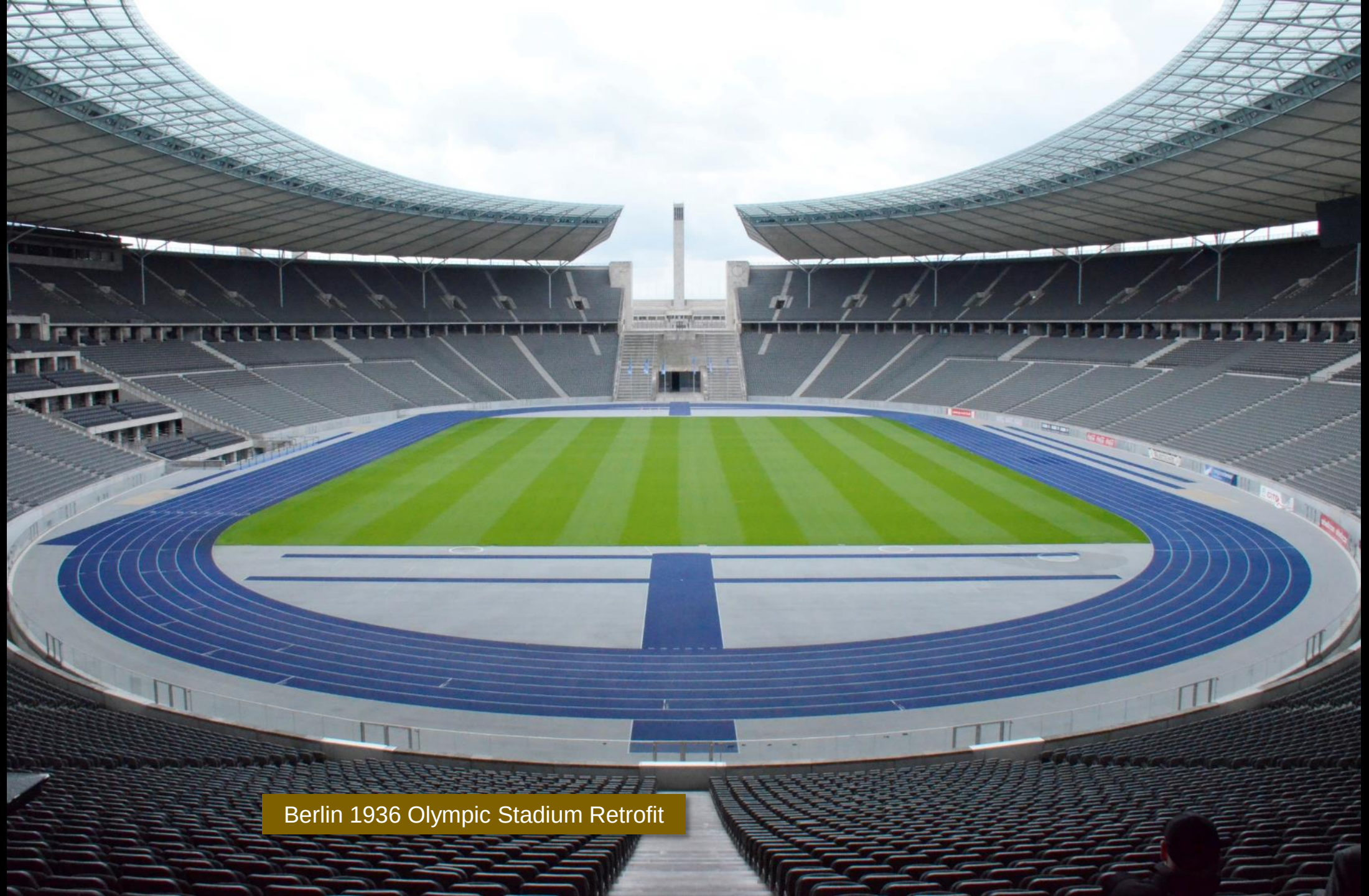



Berlin 1936 Olympic Stadium Retrofit


Berlin 1936 Olympic Stadium Retrofit

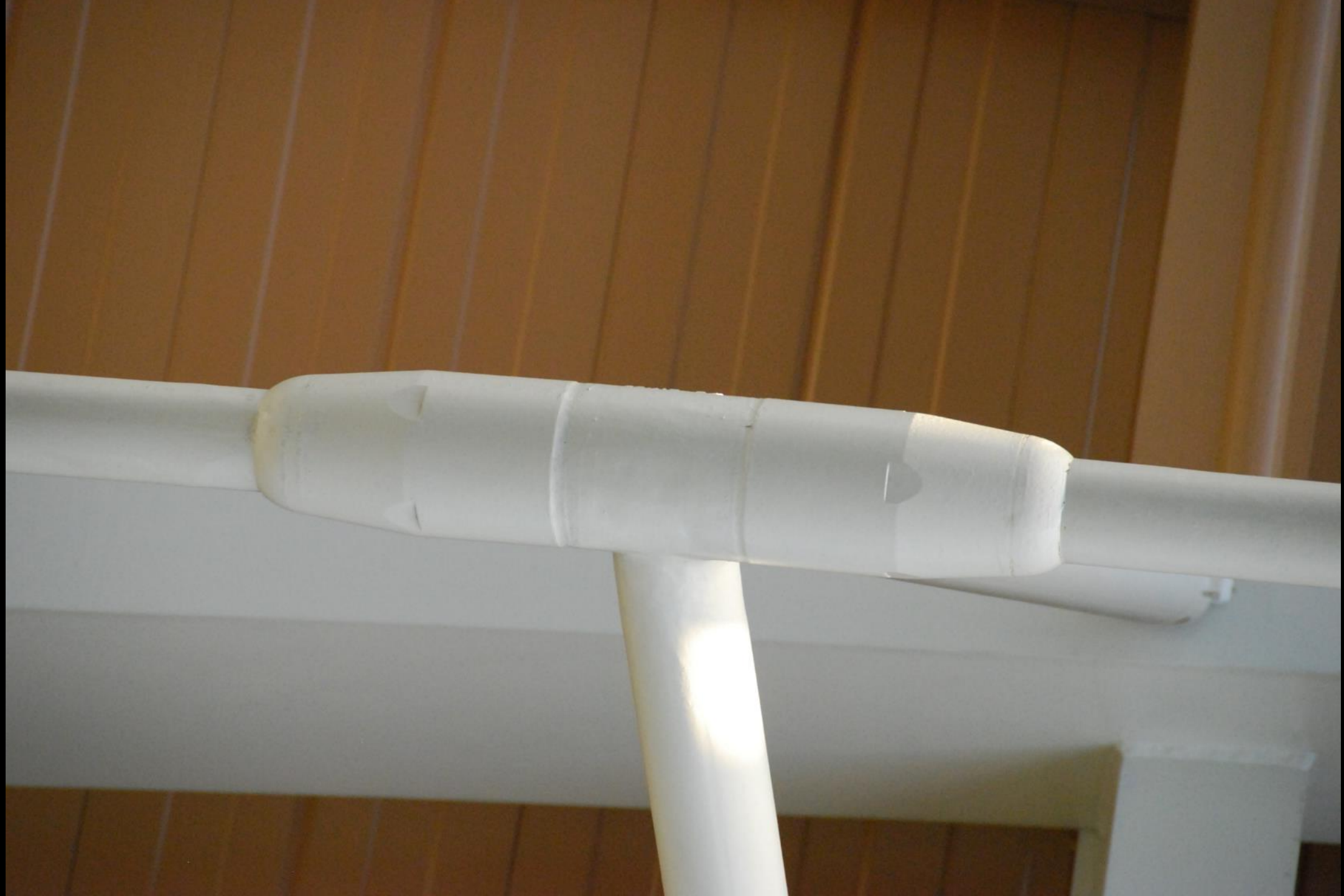
PAWS Centre, University of Alberta, Edmonton


UNIVERSITY OF
ALBERTA

The hard to see back side shows the use of simple cotter pins for the connection.

University of Alberta Pedestrian Bridge, Edmonton

Shanghai Airport, China



The Leaf at Diversity Gardens, Winnipeg, Manitoba

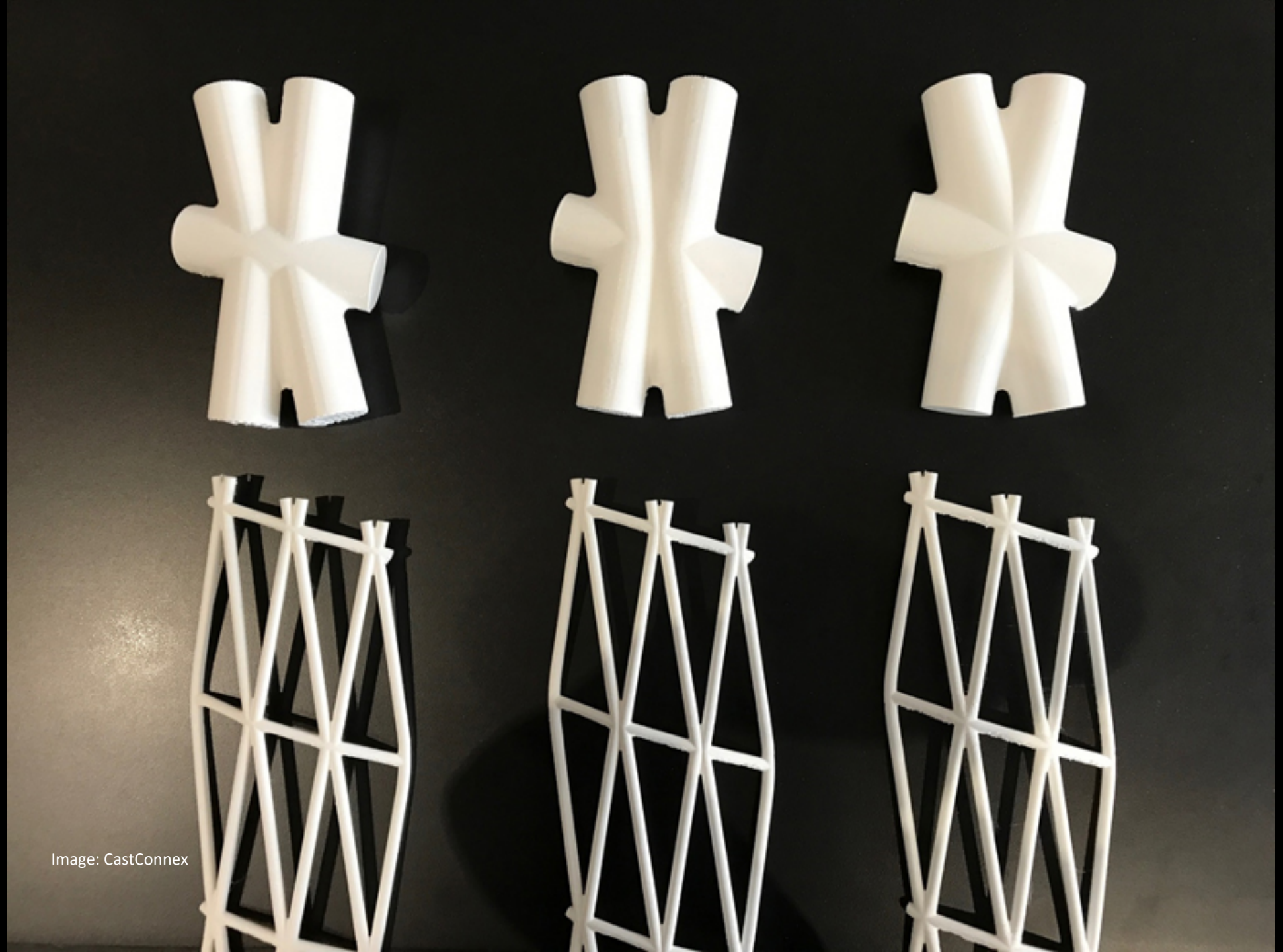


Image: CastConnex

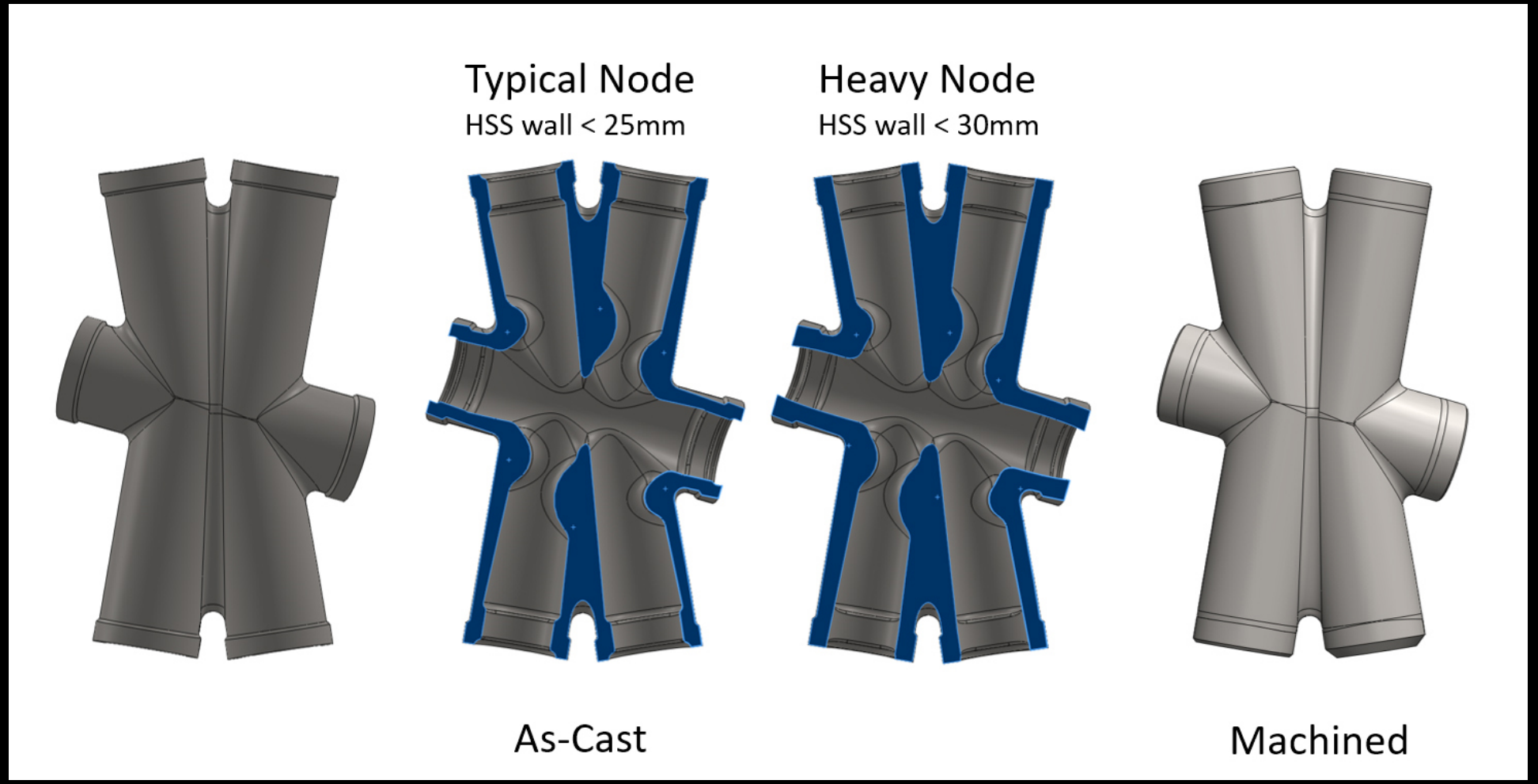


Image: CastConnex

Image: CastConnex

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Image: CastConnex

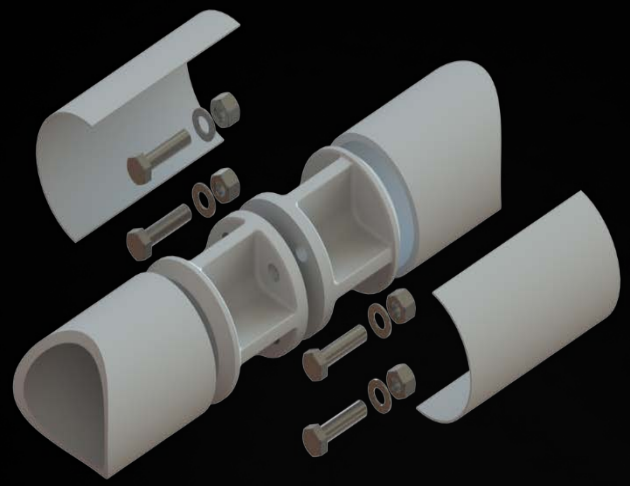
Image: CastConnex


HI-RISE
CARPENTRY LIMITED

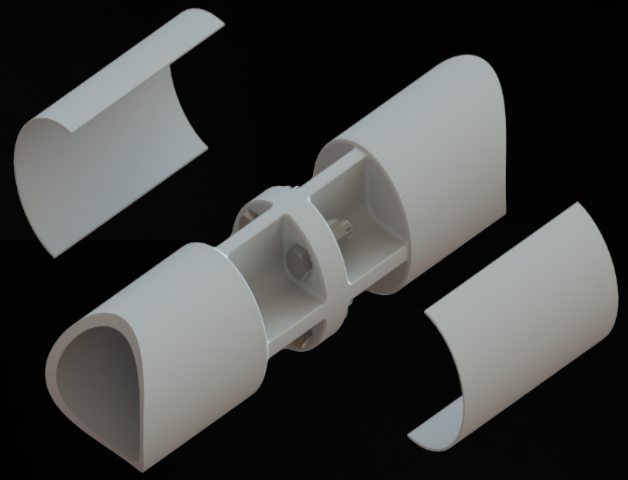
The project called for this to be AESS2… which allows for welded connections but precludes any grinding.

CastConnex had suggested the use of their Diablo Connector to make discreet or hidden connections between the nodes and the HSS tubes.

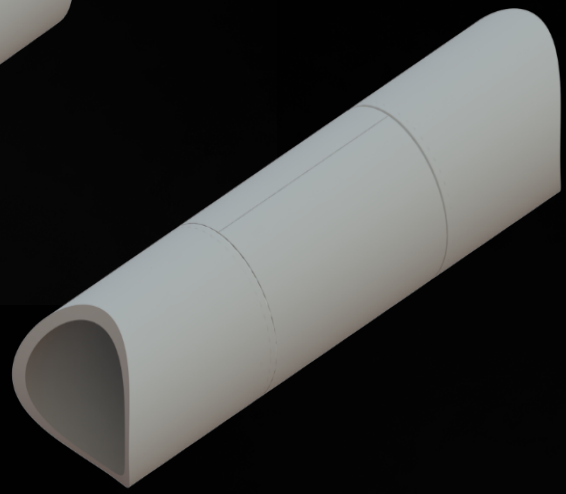
This product can result in a discreet connection if the cover plate option is not used.



1



2



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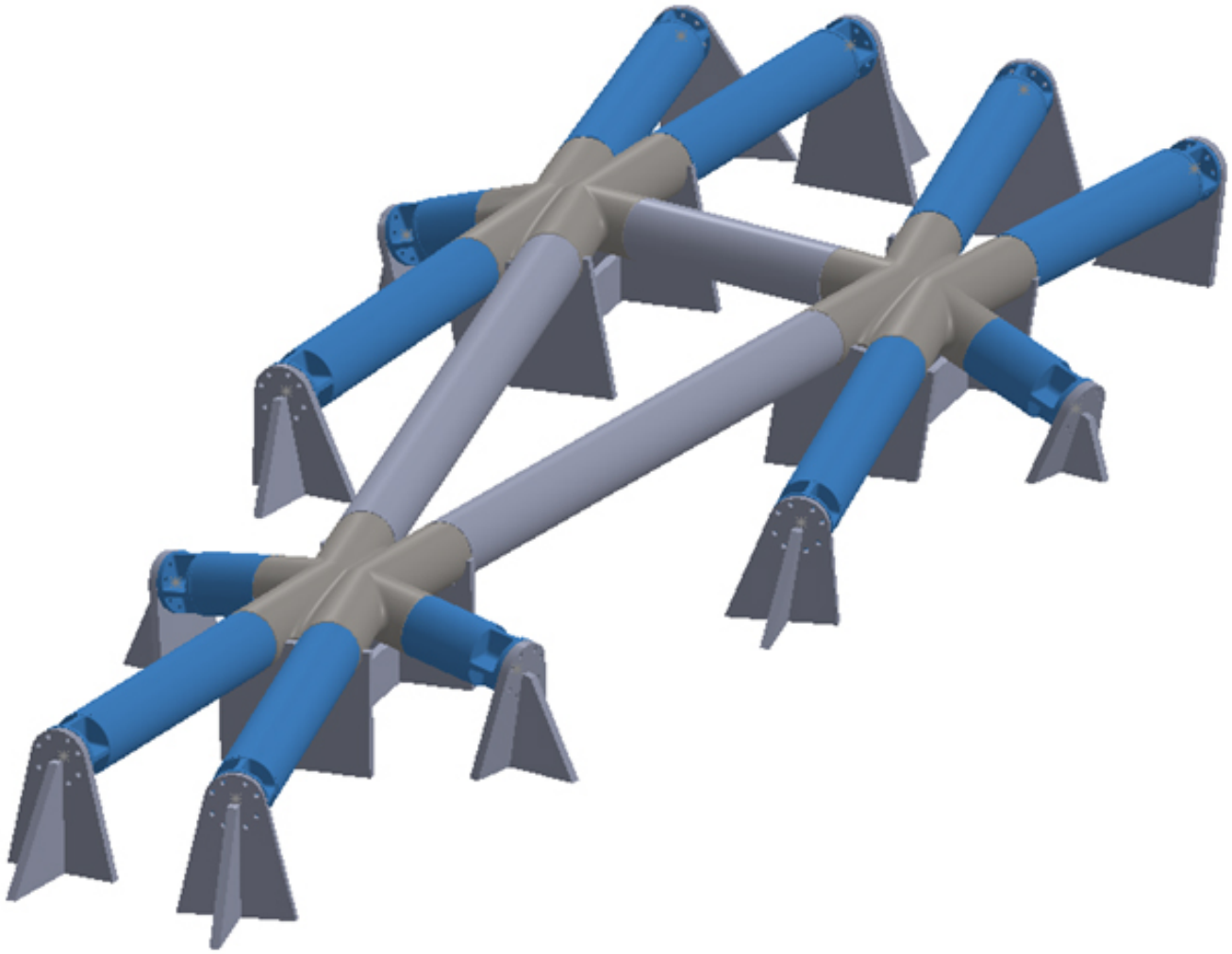
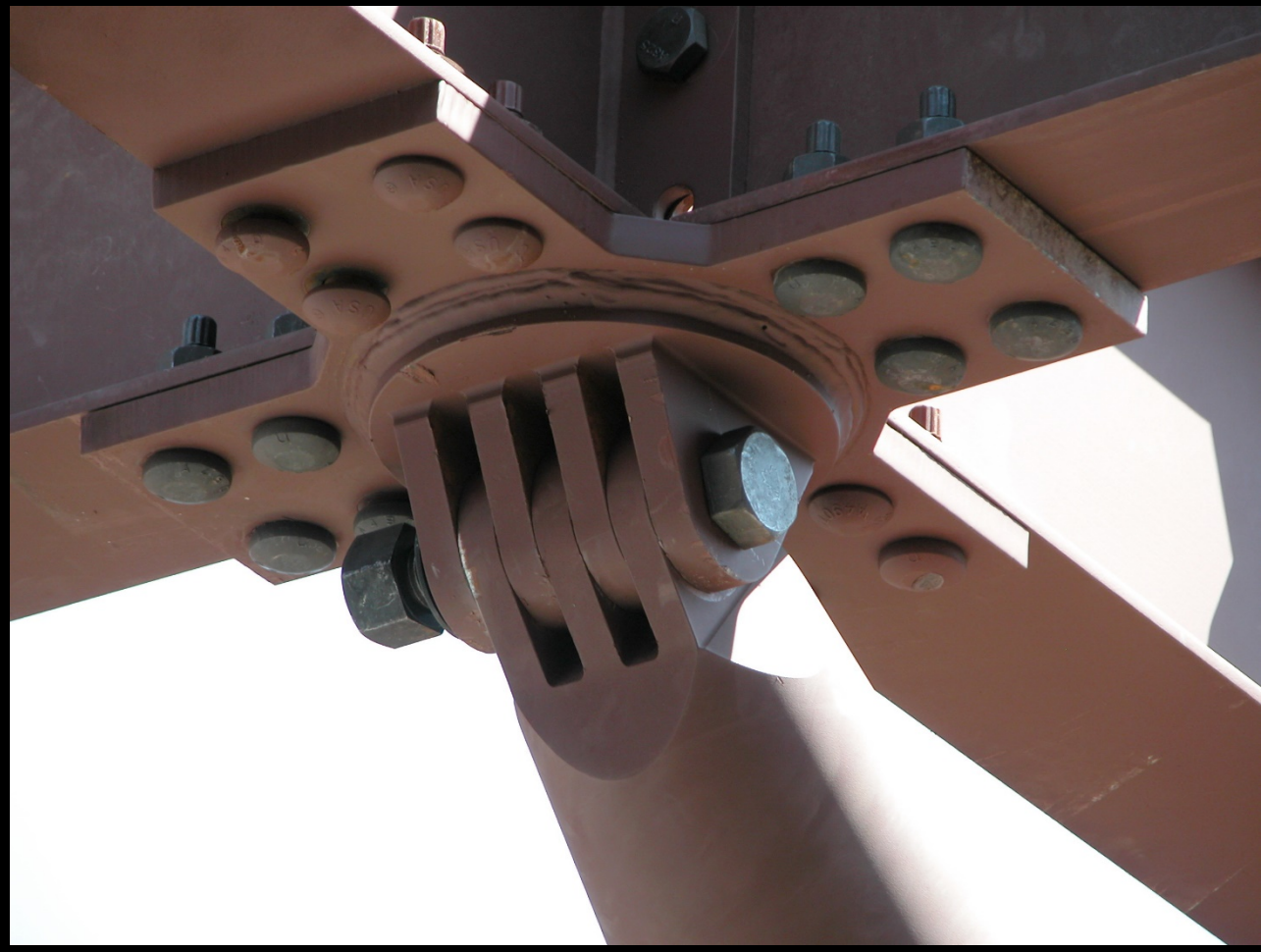


Zurich International Airport | Zurich, Switzerland

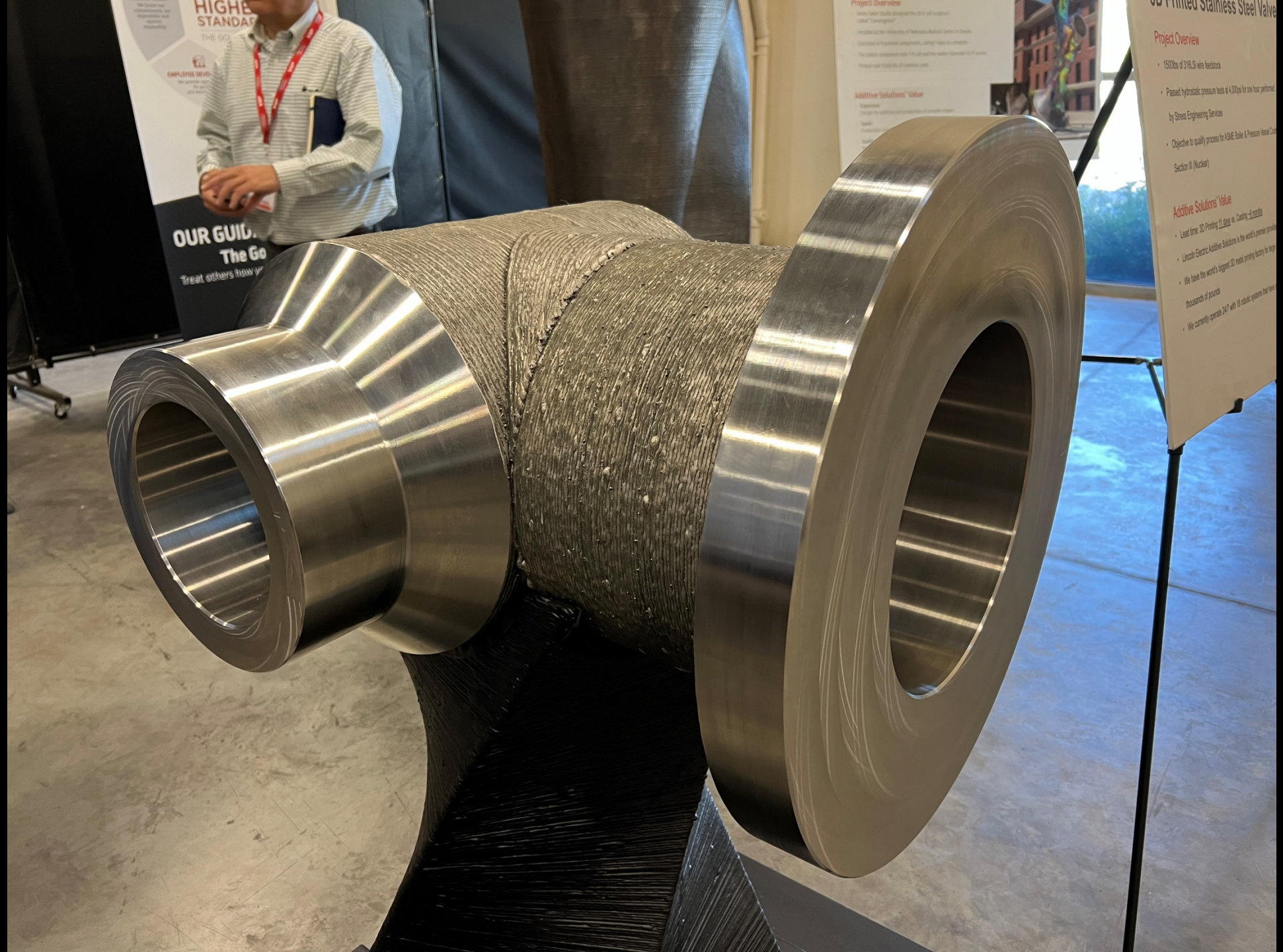
Hmm. Is this a casting or is it a large machined piece of solid steel.



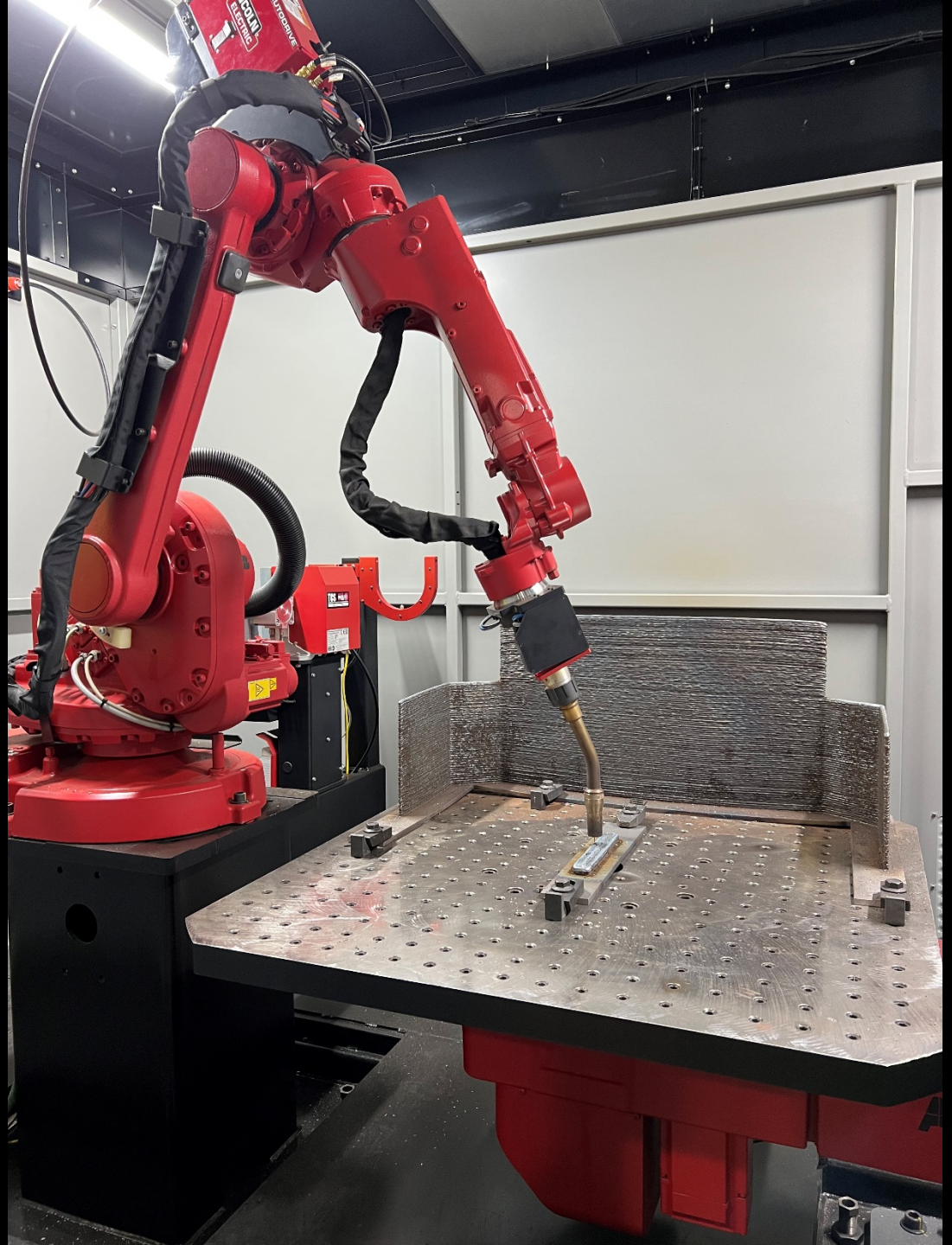
Some elements may be of a particular shape that machining out of solid steel makes sense.

Additive Manufacturing

- Used for special connections
- Is done with a 5 axis robot attached to a welding arm
- Used to replace or replicate broken parts that cannot otherwise be duplicated
- Surface can be machined smooth using the same robot


Project Overview
Additive Solutions' Value


LINCOLN ELECTRIC
SCULPTPRINT RND
LINCOLN ELECTRIC



AISC AM Pedestrian Bridge

Project Objectives

1. Demonstrate the opportunities that AM provides the structural steel industry
2. Demonstrate how AM integrates into traditional structural steel design and fabrication
3. Demonstrate acceptance and approval process for an AM component
4. Generate excitement within the industry
5. Create preliminary specification language

Project Scope

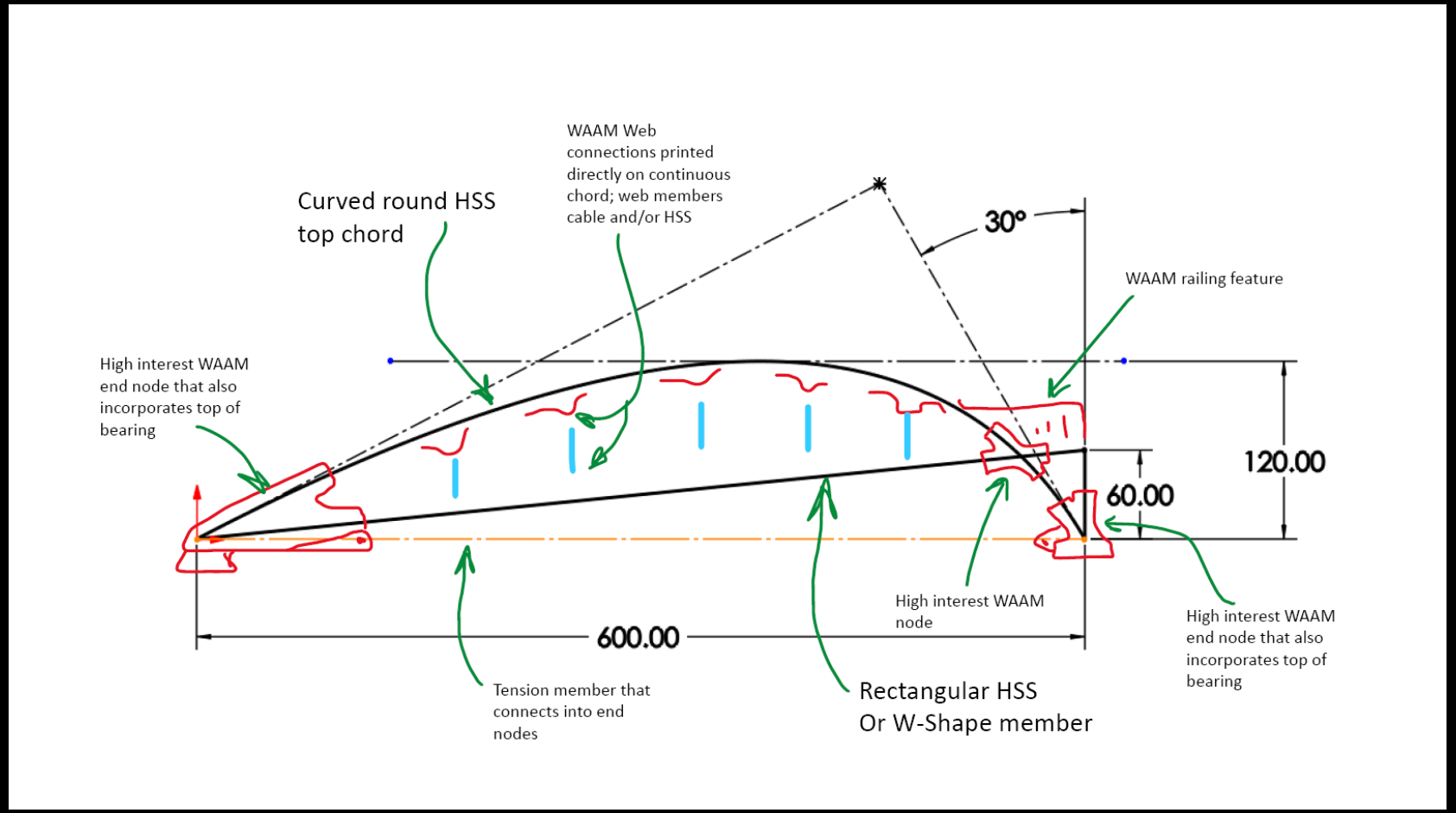
- Dimensional constraints
  - Shippable – 50 ft long x 8.5 ft wide x 8.5 ft tall
  - Longer than MX3D bridge (41 ft)
- Merge AM components with traditional rolled steel products
  - AM nodes with rolled steel members
  - Bolted and welded connections
- Highlight unique features possible with AM
  - Range of surface finishes (AESS categories)
  - Topology optimization
  - Cable elements
- Facilitate an interactive user experience that gets people excited
  - Elevated for viewing unique features
  - Instagramable

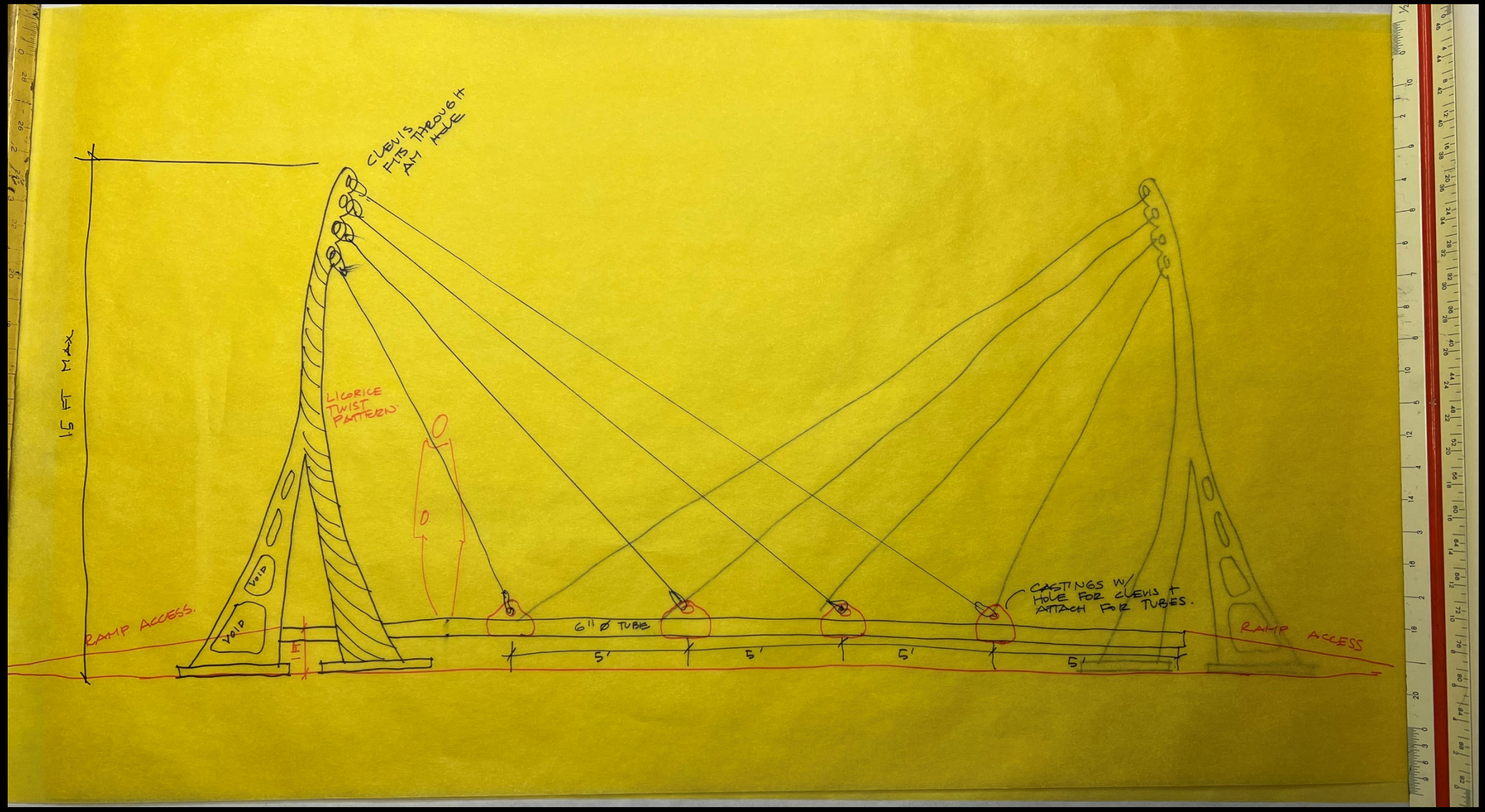
Timeline and Budget

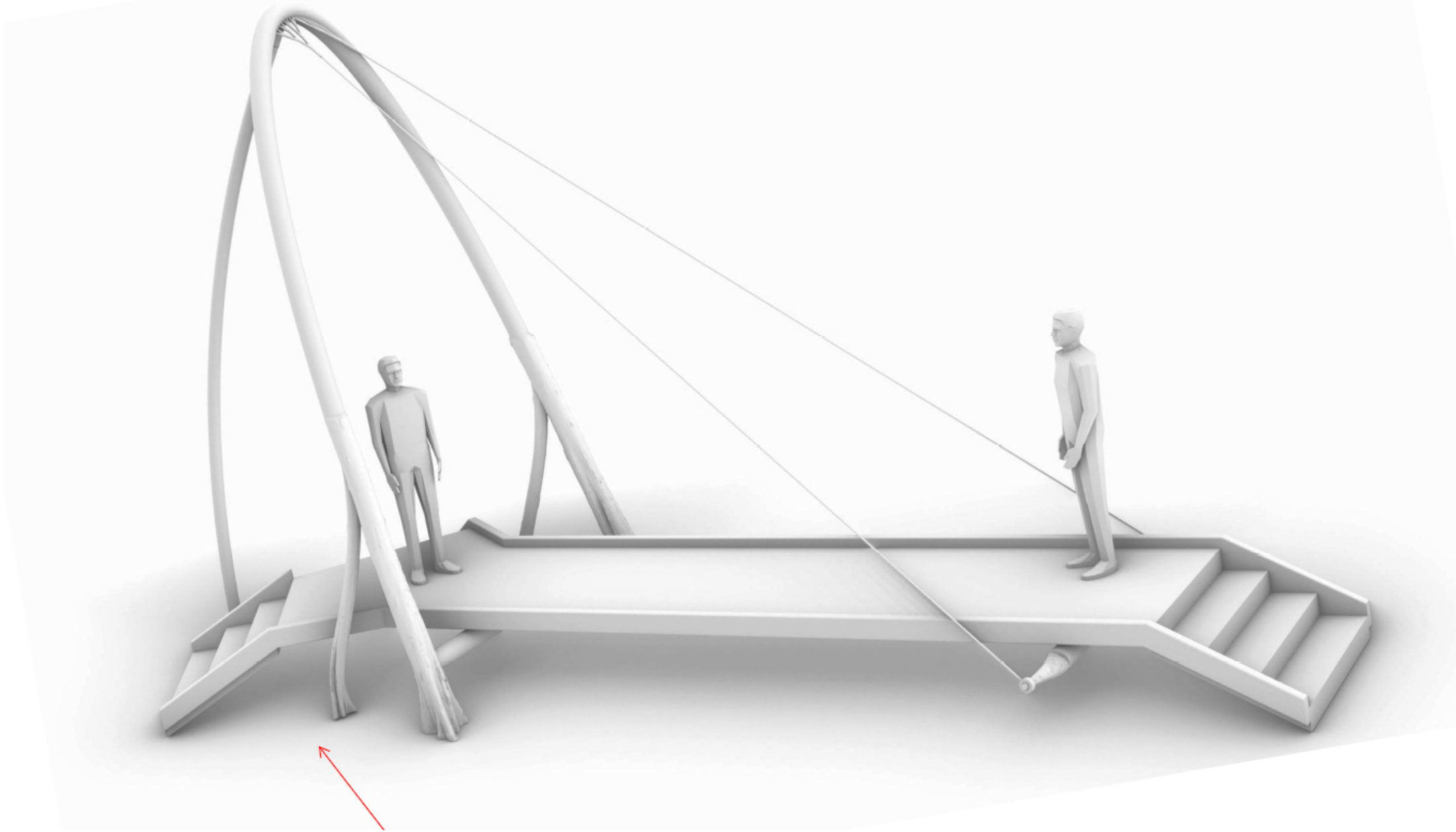
- Timeline: NASCC 2025 – Louisville, KY
- Rough order of magnitude cost: $250,000

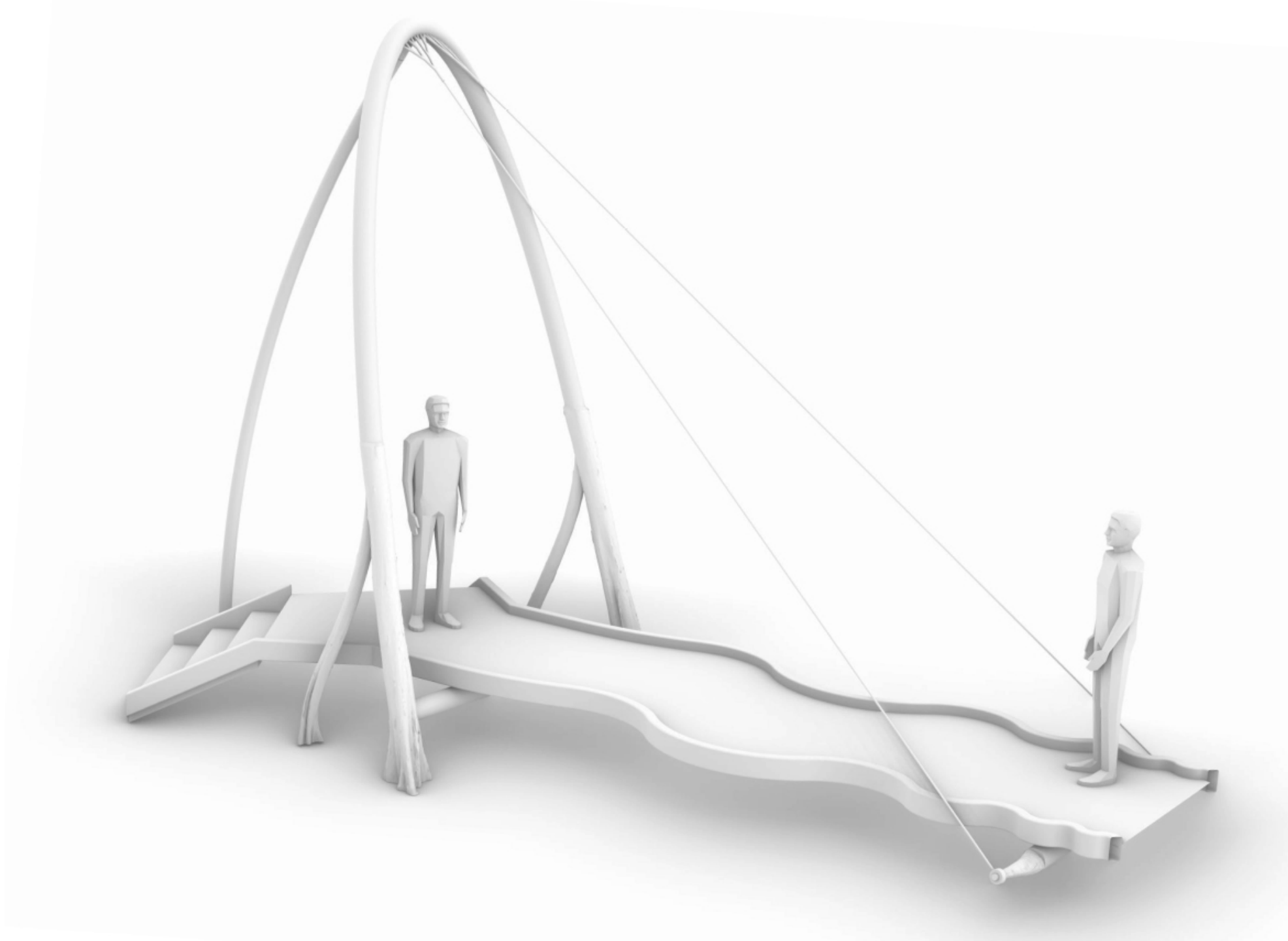
AM Task Force

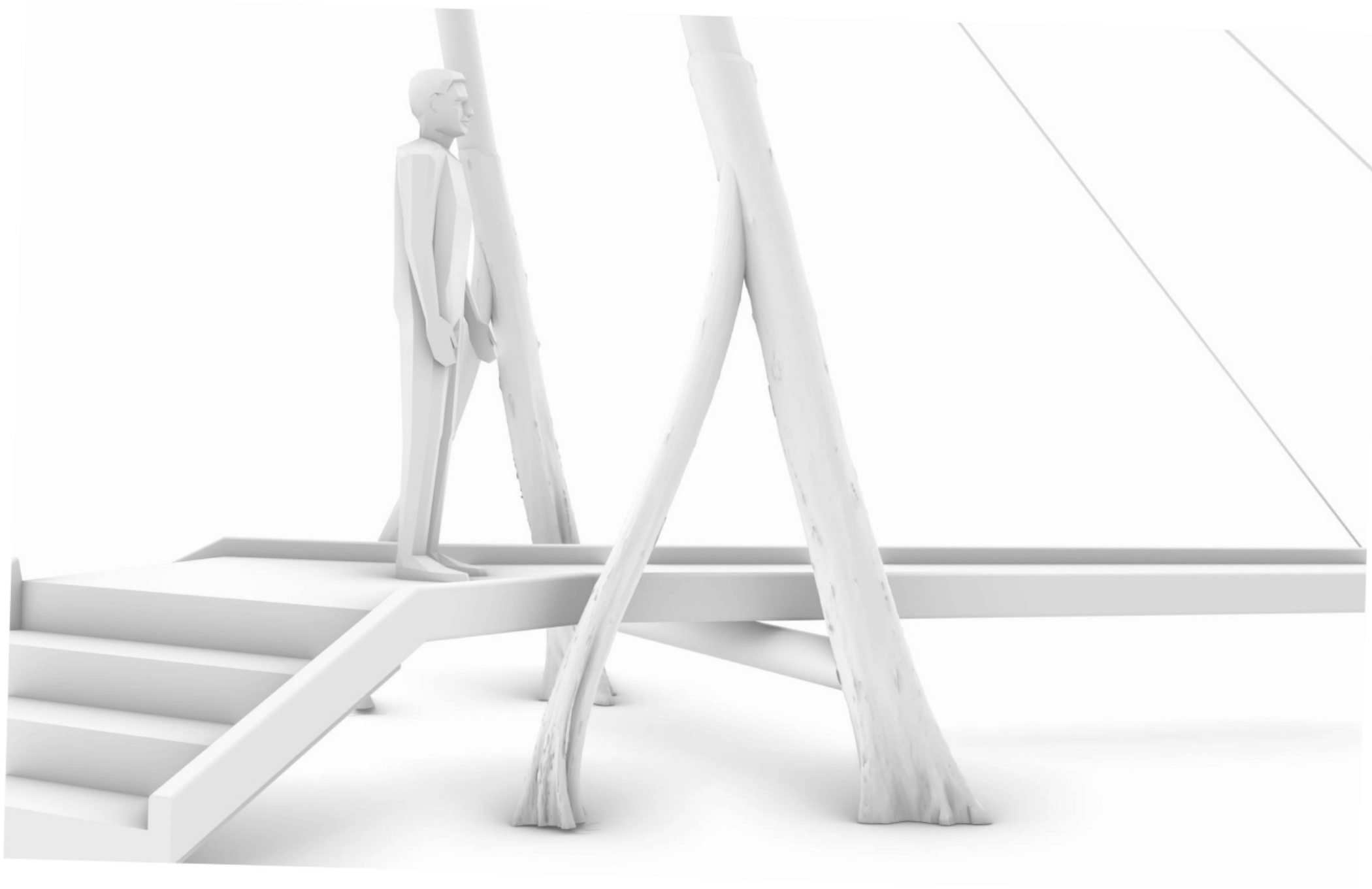
AISC, Lincoln Electric; MKA; High Steel; Atlas Tube; Pioneer Bridges; BNSF Cast Connex; Michael Baker; CHA; FHWA; U. of Waterloo, Georgia Tech

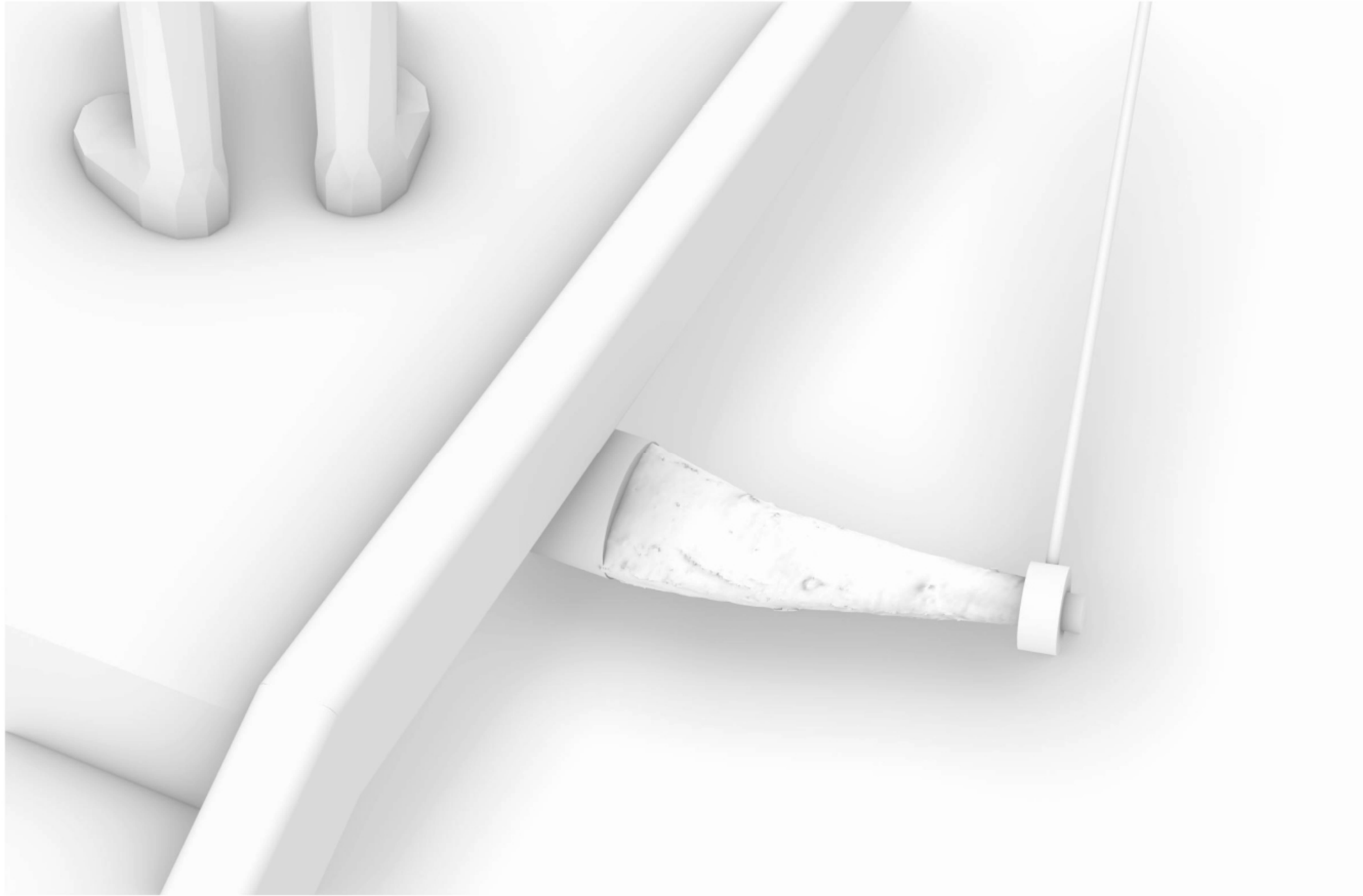

Curved round HSS
top chord
WAAM Web
connections printed
directly on continuous
chord; web members
cable and/or HSS
30°
WAAM railing feature
High interest WAAM
end node that also
incorporates top of
bearing
120.00
60.00
600.00
High interest WAAM
node
High interest WAAM
end node that also
incorporates top of
bearing
Tension member that
connects into end
nodes
Rectangular HSS
Or W-Shape member

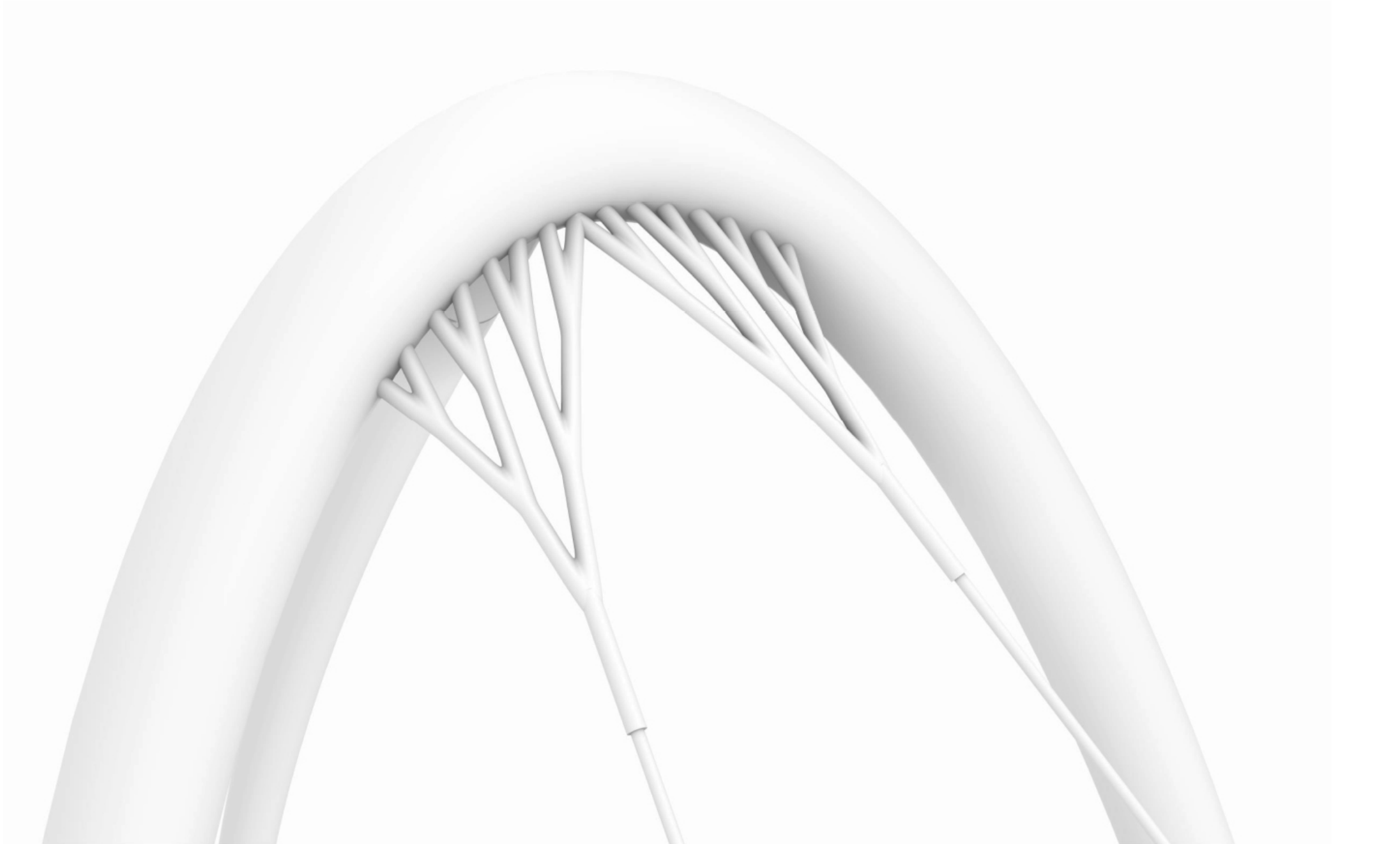

CLEVIS FITS THROUGH AM HOLE
15 FT MAX
LICORICE TWIST PATTERN
VOID
VOID
RAMP ACCESS
6" Ø TUBE
5'
5'
5'
5'
CASTINGS W/ HOLE FOR CLEVIS + ATTACH FOR TUBES.
RAMP ACCESS

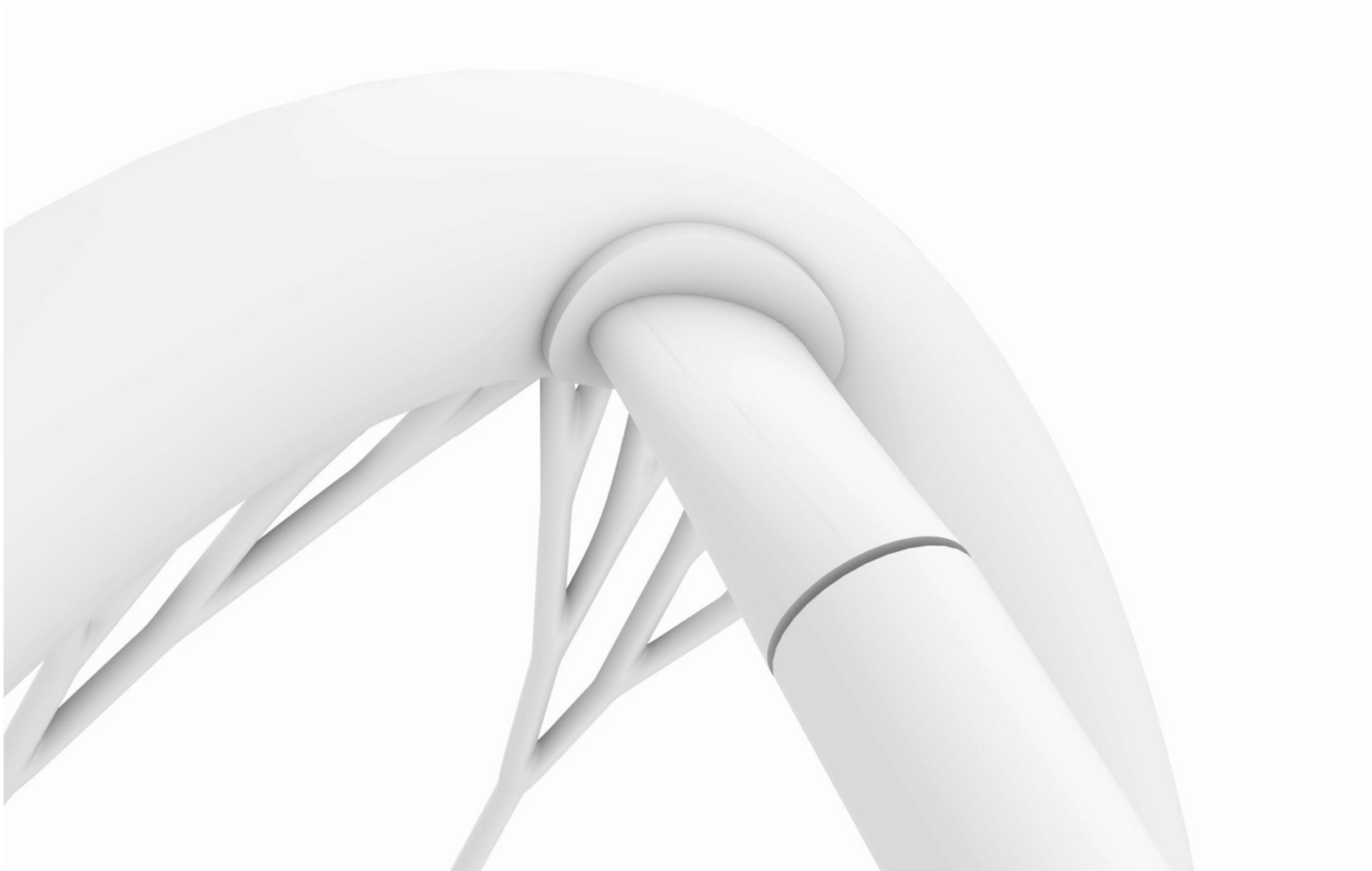












Stay tuned:

In theory to be installed at NASCC 2025 in Louisville, KY