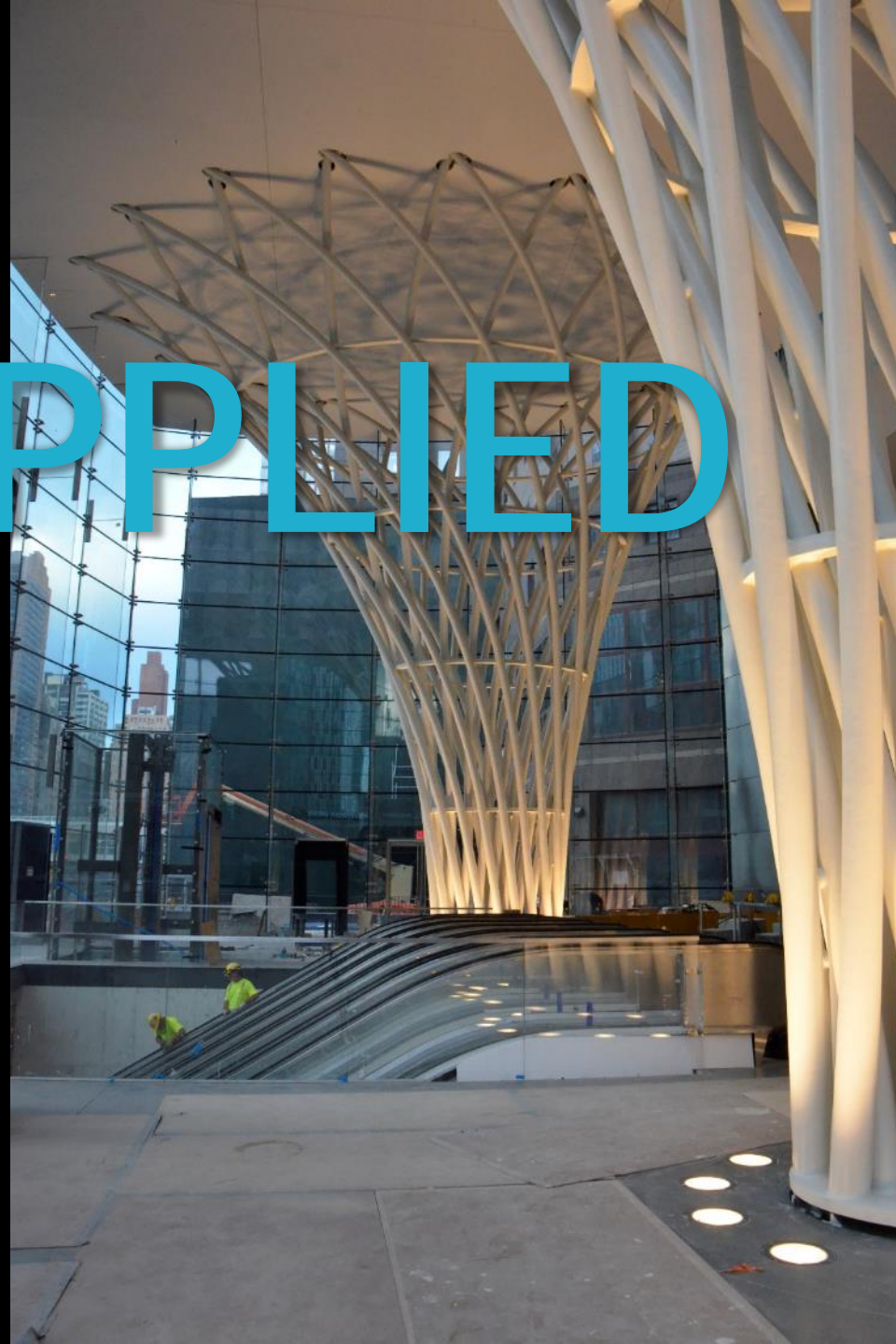


AESS APPLIED

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What is AESS?

- Architecturally Exposed Structural Steel is steel that has been purposefully left exposed
- It must fulfill structural functions
- It is normally part of the Architectural aesthetic of the space
- It usually requires detailing, finish and handling that requires more attention and care than regular structural steel
- It adds to the cost of the contract

Table 1 - AESS Category Matrix

| Category | | AESS C <i>Custom Elements</i> | AESS 4 <i>Showcase Elements</i> | AESS 3 <i>Feature Elements</i> | AESS 2 <i>Feature Elements</i> | AESS 1 <i>Basic Elements</i> | SSS <i>Standard Structural Steel</i> |
|-----------------|---|---|---|--|---|--|--|
| Characteristics | | | | <i>Viewed at a Distance ≤ 6 m</i> | <i>Viewed at a Distance > 6 m</i> | | <i>CSA S16</i> |
| 1.1 | Surface preparation to SSPC-SP 6 | | √ | √ | √ | √ | |
| 1.2 | Sharp edges ground smooth | | √ | √ | √ | √ | |
| 1.3 | Continuous weld appearance | | √ | √ | √ | √ | |
| 1.4 | Standard structural bolts | | √ | √ | √ | √ | |
| 1.5 | Weld spatters removed | | √ | √ | √ | √ | |
| 2.1 | Visual Samples | | optional | optional | optional | | |
| 2.2 | One-half standard fabrication tolerances | | √ | √ | √ | | |
| 2.3 | Fabrication marks not apparent | | √ | √ | √ | | |
| 2.4 | Welds uniform and smooth | | √ | √ | √ | | |
| 3.1 | Mill marks removed | | √ | √ | | | |
| 3.2 | Butt and plug welds ground smooth and filled | | √ | √ | | | |
| 3.3 | HSS weld seam oriented for reduced visibility | | √ | √ | | | |
| 3.4 | Cross sectional abutting surface aligned | | √ | √ | | | |
| 3.5 | Joint gap tolerances minimized | | √ | √ | | | |
| 3.6 | All welded connections | | optional | optional | | | |
| 4.1 | HSS seam not apparent | | √ | | | | |
| 4.2 | Welds contoured and blended | | √ | | | | |
| 4.3 | Surfaces filled and sanded | | √ | | | | |
| 4.4 | Weld show-through minimized | | √ | | | | |
| C.1 | | | | | | | |
| C.2 | | | | | | | |
| C.3 | | | | | | | |
| C.4 | | | | | | | |
| C.5 | | | | | | | |
| | <i>Sample Use:</i> | Elements with special requirements | Showcase or dominant elements | Airports, shopping centres, hospitals, lobbies | Retail and architectural buildings viewed at a distance | Roof trusses for arenas, retail warehouses, canopies | |
| | <i>Estimated Cost Premium:</i> | Low to High (20-250%) | High (100-250%) | Moderate (60-150%) | Low to Moderate (40-100%) | Low (20-60%) | None 0% |

Categories go from lowest at the right to highest at the left.

Table 1 - AESS Category Matrix

| Category | | AESS C Custom Elements | AESS 4 Showcase Elements | AESS 3 Feature Elements | AESS 2 Feature Elements | AESS 1 Basic Elements | SSS Standard Structural Steel CSA S16 |
|----------|---|------------------------------------|--------------------------------|--|---|--|---|
| Id | Characteristics | | | Viewed at a Distance ≤ 6 m | Viewed at a Distance > 6 m | | |
| 1.1 | Surface preparation to SSPC-SP 6 | | ✓ | ✓ | ✓ | ✓ | |
| 1.2 | Sharp edges ground smooth | | ✓ | ✓ | ✓ | ✓ | |
| 1.3 | Continuous weld appearance | | ✓ | ✓ | ✓ | ✓ | |
| 1.4 | Standard structural bolts | | | | | | |
| 1.5 | Weld spatters removed | | | | | | |
| 2.1 | Visual Samples | | | | | | |
| 2.2 | One-half standard fabrication tolerances | | | | | | |
| 2.3 | Fabrication marks not apparent | | | | | | |
| 2.4 | Welds uniform and smooth | | | | | | |
| 3.1 | Mill marks removed | | ✓ | ✓ | | | |
| 3.2 | Butt and plug welds ground smooth and filled | | ✓ | ✓ | | | |
| 3.3 | HSS weld seam oriented for reduced visibility | | ✓ | ✓ | | | |
| 3.4 | Cross sectional abutting surface aligned | | ✓ | ✓ | | | |
| 3.5 | Joint gap tolerances minimized | | ✓ | ✓ | | | |
| 3.6 | All welded connections | | optional | optional | | | |
| 4.1 | HSS seam not apparent | | ✓ | | | | |
| 4.2 | Welds contoured and blended | | ✓ | | | | |
| 4.3 | Surfaces filled and sanded | | ✓ | | | | |
| 4.4 | Weld show-through minimized | | ✓ | | | | |
| C.1 | | | | | | | |
| C.2 | | | | | | | |
| C.3 | | | | | | | |
| C.4 | | | | | | | |
| C.5 | | | | | | | |
| | Sample Use: | Elements with special requirements | Showcase or dominant elements | Airports, shopping centres, hospitals, lobbies | Retail and architectural buildings viewed at a distance | Roof trusses for arenas, retail warehouses, canopies | |
| | Estimated Cost Premium: | Low to High (20-250%) | High (100-250%) | Moderate (60-150%) | Low to Moderate (40-100%) | Low (20-60%) | None 0% |

Viewing distance is noted as the differentiating factor between the high and low end AESS Categories.



Grinding permitted \$\$

No Grinding!!

Table 1 - AESS Category Matrix

| Category | | AESS C <i>Custom Elements</i> | AESS 4 <i>Showcase Elements</i> | AESS 3 <i>Feature Elements</i> | AESS 2 <i>Feature Elements</i> | AESS 1 <i>Basic Elements</i> | SSS <i>Standard Structural Steel</i> |
|------------------------|---|---|---|--|--|--|--|
| <i>Characteristics</i> | | | | <i>Viewed at a Distance ≤ 6 m</i> | <i>Viewed at a Distance > 6 m</i> | | <i>CSA S16</i> |
| 1.1 | Surface preparation to SSPC-SP 6 | | √ | √ | √ | √ | |
| 1.2 | Sharp edges ground smooth | | √ | √ | √ | √ | |
| 1.3 | Continuous weld appearance | | √ | √ | √ | √ | |
| 1.4 | Standard structural bolts | | √ | √ | √ | √ | |
| 1.5 | Weld spatters removed | | √ | √ | √ | √ | |
| 2.1 | Visual Samples | | optional | optional | optional | | |
| 2.2 | One-half standard fabrication tolerances | | √ | √ | √ | | |
| 2.3 | Fabrication marks not apparent | | √ | √ | √ | | |
| 2.4 | Welds uniform and smooth | | √ | √ | √ | | |
| 3.1 | Mill marks removed | | √ | √ | | | |
| 3.2 | Butt and plug welds ground smooth and filled | | √ | √ | | | |
| 3.3 | HSS weld seam oriented for reduced visibility | | √ | √ | | | |
| 3.4 | Cross sectional abutting surface aligned | | √ | √ | | | |
| 3.5 | Joint gap tolerances minimized | | √ | √ | | | |
| 3.6 | All welded connections | | optional | optional | | | |
| 4.1 | HSS seam not apparent | | √ | | | | |
| 4.2 | Welds contoured and blended | | √ | | | | |
| 4.3 | Surfaces filled and sanded | | √ | | | | |
| 4.4 | Weld show-through minimized | | | | | | |
| C.1 | | | | | | | |
| C.2 | | | | | | | |
| C.3 | | | | | | | |
| C.4 | | | | | | | |
| C.5 | | | | | | | |

Estimated cost premiums over Standard Structural Steel are noted at the bottom.

| | | | | | | |
|--------------------------------|------------------------------------|-------------------------------|--|---|--|------------|
| <i>Sample Use:</i> | Elements with special requirements | Showcase or dominant elements | Airports, shopping centres, hospitals, lobbies | Retail and architectural buildings viewed at a distance | Roof trusses for arenas, retail warehouses, canopies | |
| <i>Estimated Cost Premium:</i> | Low to High (20-250%) | High (100-250%) | Moderate (60-150%) | Low to Moderate (40-100%) | Low (20-60%) | None 0% |

Standard Structural Steel

- The initial point of technical reference is Standard Structural Steel as it is already an established and well-understood as a baseline in construction Specifications.



NOTE: Even if “non rectilinear steel” LOOKS like Standard Structural Steel, the TOLERANCES and FIT required are likely to be more in tune with AESS requirements!

Table 1 - AESS Category Matrix

AESS 1

Category

AESS C
Custom Elements

AESS 4
Showcase Elements

AESS 3
Feature Elements

AESS 2
Feature Elements

AESS 1
Basic Elements

SSS
Standard Structural Steel

CSA S16

- Id* *Characteristics*
- 1.1 Surface preparation to SSPC-SP 6
 - 1.2 Sharp edges ground smooth
 - 1.3 Continuous weld appearance
 - 1.4 Standard structural bolts
 - 1.5 Weld spatters removed
 - 2.1 Visual Samples
 - 2.2 One-half standard fabrication tolerances
 - 2.3 Fabrication marks not apparent
 - 2.4 Welds uniform and smooth
 - 3.1 Mill marks removed
 - 3.2 Butt and plug welds ground smooth and filled
 - 3.3 HSS weld seam oriented for reduced visibility
 - 3.4 Cross sectional abutting surface aligned
 - 3.5 Joint gap tolerances minimized
 - 3.6 All welded connections
 - 4.1 HSS seam not apparent
 - 4.2 Welds contoured and blended
 - 4.3 Surfaces filled and sanded
 - 4.4 Weld show-through minimized
 - C.1
 - C.2
 - C.3
 - C.4
 - C.5

| | | <i>Viewed at a Distance ≤ 6 m</i> | <i>Viewed at a Distance > 6 m</i> | |
|--|----------|-----------------------------------|--------------------------------------|---|
| | | ✓ | ✓ | ✓ |
| | | ✓ | ✓ | ✓ |
| | | ✓ | ✓ | ✓ |
| | | ✓ | ✓ | ✓ |
| | | ✓ | ✓ | ✓ |
| | | | | |
| | optional | optional | optional | |
| | ✓ | ✓ | ✓ | |
| | ✓ | ✓ | ✓ | |
| | ✓ | ✓ | ✓ | |
| | | | | |
| | ✓ | ✓ | | |
| | ✓ | ✓ | | |
| | ✓ | ✓ | | |
| | ✓ | ✓ | | |
| | optional | optional | | |
| | ✓ | | | |
| | ✓ | | | |
| | ✓ | | | |
| | ✓ | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Roof trusses for arenas, retail warehouses, canopies
Cost premium: Low (20-60%)

Sample Use:

Elements with special requirements

Showcase or dominant elements

Airports, shopping centres, hospitals, lobbies

Retail and architectural buildings viewed at a distance

Roof trusses for arenas, retail warehouses, canopies

Estimated Cost Premium:

Low to High
(20-250%)

High
(100-250%)

Moderate
(60-150%)

Low to Moderate
(40-100%)

Low
(20-60%)

None
0%

AESS 1 - Basic Elements

- the first step above Standard Structural Steel
- suitable for "basic" elements, which require enhanced workmanship
- should only require a low cost premium in the range of 20% to 60% due to its relatively large viewing distance as well as the lower profile nature of the architectural spaces in which it is used.



Table 1 - AESS Category Matrix

AESS 2

Category

| Id | Characteristics |
|-----|--|
| 1.1 | Surface preparation to SSPC-SP 6 |
| 1.2 | Sharp edges ground smooth |
| 1.3 | Continuous weld appearance |
| 1.4 | Standard structural bolts |
| 1.5 | Weld spatters removed |
| 2.1 | Visual Samples |
| 2.2 | One-half standard fabrication tolerances |
| 2.3 | Fabrication marks not apparent |
| 2.4 | Welds uniform and smooth |

| | AESS C Custom Elements | AESS 4 Showcase Elements | AESS 3 Feature Elements <i>Viewed at a Distance ≤ 6 m</i> | AESS 2 Feature Elements <i>Viewed at a Distance > 6 m</i> | AESS 1 Basic Elements | SSS Standard Structural Steel CSA S16 |
|-----|----------------------------------|------------------------------------|--|---|---------------------------------|--|
| 1.1 | | ✓ | ✓ | ✓ | ✓ | |
| 1.2 | | ✓ | ✓ | ✓ | ✓ | |
| 1.3 | | ✓ | ✓ | ✓ | ✓ | |
| 1.4 | | ✓ | ✓ | ✓ | ✓ | |
| 1.5 | | ✓ | ✓ | ✓ | ✓ | |
| 2.1 | | optional | optional | optional | | |
| 2.2 | | ✓ | ✓ | ✓ | | |
| 2.3 | | ✓ | ✓ | ✓ | | |
| 2.4 | | ✓ | ✓ | ✓ | | |
| 3.1 | | ✓ | ✓ | | | |
| 3.2 | | ✓ | ✓ | | | |
| 3.3 | | ✓ | ✓ | | | |
| 3.4 | | ✓ | ✓ | | | |
| 3.5 | | ✓ | ✓ | | | |
| 3.6 | | optional | optional | | | |
| 4.1 | | ✓ | | | | |
| 4.2 | | ✓ | | | | |
| 4.3 | | ✓ | | | | |
| 4.4 | | ✓ | | | | |
| C.1 | | | | | | |
| C.2 | | | | | | |
| C.3 | | | | | | |
| C.4 | | | | | | |
| C.5 | | | | | | |

Retail and architectural bldgs viewed at a distance
 Cost premium: Low to Moderate (40-100%)

Sample Use:

| | | | | | |
|------------------------------------|-------------------------------|--|---|--|--|
| Elements with special requirements | Showcase or dominant elements | Airports, shopping centres, hospitals, lobbies | Retail and architectural buildings viewed at a distance | Roof trusses for arenas, retail warehouses, canopies | |
|------------------------------------|-------------------------------|--|---|--|--|

Estimated Cost Premium:

| | | | | | |
|-----------------------|-----------------|--------------------|---------------------------|--------------|-----------|
| Low to High (20-250%) | High (100-250%) | Moderate (60-150%) | Low to Moderate (40-100%) | Low (20-60%) | None (0%) |
|-----------------------|-----------------|--------------------|---------------------------|--------------|-----------|

AESS 2 - Feature Elements (> 6 m)

- structure that is intended to be viewed at a distance > 6 m
- The process requires basically good fabrication practices with enhanced treatment of welds, connection and fabrication details, tolerances for gaps, and copes
- might be found in retail and architectural applications where a low to moderate cost premium in the range of 40% to 100% over the cost of Standard Structural Steel would be expected.
- NO GRINDING



Although using fairly standard W and C sections, this AESS has incorporated castellated members

Table 1 - AESS Category Matrix

AESS 3

Category

| Id | Characteristics |
|-----|---|
| 1.1 | Surface preparation to SSPC-SP 6 |
| 1.2 | Sharp edges ground smooth |
| 1.3 | Continuous weld appearance |
| 1.4 | Standard structural bolts |
| 1.5 | Weld spatters removed |
| 2.1 | Visual Samples |
| 2.2 | One-half standard fabrication tolerances |
| 2.3 | Fabrication marks not apparent |
| 2.4 | Welds uniform and smooth |
| 3.1 | Mill marks removed |
| 3.2 | Butt and plug welds ground smooth and filled |
| 3.3 | HSS weld seam oriented for reduced visibility |
| 3.4 | Cross sectional abutting surface aligned |
| 3.5 | Joint gap tolerances minimized |
| 3.6 | All welded connections |
| 4.1 | HSS seam not apparent |
| 4.2 | Welds contoured and blended |
| 4.3 | Surfaces filled and sanded |
| 4.4 | Weld show-through minimized |
| C.1 | |
| C.2 | |
| C.3 | |
| C.4 | |
| C.5 | |

| AESS C Custom Elements | AESS 4 Showcase Elements | AESS 3 Feature Elements <i>Viewed at a Distance ≤ 6 m</i> | AESS 2 Feature Elements <i>Viewed at a Distance > 6 m</i> | AESS 1 Basic Elements | SSS Standard Structural Steel CSA S16 |
|---------------------------|-----------------------------|---|--|--------------------------|---|
| | | ✓ | ✓ | ✓ | |
| | | ✓ | ✓ | ✓ | |
| | | ✓ | ✓ | ✓ | |
| | | ✓ | ✓ | ✓ | |
| | | ✓ | ✓ | ✓ | |
| | | | | | |
| | optional | optional | optional | | |
| | ✓ | ✓ | ✓ | | |
| | ✓ | ✓ | ✓ | | |
| | ✓ | ✓ | ✓ | | |
| | | | | | |
| | | ✓ | ✓ | | |
| | | ✓ | ✓ | | |
| | | ✓ | ✓ | | |
| | | ✓ | ✓ | | |
| | | ✓ | ✓ | | |
| | optional | optional | | | |
| | | ✓ | | | |
| | | ✓ | | | |
| | | ✓ | | | |
| | | ✓ | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Airports, shopping centres, hospitals, lobbies
 Cost premium: Moderate (60-150%)

Sample Use:

Estimated Cost Premium:

| | | | | | |
|------------------------------------|------------------------------|--|---|--|---------|
| Elements with special requirements | Showcase or dominant element | Airports, shopping centres, hospitals, lobbies | Retail and architectural buildings viewed at a distance | Roof trusses for arenas, retail warehouses, canopies | |
| Low to High (20-250%) | High (100-250%) | Moderate (60-150%) | Low to Moderate (40-100%) | Low (20-60%) | None 0% |

AESS 3 - Feature Elements ($\leq 6\text{m}$)

- structures that will be **viewed at a distance $\leq 6\text{m}$**
- suitable for "feature" elements - where the designer is comfortable allowing the viewer to see the art of metalworking
- welds should be generally smooth but visible and some grind marks would be acceptable
- Welds can be ground if desired



- Tolerances must be tighter than normal standards. As this structure is normally viewed closer than six meters it might also frequently be subject to touch by the public, therefore warranting a smoother and more uniform finish and appearance.
- could be expected to incur a moderate cost premium that could range from 60% to 150% over Standard Structural Steel as a function of the complexity and level of final finish desired

AESS 4 - Showcase Elements

- used where the designer intends that the form is the only feature showing in an element
- All welds are ground and filled edges are ground square and true
- All surfaces are sanded and filled. Tolerances of these fabricated forms are more stringent, generally to half of standard tolerance for standard structural steel



- All of the surfaces would be "glove" smooth
- The cost premium of these elements would be high and could range from 100% to 250% over the cost of Standard Structural Steel - completely as a function of the nature of the details, complexity of construction and selected finishes.

Challenge Points for Design

- Decide on the AESS categories
- Understand transportation limitations (how large are the pieces that can fit on a truck, height, weight, width)
- How big is the staging area?
- Can you sub assemble larger components on site before lifting?
- Crane position? Reach? How many cranes?
- Limits on access due to roads, traffic, rail lines, etc.
- Determination of splice positions and therefore site welding versus bolting



Owner

Calgary International Airport

Architect

DIALOG

Structural Engineers

Read Jones Christoffersen Ltd.

Construction Manager

Ellis Don Construction Management Services

Steel Fabricator / Detailer / Erector

Supermétal

Project Profile

CALGARY INTERNATIONAL AIRPORT

International Facilities Project



Photo credits this section: Supermétal

Content: Sylvie Boulanger, Vice President, Technical Marketing

Calgary Airport International Facilities Project

image: DIALOG

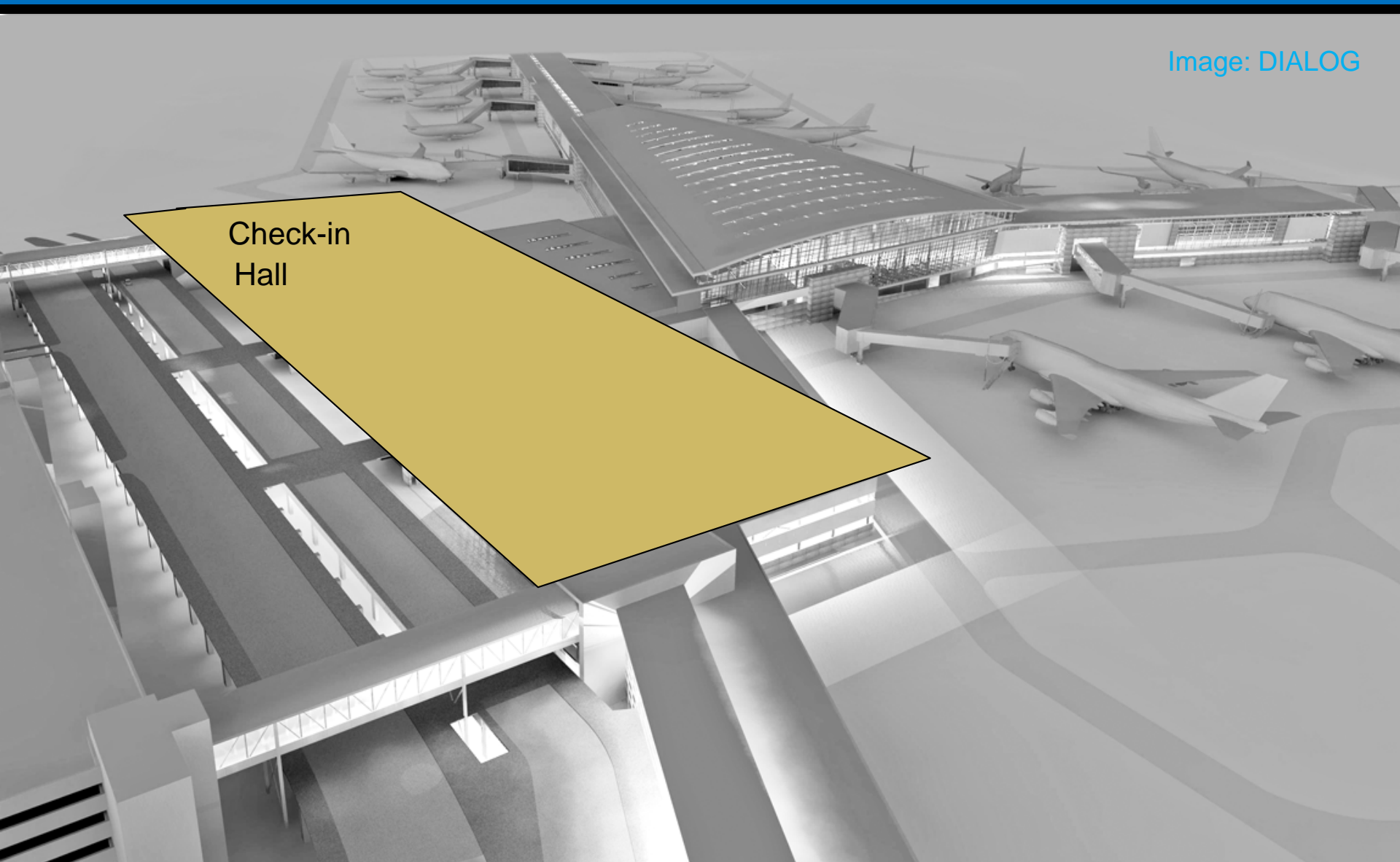


“The notion of natural light has driven every decision we made during the design process.”

**Doug Cinnamon
DIALOG**

Calgary Airport International Facilities Project

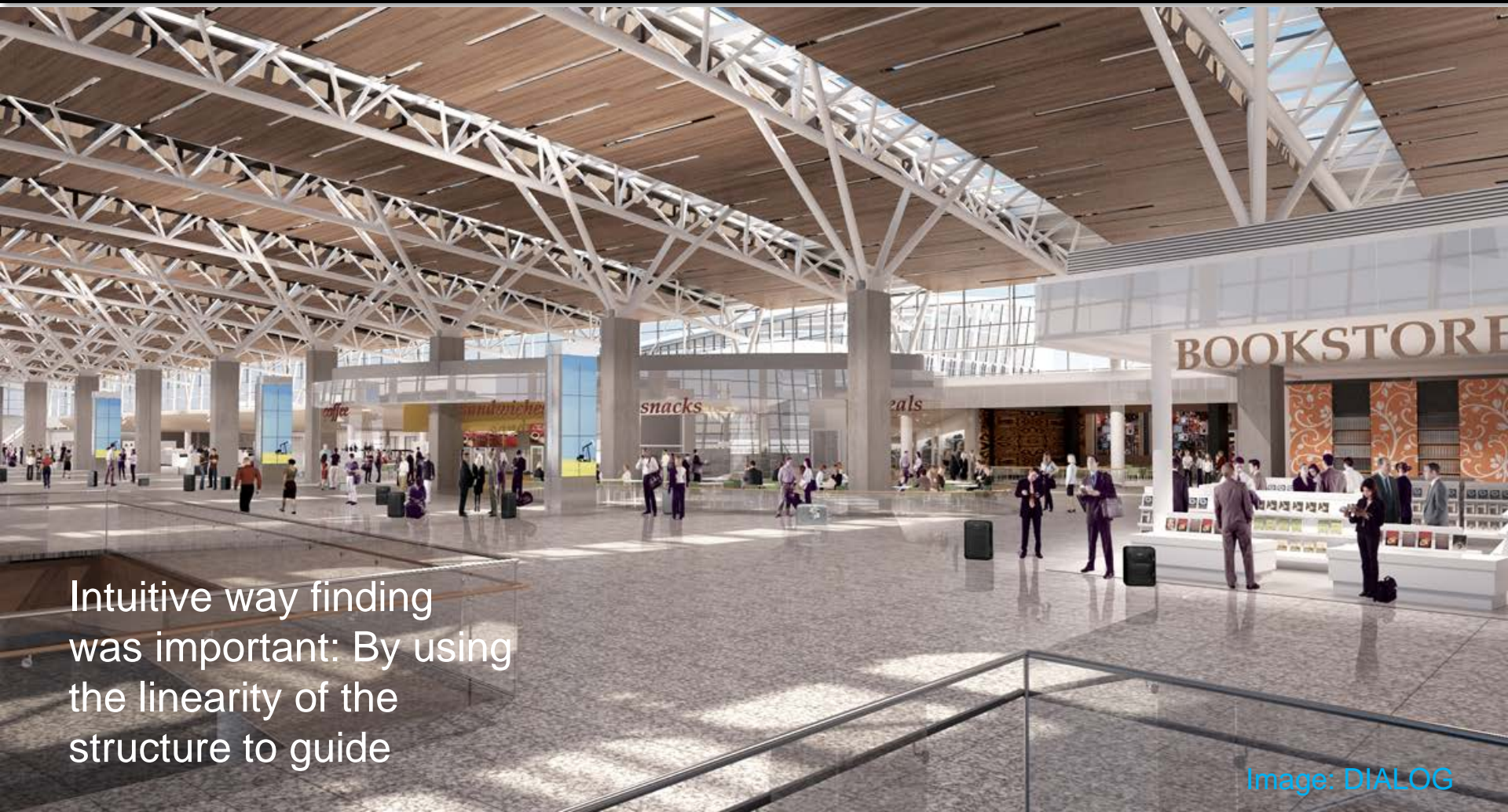
Image: DIALOG



Check-in
Hall

A 3D architectural rendering of the Calgary Airport International Facilities Project. The image shows a large, modern airport terminal building with a curved roof and a glass facade. Several aircraft are parked at gates along the terminal. A yellow callout box highlights a specific area of the terminal, labeled 'Check-in Hall'. The rendering is presented in a monochromatic style with a blue header and an orange footer.

Check-in Hall



Intuitive way finding was important: By using the linearity of the structure to guide

Image: DIALOG

Calgary Airport International Facilities Project



Clear open space was another driver:
Fewest columns for maximum flexibility
and comfort

Image: RJC

Quick Facts

International Facilities Project

\$1.4 billion investment

In-service October 2015

Five levels and 183,500 m²

22 new aircraft gates

Green building features

Structural Steel

8000 tons, including

2000 tons of AESS in

Check-in and Departures Halls

Check-in Hall

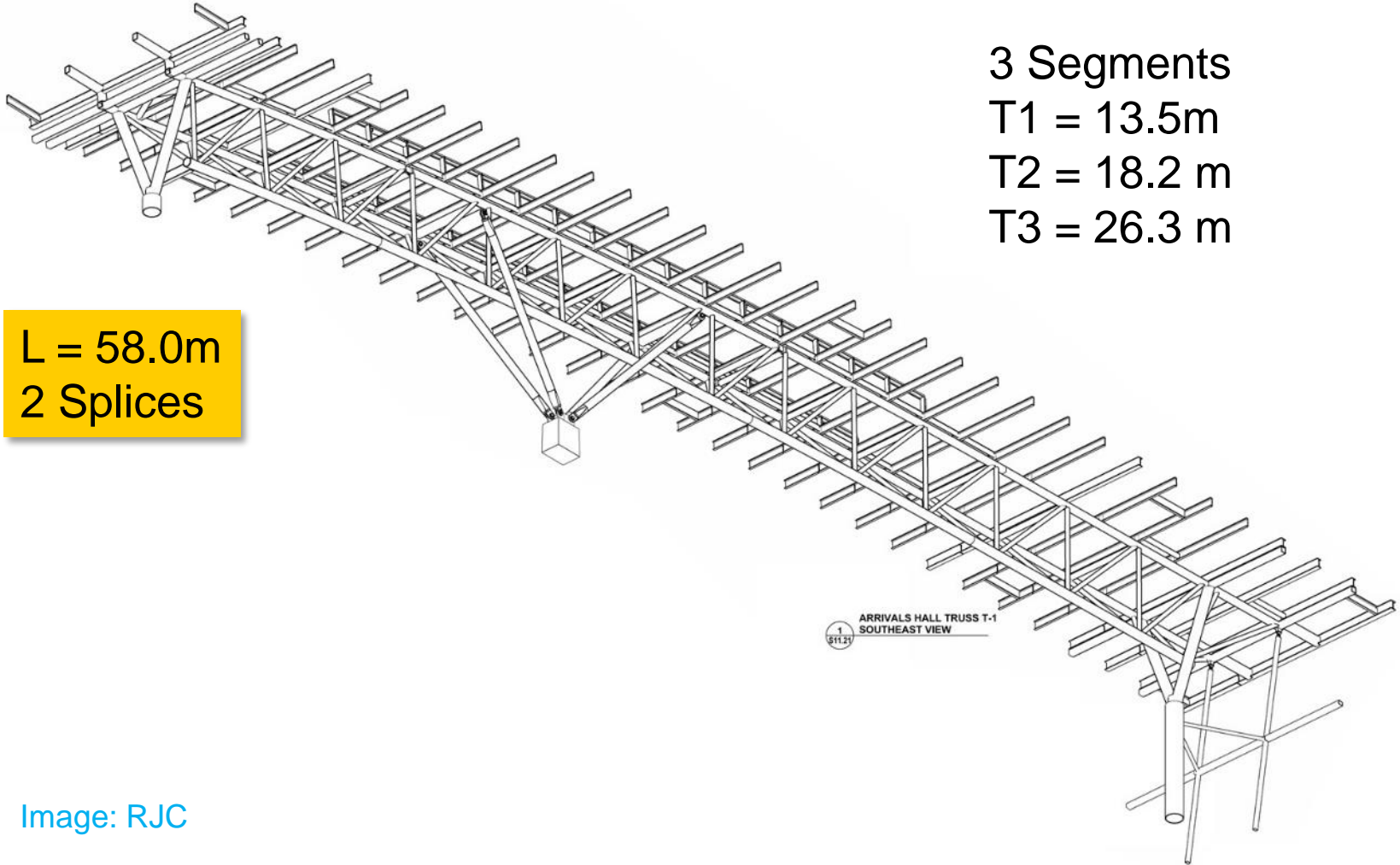
Area of 48,100 m²

17 x 58m triangulated trusses

Weight per truss: 22.5 tons

Heaviest segment: 9 tons

Typical truss



3 Segments

T1 = 13.5m

T2 = 18.2 m

T3 = 26.3 m

L = 58.0m
2 Splices

Image: RJC

Typical Truss

Width = 3.2m
Depth = 2.3 m

Top Chords – **RHS**
Bottom Chord and Web –
CHS

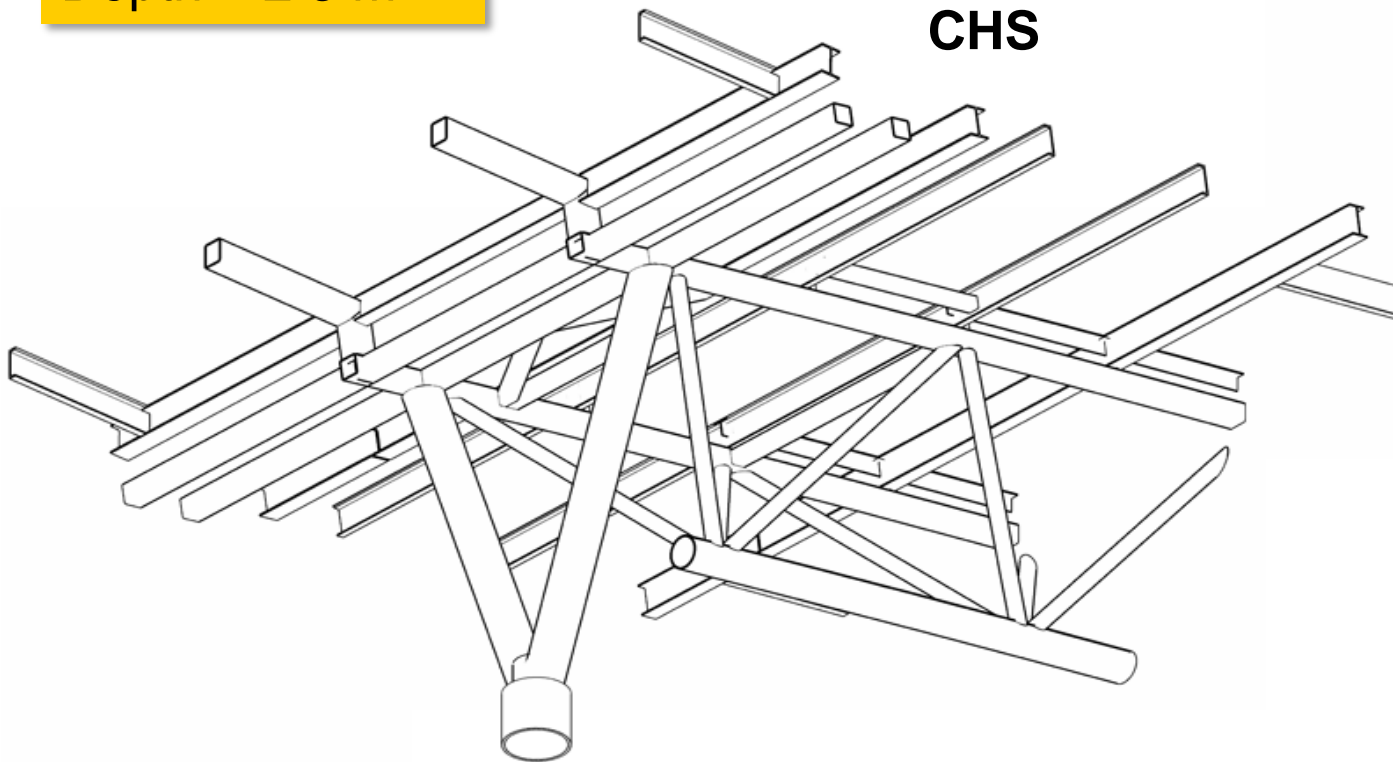


Image: RJC

2
\$11.21

ARRIVALS HALL TRUSS T-1 GRID 'AF'
SOUTHEAST VIEW

Select AESS Categories associated to members or assemblies

Sample AESS Specification

Specify if specialty bolts will be used, and preferably, which side the bolt heads are to be

Are there unique primers?

Or more stringent galvanizing requirements?

SAMPLE AESS SPECIFICATION FOR CANADA

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS) Procedure AESS Specification of Division 5, Structural Steel - Section 0520

- PART 1 - GENERAL**
- 1.1. RELATED DOCUMENTS
 1. Drawings are general conditions of the Contract, including General and Supplementary Conditions and Division 5 Specification Sections, apply with this Section.
 - For subitems of Categories AESS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.
 - 1.2. SUMMARY
 1. Section Includes
 1. Fabrication and erection of AESS steel members and connections.
 1. Painting of AESS steel members and connections.

2. Fabrication and erection of AESS steel members and connections.
3. Painting of AESS steel members and connections.

PART 2 - PRODUCTS

- 2.1. MATERIALS
 1. Steel members and connections shall be fabricated from AESS steel.
 1. Steel members and connections shall be fabricated from AESS steel.
- 2.2. SPECIAL SURFACE PREPARATION
 1. Steel members and connections shall be fabricated from AESS steel.
- 2.3. FABRICATION
 1. Fabrication shall be in accordance with the AESS Specification.

Section 0520. Fabrication and erection of AESS steel members and connections.

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Section 0520. Fabrication and erection of AESS steel members and connections.

1. FIELD CONNECTIONS
 1. Fabrication and erection of AESS steel members and connections.
2. MEMBER CONNECTIONS
 1. Fabrication and erection of AESS steel members and connections.

Table 1 - AESS Categories

| Category | AESS C Division Elements | AESS 4 Specialty Elements | AESS J Paint Elements | AESS 2 Paint Elements | AESS 1 Bolt Elements | AESS Specialty Steel |
|-------------|--------------------------------|---------------------------------|-----------------------------|-----------------------------|----------------------------|----------------------------|
| CONNECTIONS | | | | | | |
| 11 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 13 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 14 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 15 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 16 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 17 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 18 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 19 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 20 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 21 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 22 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 23 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 24 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 25 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 26 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 27 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 28 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 29 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 30 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 31 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 32 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 33 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 34 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 35 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 36 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 37 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 38 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 39 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 40 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 41 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 42 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 43 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 44 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 45 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 46 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 47 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 48 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 49 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 50 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 51 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 52 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 53 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 54 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 55 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 56 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 57 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 58 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 59 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 60 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 61 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 62 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 63 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 64 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 65 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 66 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 67 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 68 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 69 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 70 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 71 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 72 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 73 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 74 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 75 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 76 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 77 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 78 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 79 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 80 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 81 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 82 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 83 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 84 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 85 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 86 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 87 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 88 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 89 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 90 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 91 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 92 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 93 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 94 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 95 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 96 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 97 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 98 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 99 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 100 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

11. Fabrication and erection of AESS steel members and connections.
12. Fabrication and erection of AESS steel members and connections.
13. Fabrication and erection of AESS steel members and connections.
14. Fabrication and erection of AESS steel members and connections.
15. Fabrication and erection of AESS steel members and connections.
16. Fabrication and erection of AESS steel members and connections.
17. Fabrication and erection of AESS steel members and connections.
18. Fabrication and erection of AESS steel members and connections.
19. Fabrication and erection of AESS steel members and connections.
20. Fabrication and erection of AESS steel members and connections.
21. Fabrication and erection of AESS steel members and connections.
22. Fabrication and erection of AESS steel members and connections.
23. Fabrication and erection of AESS steel members and connections.
24. Fabrication and erection of AESS steel members and connections.
25. Fabrication and erection of AESS steel members and connections.
26. Fabrication and erection of AESS steel members and connections.
27. Fabrication and erection of AESS steel members and connections.
28. Fabrication and erection of AESS steel members and connections.
29. Fabrication and erection of AESS steel members and connections.
30. Fabrication

Select AESS Categories associated to members or assemblies

Sample AESS Specification

SAMPLE AESS SPECIFICATION FOR CANADA

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)
Procedure AESS - Subsection of Division 5 - Structural Steel - Section 0520

NOTE - GENERAL

1.1. RELATED DOCUMENTS

1. Drawings are general conditions of the Contract, including General and Supplementary Conditions and Division 5 "Structural Steel" section, with this Subsection.
2. For references of Categories AESS 1, 2, 3, 4, 5, and C, see the AESS Herb (see Table 1), which is the CISC Code of Standard Practice Appendix I.

1.2. SUMMARY

1. The Subsection includes requirements regarding the appearance, surface preparation and finish of the architecturally exposed structural steel (AESS) work.

2. For each item, the quantity is indicated by the Subsection of Division 5 "Structural Steel" Section.

3. The Subsection applies to any structural steel members made of structural steel according to the CISC Code of Standard Practice Appendix I.

4. Related Sections: The following sections describe requirements that may relate to this Subsection:

1. Division 5 "Structural Steel" Section for preparation, including shop processes and field welding.
2. Division 5 "Structural Steel" Section for erection.
3. Division 5 "Structural Steel" Section for anchor requirements relating to exposed steel members.
4. Division 5 "Structural Steel" Section for field connections and connections that require an on-site preparation according to this Subsection.

1.3. SUBMITTALS

1. General: Submit and have below according to the Conditions of the Contract and Division 5 "Structural Steel" Section:

2. Shop drawings for each fabrication of AESS components:

1. Profile as members
2. Substrate as fabricator
3. Fabrication as shown
4. Surface as shown
5. Material as shown
6. Material as shown

Specify if specialty bolts will be used, and preferably, which side the bolt heads are to be

1.1. FIELD CONNECTIONS

1. Bolts Connections shall be according to Section 0520. Provide bolt specifications (M16 or M20) as per the approved shop drawings.
2. Make Connections: Comply with CISC Code of Standard Practice Appendix I, and the AESS Herb (see Table 1), which is the CISC Code of Standard Practice Appendix I.
3. Make Connections: Comply with CISC Code of Standard Practice Appendix I, and the AESS Herb (see Table 1), which is the CISC Code of Standard Practice Appendix I.

1.2. ARCHITECTURAL FINISH

1. The fabricator shall provide the AESS steel in place and assemble according to the shop drawings and the AESS Herb (see Table 1), which is the CISC Code of Standard Practice Appendix I.

1.1. FIELD CONNECTIONS

1. Bolts Connections shall be according to Section 0520. Provide bolt specifications (M16 or M20) as per the approved shop drawings.
2. Make Connections: Comply with CISC Code of Standard Practice Appendix I, and the AESS Herb (see Table 1), which is the CISC Code of Standard Practice Appendix I.
3. Make Connections: Comply with CISC Code of Standard Practice Appendix I, and the AESS Herb (see Table 1), which is the CISC Code of Standard Practice Appendix I.

1.2. ARCHITECTURAL FINISH

1. The fabricator shall provide the AESS steel in place and assemble according to the shop drawings and the AESS Herb (see Table 1), which is the CISC Code of Standard Practice Appendix I.

Table 1 - AESS Categories Herb

| Category | Description |
|----------|------------------|
| A | Structural Steel |
| B | Structural Steel |
| C | Structural Steel |
| D | Structural Steel |
| E | Structural Steel |
| F | Structural Steel |
| G | Structural Steel |
| H | Structural Steel |
| I | Structural Steel |
| J | Structural Steel |
| K | Structural Steel |
| L | Structural Steel |
| M | Structural Steel |
| N | Structural Steel |
| O | Structural Steel |
| P | Structural Steel |
| Q | Structural Steel |
| R | Structural Steel |
| S | Structural Steel |
| T | Structural Steel |
| U | Structural Steel |
| V | Structural Steel |
| W | Structural Steel |
| X | Structural Steel |
| Y | Structural Steel |
| Z | Structural Steel |
| AA | Structural Steel |
| AB | Structural Steel |
| AC | Structural Steel |
| AD | Structural Steel |
| AE | Structural Steel |
| AF | Structural Steel |
| AG | Structural Steel |
| AH | Structural Steel |
| AI | Structural Steel |
| AJ | Structural Steel |
| AK | Structural Steel |
| AL | Structural Steel |
| AM | Structural Steel |
| AN | Structural Steel |
| AO | Structural Steel |
| AP | Structural Steel |
| AQ | Structural Steel |
| AR | Structural Steel |
| AS | Structural Steel |
| AT | Structural Steel |
| AU | Structural Steel |
| AV | Structural Steel |
| AW | Structural Steel |
| AX | Structural Steel |
| AY | Structural Steel |
| AZ | Structural Steel |
| BA | Structural Steel |
| BB | Structural Steel |
| BC | Structural Steel |
| BD | Structural Steel |
| BE | Structural Steel |
| BF | Structural Steel |
| BG | Structural Steel |
| BH | Structural Steel |
| BI | Structural Steel |
| BJ | Structural Steel |
| BK | Structural Steel |
| BL | Structural Steel |
| BM | Structural Steel |
| BN | Structural Steel |
| BO | Structural Steel |
| BP | Structural Steel |
| BQ | Structural Steel |
| BR | Structural Steel |
| BS | Structural Steel |
| BT | Structural Steel |
| BU | Structural Steel |
| BV | Structural Steel |
| BW | Structural Steel |
| BX | Structural Steel |
| BY | Structural Steel |
| BZ | Structural Steel |
| CA | Structural Steel |
| CB | Structural Steel |
| CC | Structural Steel |
| CD | Structural Steel |
| CE | Structural Steel |
| CF | Structural Steel |
| CG | Structural Steel |
| CH | Structural Steel |
| CI | Structural Steel |
| CJ | Structural Steel |
| CK | Structural Steel |
| CL | Structural Steel |
| CM | Structural Steel |
| CN | Structural Steel |
| CO | Structural Steel |
| CP | Structural Steel |
| CQ | Structural Steel |
| CR | Structural Steel |
| CS | Structural Steel |
| CT | Structural Steel |
| CU | Structural Steel |
| CV | Structural Steel |
| CW | Structural Steel |
| CX | Structural Steel |
| CY | Structural Steel |
| CZ | Structural Steel |
| DA | Structural Steel |
| DB | Structural Steel |
| DC | Structural Steel |
| DD | Structural Steel |
| DE | Structural Steel |
| DF | Structural Steel |
| DG | Structural Steel |
| DH | Structural Steel |
| DI | Structural Steel |
| DJ | Structural Steel |
| DK | Structural Steel |
| DL | Structural Steel |
| DM | Structural Steel |
| DN | Structural Steel |
| DO | Structural Steel |
| DP | Structural Steel |
| DQ | Structural Steel |
| DR | Structural Steel |
| DS | Structural Steel |
| DT | Structural Steel |
| DU | Structural Steel |
| DV | Structural Steel |
| DW | Structural Steel |
| DX | Structural Steel |
| DY | Structural Steel |
| DZ | Structural Steel |
| EA | Structural Steel |
| EB | Structural Steel |
| EC | Structural Steel |
| ED | Structural Steel |
| EE | Structural Steel |
| EF | Structural Steel |
| EG | Structural Steel |
| EH | Structural Steel |
| EI | Structural Steel |
| EJ | Structural Steel |
| EK | Structural Steel |
| EL | Structural Steel |
| EM | Structural Steel |
| EN | Structural Steel |
| EO | Structural Steel |
| EP | Structural Steel |
| EQ | Structural Steel |
| ER | Structural Steel |
| ES | Structural Steel |
| ET | Structural Steel |
| EU | Structural Steel |
| EV | Structural Steel |
| EW | Structural Steel |
| EX | Structural Steel |
| EY | Structural Steel |
| EZ | Structural Steel |
| FA | Structural Steel |
| FB | Structural Steel |
| FC | Structural Steel |
| FD | Structural Steel |
| FE | Structural Steel |
| FF | Structural Steel |
| FG | Structural Steel |
| FH | Structural Steel |
| FI | Structural Steel |
| FJ | Structural Steel |
| FK | Structural Steel |
| FL | Structural Steel |
| FM | Structural Steel |
| FN | Structural Steel |
| FO | Structural Steel |
| FP | Structural Steel |
| FQ | Structural Steel |
| FR | Structural Steel |
| FS | Structural Steel |
| FT | Structural Steel |
| FU | Structural Steel |
| FV | Structural Steel |
| FW | Structural Steel |
| FX | Structural Steel |
| FY | Structural Steel |
| FZ | Structural Steel |
| GA | Structural Steel |
| GB | Structural Steel |
| GC | Structural Steel |
| GD | Structural Steel |
| GE | Structural Steel |
| GF | Structural Steel |
| GG | Structural Steel |
| GH | Structural Steel |
| GI | Structural Steel |
| GJ | Structural Steel |
| GK | Structural Steel |
| GL | Structural Steel |
| GM | Structural Steel |
| GN | Structural Steel |
| GO | Structural Steel |
| GP | Structural Steel |
| GQ | Structural Steel |
| GR | Structural Steel |
| GS | Structural Steel |
| GT | Structural Steel |
| GU | Structural Steel |
| GV | Structural Steel |
| GW | Structural Steel |
| GX | Structural Steel |
| GY | Structural Steel |
| GZ | Structural Steel |
| HA | Structural Steel |
| HB | Structural Steel |
| HC | Structural Steel |
| HD | Structural Steel |
| HE | Structural Steel |
| HF | Structural Steel |
| HG | Structural Steel |
| HH | Structural Steel |
| HI | Structural Steel |
| HJ | Structural Steel |
| HK | Structural Steel |
| HL | Structural Steel |
| HM | Structural Steel |
| HN | Structural Steel |
| HO | Structural Steel |
| HP | Structural Steel |
| HQ | Structural Steel |
| HR | Structural Steel |
| HS | Structural Steel |
| HT | Structural Steel |
| HU | Structural Steel |
| HV | Structural Steel |
| HW | Structural Steel |
| HX | Structural Steel |
| HY | Structural Steel |
| HZ | Structural Steel |
| IA | Structural Steel |
| IB | Structural Steel |
| IC | Structural Steel |
| ID | Structural Steel |
| IE | Structural Steel |
| IF | Structural Steel |
| IG | Structural Steel |
| IH | Structural Steel |
| II | Structural Steel |
| IJ | Structural Steel |
| IK | Structural Steel |
| IL | Structural Steel |
| IM | Structural Steel |
| IN | Structural Steel |
| IO | Structural Steel |
| IP | Structural Steel |
| IQ | Structural Steel |
| IR | Structural Steel |
| IS | Structural Steel |
| IT | Structural Steel |
| IU | Structural Steel |
| IV | Structural Steel |
| IW | Structural Steel |
| IX | Structural Steel |
| IY | Structural Steel |
| IZ | Structural Steel |
| JA | Structural Steel |
| JB | Structural Steel |
| JC | Structural Steel |
| JD | Structural Steel |
| JE | Structural Steel |
| JF | Structural Steel |
| JG | Structural Steel |
| JH | Structural Steel |
| JI | Structural Steel |
| JJ | Structural Steel |
| JK | Structural Steel |
| JL | Structural Steel |
| JM | Structural Steel |
| JN | Structural Steel |
| JO | Structural Steel |
| JP | Structural Steel |
| JQ | Structural Steel |
| JR | Structural Steel |
| JS | Structural Steel |
| JT | Structural Steel |
| JU | Structural Steel |
| JV | Structural Steel |
| JW | Structural Steel |
| JX | Structural Steel |
| JY | Structural Steel |
| JZ | Structural Steel |
| KA | Structural Steel |
| KB | Structural Steel |
| KC | Structural Steel |
| KD | Structural Steel |
| KE | Structural Steel |
| KF | Structural Steel |
| KG | Structural Steel |
| KH | Structural Steel |
| KI | Structural Steel |
| KJ | Structural Steel |
| KL | Structural Steel |
| KM | Structural Steel |
| KN | Structural Steel |
| KO | Structural Steel |
| KP | Structural Steel |
| KQ | Structural Steel |
| KR | Structural Steel |
| KS | Structural Steel |
| KT | Structural Steel |
| KU | Structural Steel |
| KV | Structural Steel |
| KW | Structural Steel |
| KX | Structural Steel |
| KY | Structural Steel |
| KZ | Structural Steel |
| LA | Structural Steel |
| LB | Structural Steel |
| LC | Structural Steel |
| LD | Structural Steel |
| LE | Structural Steel |
| LF | Structural Steel |
| LG | Structural Steel |
| LH | Structural Steel |
| LI | Structural Steel |
| LJ | Structural Steel |
| LK | Structural Steel |
| LL | Structural Steel |
| LM | Structural Steel |
| LN | Structural Steel |
| LO | Structural Steel |
| LP | Structural Steel |
| LQ | Structural Steel |
| LR | Structural Steel |
| LS | Structural Steel |
| LT | Structural Steel |
| LU | Structural Steel |
| LV | Structural Steel |
| LW | Structural Steel |
| LX | Structural Steel |
| LY | Structural Steel |
| LZ | Structural Steel |
| MA | Structural Steel |
| MB | Structural Steel |
| MC | Structural Steel |
| MD | Structural Steel |
| ME | Structural Steel |
| MF | Structural Steel |
| MG | Structural Steel |
| MH | Structural Steel |
| MI | Structural Steel |
| MJ | Structural Steel |
| MK | Structural Steel |
| ML | Structural Steel |
| MM | Structural Steel |
| MN | Structural Steel |
| MO | Structural Steel |
| MP | Structural Steel |
| MQ | Structural Steel |
| MR | Structural Steel |
| MS | Structural Steel |
| MT | Structural Steel |
| MU | Structural Steel |
| MV | Structural Steel |
| MW | Structural Steel |
| MX | Structural Steel |
| MY | Structural Steel |
| MZ | Structural Steel |
| NA | Structural Steel |
| NB | Structural Steel |
| NC | Structural Steel |
| ND | Structural Steel |
| NE | Structural Steel |
| NF | Structural Steel |
| NG | Structural Steel |
| NH | Structural Steel |
| NI | Structural Steel |
| NJ | Structural Steel |
| NK | Structural Steel |
| NL | Structural Steel |
| NM | Structural Steel |
| NN | Structural Steel |
| NO | Structural Steel |
| NP | Structural Steel |
| NQ | Structural Steel |
| NR | Structural Steel |
| NS | Structural Steel |
| NT | Structural Steel |
| NU | Structural Steel |
| NV | Structural Steel |
| NW | Structural Steel |
| NX | Structural Steel |
| NY | Structural Steel |
| NZ | Structural Steel |
| OA | Structural Steel |
| OB | Structural Steel |
| OC | Structural Steel |
| OD | Structural Steel |
| OE | Structural Steel |
| OF | Structural Steel |
| OG | Structural Steel |
| OH | Structural Steel |
| OI | Structural Steel |
| OJ | Structural Steel |
| OK | Structural Steel |
| OL | Structural Steel |
| OM | Structural Steel |
| ON | Structural Steel |
| OO | Structural Steel |
| OP | Structural Steel |
| OQ | Structural Steel |
| OR | Structural Steel |
| OS | Structural Steel |
| OT | Structural Steel |
| OU | Structural Steel |
| OV | Structural Steel |
| OW | Structural Steel |
| OX | Structural Steel |
| OY | Structural Steel |
| OZ | Structural Steel |
| PA | Structural Steel |
| PB | Structural Steel |
| PC | Structural Steel |
| PD | Structural Steel |
| PE | Structural Steel |
| PF | Structural Steel |
| PG | Structural Steel |
| PH | Structural Steel |
| PI | Structural Steel |
| PJ | Structural Steel |
| PK | Structural Steel |
| PL | Structural Steel |
| PM | Structural Steel |
| PN | Structural Steel |
| PO | Structural Steel |
| PP | Structural Steel |
| PQ | Structural Steel |
| PR | Structural Steel |
| PS | Structural Steel |
| PT | Structural Steel |
| PU | Structural Steel |
| PV | Structural Steel |
| PW | Structural Steel |
| PX | Structural Steel |
| PY | Structural Steel |
| PZ | Structural Steel |
| QA | Structural Steel |
| QB | Structural Steel |
| QC | Structural Steel |
| QD | Structural Steel |
| QE | Structural Steel |
| QF | Structural Steel |
| QG | Structural Steel |
| QH | Structural Steel |
| QI | Structural Steel |
| QJ | Structural Steel |
| QK | Structural Steel |
| QL | Structural Steel |
| QM | Structural Steel |
| QN | Structural Steel |
| QO | Structural Steel |
| QP | Structural Steel |
| QQ | Structural Steel |
| QR | Structural Steel |
| QS | Structural Steel |
| QT | Structural Steel |
| QU | Structural Steel |
| QV | Structural Steel |
| QW | Structural Steel |
| QX | Structural Steel |
| QY | Structural Steel |
| QZ | Structural Steel |
| RA | Structural Steel |
| RB | Structural Steel |
| RC | Structural Steel |
| RD | Structural Steel |
| RE | Structural Steel |
| RF | Structural Steel |
| RG | Structural Steel |
| RH | Structural Steel |
| RI | Structural Steel |
| RJ | Structural Steel |
| RK | Structural Steel |
| RL | Structural Steel |
| RM | Structural Steel |
| RN | Structural Steel |
| RO | Structural Steel |

Select AESS Categories associated to members or assemblies

Sample AESS2 / AESS3 Table

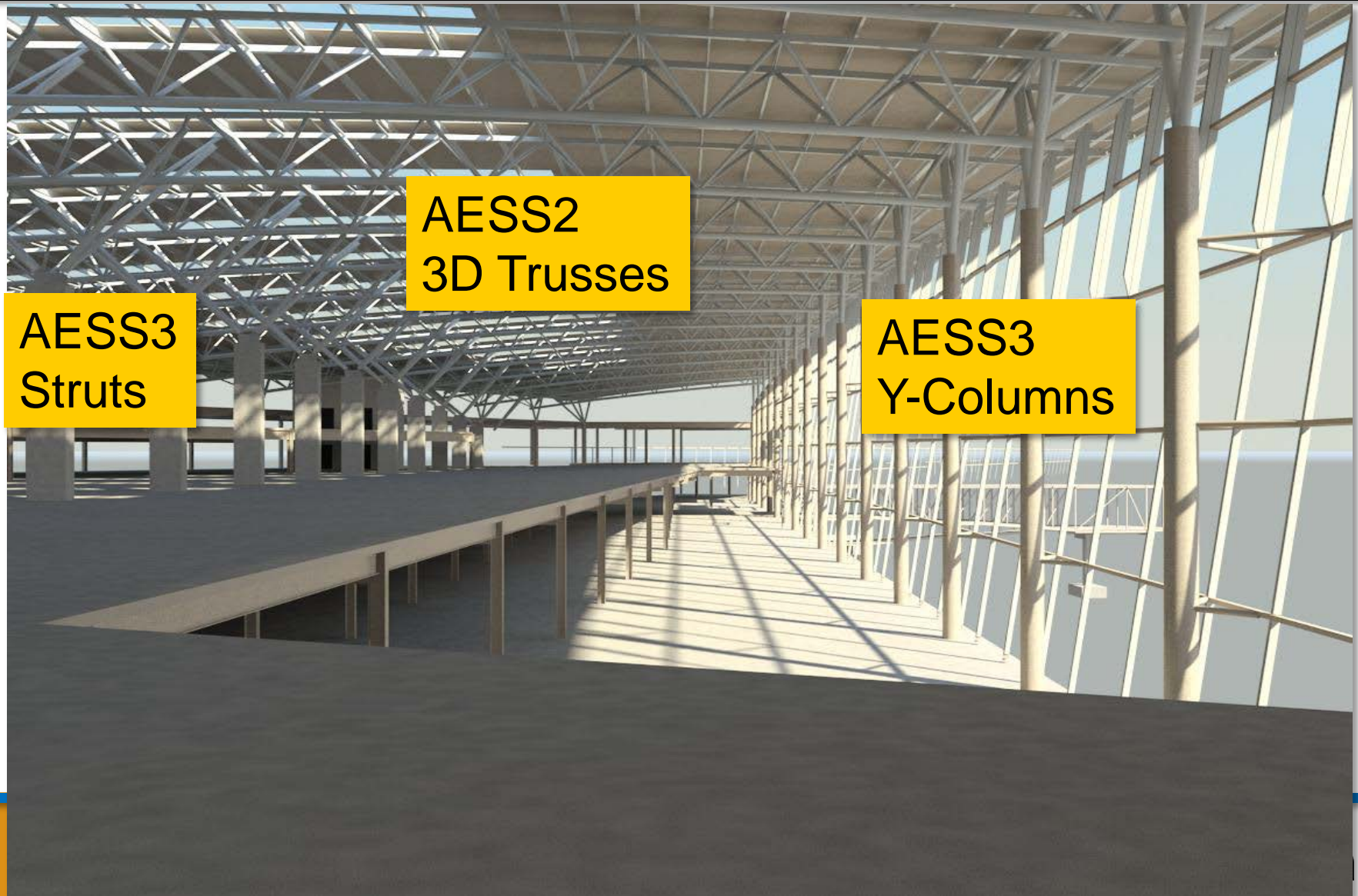
| Contract Area(s) | Element (Members and Associated Connections) | AESS Category (Refer to TABLE 1) |
|-------------------------|---|---|
| Hotel Terminal | Canopies | - |
| Hotel Terminal Piers | Glazing Supports (Interior) | AESS 3 |
| Terminal Piers | Glazing Supports (Exterior) | AESS 3 |
| Hotel Terminal Piers | Glazing Support Pin Connections at Floor Level | AESS 3 |
| Hotel Terminal Piers | Columns | AESS 3 |
| Hotel Terminal Piers | Column Struts to Glazing | AESS 3 |
| Terminal | Column Struts to Trusses | AESS 3 |
| Terminal | Roof Trusses | AESS 2 |
| Hotel Terminal | Braces | AESS 3 |
| Hotel Terminal Piers | Moment Frames | AESS 2 |

Select AESS Categories associated to members or assemblies

Sample AESS2 / AESS3 Table

| Contract Area(s) | Element (Members and Associated Connections) | AESS Category (Refer to TABLE 1) |
|----------------------|---|-------------------------------------|
| Hotel Terminal | Canopies | - |
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| Terminal Piers | Glazing Supports (Exterior) | AESS 3 |
| Hotel Terminal Piers | Glazing Support Pin Connections at Floor Level | AESS 3 |
| Hotel Terminal Piers | Columns | AESS 3 |
| Hotel Terminal Piers | Column Struts to Glazing | AESS 3 |
| Terminal | Column Struts to Trusses | AESS 3 |
| Terminal | Roof Trusses | AESS 2 |
| Hotel Terminal | Braces | AESS 3 |
| Hotel Terminal Piers | Moment Frames | AESS 2 |

Location of the AESS elements



AESS2
3D Trusses

AESS3
Struts

AESS3
Y-Columns

Mockups at Supermétal Plant



Mockups at Supermétal Plant



During fabrication it is essential that elements ► provide good access for operations.

The “Rotator”!

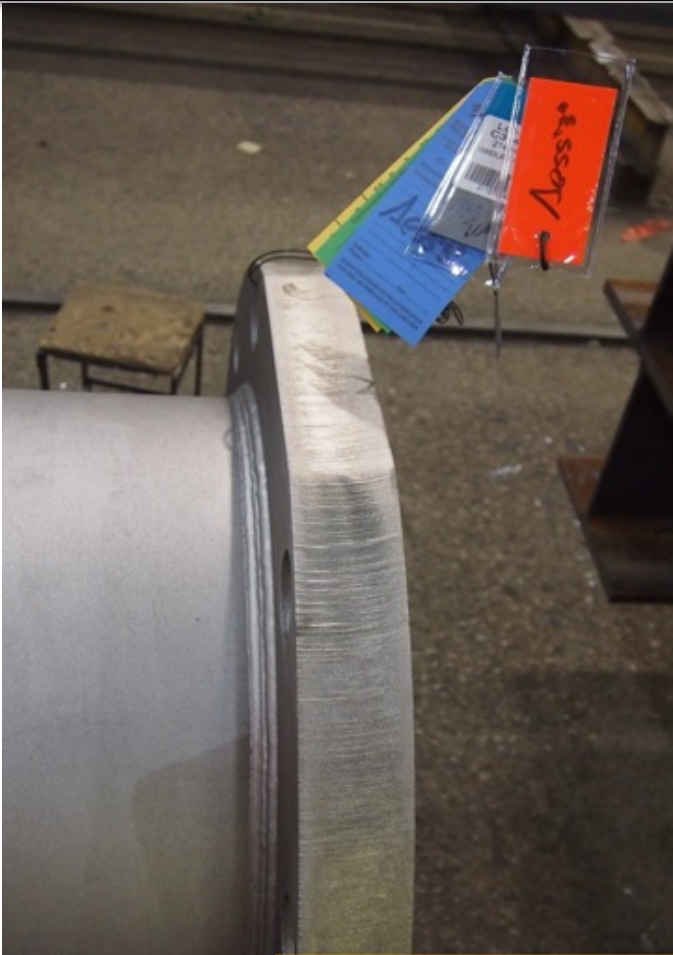


The main truss elements were placed in a jig that rotated to permit access for operations.

Calgary Airport Assemblies Mockup at Supermétal Plant

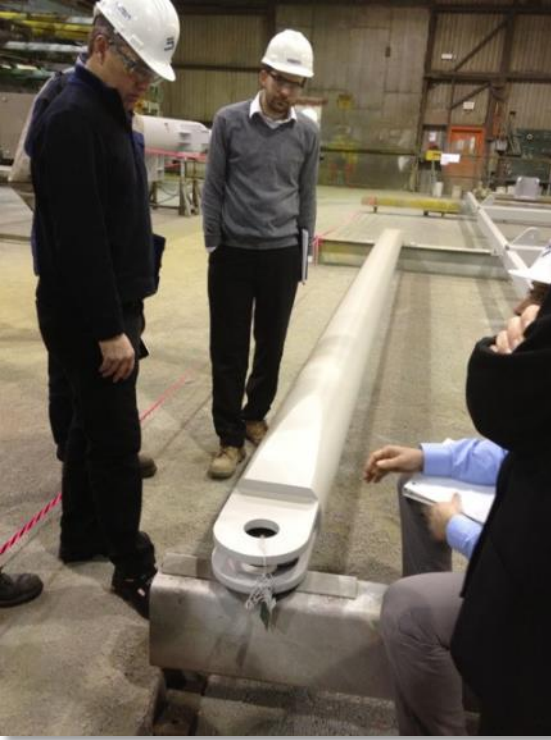


Avoiding confusion



Labels help during
fabrication and
erection

When a Mockup is required ...



Remember that the shop conditions are different than the final conditions, with respect to:

- Distance
- Position
- Lighting



When a Mockup is required ...



When a Mockup is required ...



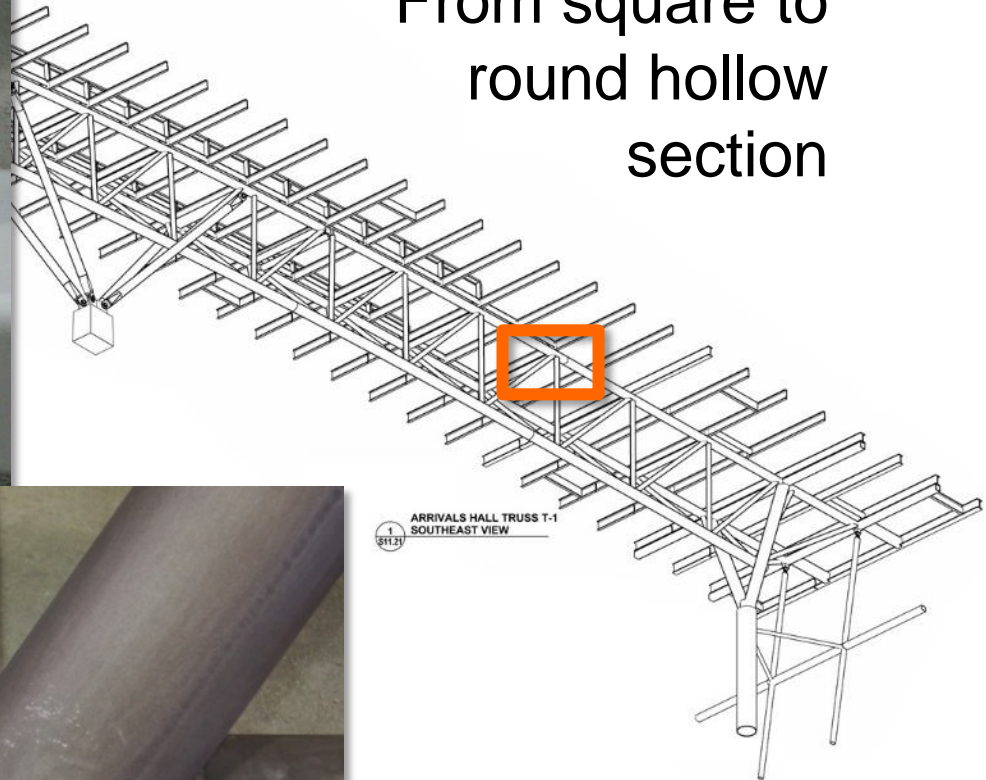
Photos: Sylvie Boulanger, Superm tal

Member sizes and alignment issues



- It is critical to understand the physical 'size' of the weld when choosing member sizes.
- Must allow for the weld.

Alignment issues



From square to
round hollow
section

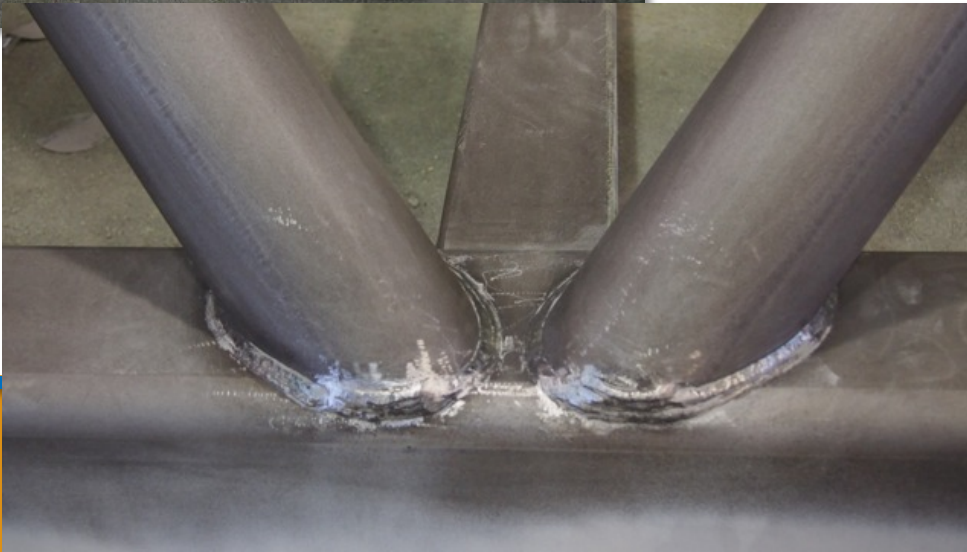


Image: RJC

Alignment issues

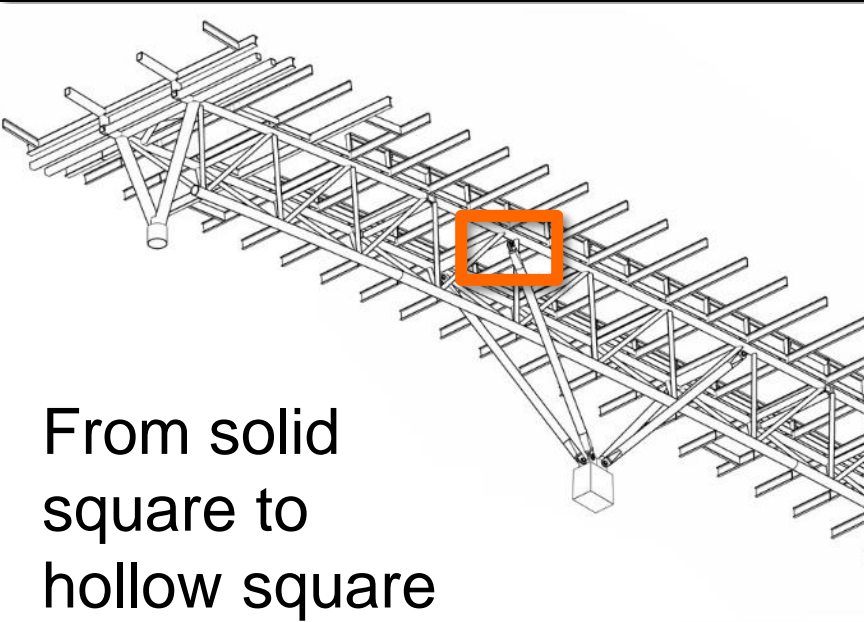


Image: RJC





Hidden splices



Hiding bolted splice
with steel sleeves

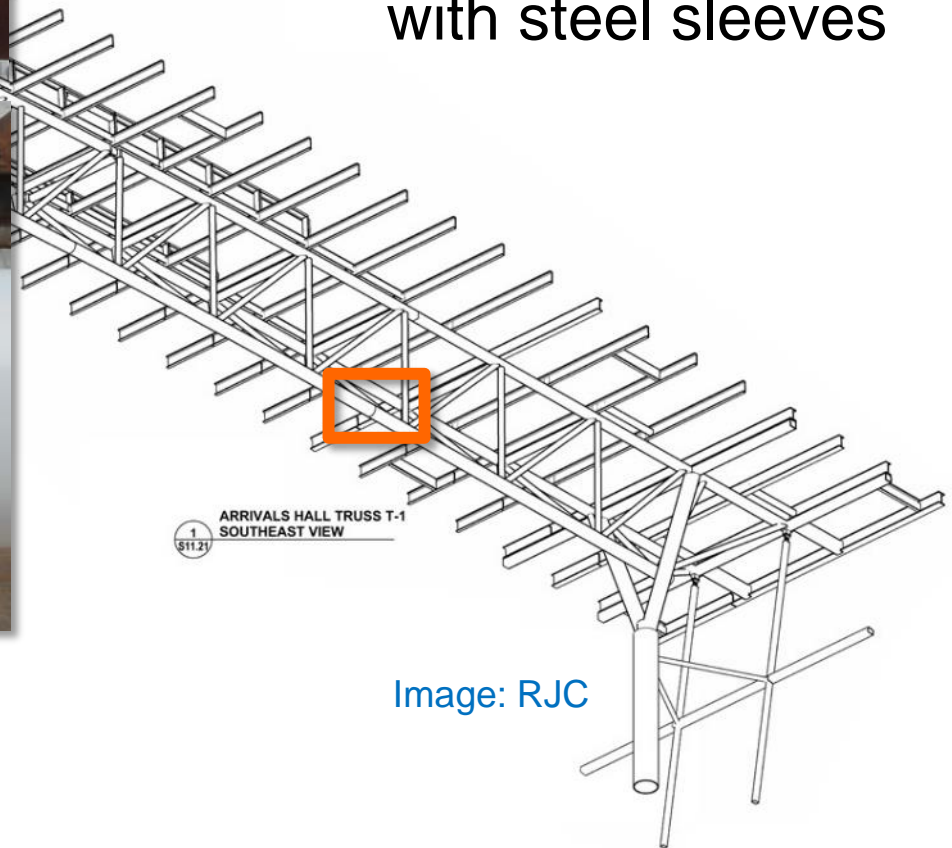
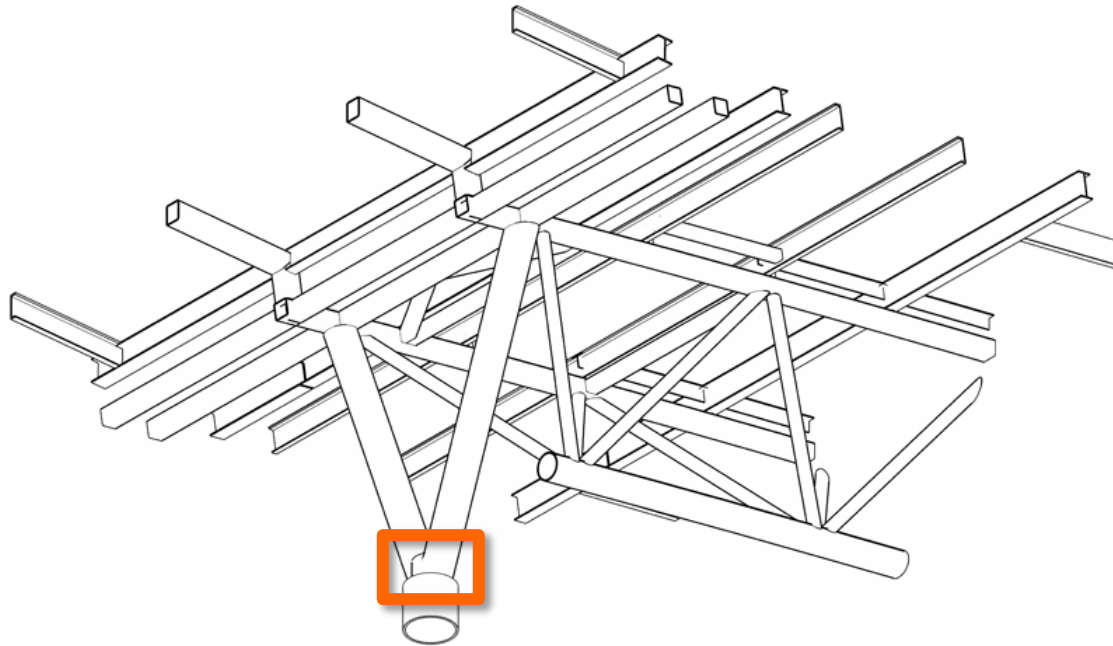


Image: RJC

How round is round?



From round column to
round plate

ARRIVALS HALL TRUSS T-1 GRID 'AF'
SOUTHEAST VIEW

2
S11.21

Image: RJC

How round is round?

FACT:
A round plate is
not the same
shape as a round
tube!

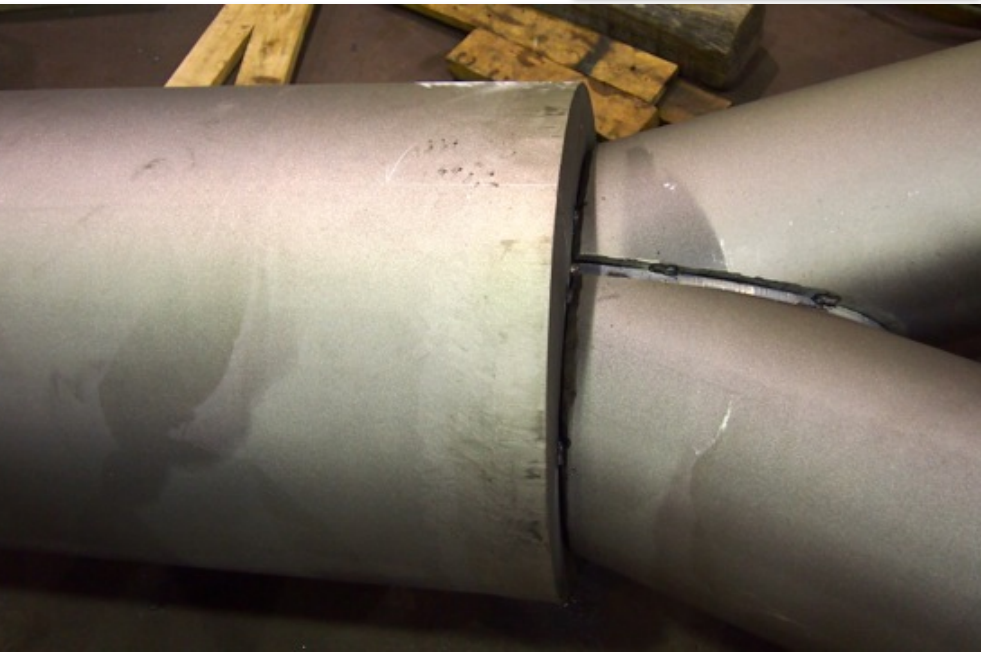


Plate either goes on top of tube
or inside tube...

Care in transportation and handling



- AESS is normally shop painted
- Must be well protected during transport
- Use padded slings and supports



Lifting a truss element



Threading the struts



Bolting the strut



Location of AESS Categories



Truss is AESS2

Struts and columns are AESS3



Overall progress



Closer view



Panoramic view

Calgary Airport Panorama – Terminal / Hotel – From North side at Grid 10

28 AOÙt 2012



30 SEPTEMBRE 2012

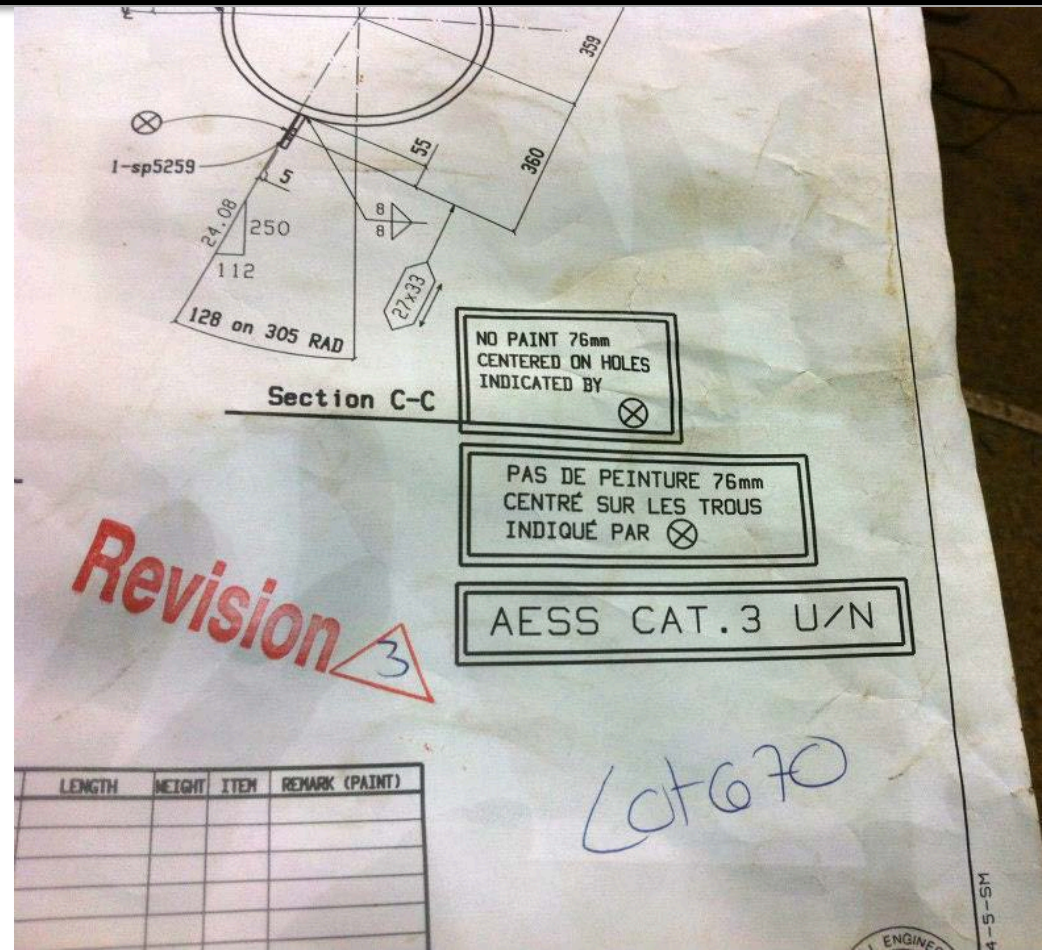


26 OCTOBRE 2012



Lessons Learned

- Better bids
- More productive plant visits
- Expectations more aligned
-
- Smooth weld still subject to interpretation
- Identical vs equivalent reproduction
- Inspection consistency



Next phase!

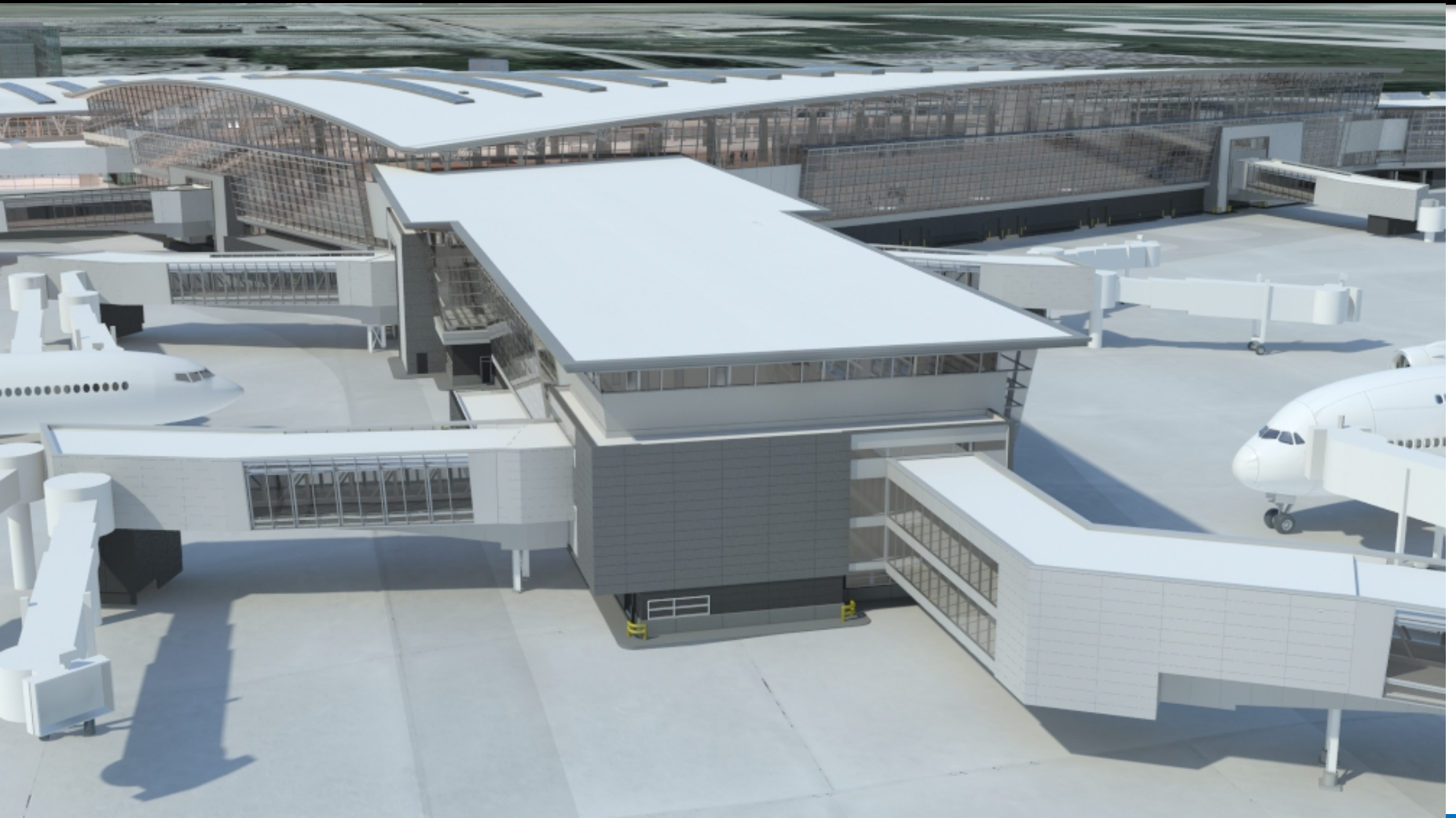
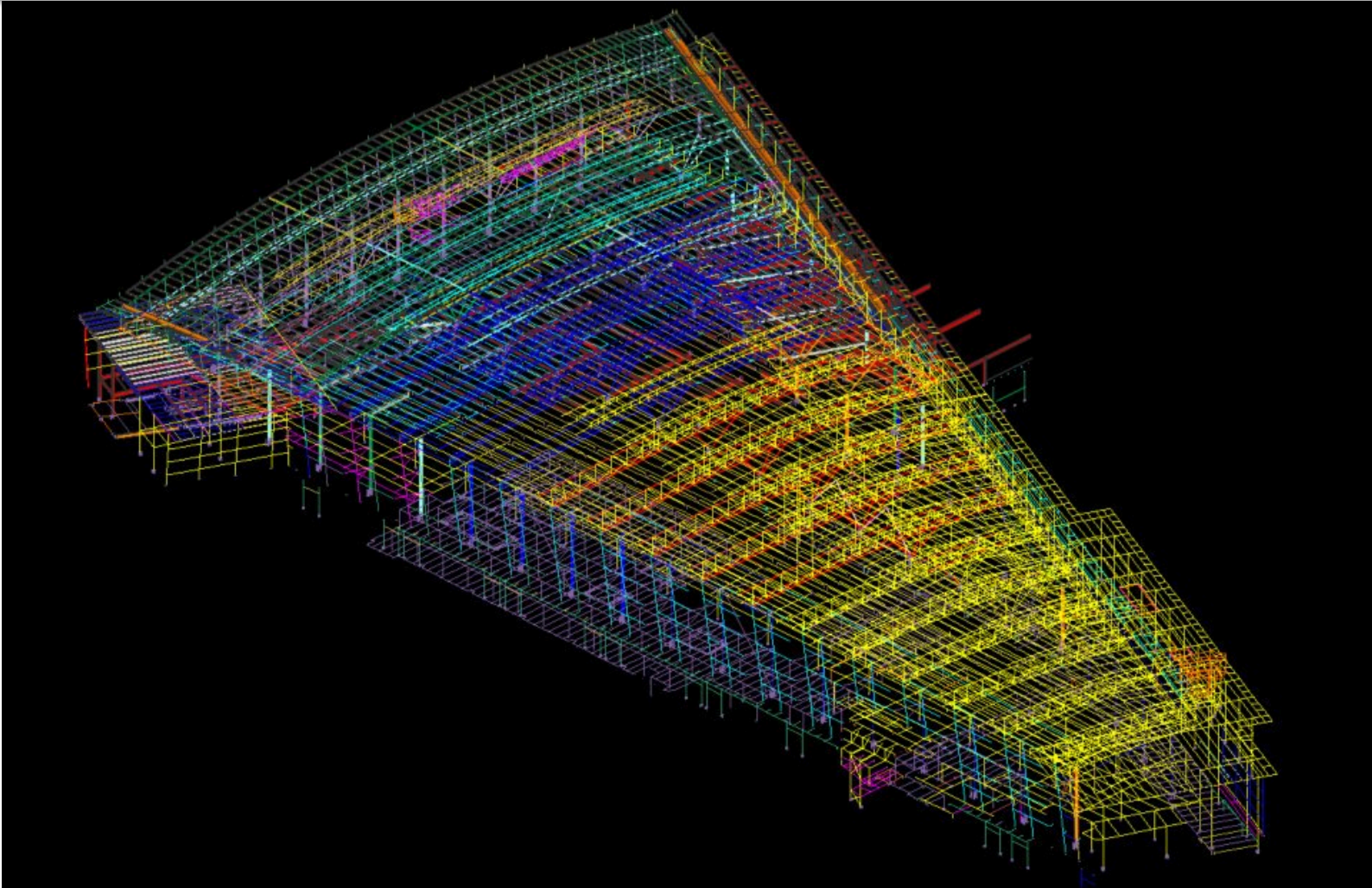
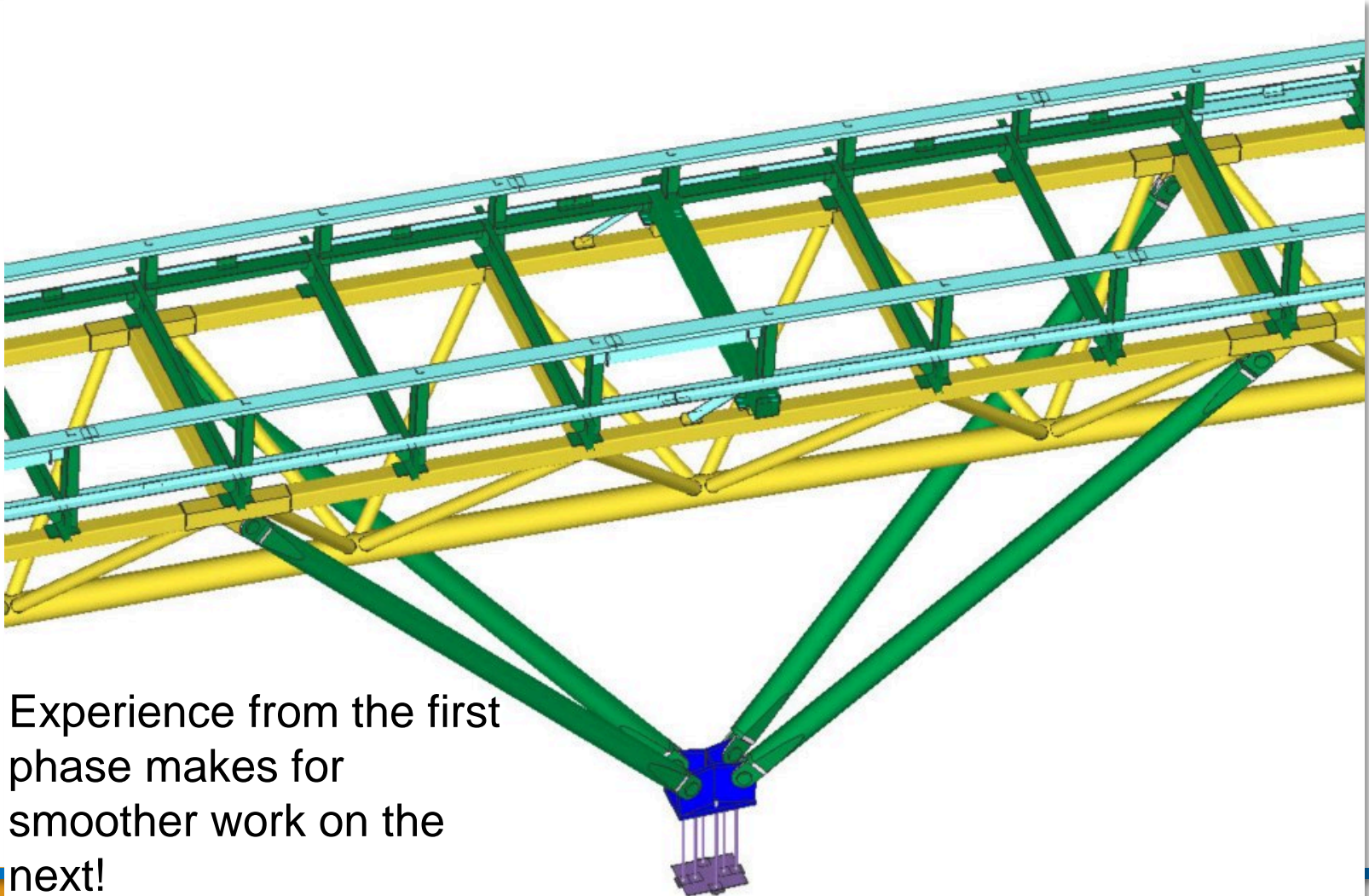


Image: DIALOG

Overall structural drawing



Detail



Experience from the first phase makes for smoother work on the next!

The core idea! FORM, FIT & FINISH



Two “TREES” – both AESS – each quite different from the other – so why would the AESS Specification be even remotely the same???


Cost impact items

- Custom “shapes”
- Use of welded plate in lieu of W, C and L sections
- Connection details
- Transportation restrictions
- Staging area restrictions
- Bending the steel
- Custom castings
- General level of complexity of the elements or structure
- Eccentric elements

Design process implications

- Architects and engineers have to talk to **decide on AESS Categories**.
- AESS Categories need to **appear on all contract documents** as per Spec.
- We typically expect that there will be **2 Categories specified per structure**
 - ex. AESS 2 upper portion of atrium, AESS 3 for the lower portion; 1 and 2; 2 and 3; 3 and 4...
- Fabricators to **bid on Engineering documents** and the Categories specified.

Fabrication and Erection Implications

- Architects need to fully appreciate and include AESS considerations in their designs and *negotiate with the Fabricator for more appropriate details*
- Categories specified infer sequencing, cost and constructability issues. 
- Higher level of care as provided for in the Code for Fabricators.
- AESS Categories to appear on all Shop and Erection drawings.

Positive outcomes

- AESS system standardizes basic design and fabrication issues
- Eliminates many 'routine' issues through the Category System
- Very important NOT to change AESS Categories
- If you want something different, pick CUSTOM
- Allows team to concentrate efforts on more particular issues for the project

*SAMPLE AESS SPEC FOR
STRUCTURAL STEEL*

Engineer



Architect

*GUIDE FOR
SPECIFYING
AESS*

Fabricator

*CODE OF
PRACTICE*





Project Profile

AQUATIC CENTRE FOR THE 2015 PANAM GAMES
Toronto, Ontario

Owner

University of Toronto, Scarborough Campus

Architects

NORR Architects

Construction Manager

PCL

Structural Engineer

Yolles

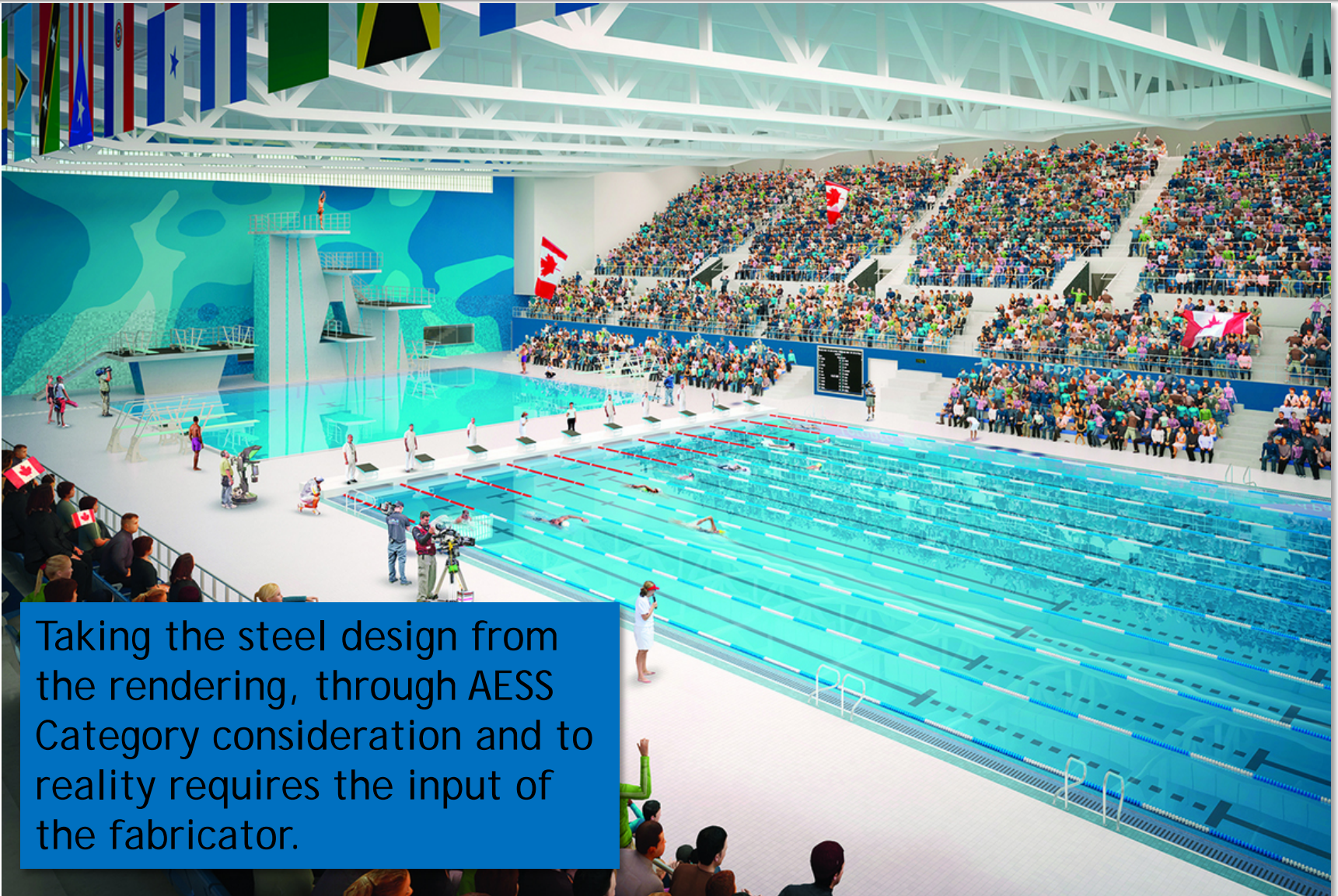
Steel Fabricator / Detailer / Erector

Walters Inc., Benson Steel, Casey Welding



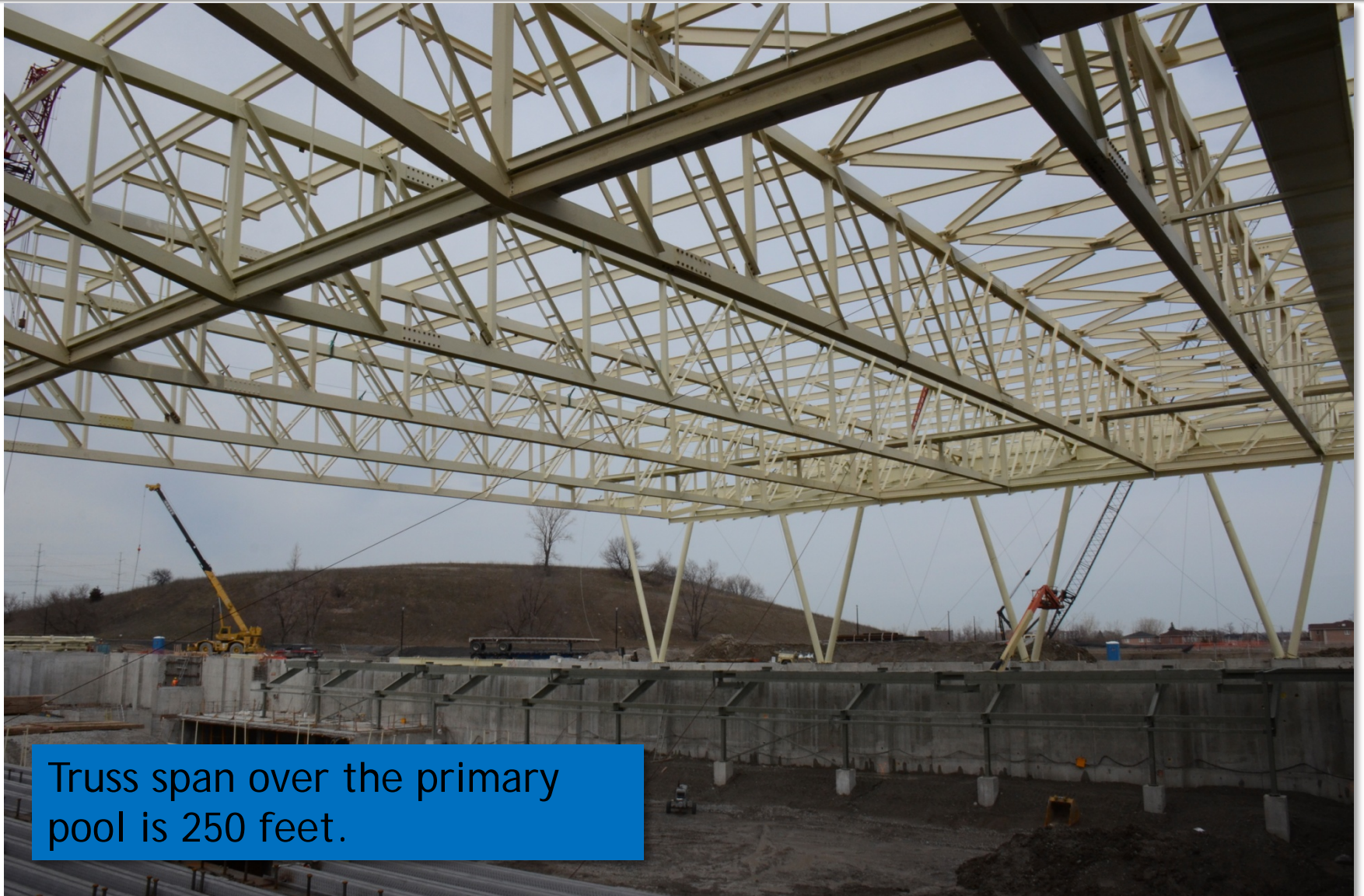
Site access courtesy: Walters Inc.

Working with the fabricator



Taking the steel design from the rendering, through AESS Category consideration and to reality requires the input of the fabricator.

Details of the trusses



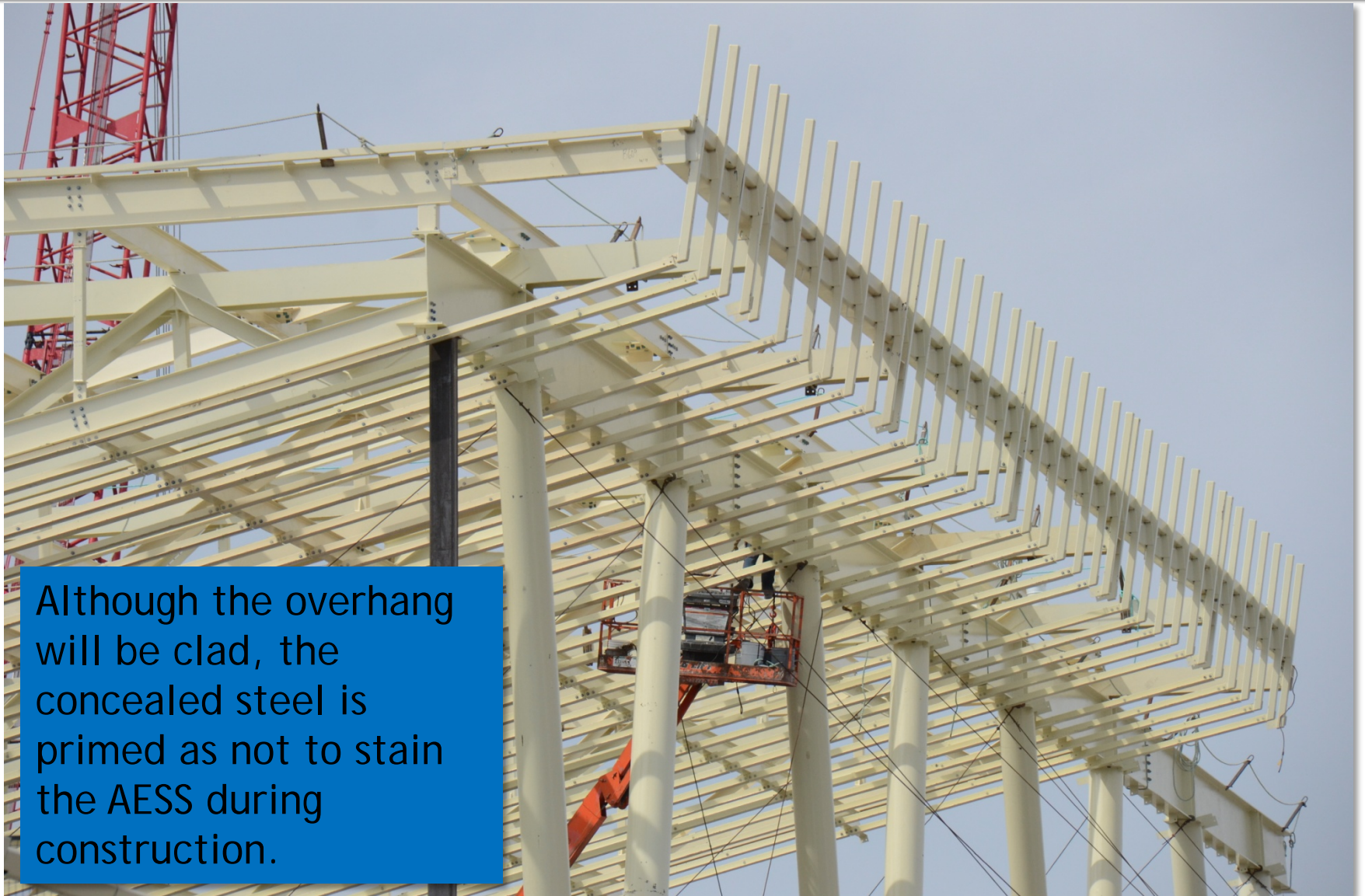
Truss span over the primary pool is 250 feet.

Differentiated steel throughout



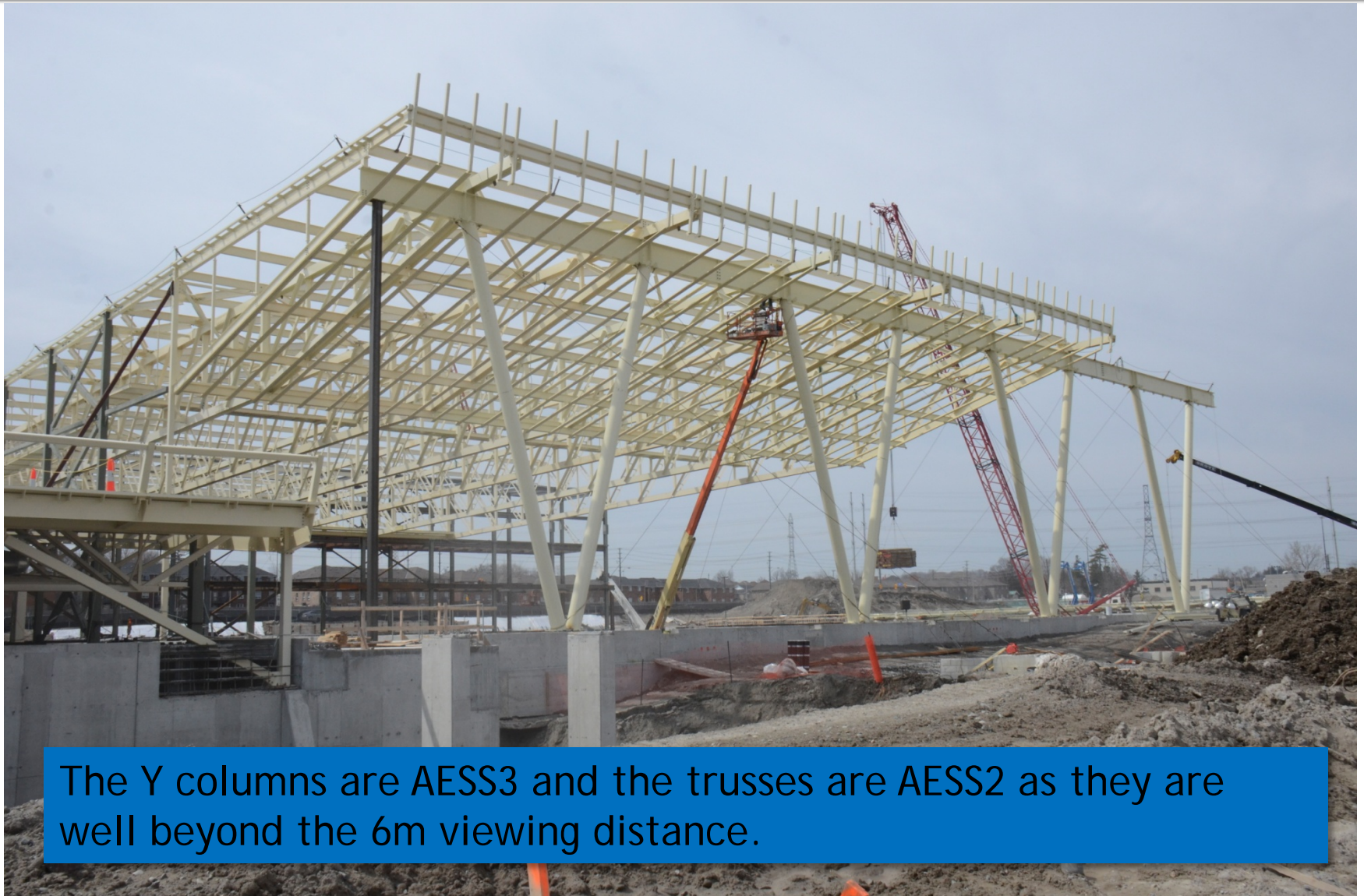
Different categories of AESS are chosen in combination with standard structural steel for concealed work.

Primed steel



Although the overhang will be clad, the concealed steel is primed as not to stain the AESS during construction.

Different categories



The Y columns are AESS3 and the trusses are AESS2 as they are well beyond the 6m viewing distance.

Column to beam connection



Ladder design of web members



Simple steel shapes and welding create an interesting truss detail.

Bolted vs welded connections



Splicing the trusses



Splicing the trusses



The 250 foot long trusses arrive to the site in transportable sections. They are assembled on the 'flat' prior to lifting. Site connections are bolted.

Bolted splice

Simple splice. Bolt heads all on the same side.



Training pool roof



This smaller roof is simple AESS1.



Owner
Brookfield

Architects
Pelli Clarke Pelli Architects

Construction Manager
Plaza Construction

Steel Fabricator / Detailer / Erector
Walters Inc. Hamilton/Metropolitan Walters

Project Profile

WORLD FINANCIAL CENTRE ENTRY PAVILION
New York City, New York

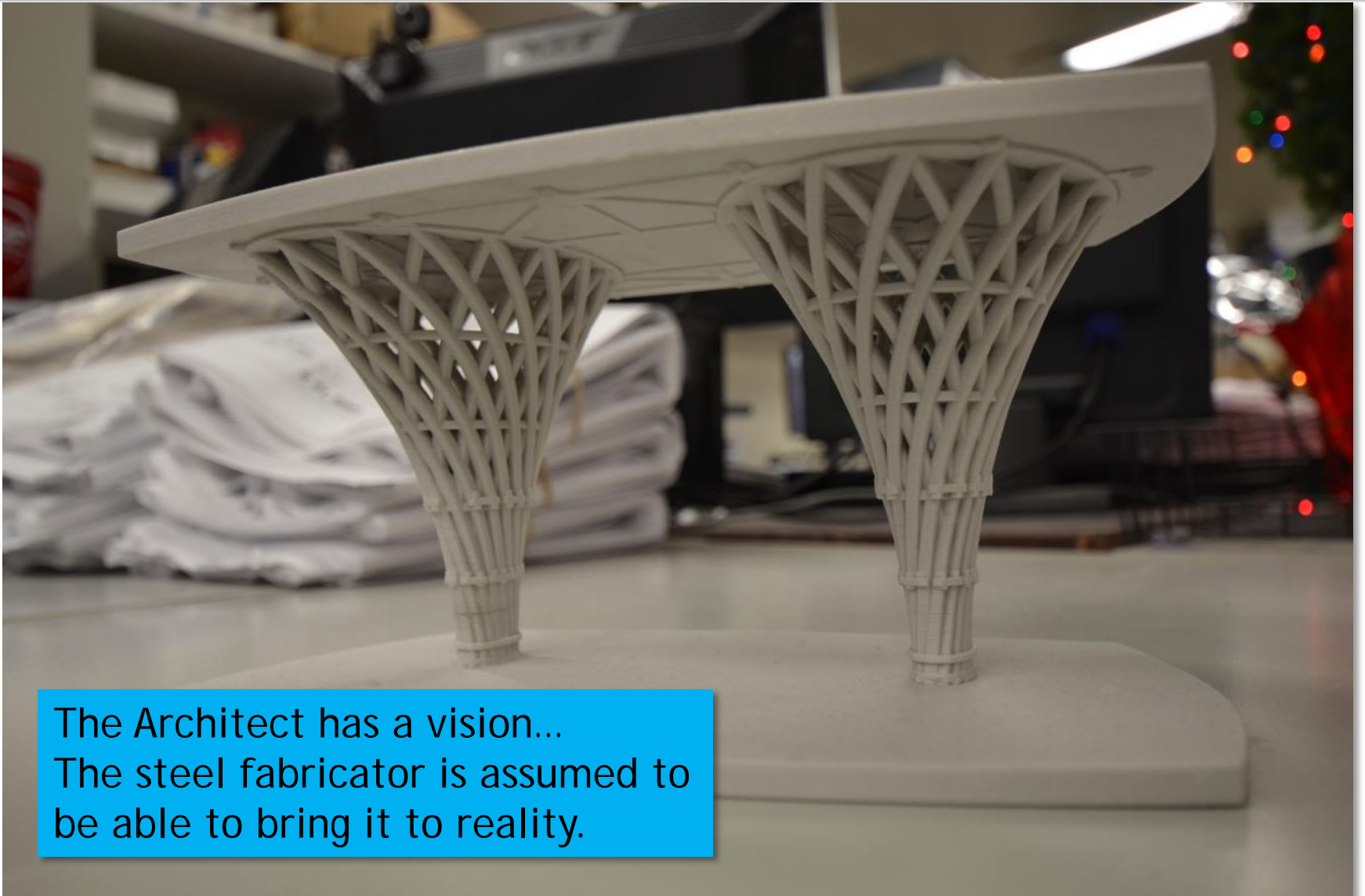


Site access courtesy: Walters Inc.

The Architect's Concept

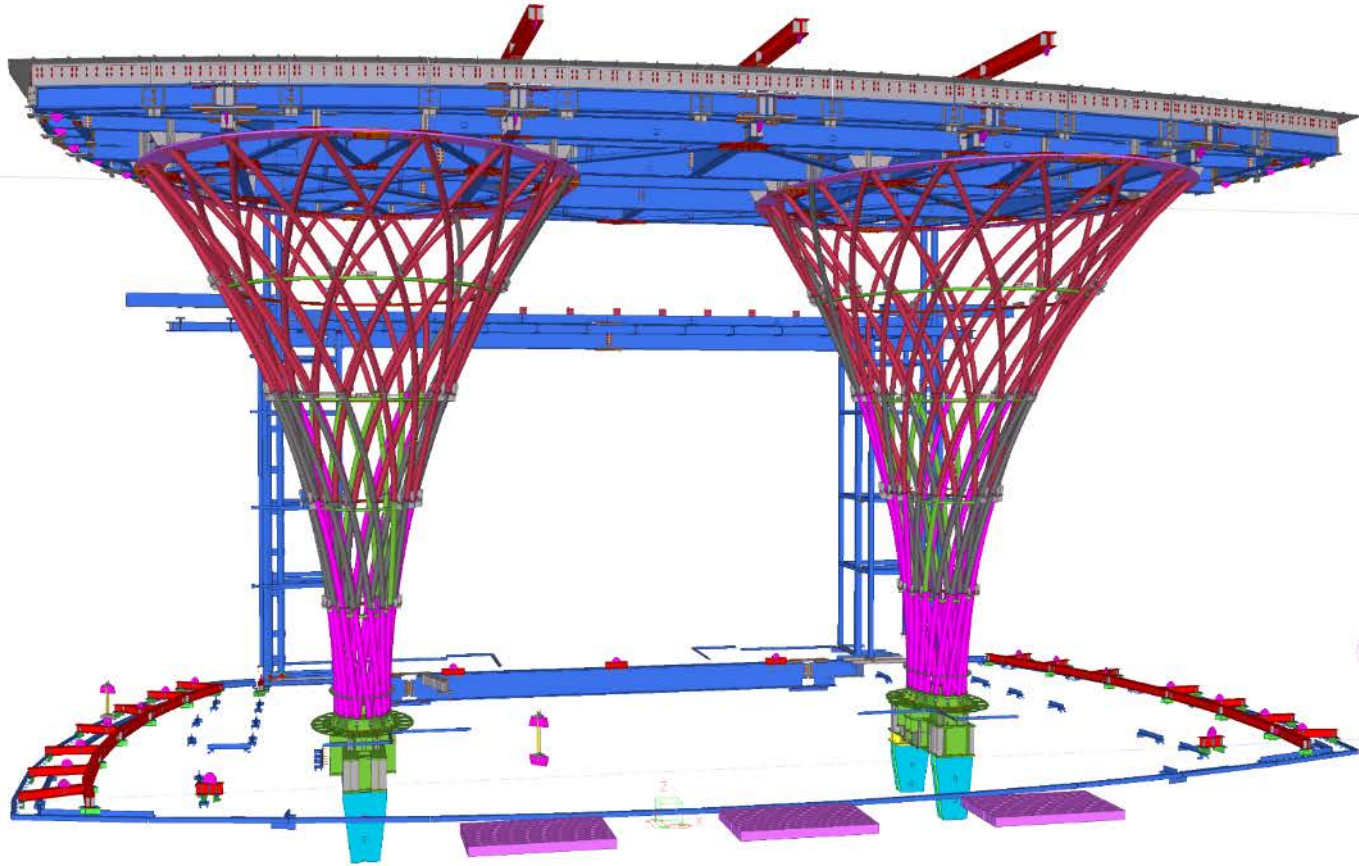


The 3D Model

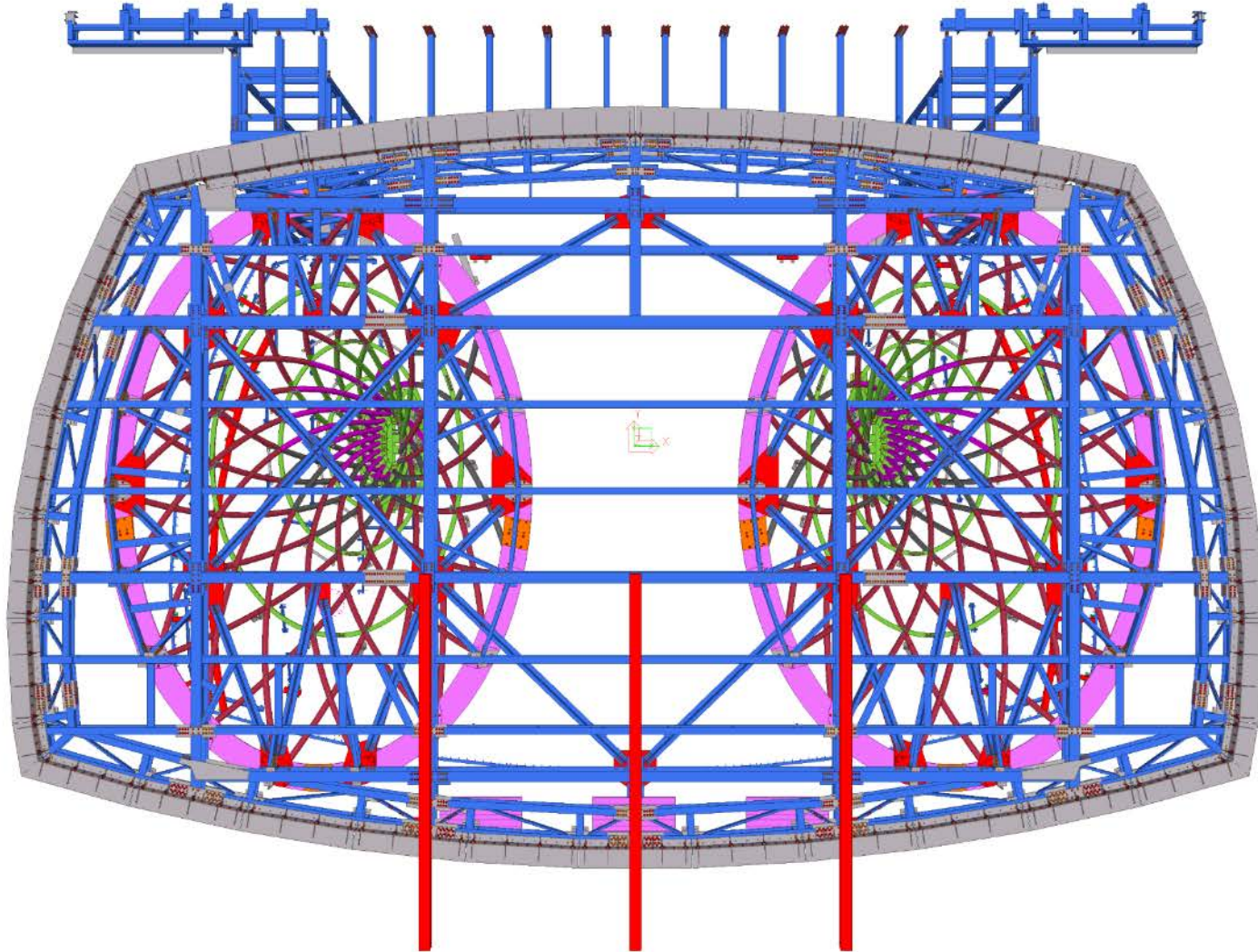


The Architect has a vision...
The steel fabricator is assumed to
be able to bring it to reality.

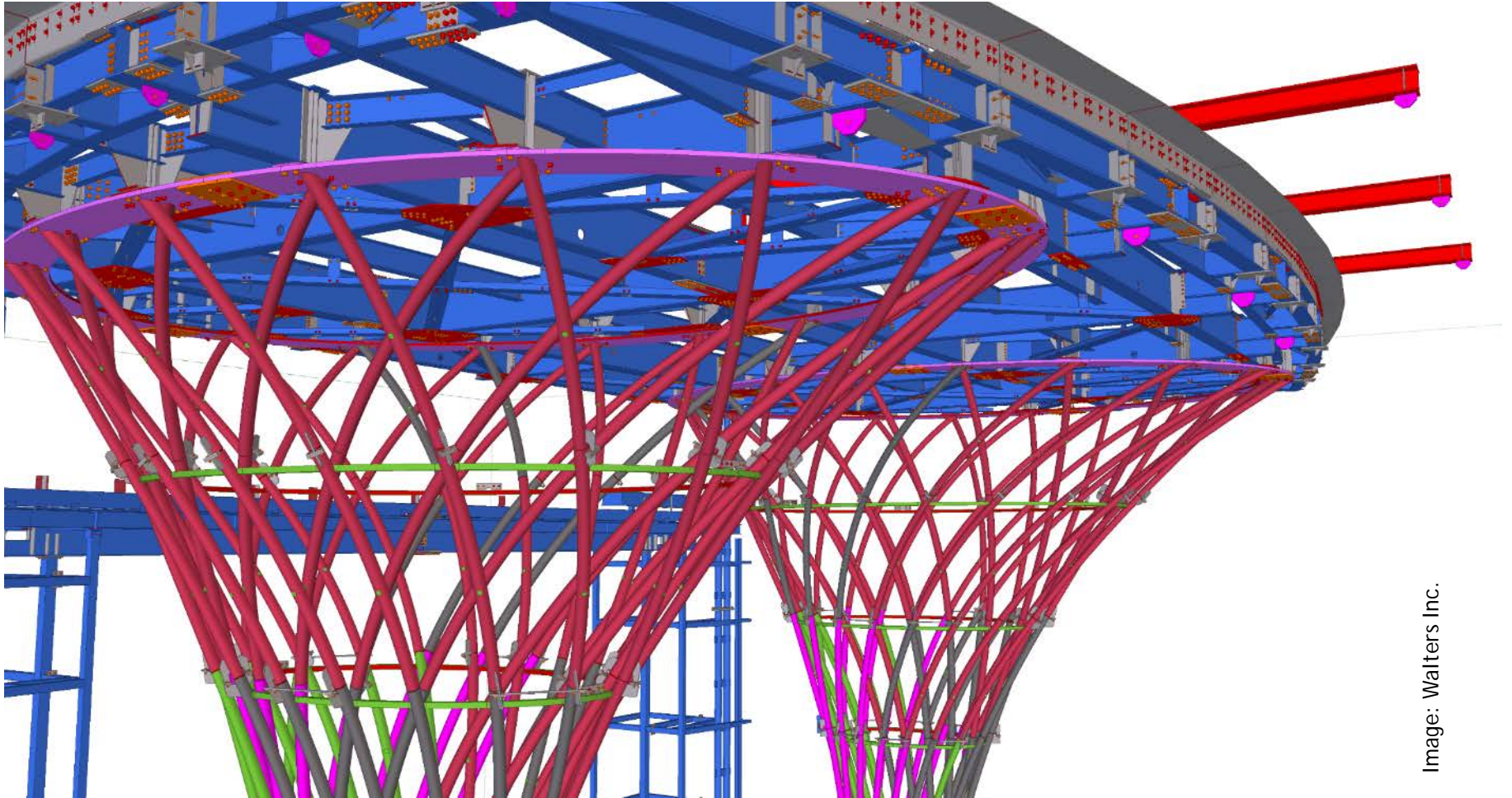
Complex steel uses digital methods



Top view of plan



Detailed view



Setting the jigs



- Two “baskets”
- 5 tiers each
- Fully welded AESS4
- Understand truck limitations
- Minimize site connections
- Transport to NYC from Hamilton



Maximizing the fabrication in shop



Temporary steel holds a permanent ring in position for alignment and welding.

Curved tubular steel



Issues with matching connecting curved pieces for seamless welded connections.

Solid connecting steel rods

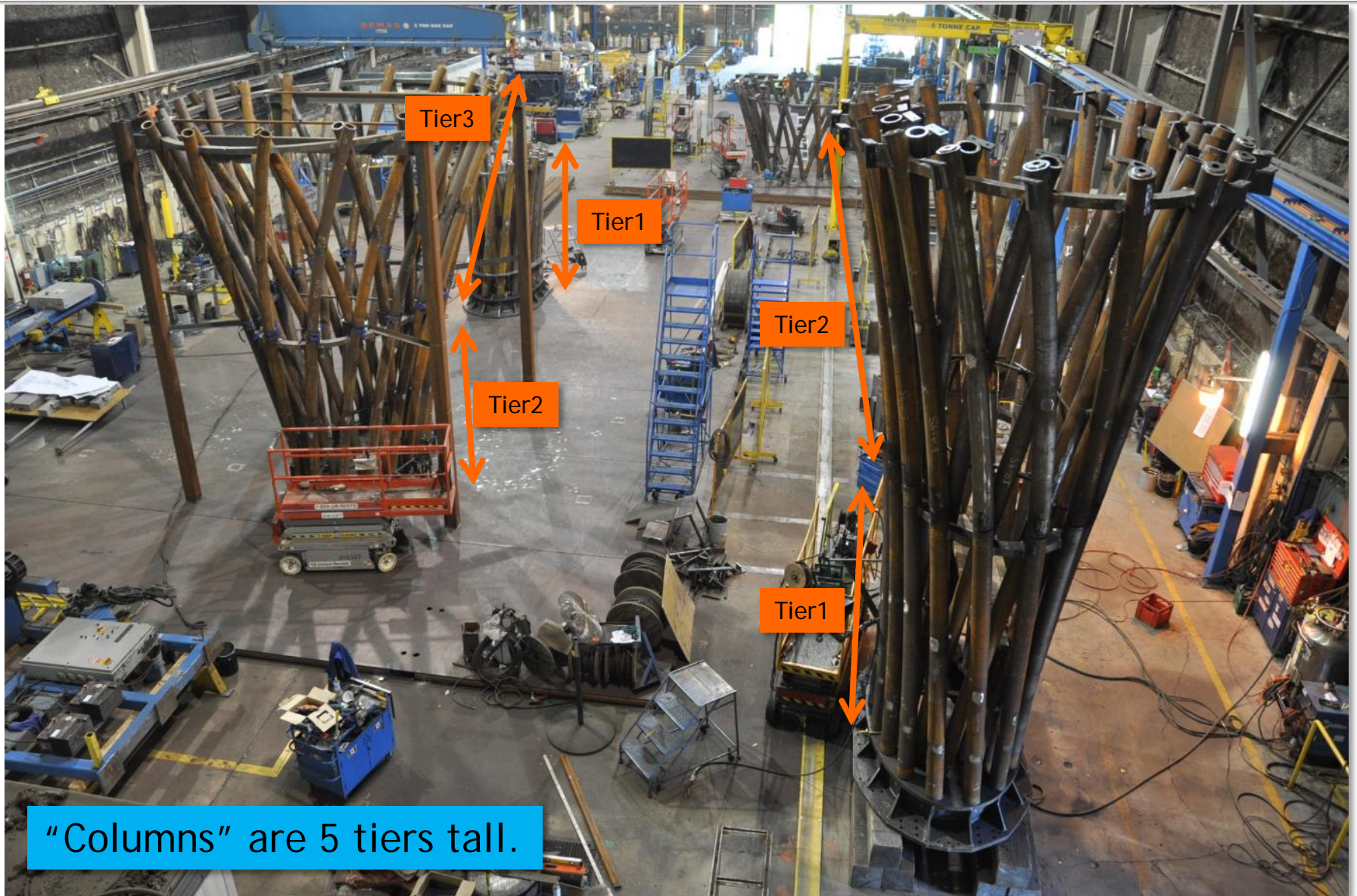


For AESS4 these connections must be ground and filled and 'made to disappear'

Curves, overlaps and geometry



Shop space and pre-fitting



Aligning future site connections



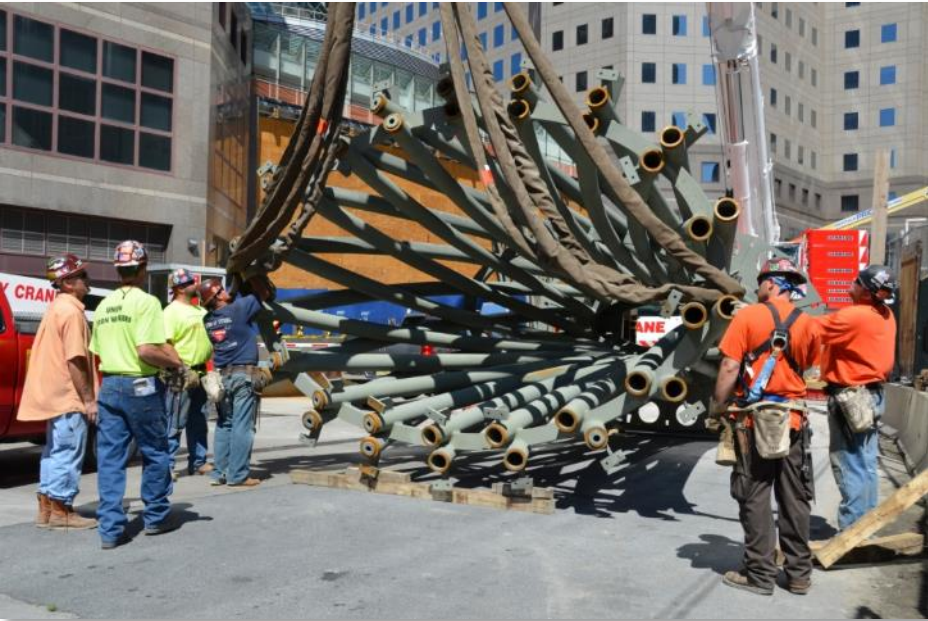
Why shop weld?



Transportation



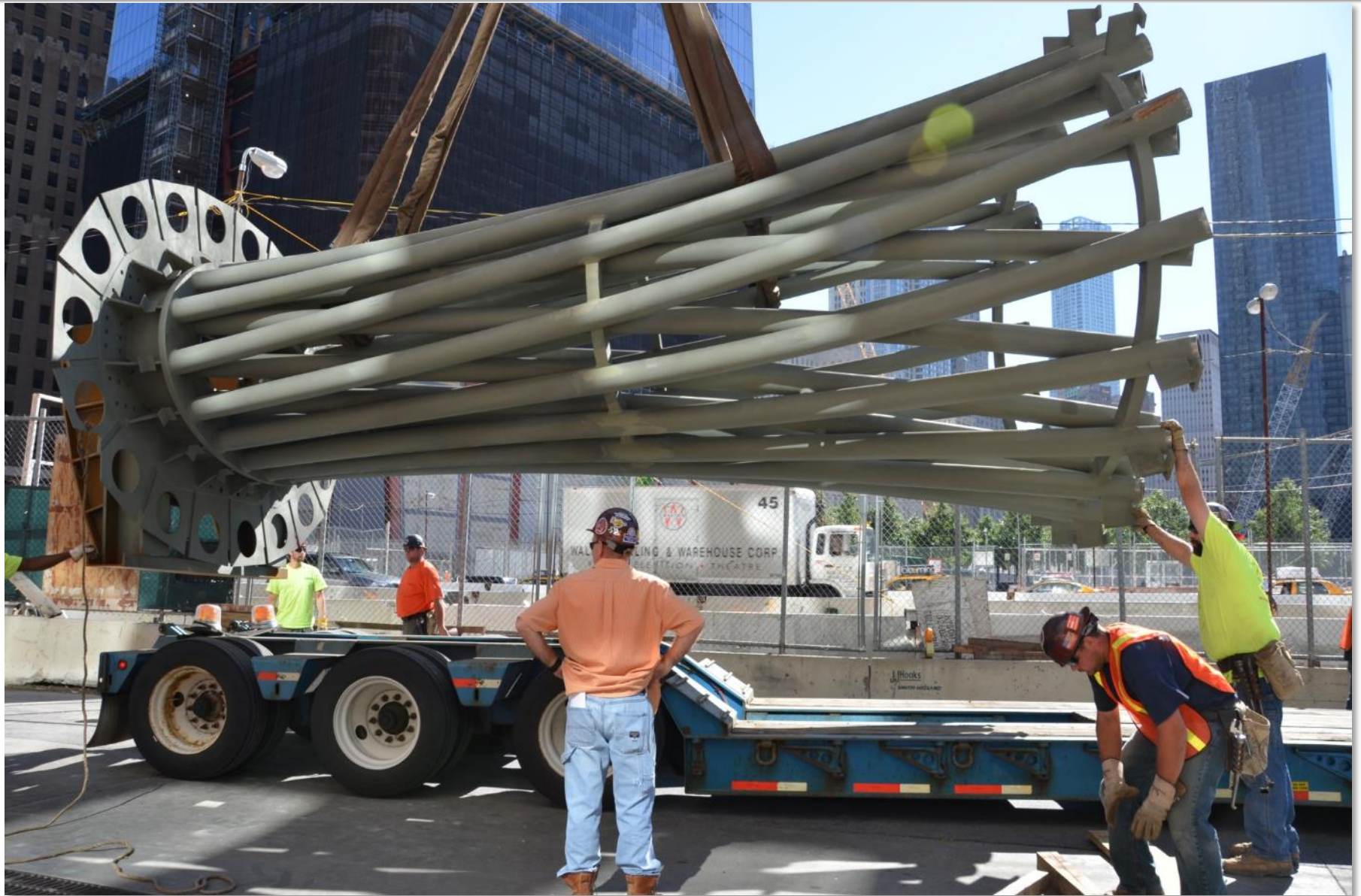
Handle with care



- Erection crew different from fabrication crew
- Lifting odd shapes difficult
- Steel is primed
- Surfaces must not be damaged



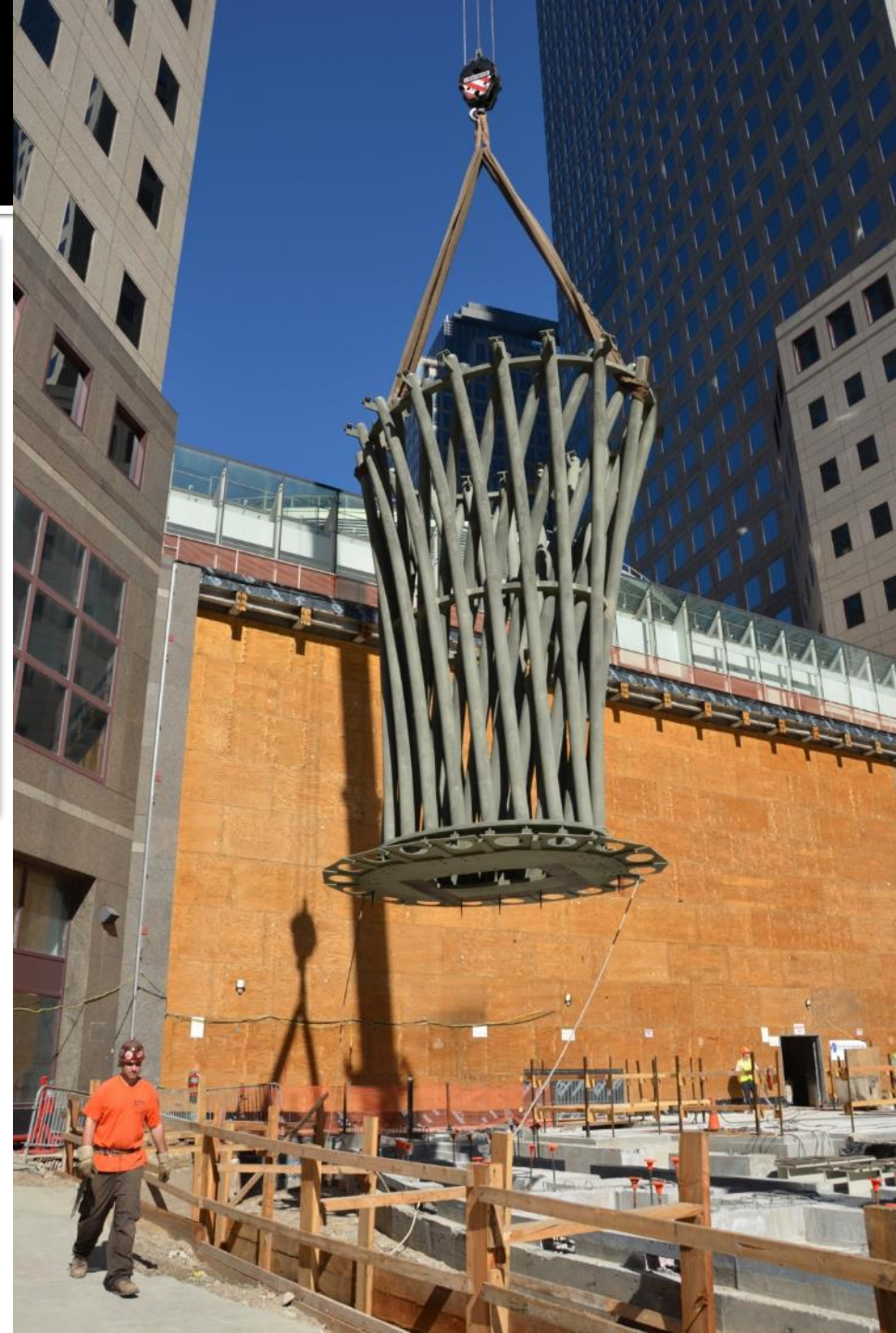
Lift off of the truck



Lift into place



- Site preparations must be accurate
- AESS requires precision
- Plumb element
- Remember this is structural steel



Access to complete connections



Staging and site issues



Sorting pieces



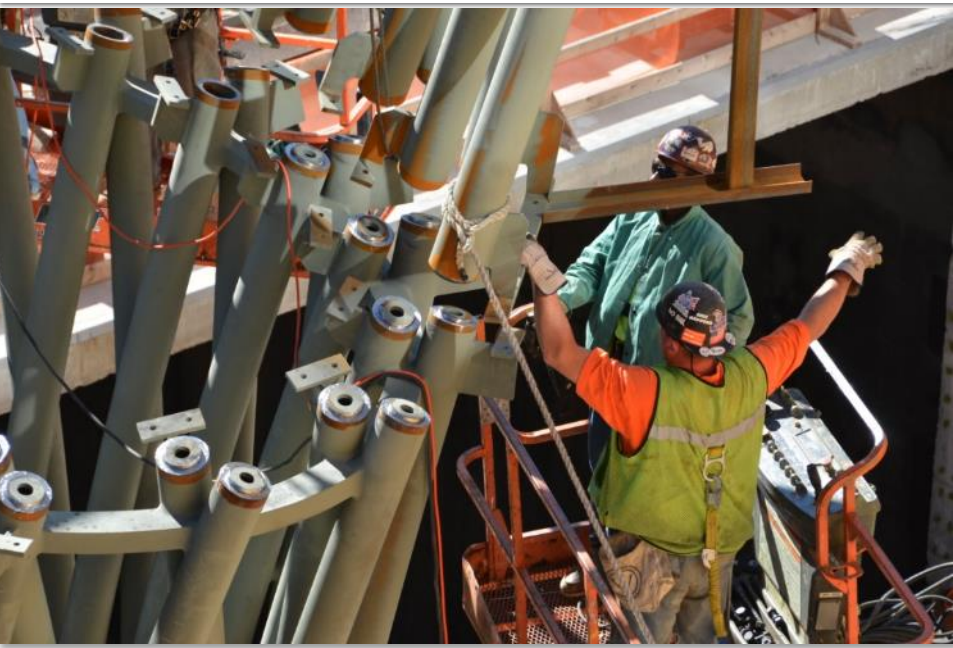
- Many pieces for a complex project
- Need to ensure adequate labeling to avoid confusion
- Upper tiers too large to be shipped assembled
- Subdivided into sections to fit shipping limitations



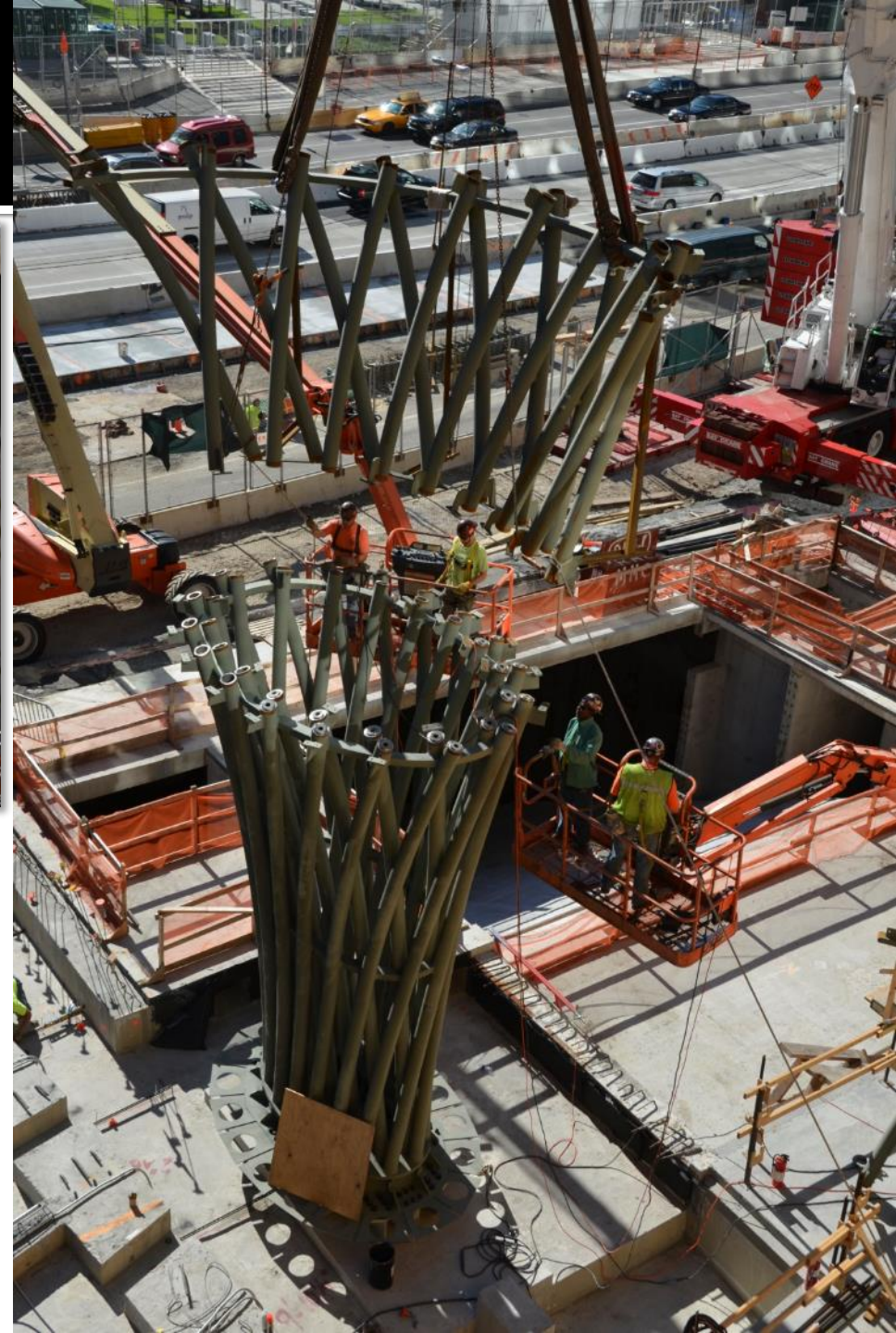
Access to perform work



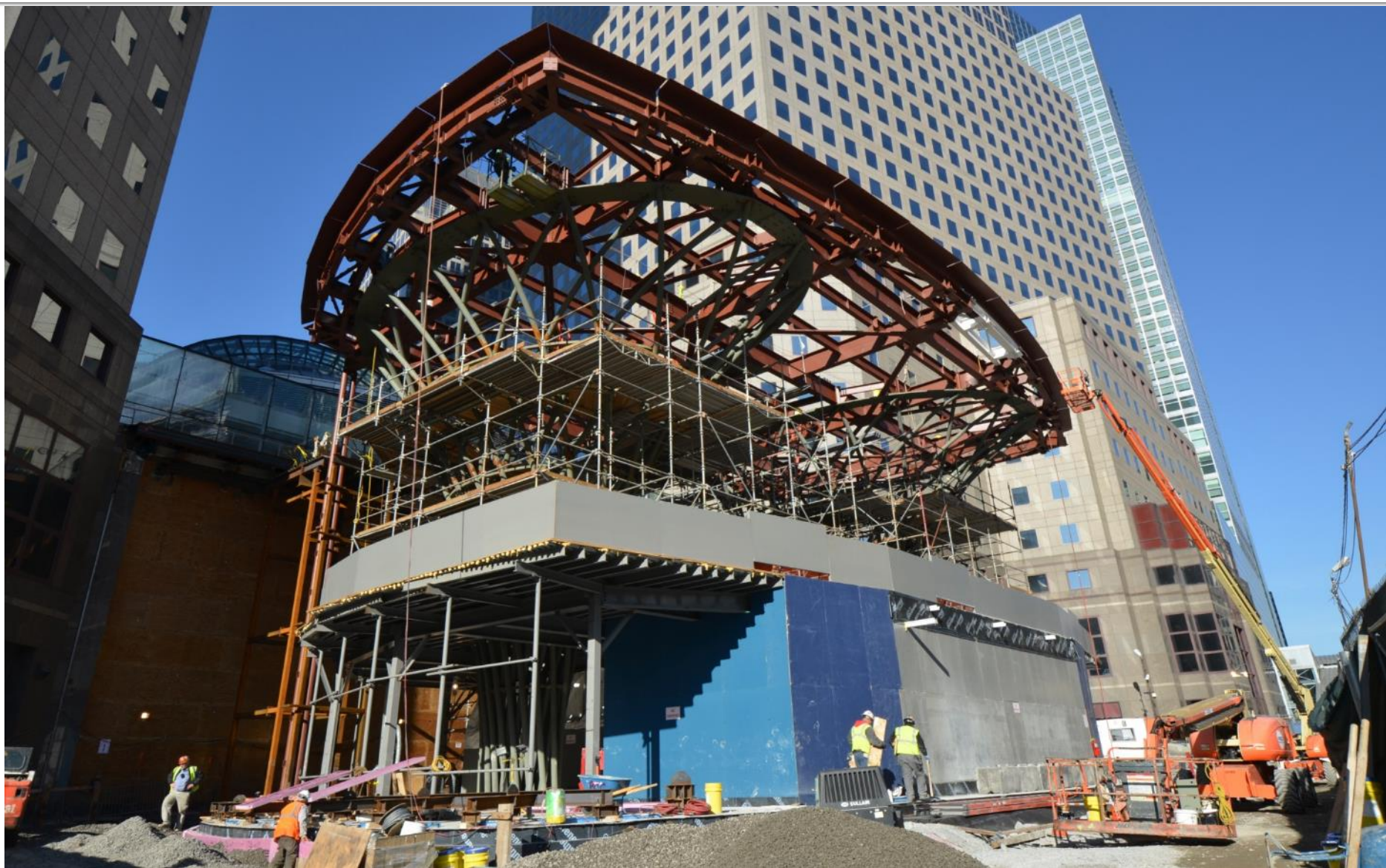
Complex fit



- If it does not fit, it is a HUGE problem
- Precision at the shop AND precision at the site



3 months later...



Weld remediation

3 months to complete the site welding of the connections between the components.



Installation of roof decking



This takes a long time...

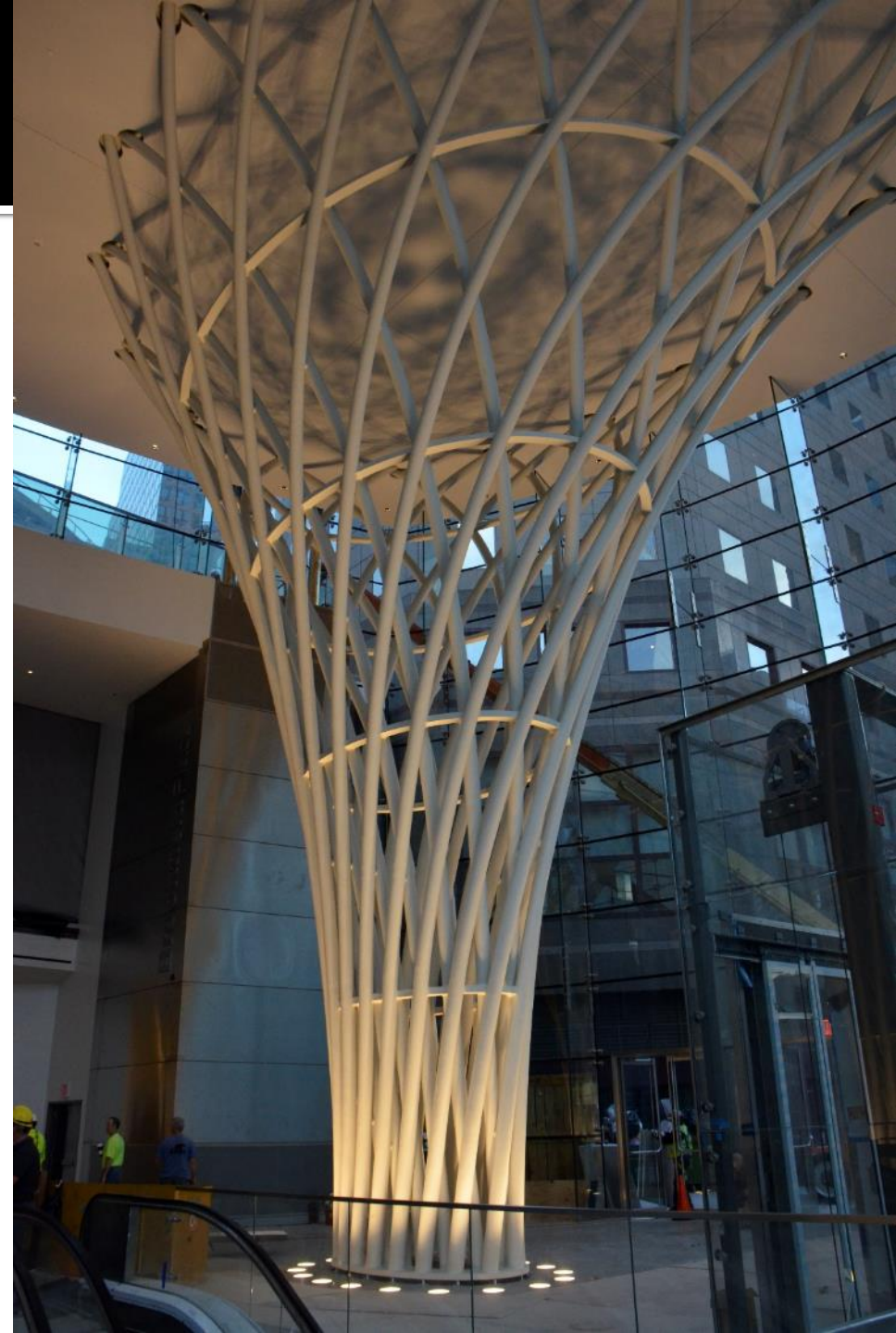
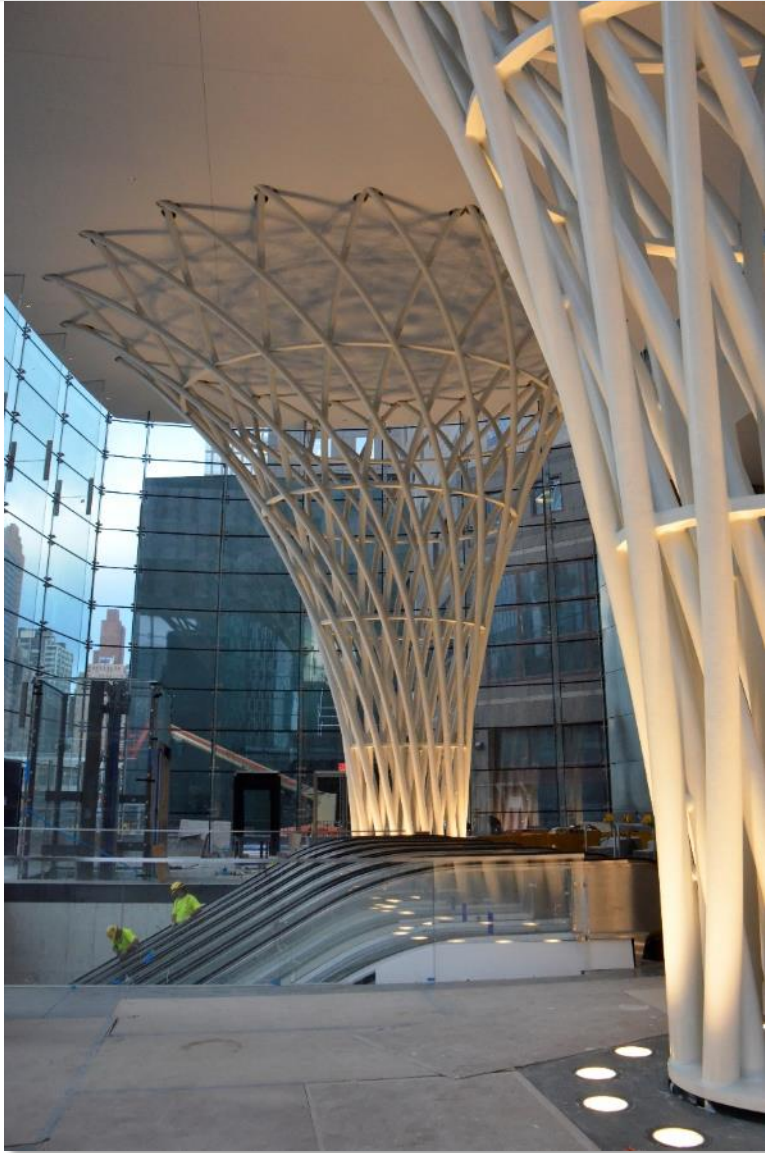


Welding, erecting scaffolding and the sheer number of connections adds up.

The Glass Box



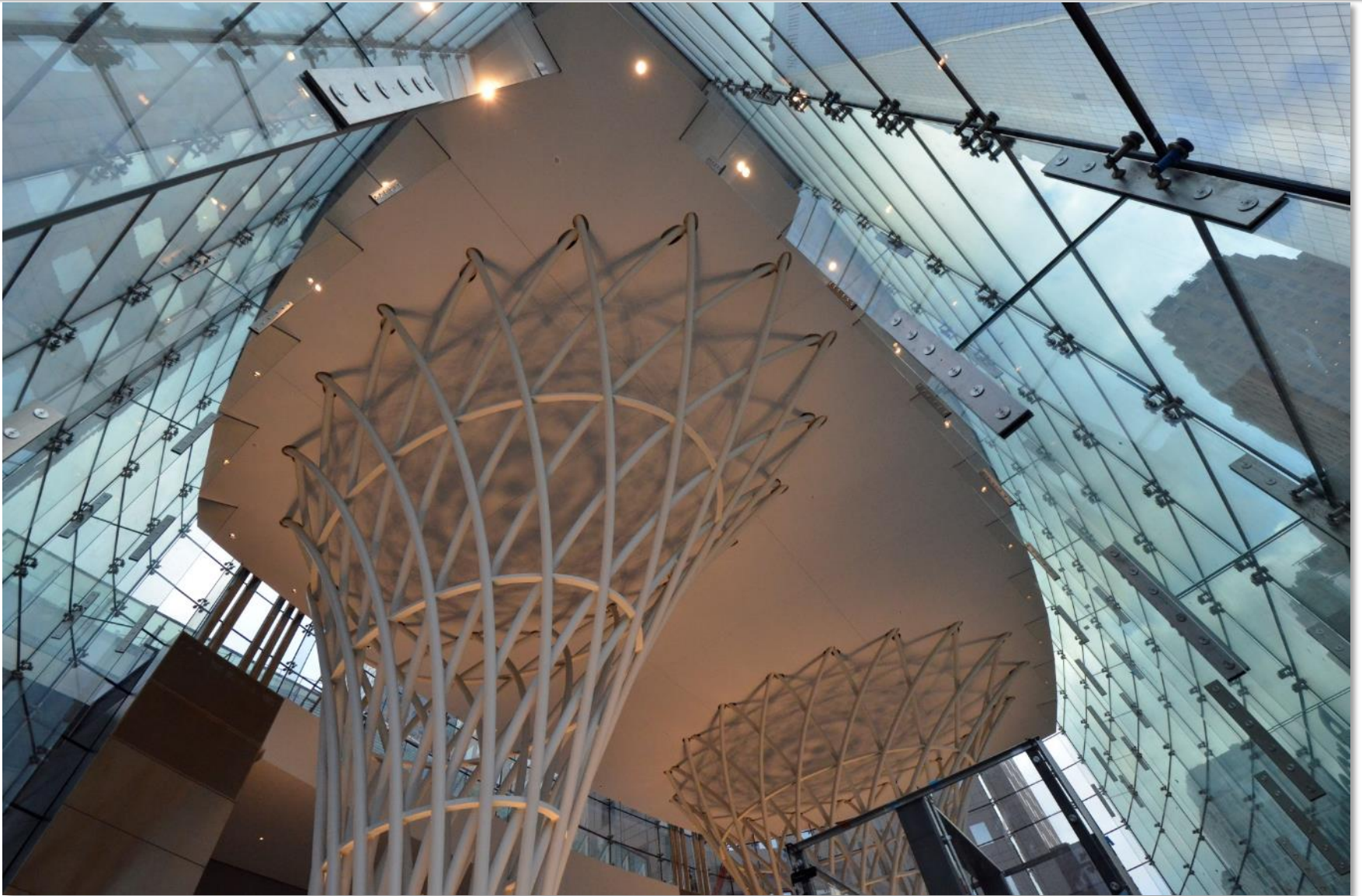
Finished steel



Intumescent coating



Structural columns in glass box





Project Profile

EIGHTH AVENUE PLACE
WINTERGARDEN
Calgary, Alberta

Owner

Penny Lane II Limited Partnership

Development Manager

Hines Canada Management Co., ULC

Architects

Pickard Chilton International **Design architect**

Gibbs Gage Architects **AOR**

Kendall/Heaton Associates Inc. **Production architect**

Structural Engineers

Dr. P.V. Banavalkar, CBM **Design engineer**

Read Jones Christoffersen Ltd. **EOR**

Construction Manager

Ellis Don Construction Management Services

Steel Fabricator / Detailer / Erector

Supermétal



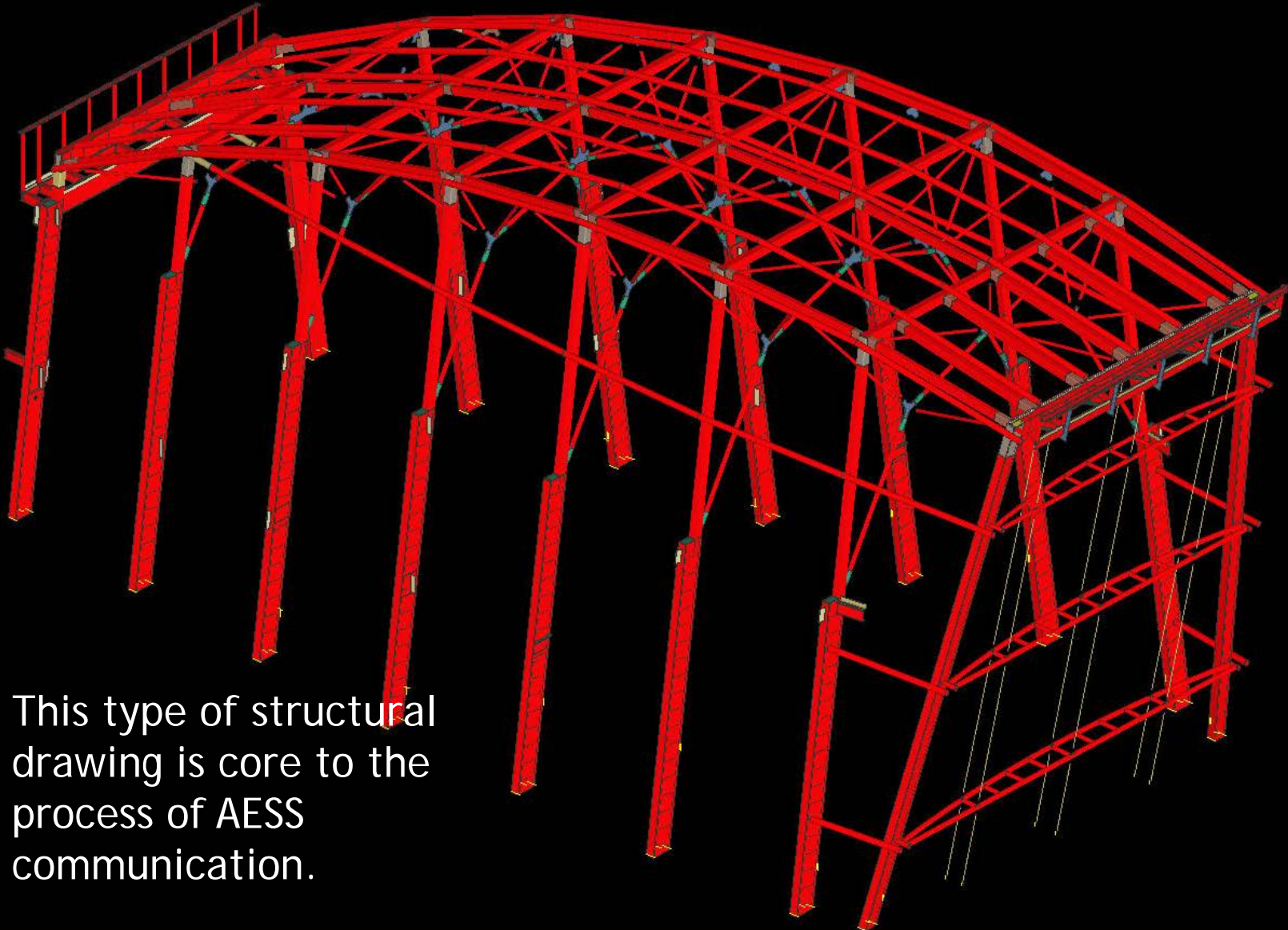
Photo credits this section: Supermétal

Content: Sylvie Boulanger, Vice President, Technical Marketing

Concept

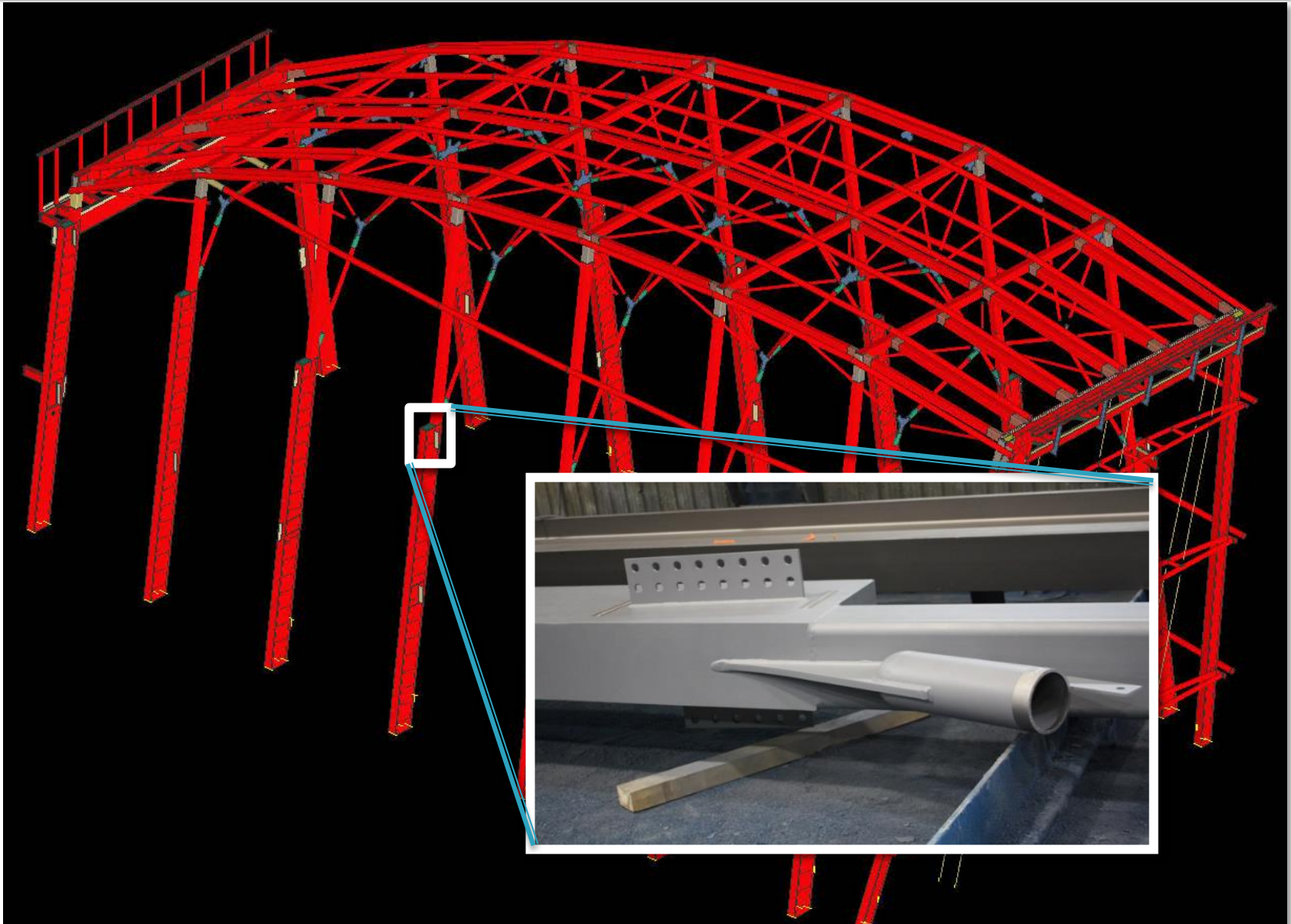
- The main structure comprises **eight large trapezoidal arches** connected by a web of smaller steel tubes, which form an interconnected three dimensional truss-frame.
- All of the **complex structural connections** between the steel arches and tubes were architecturally designed and engineered
- Specification approaches **CISC's AESS2 and AESS3** Categories, for 'far from view' and 'close to view' steel

Overall structural drawing



This type of structural drawing is core to the process of AESS communication.

Haunch detail



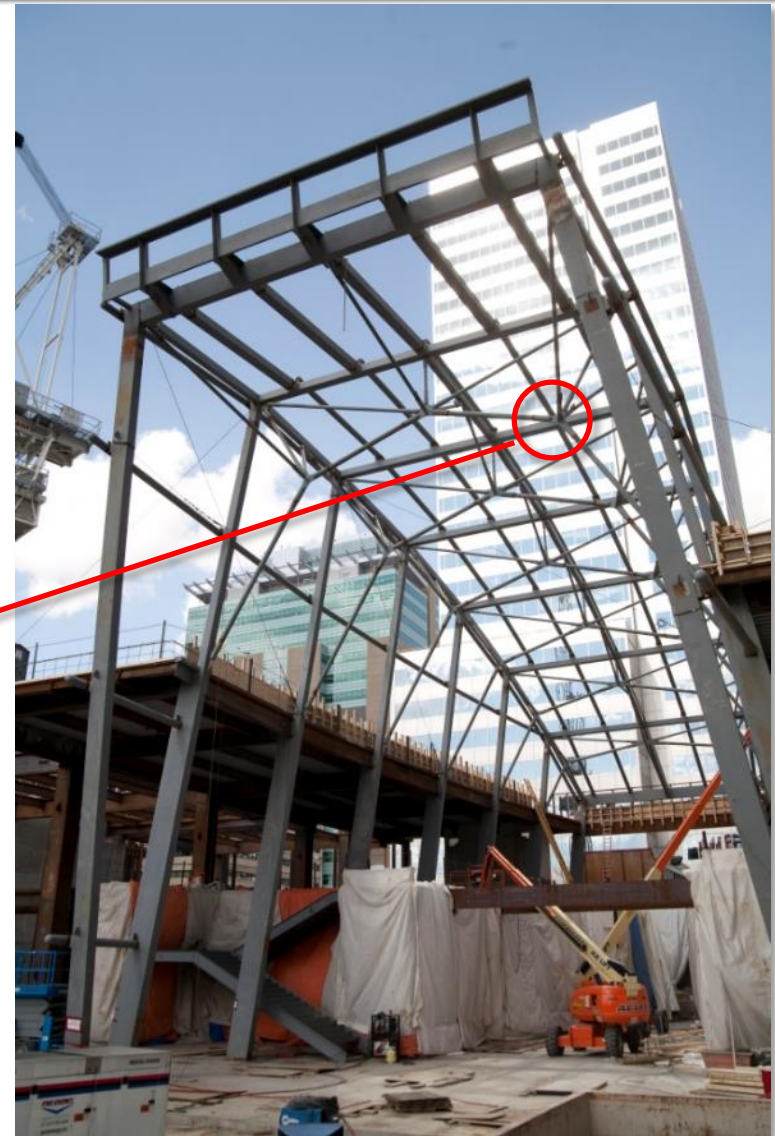
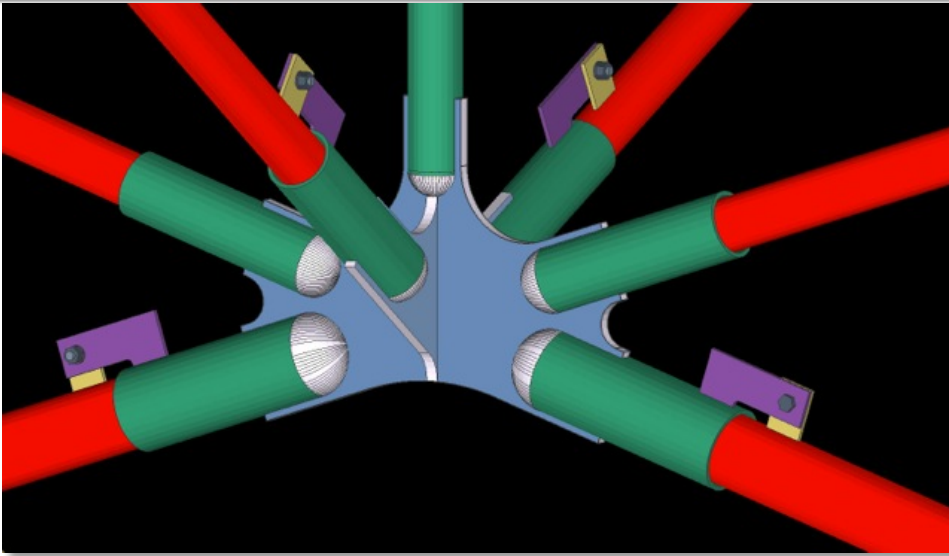
Column fabrication



Custom plate columns with sharp corners are typical of high level AESS



Node connection



Steel erection



Last Arch erection

2nd Arch erection

Completed node



Completed Wintergarden



Details





Owner

Cityzen, Fernbrook Homes

Architects

architectsAlliance

Construction Manager

Steel Fabricator / Detailer / Erector

Walters Inc. Hamilton/Metropolitan Walters

Project Profile

PIER 27 RESIDENCES

Toronto, Ontario



Site access courtesy: Walters Inc.

Bridging with a diagrid 'truss'



Prepping for a lift



Floor support element erected



Team accepting element



What is exposed? What is not?



Bracing in all planes



Intersections



Stiffness through structural choices



Steel to concrete issues



AESS vs structural components



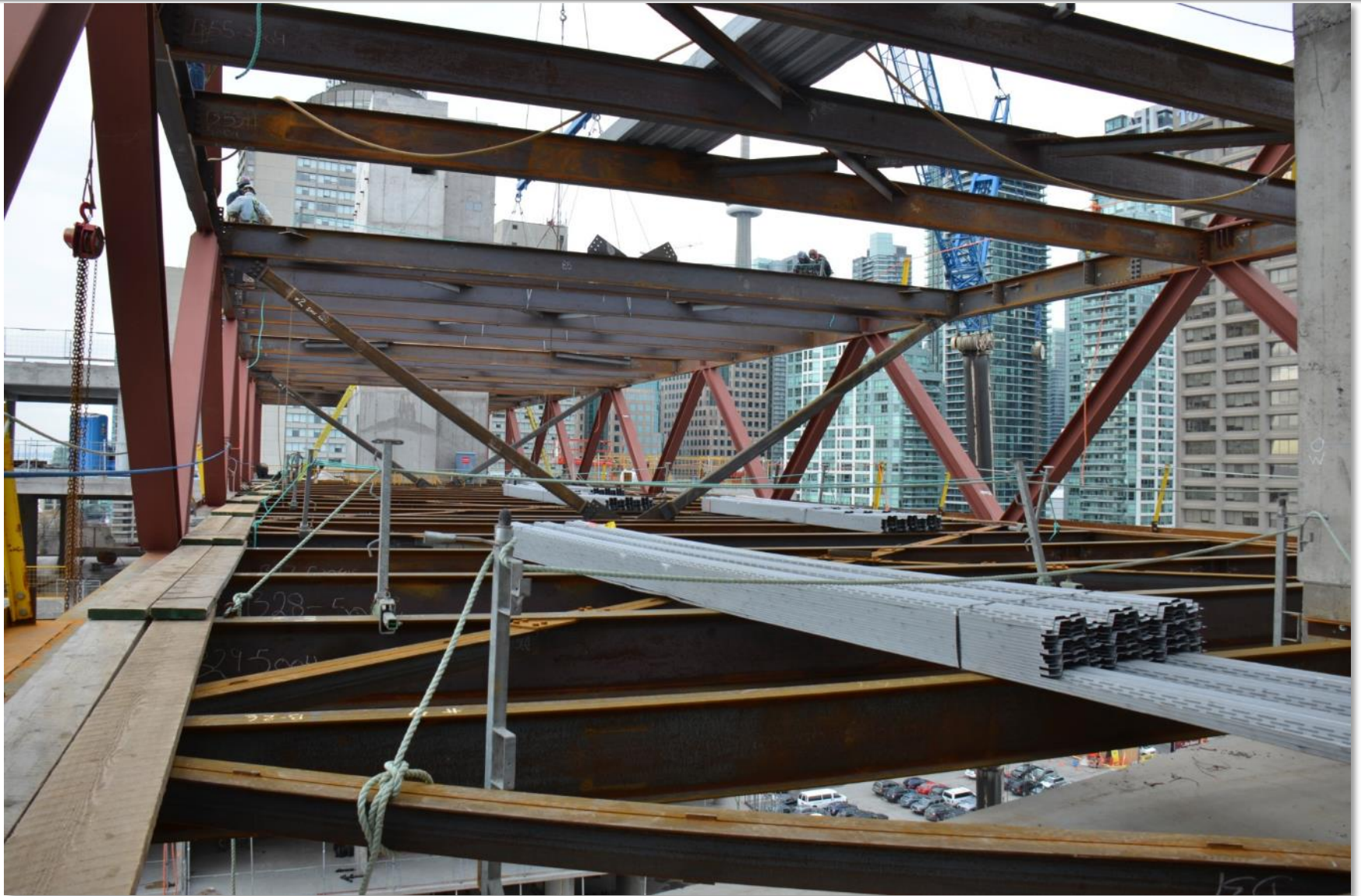
Splice locations



Shipping restrictions



Temporary stabilization systems



Bridges and cantilevers



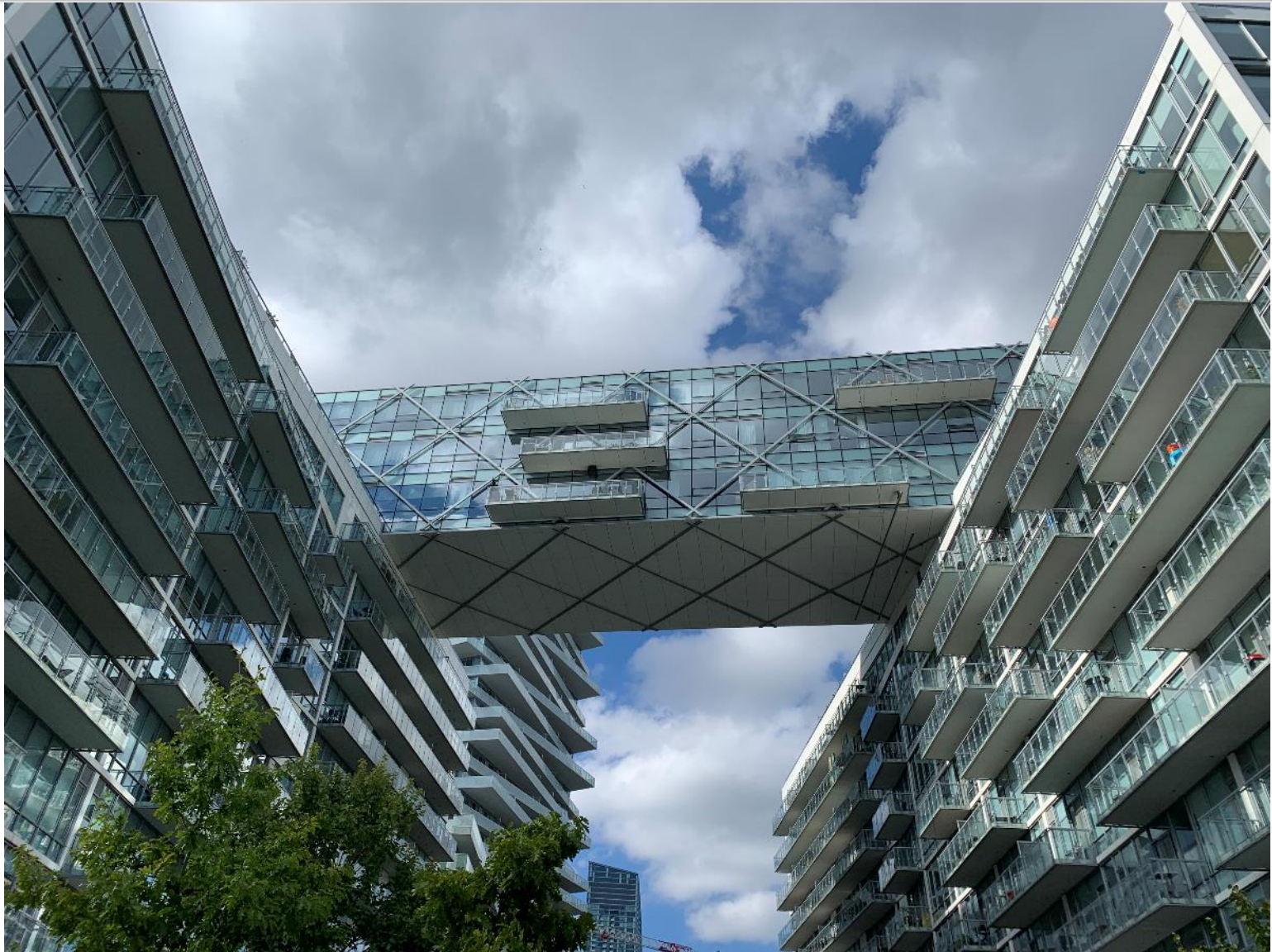
Diagrid as result



Subtle differentiation



Completed project





Project Profile

PEMBINA HALL
University of Manitoba
Winnipeg, Manitoba

Owner

The University of Manitoba

Architects

Raymond S.C. Wan Architect

Structural Engineers

Crosier Kilgour & Partners Ltd.

SMS Engineering Ltd.

McGowan Russell Group

Stantec Engineering

Dyregrov Robinson Inc.

Construction Manager

Bird Construction Company Ltd.

Steel Fabricator / Detailer / Erector

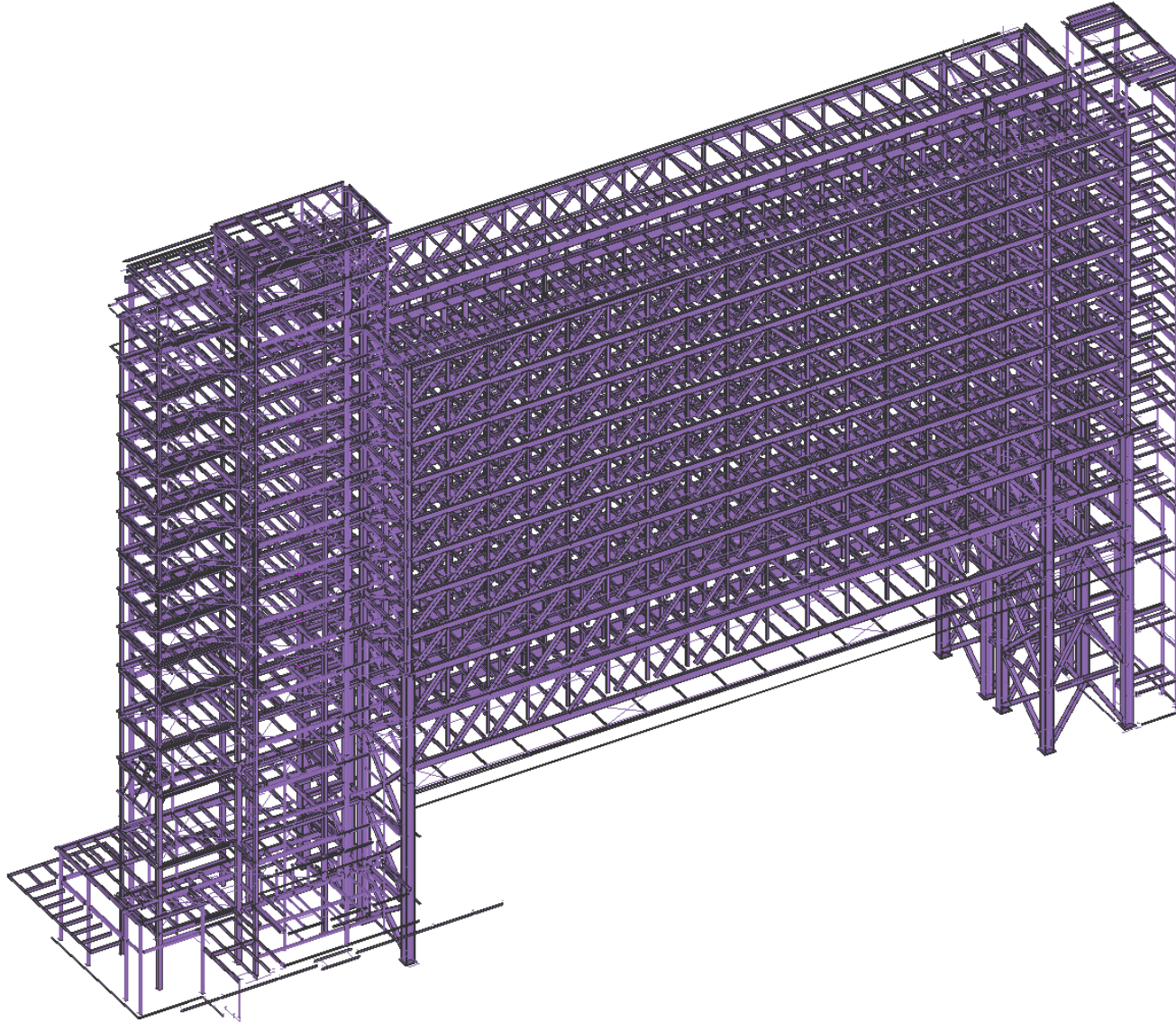
Supermétal



Photo credits this section: Supermétal

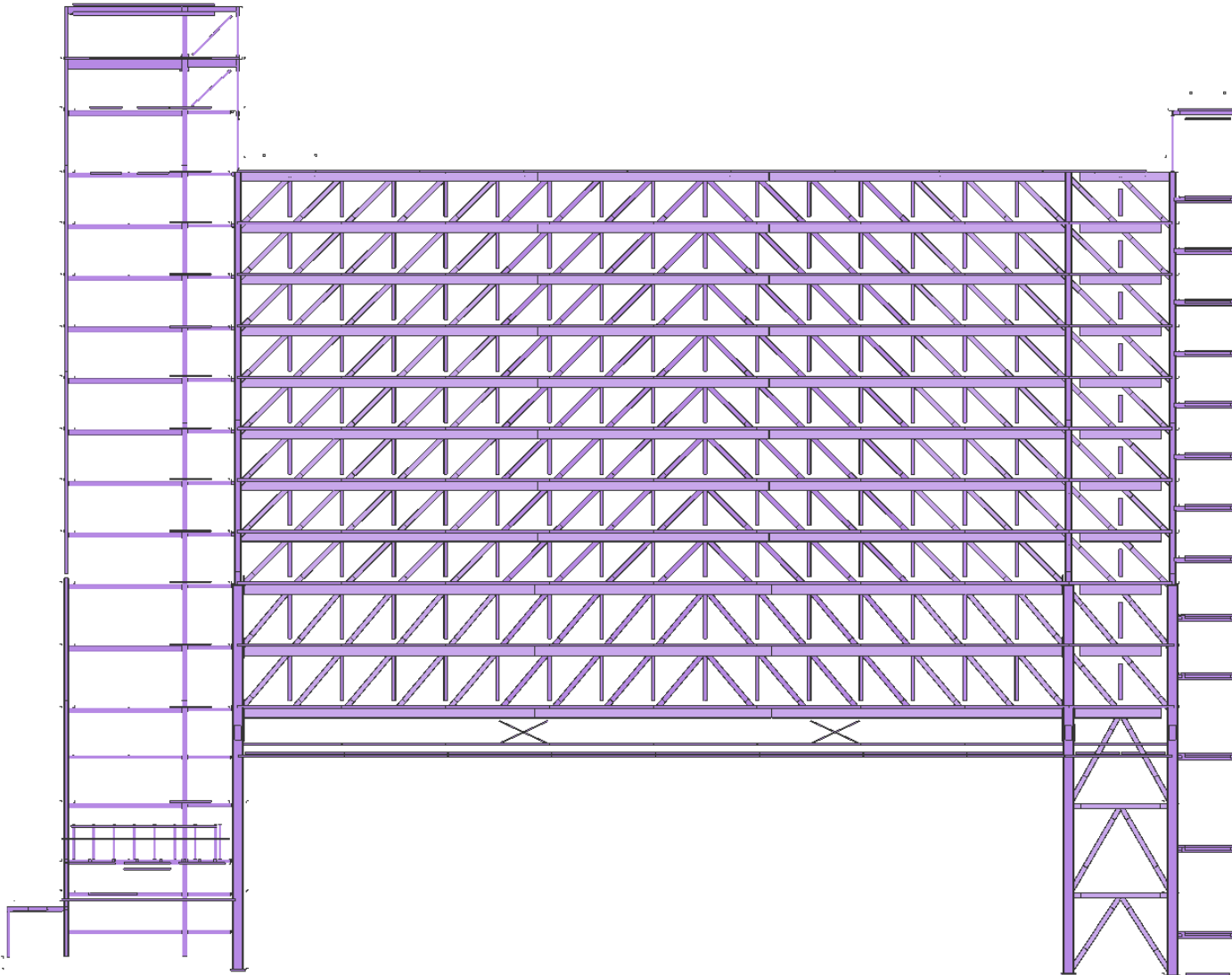
Content: Sylvie Boulanger, Vice President, Technical Marketing

Structural Isometric



This drawing type is useful for showing the extent of the steel in the project as it excludes other materials such as reinforced concrete from the view.

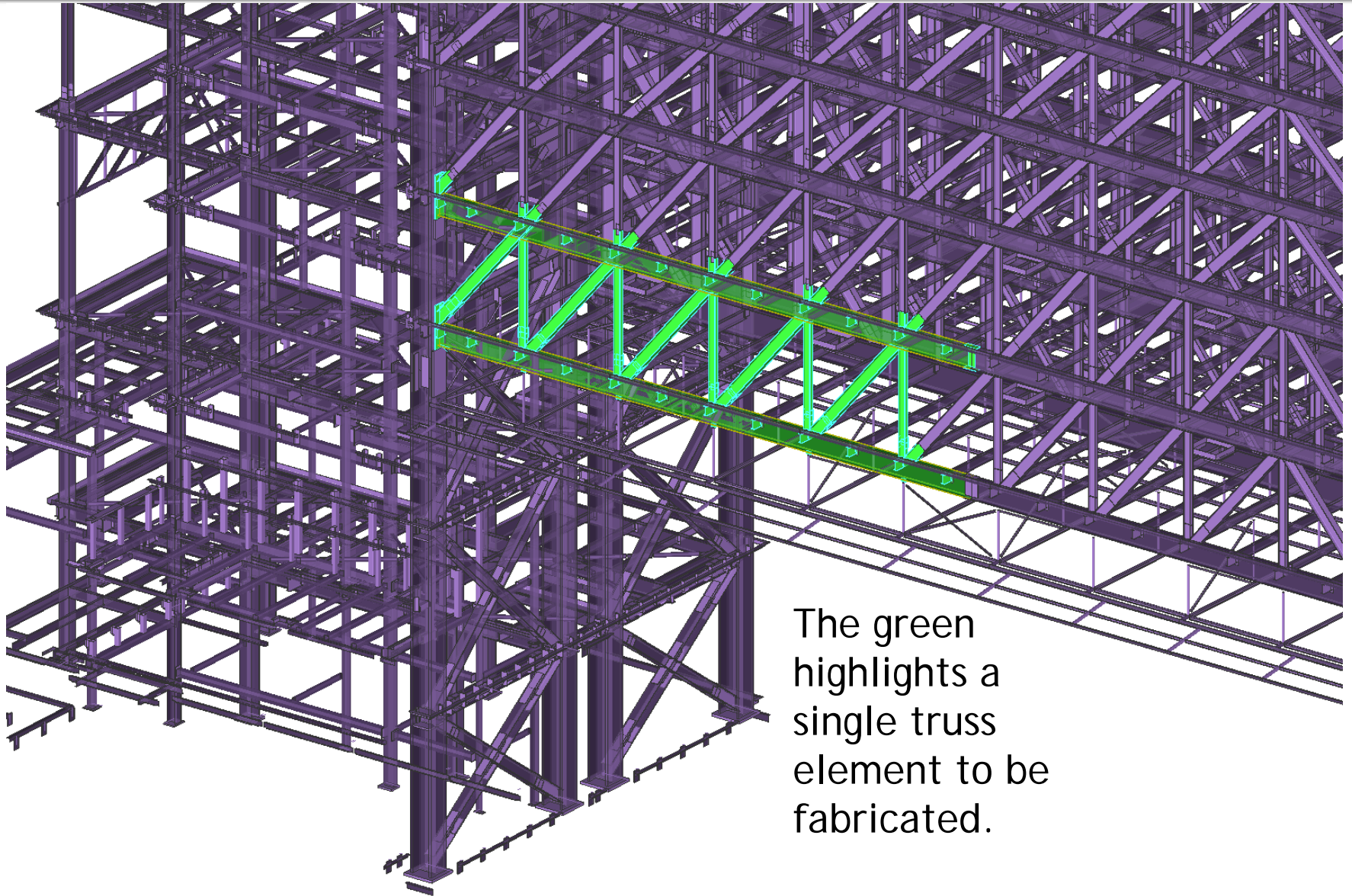
Elevation view of steel



The elevation view highlights that the main slab of student residences will be clear spanning between the tower elements.

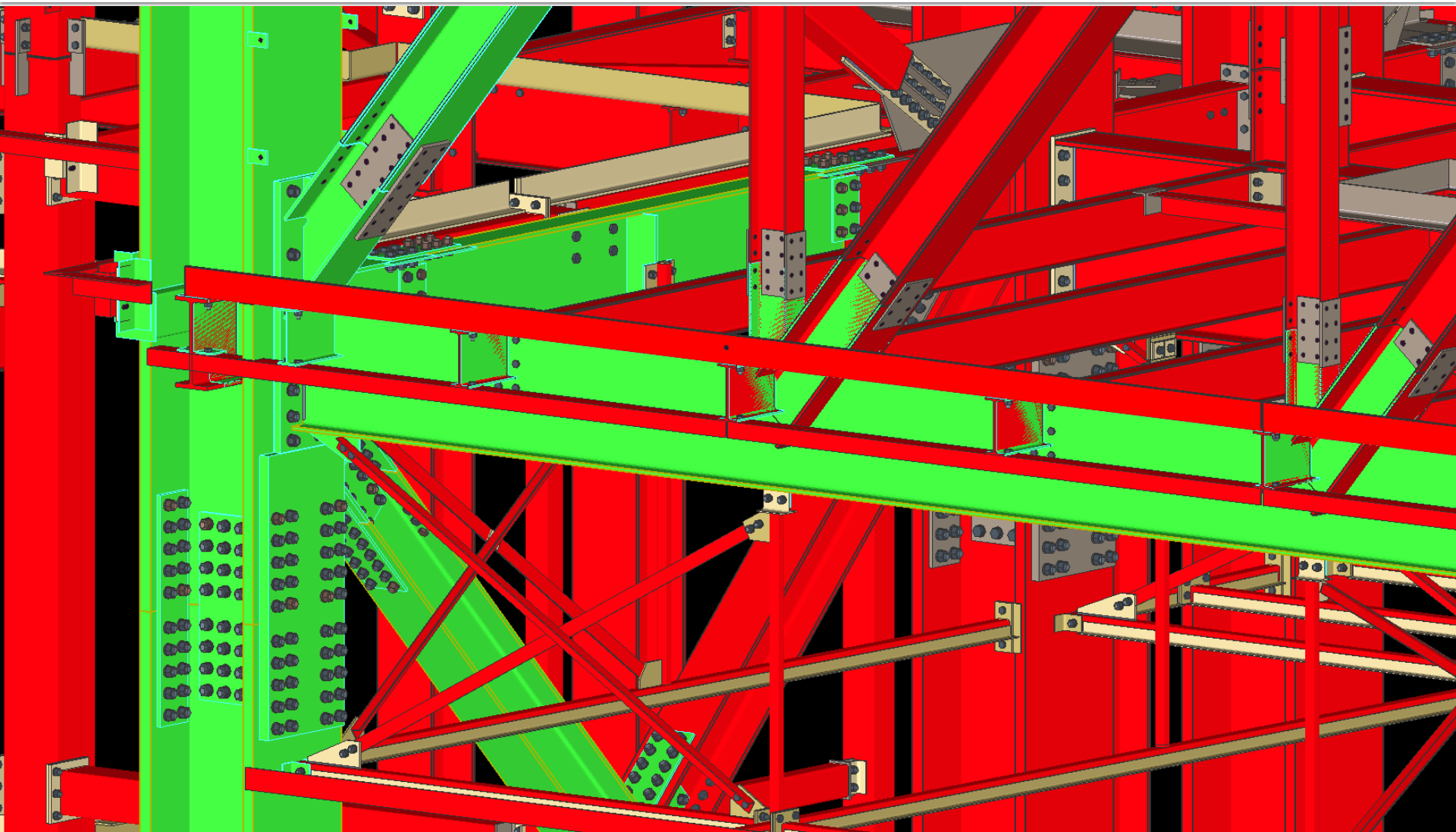
The direction of the diagonal chords was an aesthetic choice as it puts them in compression which is not optimal loading.

Truss element

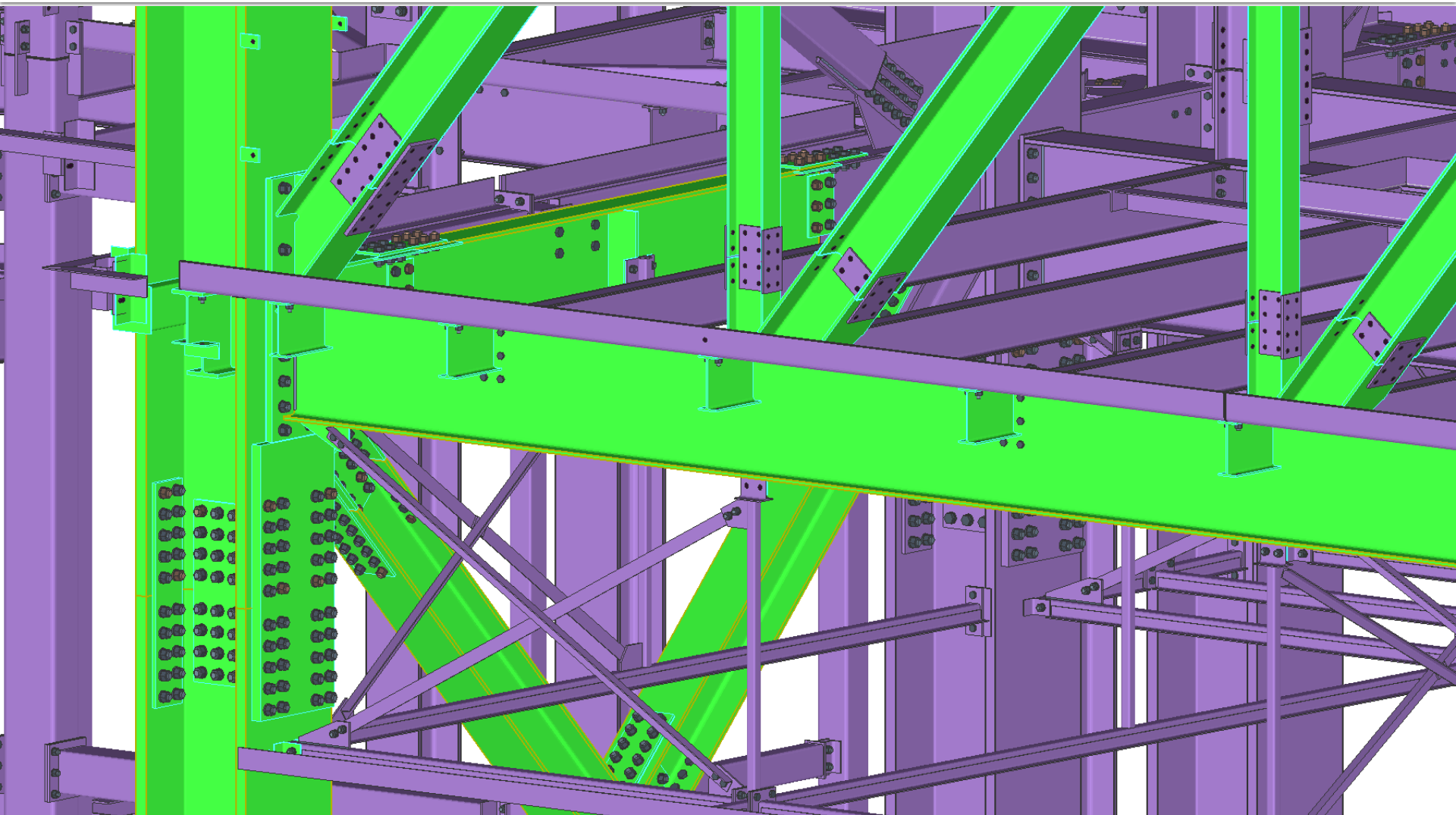


The green highlights a single truss element to be fabricated.

Connections and splices



Connections and splices



Site assembly of truss components



Lifting an assembled truss section



First truss in place



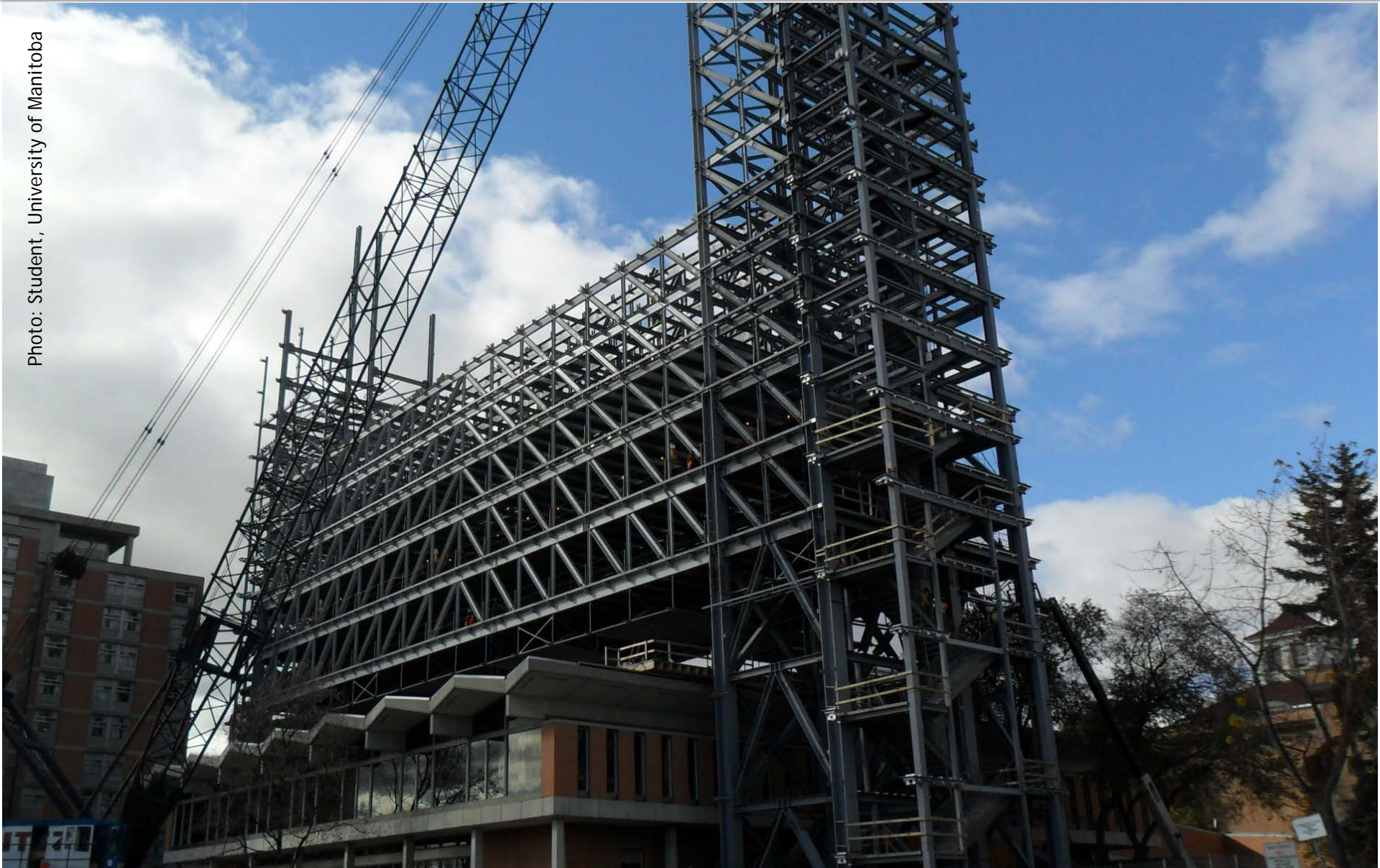
Site bolting



Semi finished structural frame



Photo: Student, University of Manitoba



Interior



photos: University of Manitoba

For the interior of the rooms they provided intumescent coating on the diagonals (because they transfer gravity loads), and left the deck exposed (galvanized deck for more luminosity) modifying the concrete mix above and other parameters.





Project Profile

UNION STATION ATRIUM
Toronto, Ontario

Owner

Yolles (CH2M HILL) - lead for GO Transit / Metrolinx

Architects

Zeidler Partnership

Construction Manager

Aecon

Structural Engineer

Yolles

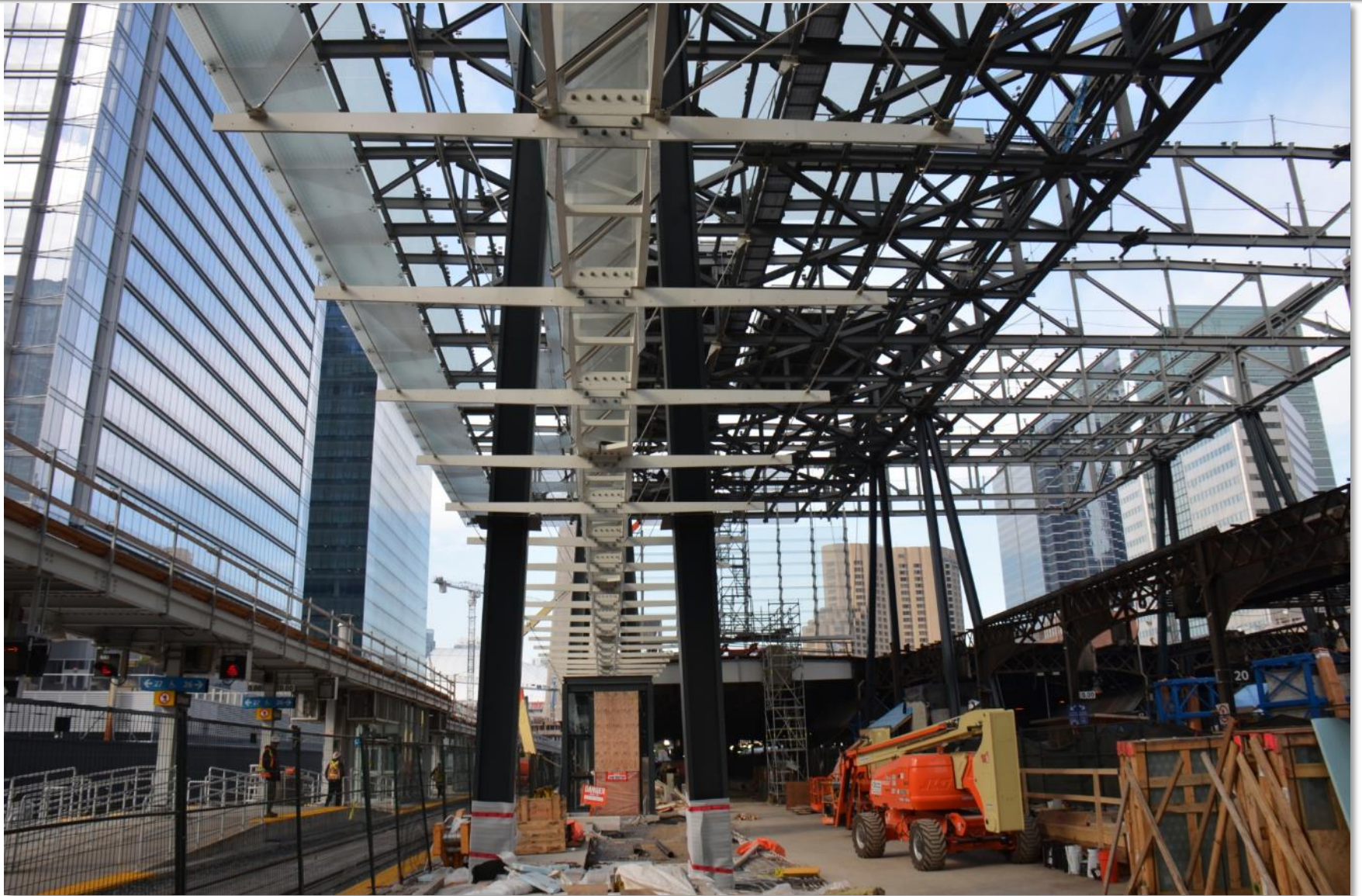
Steel Fabricator / Detailer / Erector

Walters Inc.

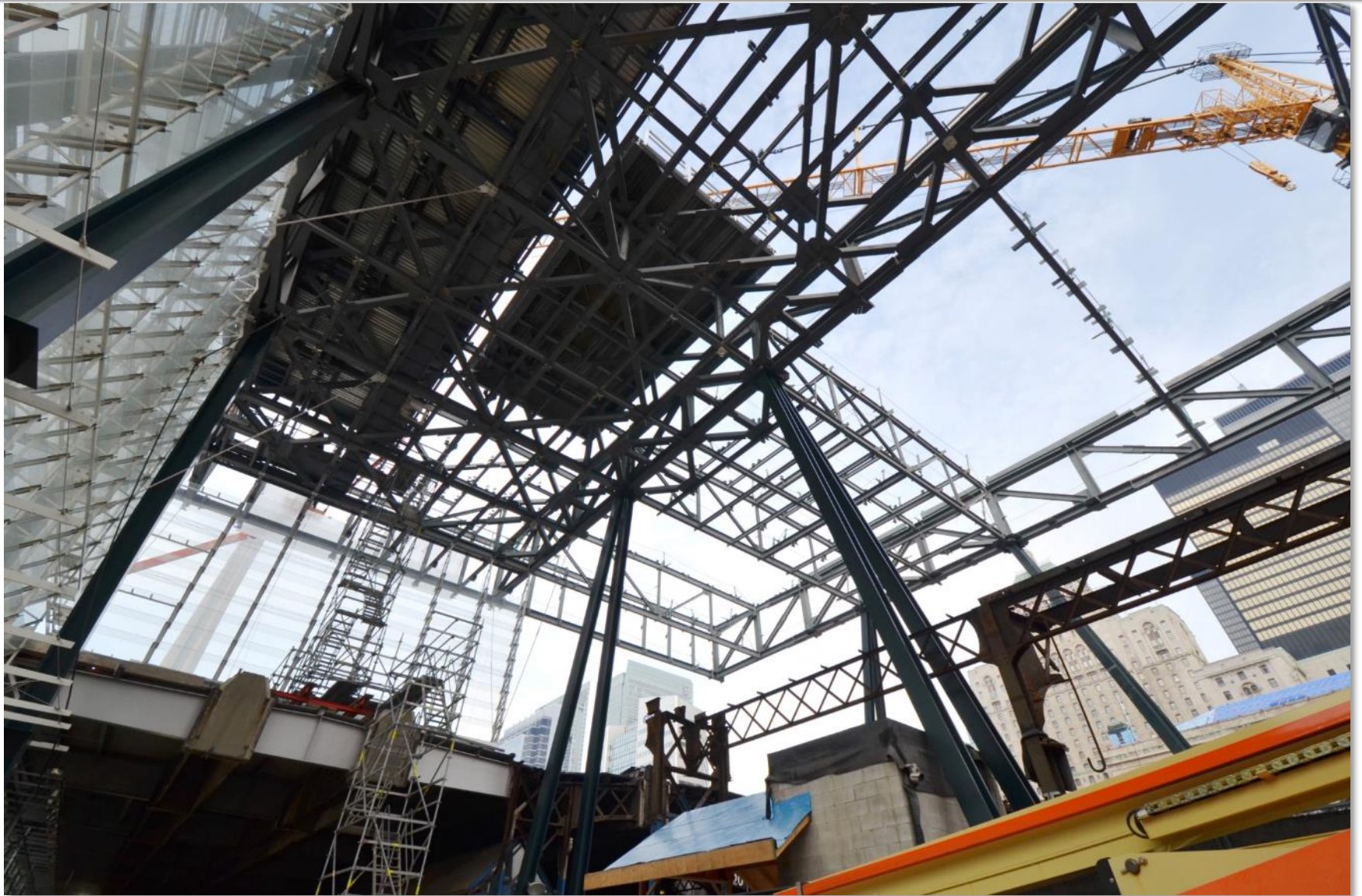


Site access courtesy: Walters Inc.

Union Station Train Shed

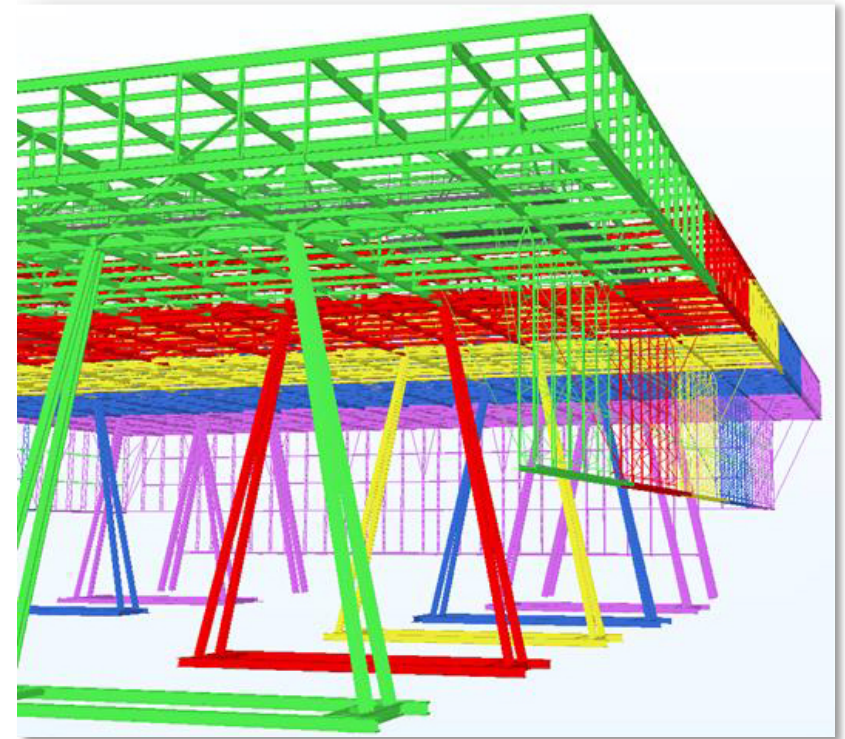


View towards roof

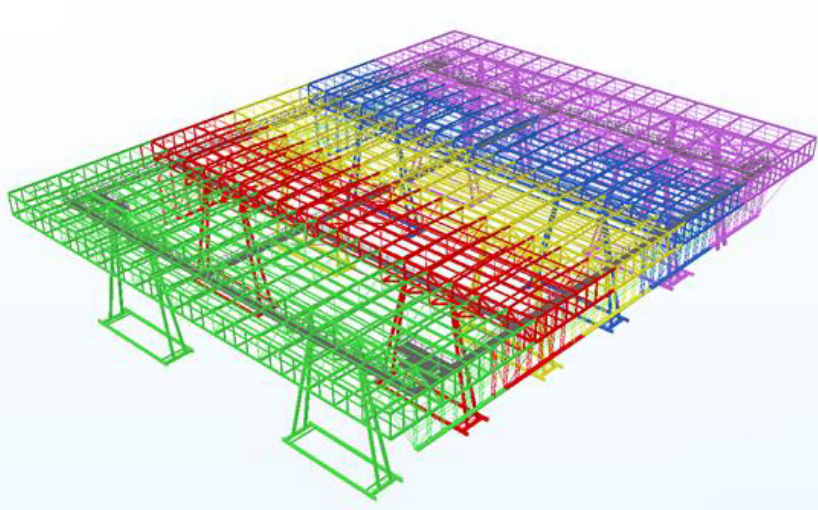
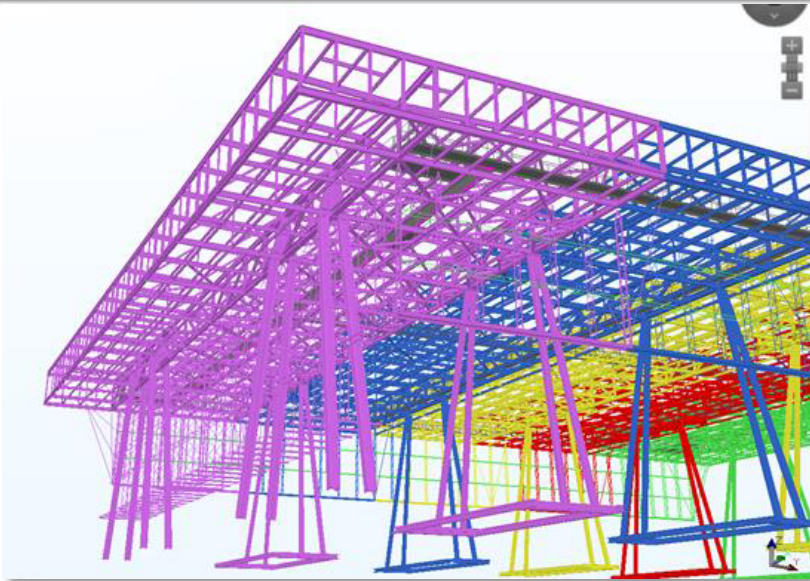


Construction phasing

- The location provides many 'issues'
- The tracks have to be kept open and operational
- The work has to be sequenced
- Major lifting that does require track closure can only occur at night
- This costs 'extra' given the time of day issues



Drawings

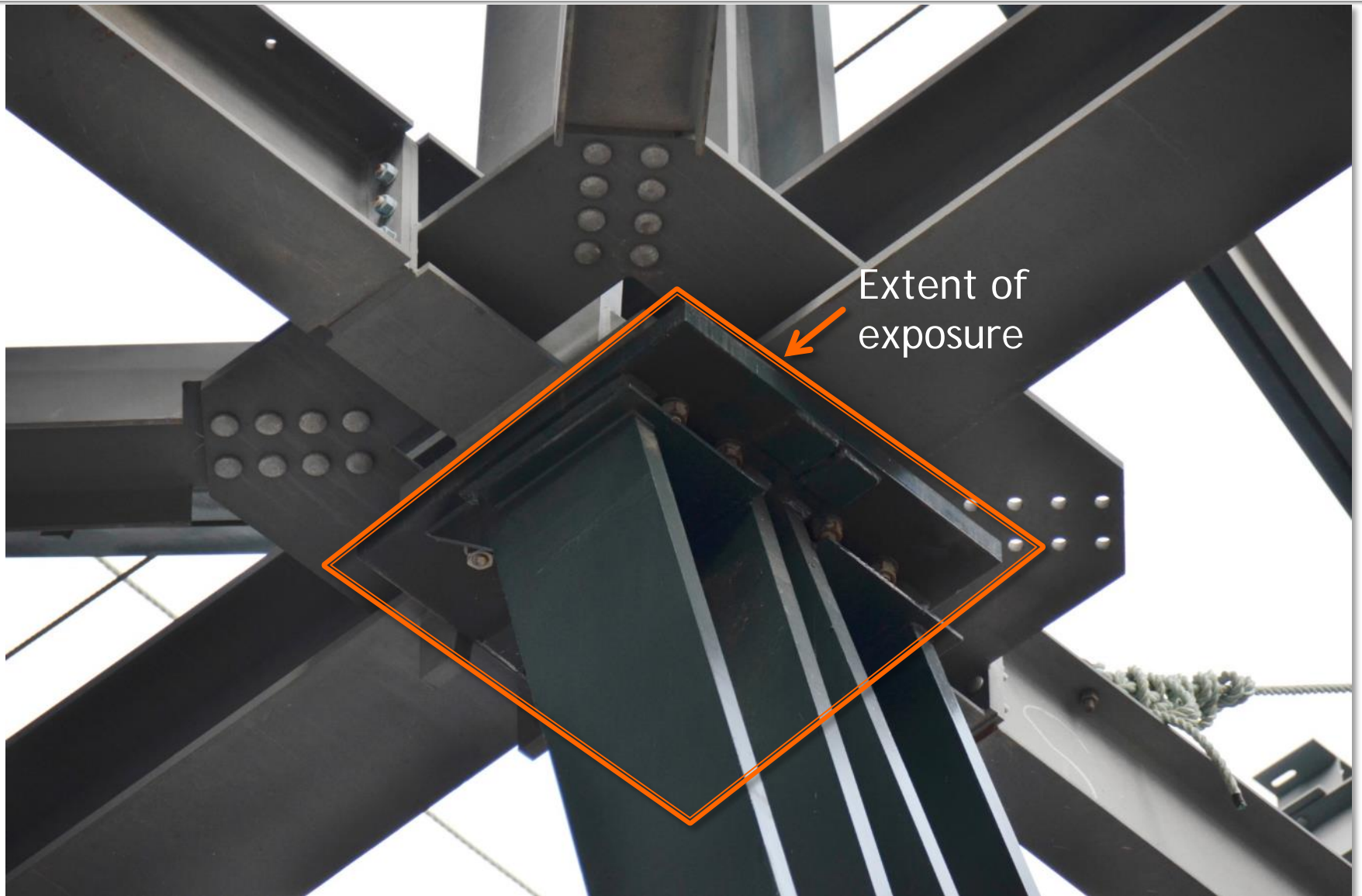


Detailing software allows the fabricator to design all of the connections as well as produce drawings for each element and for erection sequencing.

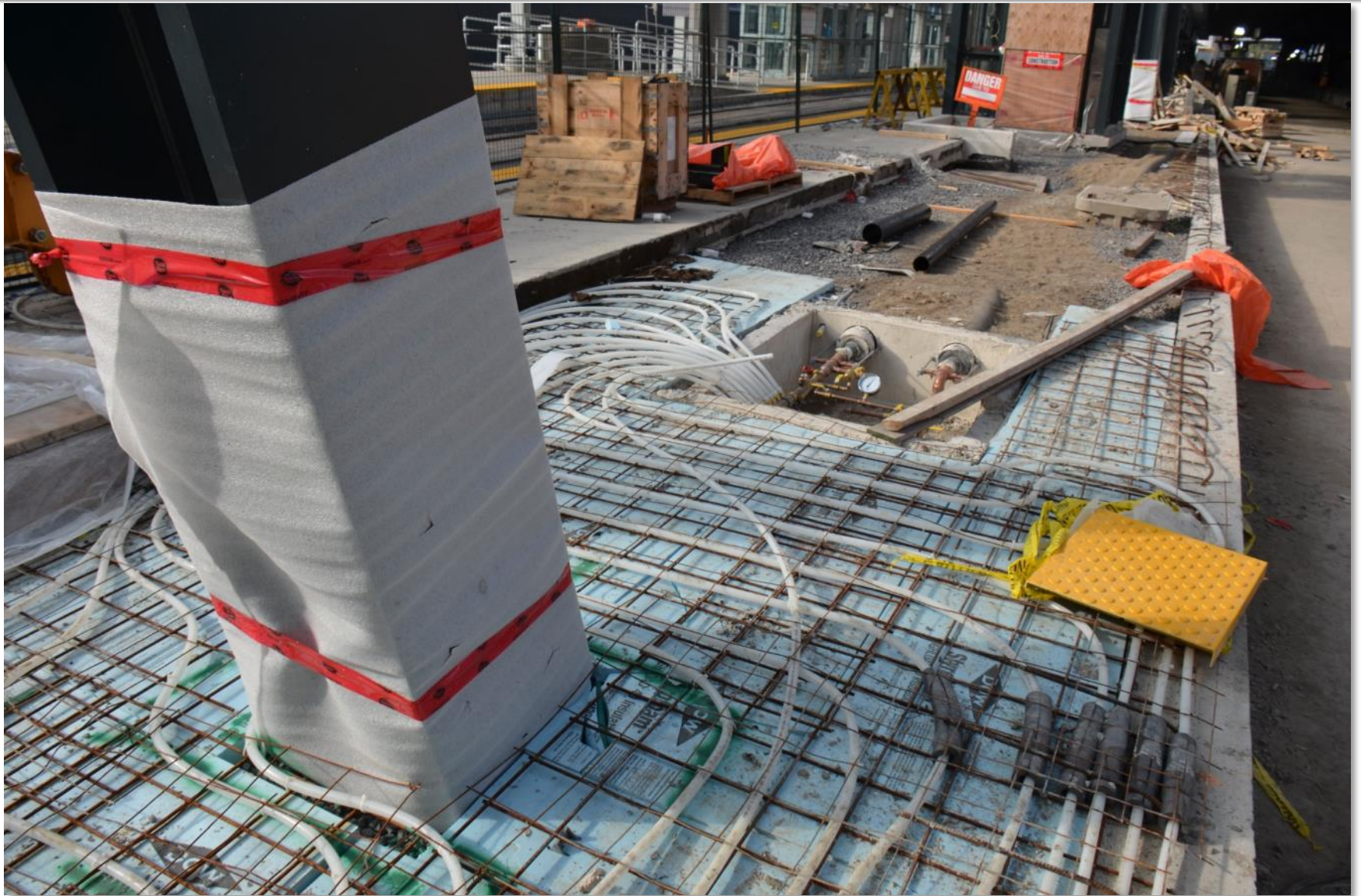
Truss construction



Truss connector



Column meets heated floor



Exposure levels

- Not all steel is exposed
- Columns are AESS3
- Hanger system is fabricated to AESS standards but is not considered “structural” per se
- Fritted, translucent glazing on soffit obscures the steel trusses
- Stainless steel cables provide some tension support for the glazed wall



Quality fabrication brings projects to life

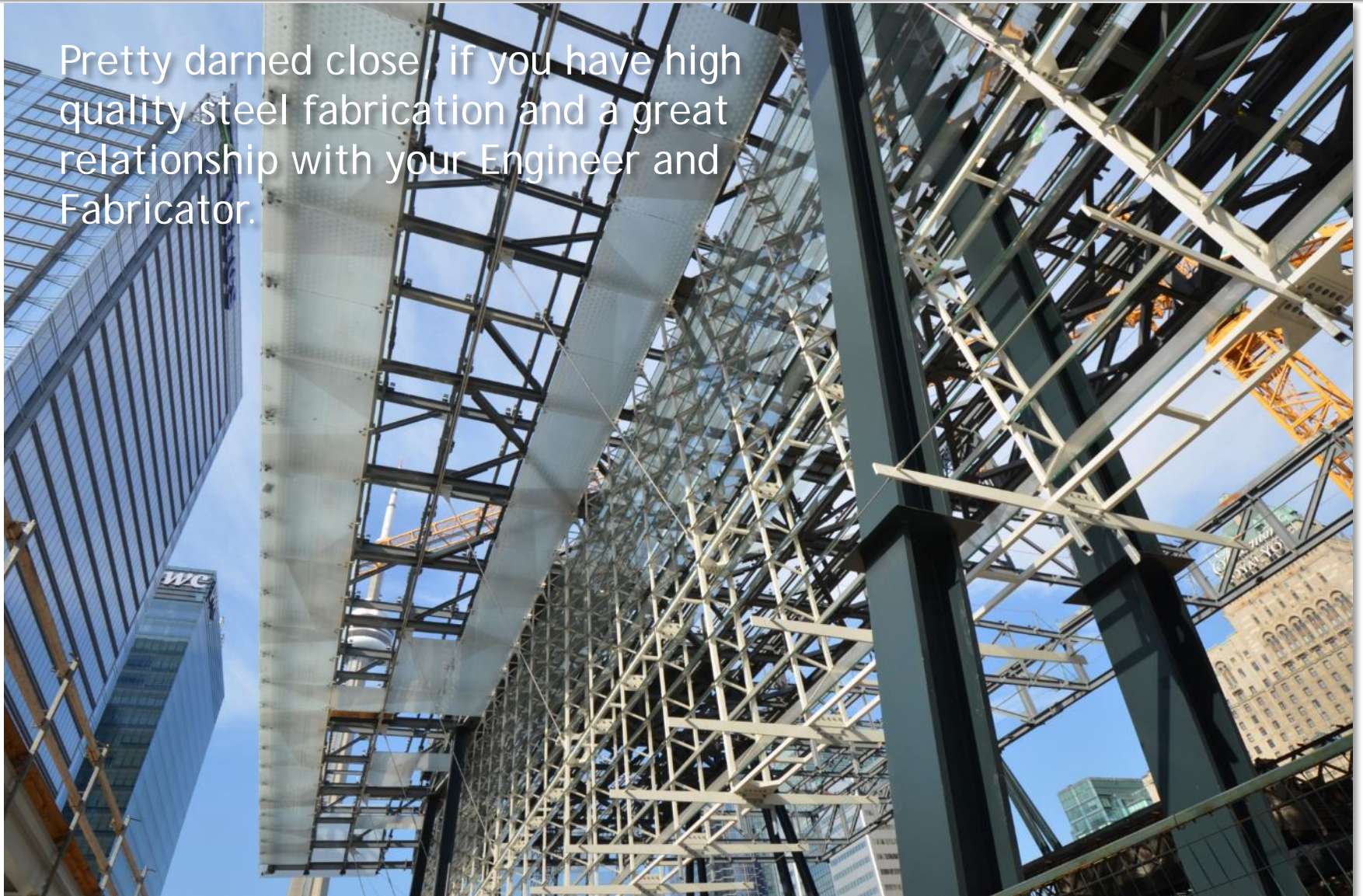
From the Architect's rendering to the building.
How close can you get?



Image: Zeidler Partnership

Front elevation

Pretty darned close, if you have high quality steel fabrication and a great relationship with your Engineer and Fabricator.



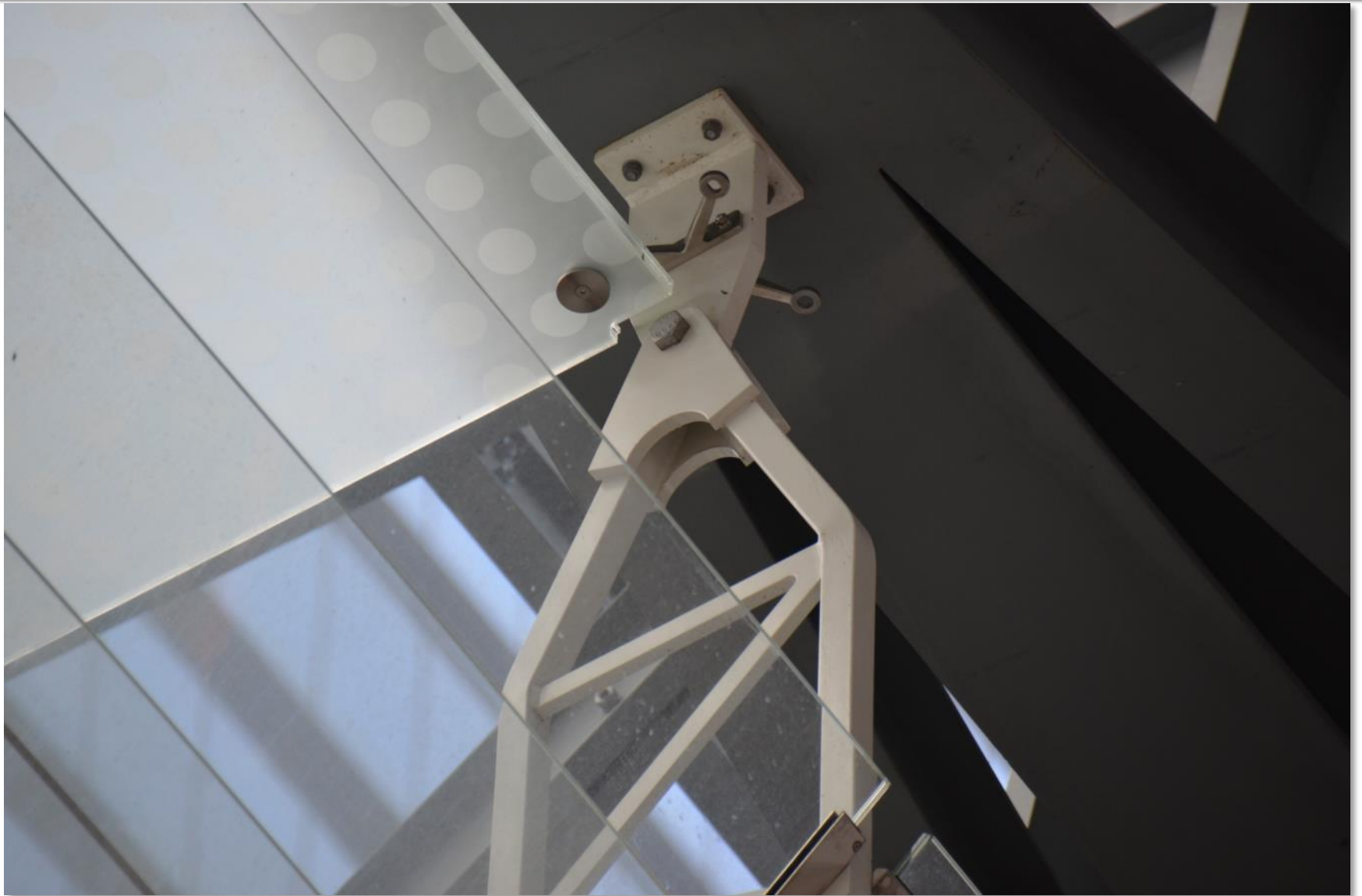
Translucency



Support for venting glazing



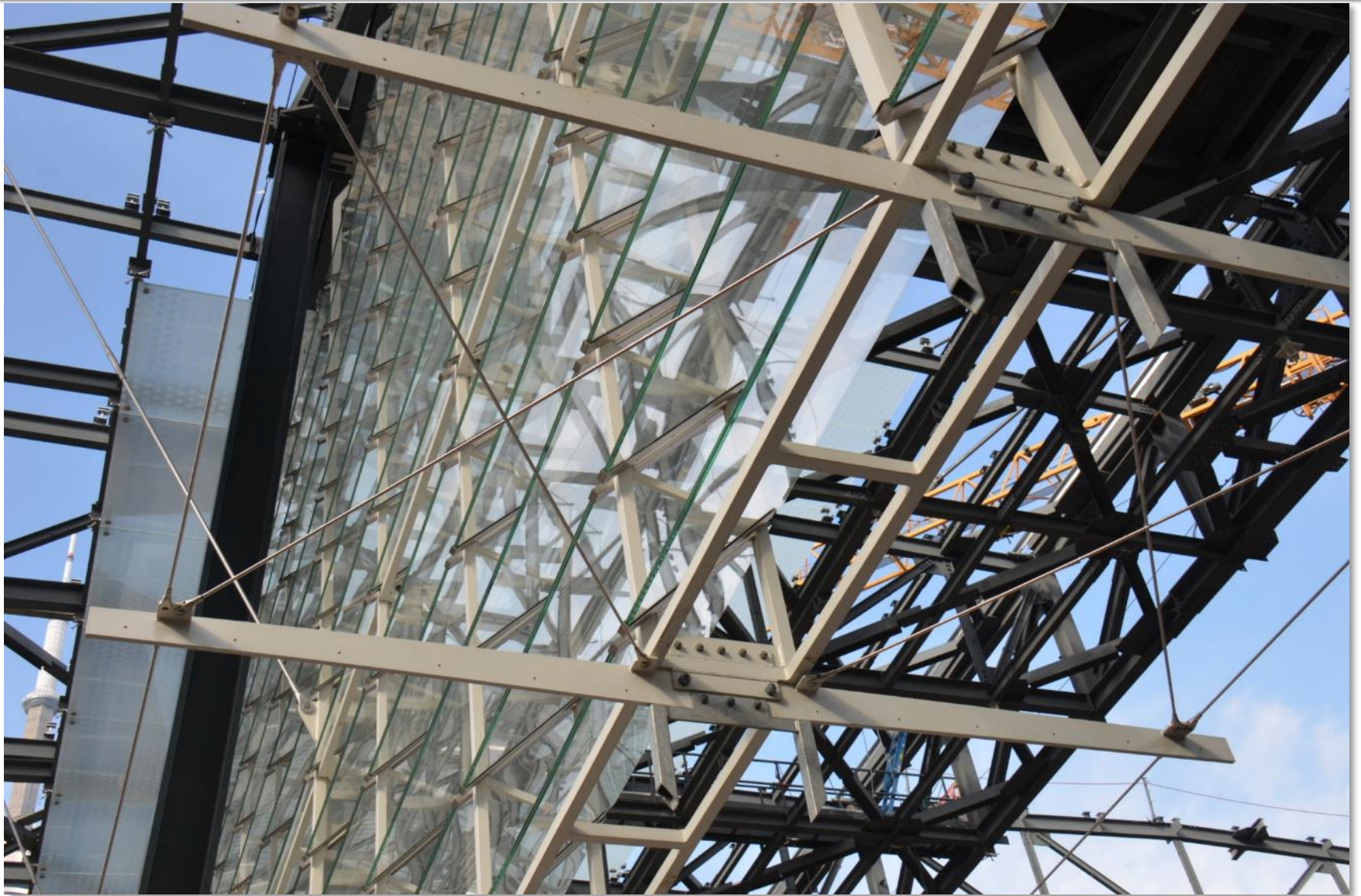
Hanger connection for side glazing



Custom welded plate for columns



Fine support system for glazing



Obscured by glazing





Construction during a live station





Blending historic with new



Last piece of steel to be lifted

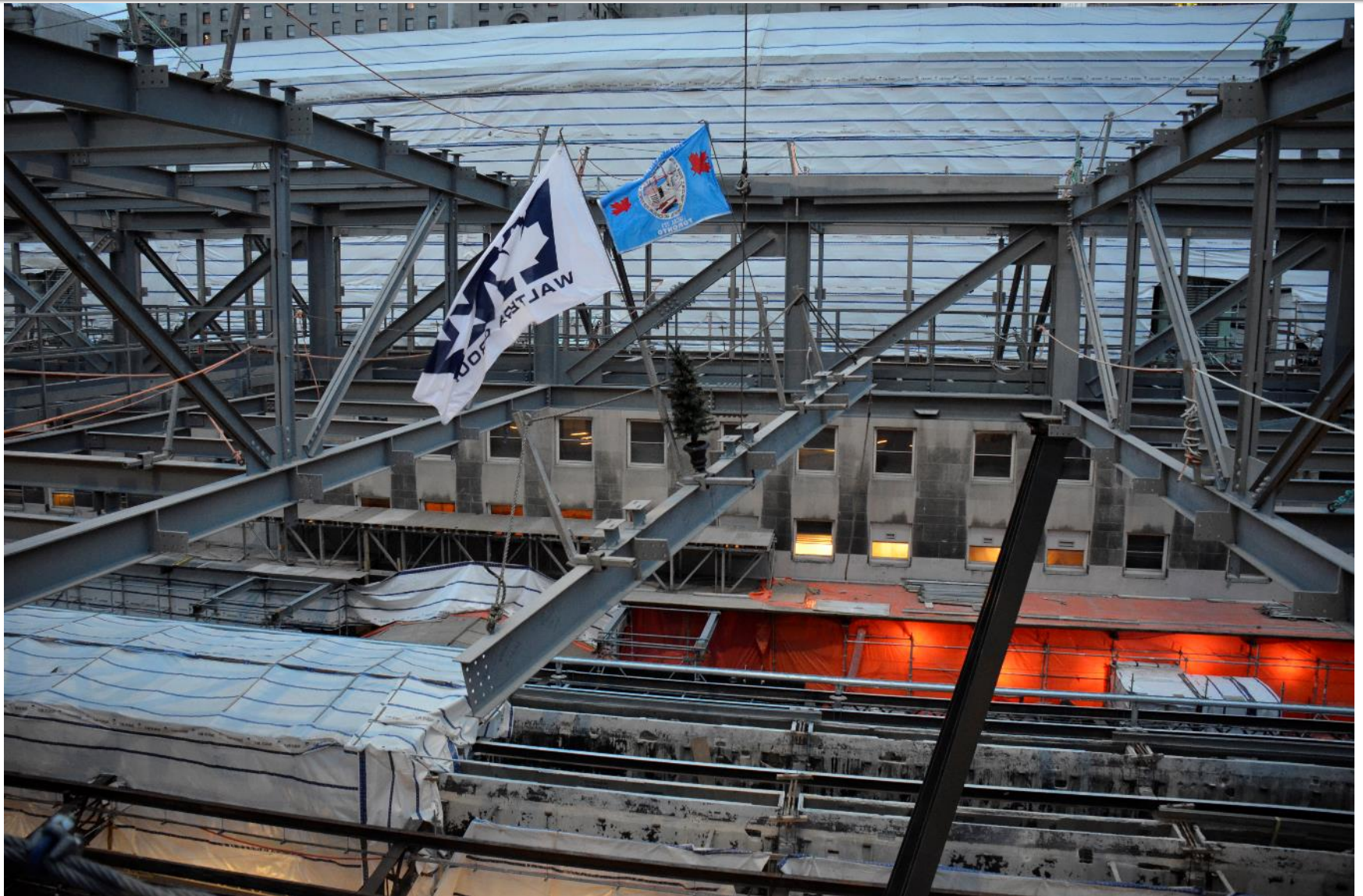




Inside the space truss



Placing the last piece





First Union Station, 1858





Steel Fabricator / Detailer / Erector
Walters Inc. Hamilton/Metropolitan Walters

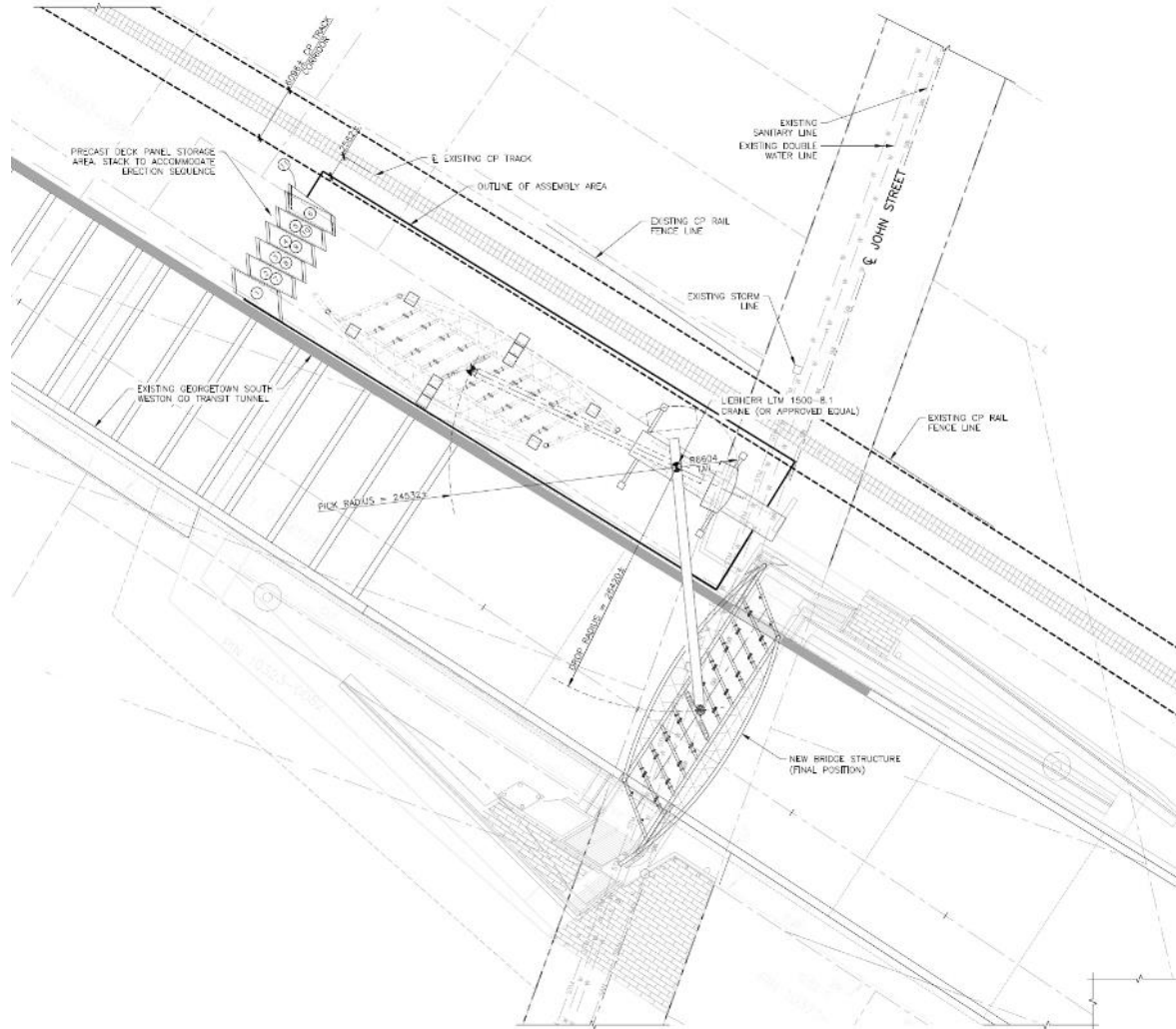
Project Profile

John Street Bridge
Toronto, Ontario



Site access courtesy: Walters Inc.

John Street Bridge



SITE PLAN

1:250

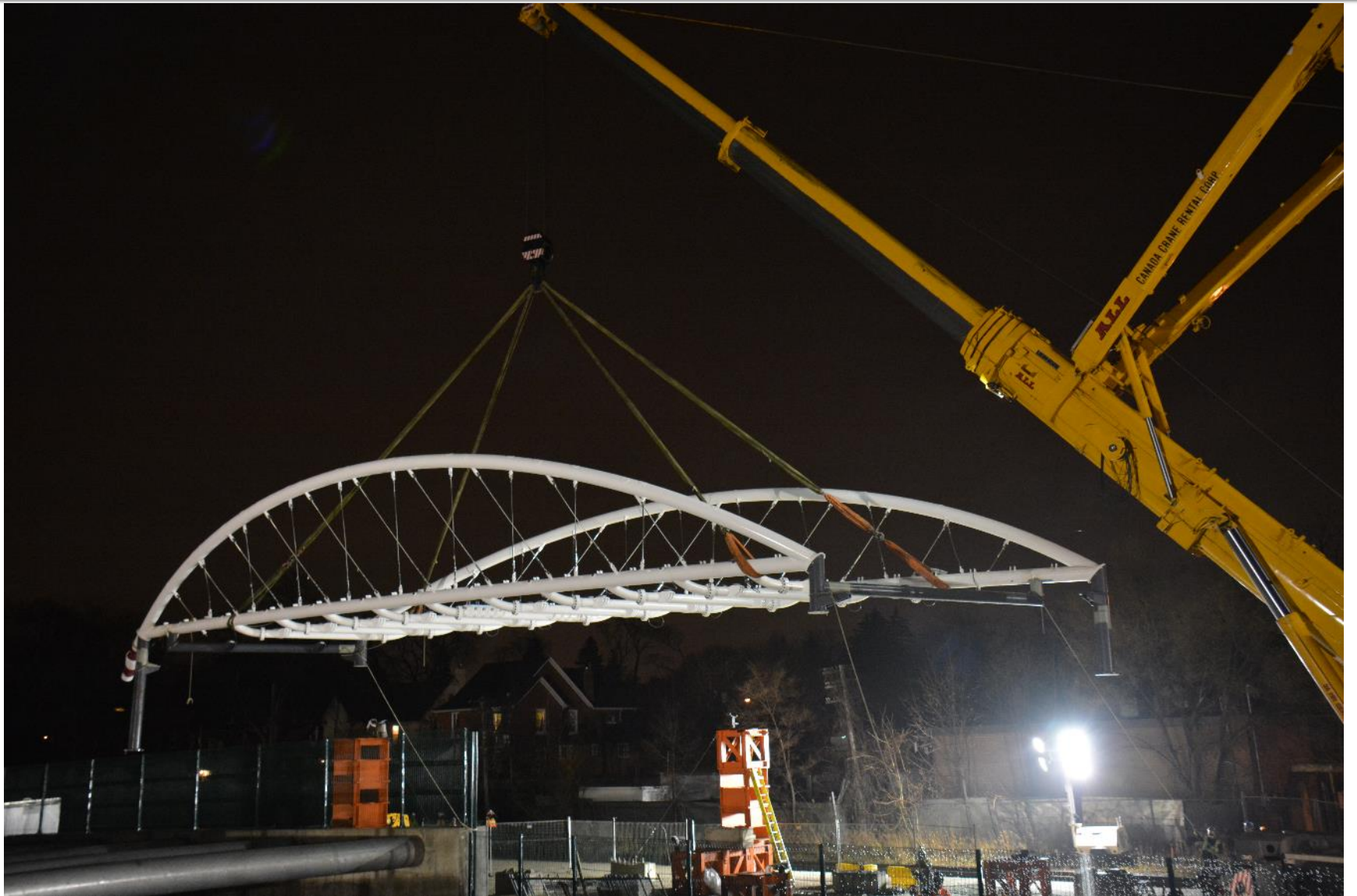
(PHASE 5)

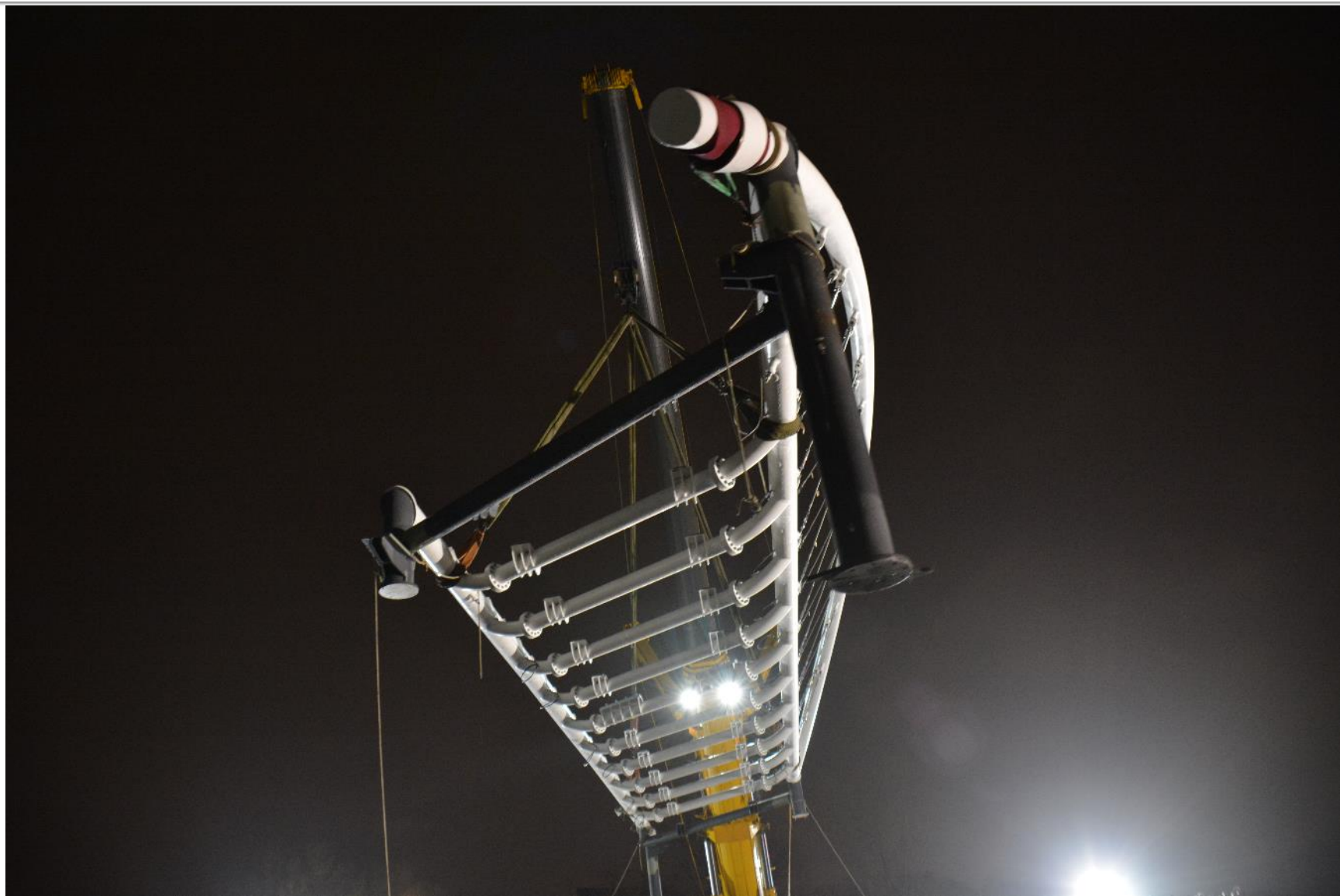
FINAL POSITIONING



All of the pre painted bridge elements were shipped to the site as would fit transport and assembled on site into one element for a unified lift.















Steel Fabricator / Detailer / Erector
Walters Inc. Hamilton/Metropolitan Walters

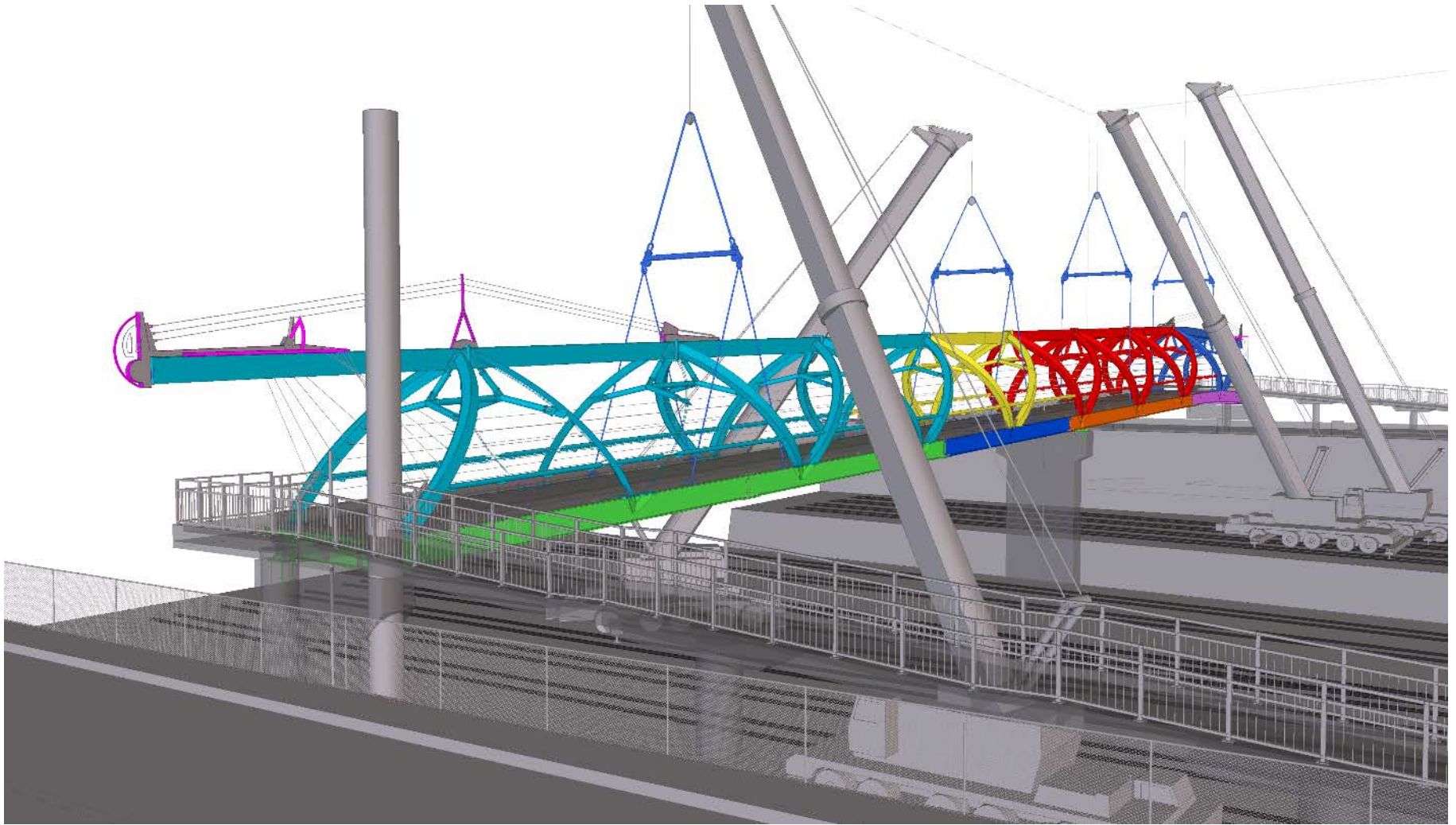
Project Profile

Puente de Luz
Toronto, Ontario

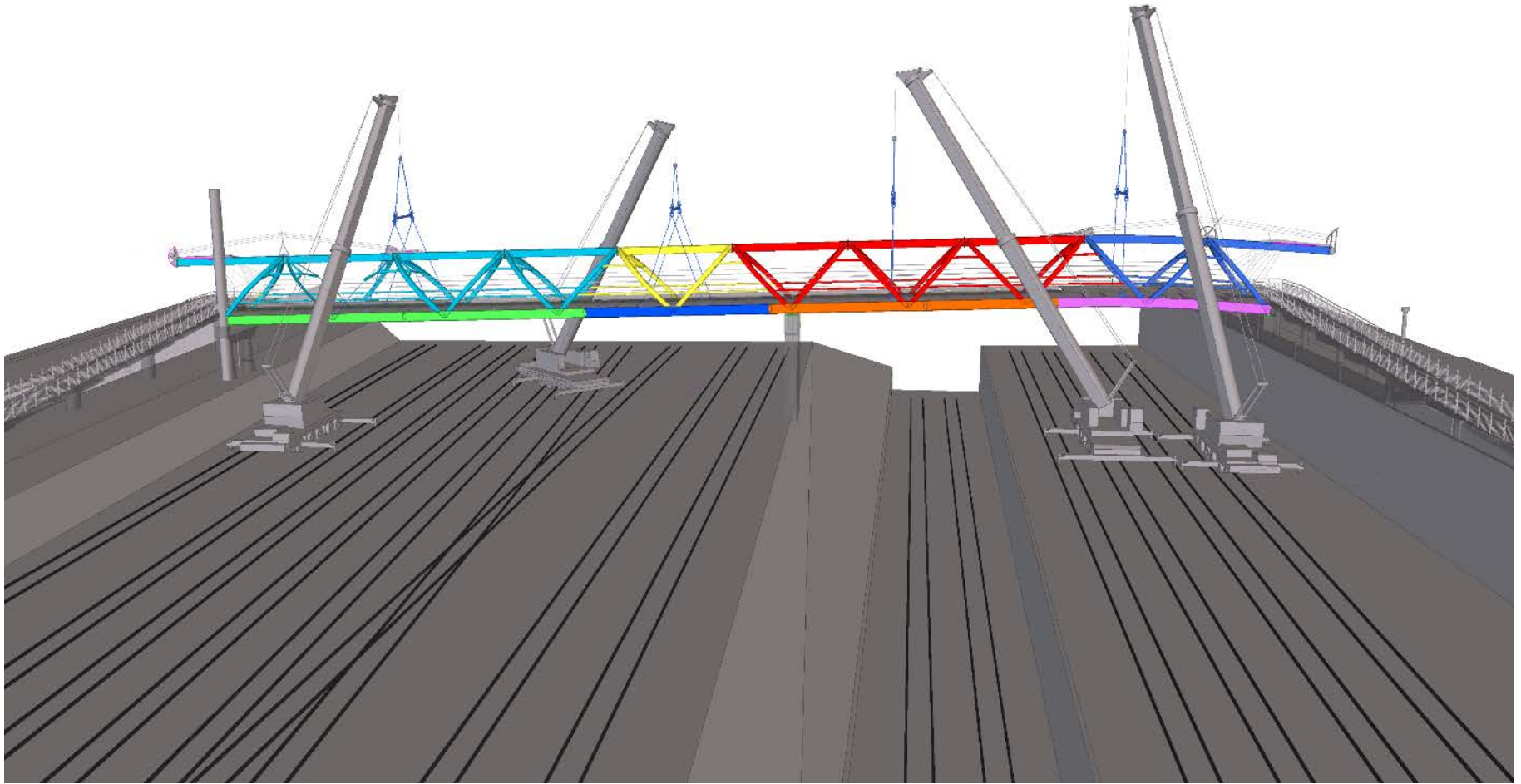


Site access courtesy: Walters Inc.

Erection logistics



Closure of GO trains for 5 hours max



Placing the splices



Bolted connections











Owner
Allied Properties

Architects
&Co Architects

Construction Manager
Eastern Construction

Steel Fabricator / Detailer / Erector
Walters Inc. Hamilton/Metropolitan Walters

Castings
CastConnex

Project Profile

QUEEN RICHMOND WEST CENTRE
Toronto, Ontario



Site access courtesy: Walters Inc. and CastConnex

Special legs



Image: &Co Architects

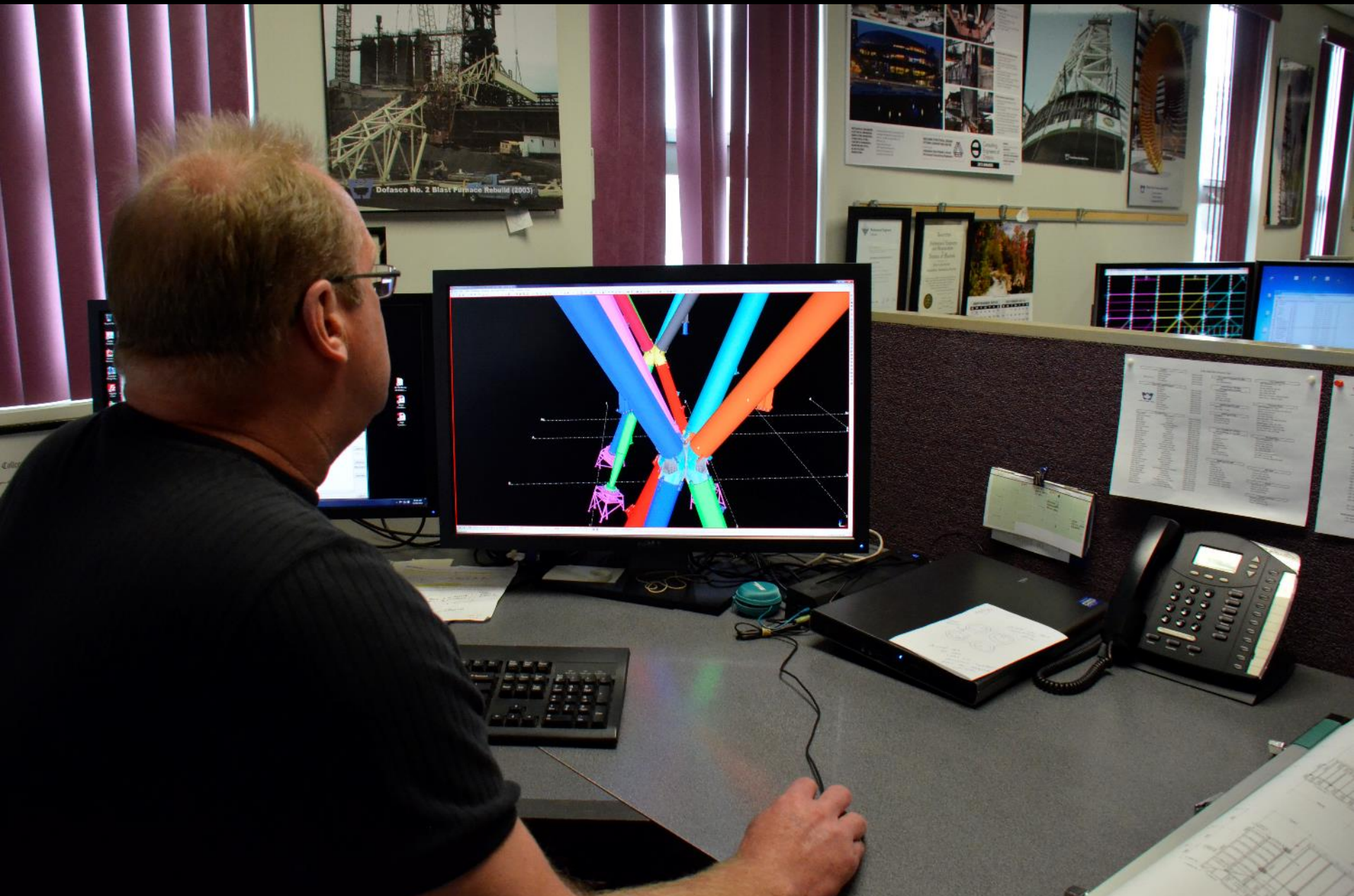
- The 'legs' that will support the new office tower that sits over the older building at Queen and Richmond Streets in Toronto is set on very large legs created from hollow steel, connected with a large cast connector.
- Referred to as "delta frames" by the team.

Modeling to design

The decisions regarding the shape of the lower 'legs' were based on these models. The tapered ends were chosen.

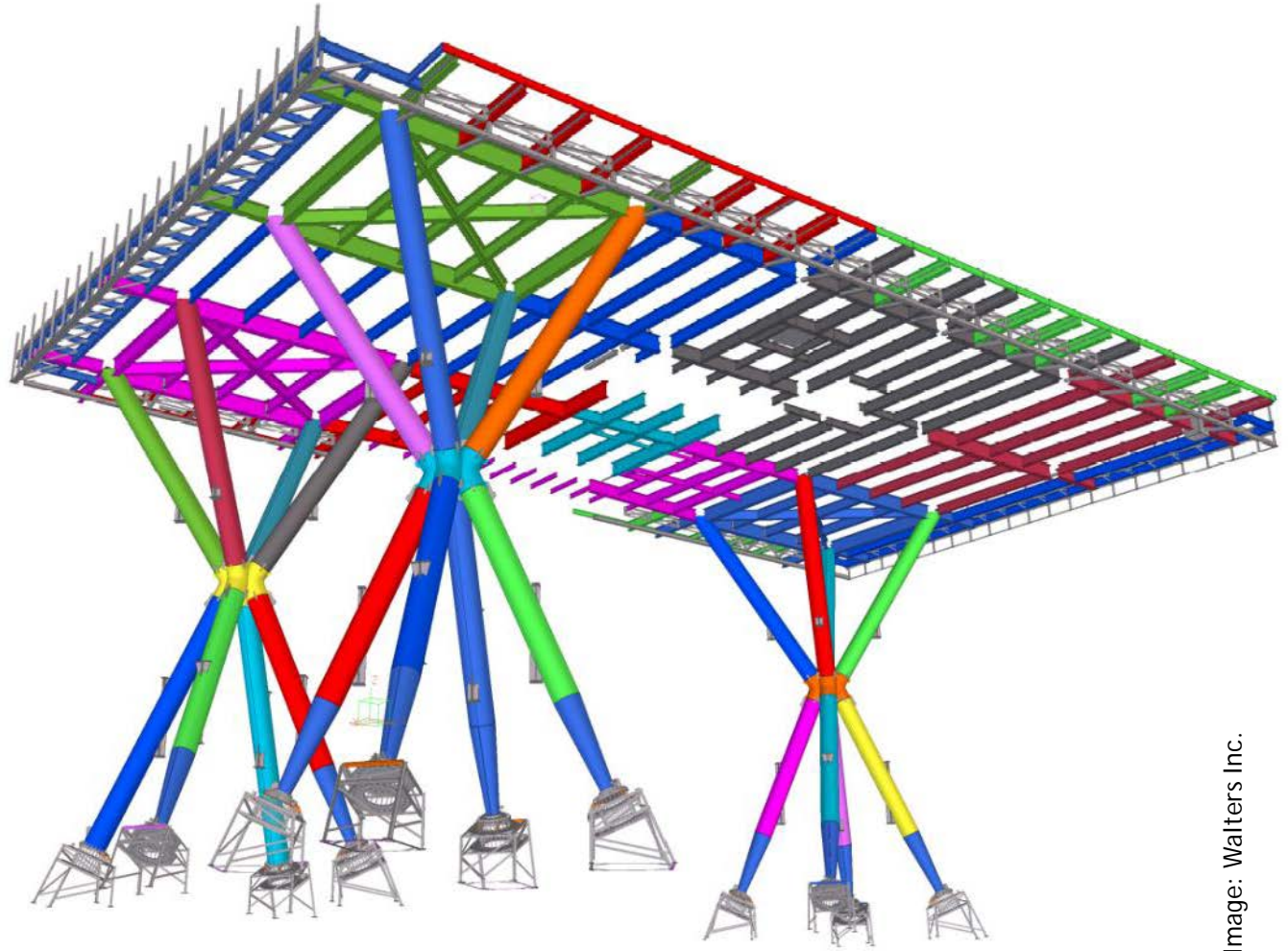


Image: CastConnex

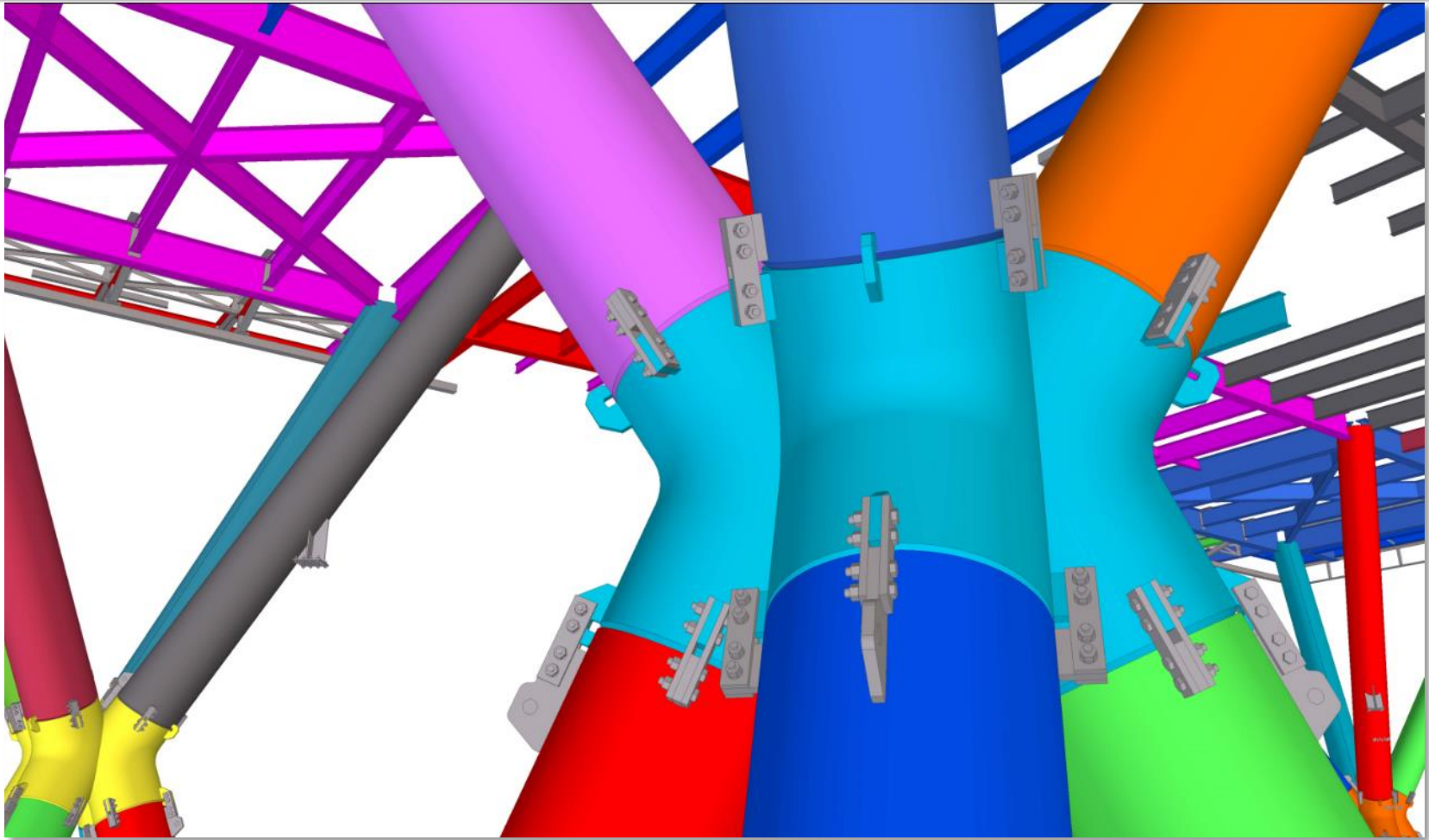


Overall structural model

Tekla Structures was used to model the overall steel system. The software incorporates full structural requirements as well as detailing of connections.



Connection details



The Tekla model allows for a very detailed development of the connections. Shows temporary tabs for support during erection.

Resin model

A resin casting of the node allowed better visualization of the connection and its curvatures.

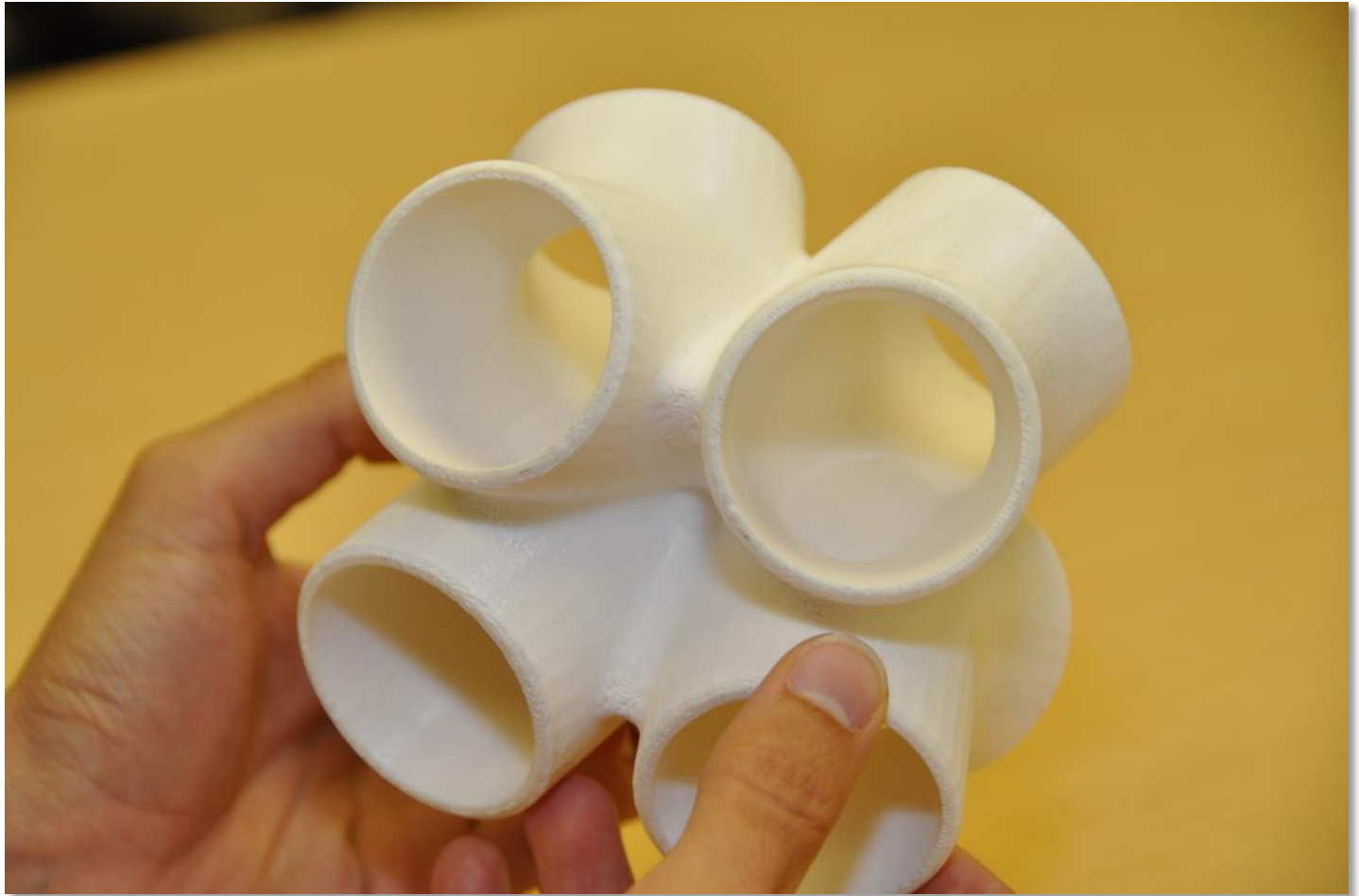


Image: CastConnex

Casting process

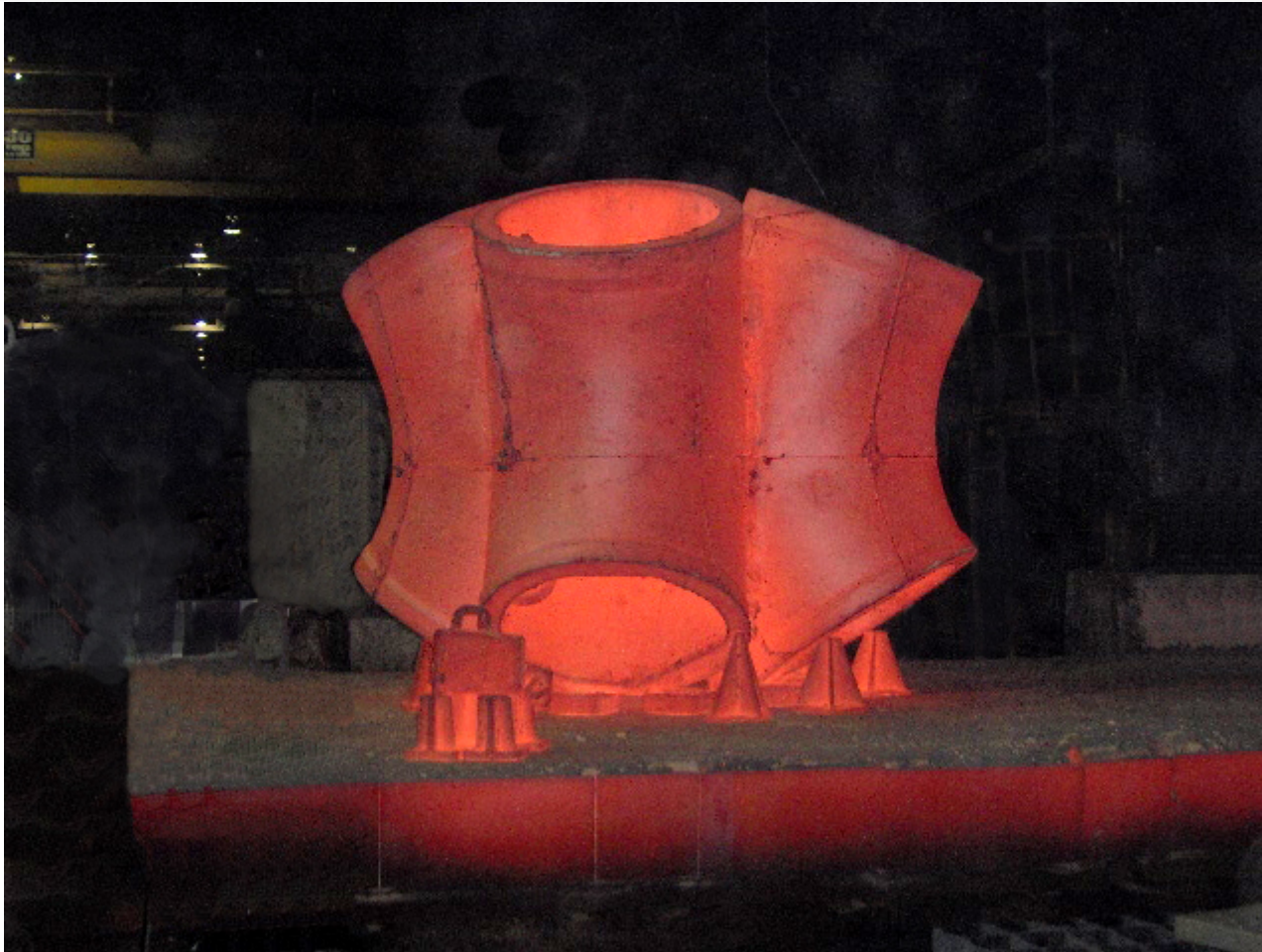


Image: CastConnex

The casting was done in Kansas as this facility offered the best quality and price.

This sort of node is created using an expendable mould. This means that it is broken in order to remove the casting. These are normally made from sand/resin casting.

Cleaned up

Once the casting is cooled, it is cleaned up and rough edges removed. These were shipped from Kansas to Walters Inc. in Hamilton for further work and preparation for attachment to the legs.



Image: CastConnex

Pre fit the legs to the node



The large tubular legs were fabricated and pre-fit to the node. The system will be filled with concrete to create the required structural strength.



CAPACITY
15 TON
LOADRUM

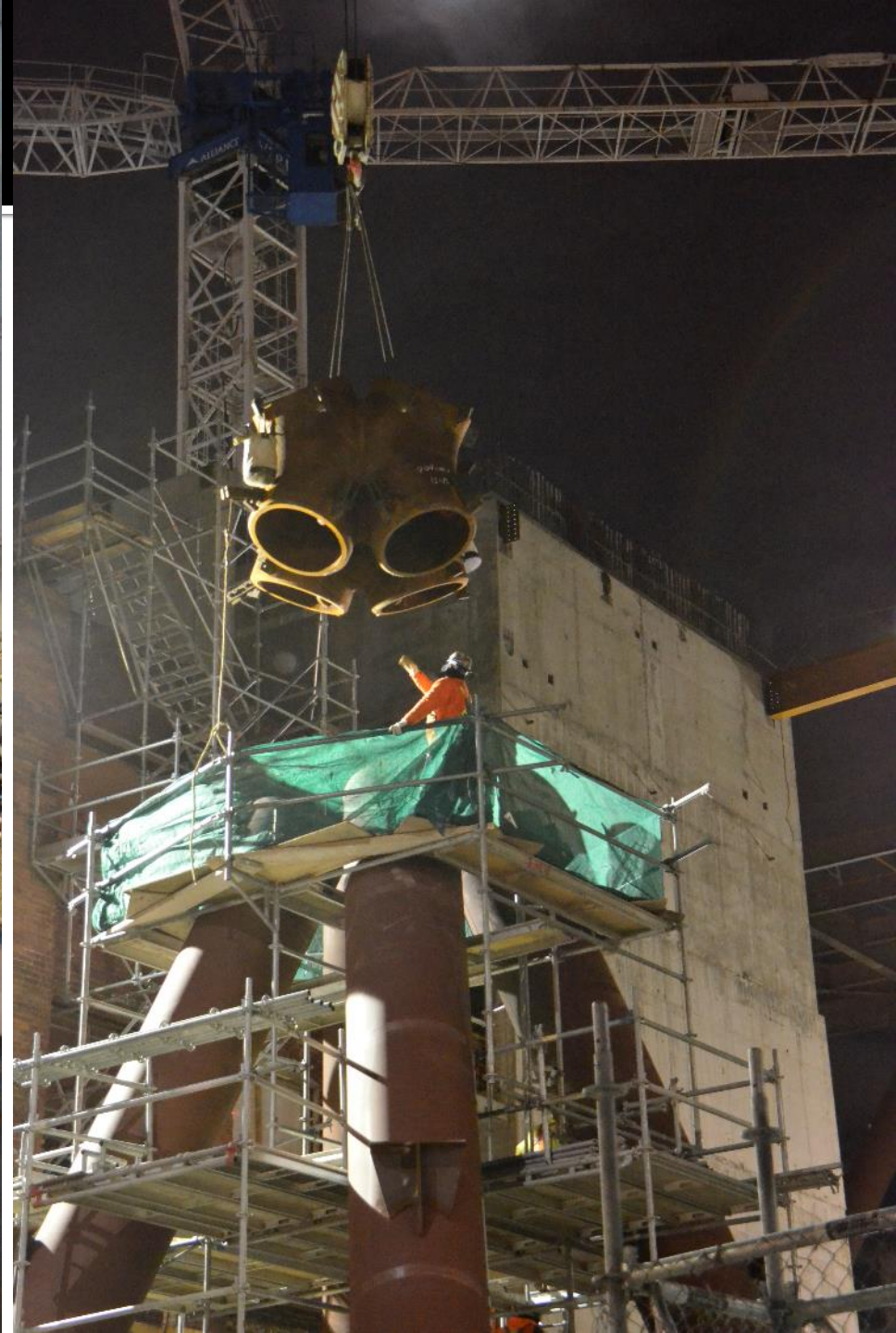
15 TON 4

LOADRUM

15 TON

15 TON

15 TON

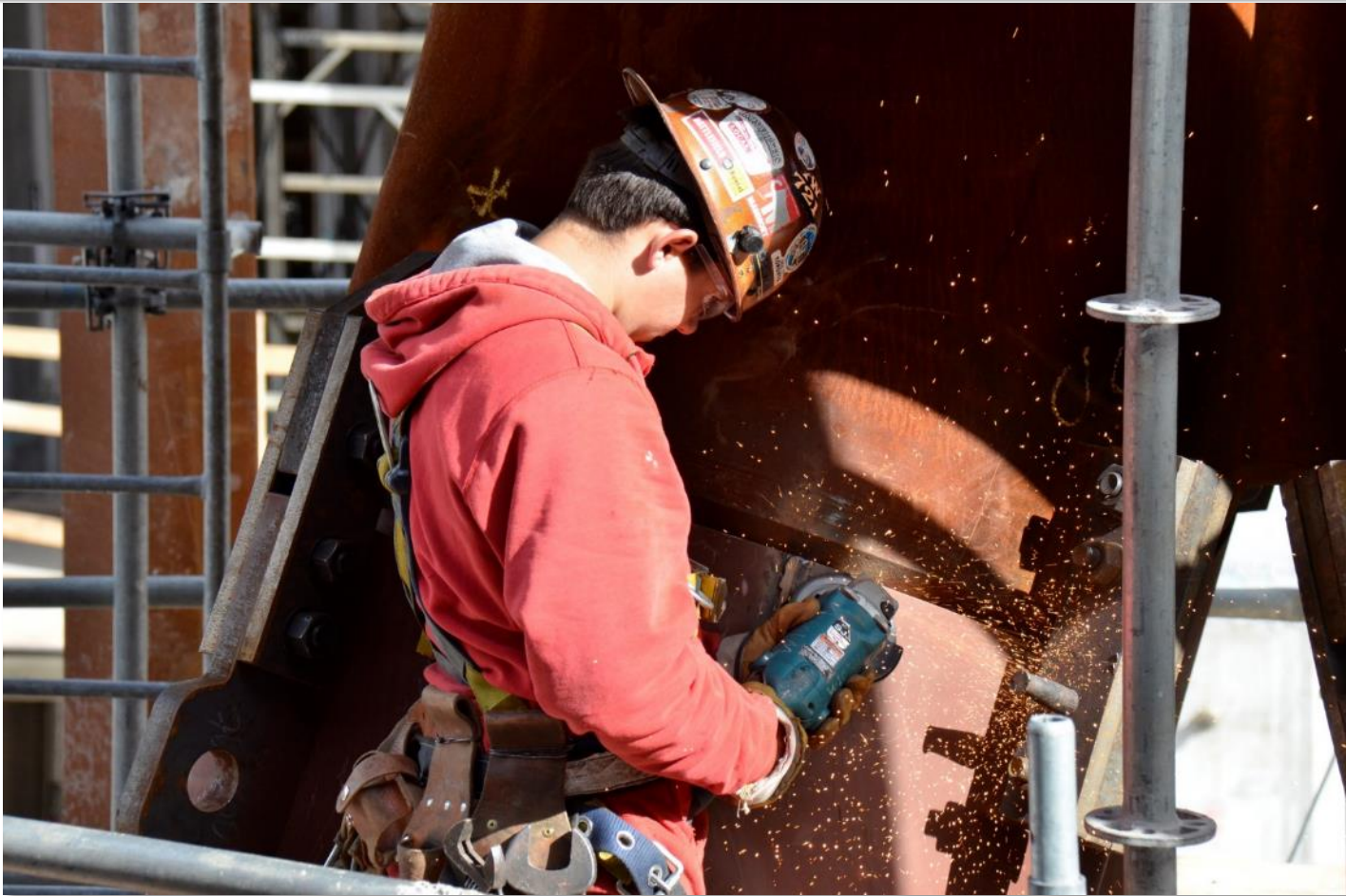


Coordination



Lifting a 31,500 pound cast node requires lot of precision and planning.

Grinding



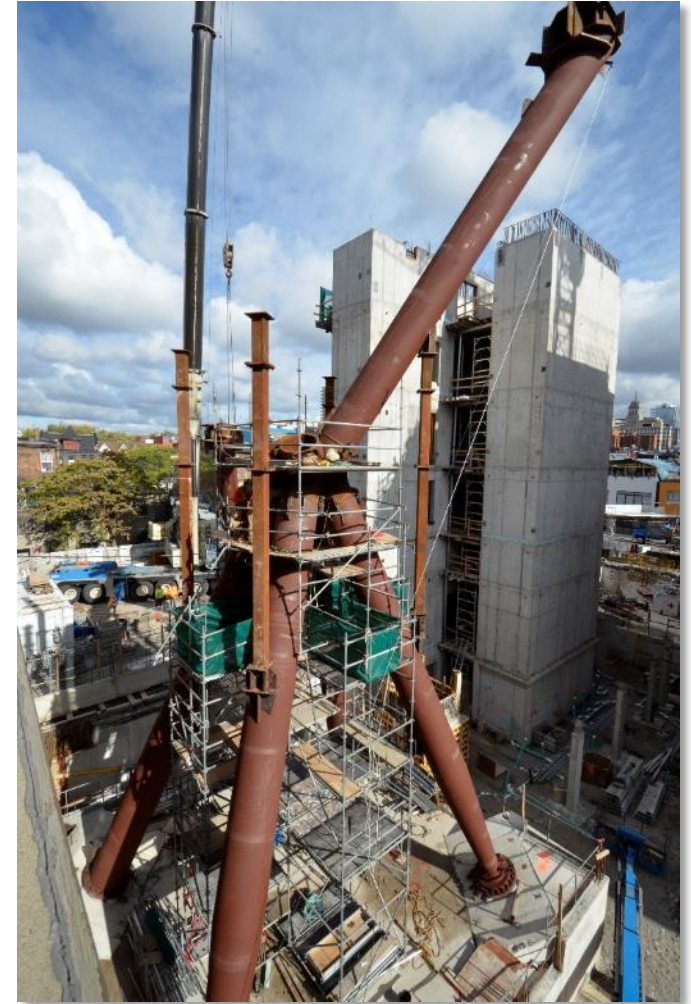
AESS 3 and 4 are the only categories that permit grinding. Here some of the temporary tabs are being removed prior to welding the joint.



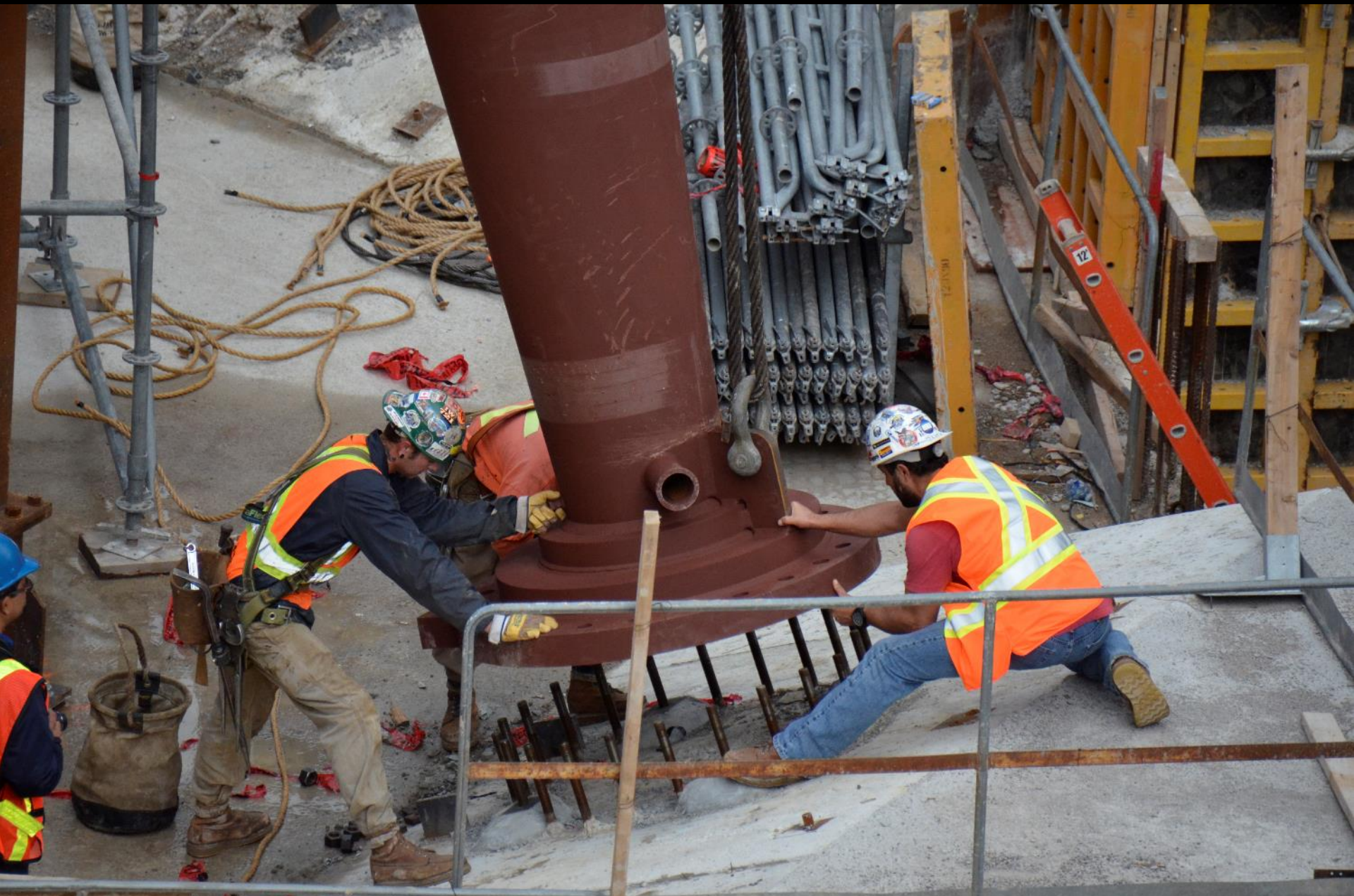
Appreciation of logistics



Erectors will need to work out temporary support systems for geometries that are incapable of stability due to eccentric loading during construction.



The bottom of the leg is a tapered tube. Fabricated via break forming with fully ground welds. AESS4 quality.



Staging of erection



Timing needed to account for the pouring of the concrete to catch up to the steel which is faster to erect.

Support system



The three delta frames support a steel platform that will in turn be used to support the multiple floors of office above.

Weld finishing






walters group
www.waltersgroupinc.com







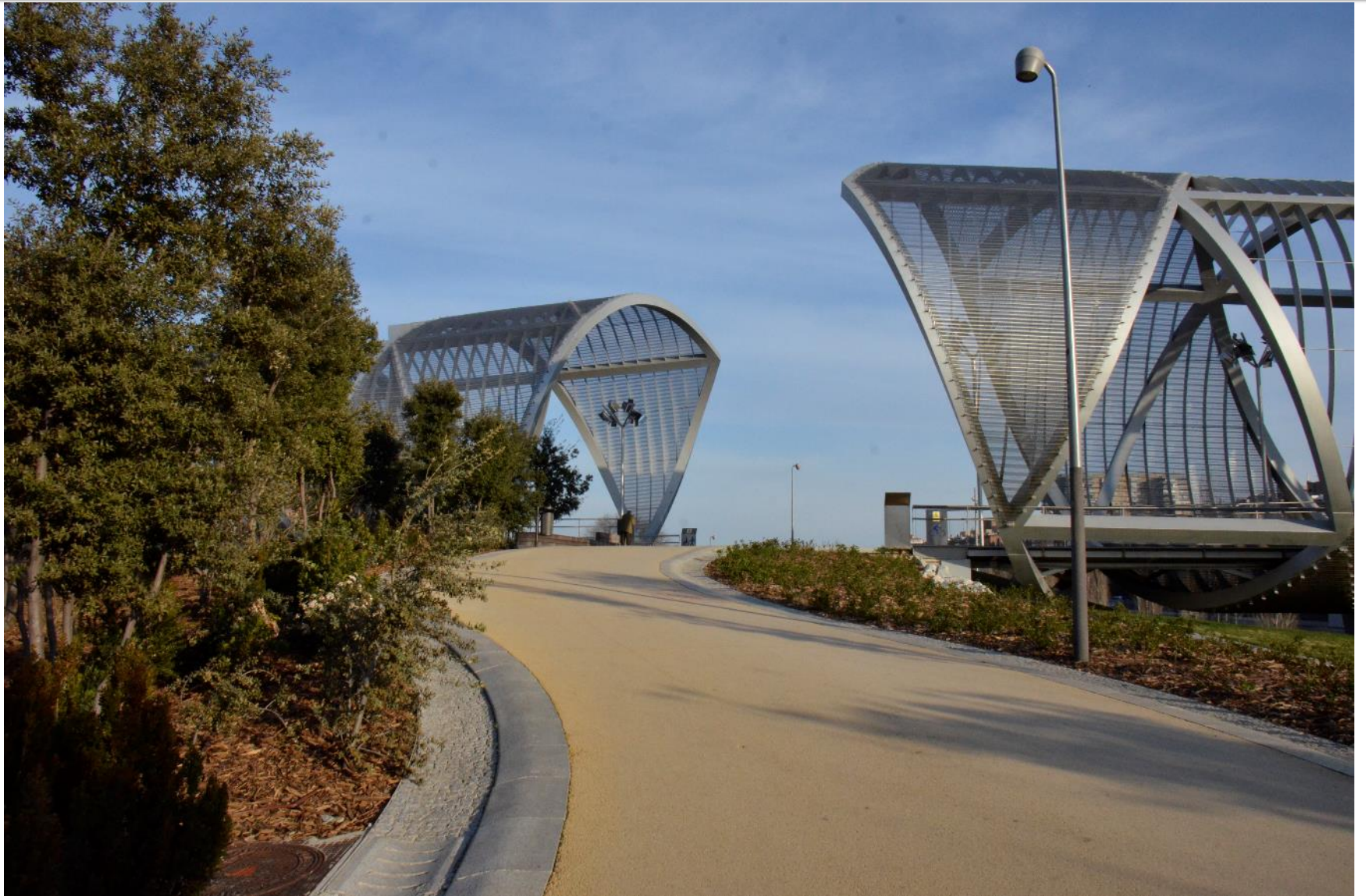


Architects
Dominique Perrault

Project Profile

ARGANZUELA FOOTBRIDGE
Madrid, Spain



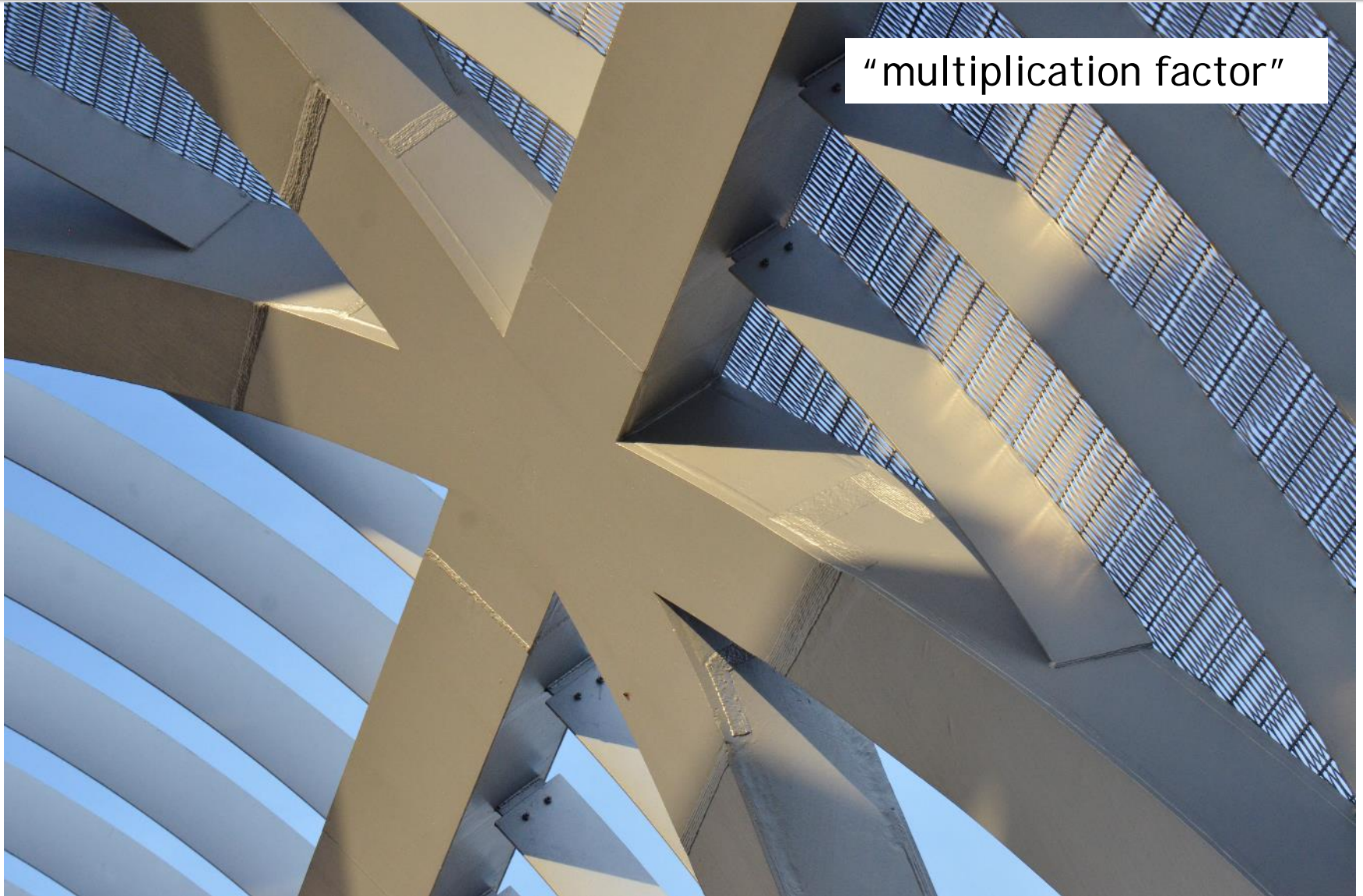


Scale: too large to fit on a truck...





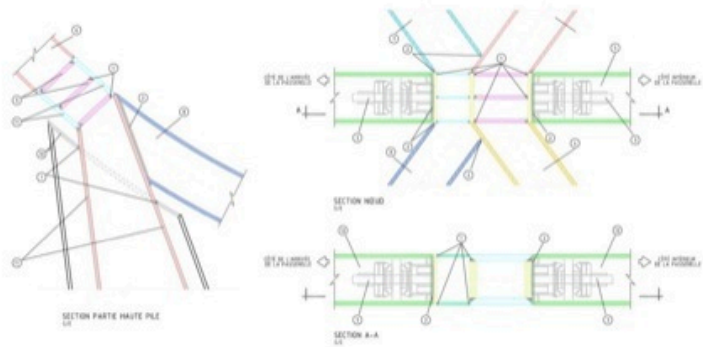
Unremediated welded connections



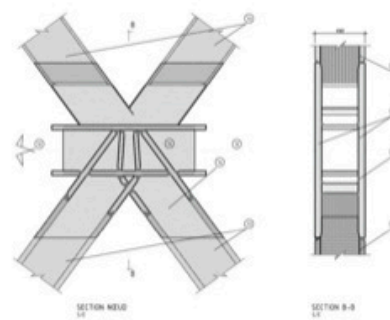
"multiplication factor"

Details

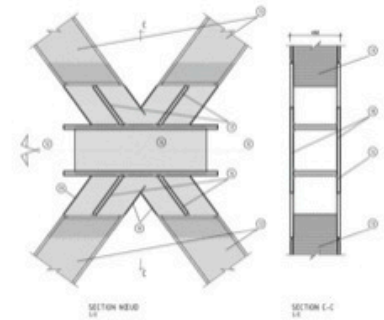
SCHEMA DU NOUD TYPE DE LA PILE INEUD ARTICULEE



DÉTAIL DU NOUD ENCASTRE



DÉTAIL DU NOUD DEMI-ARTICULÉ







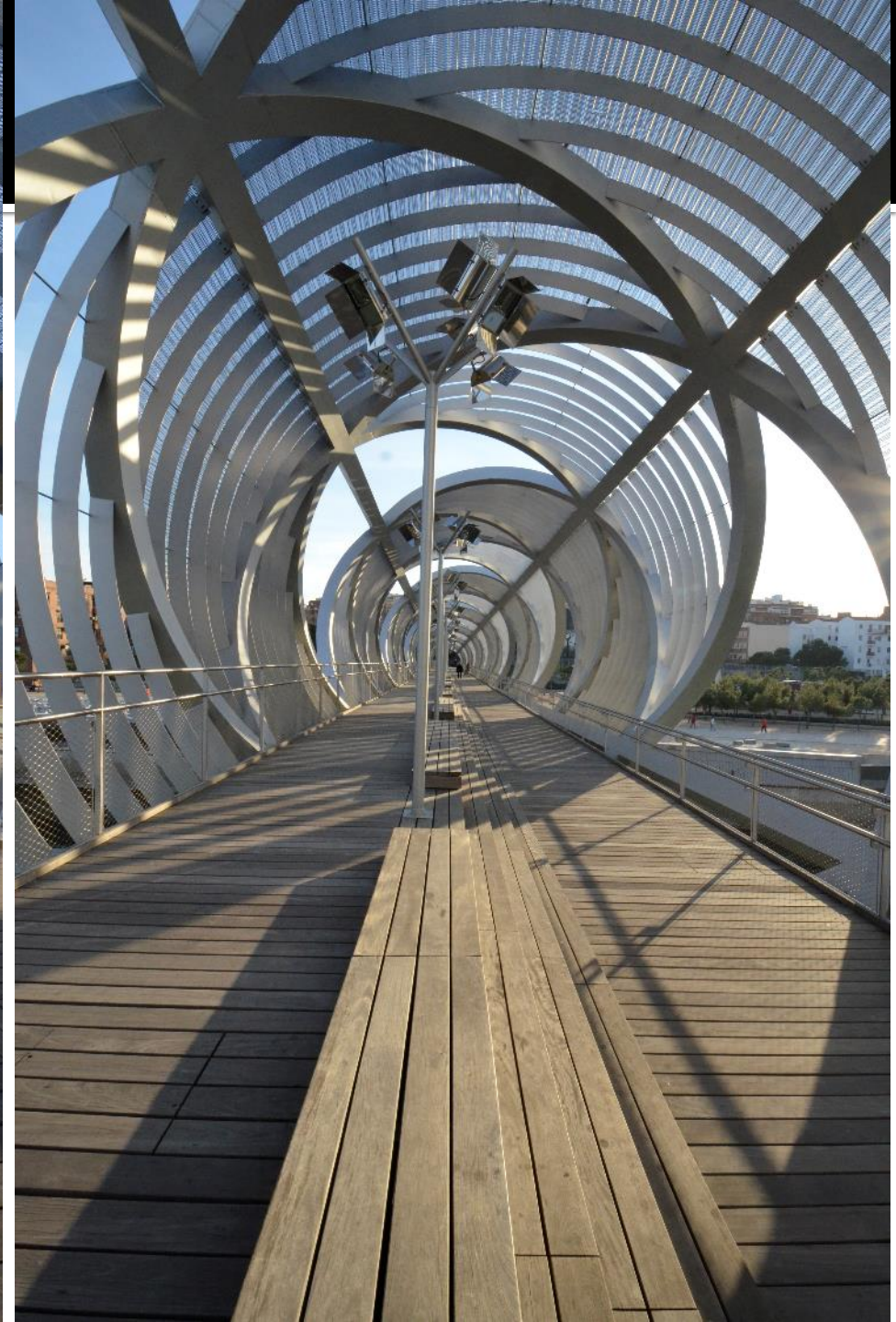


Substantial site welds



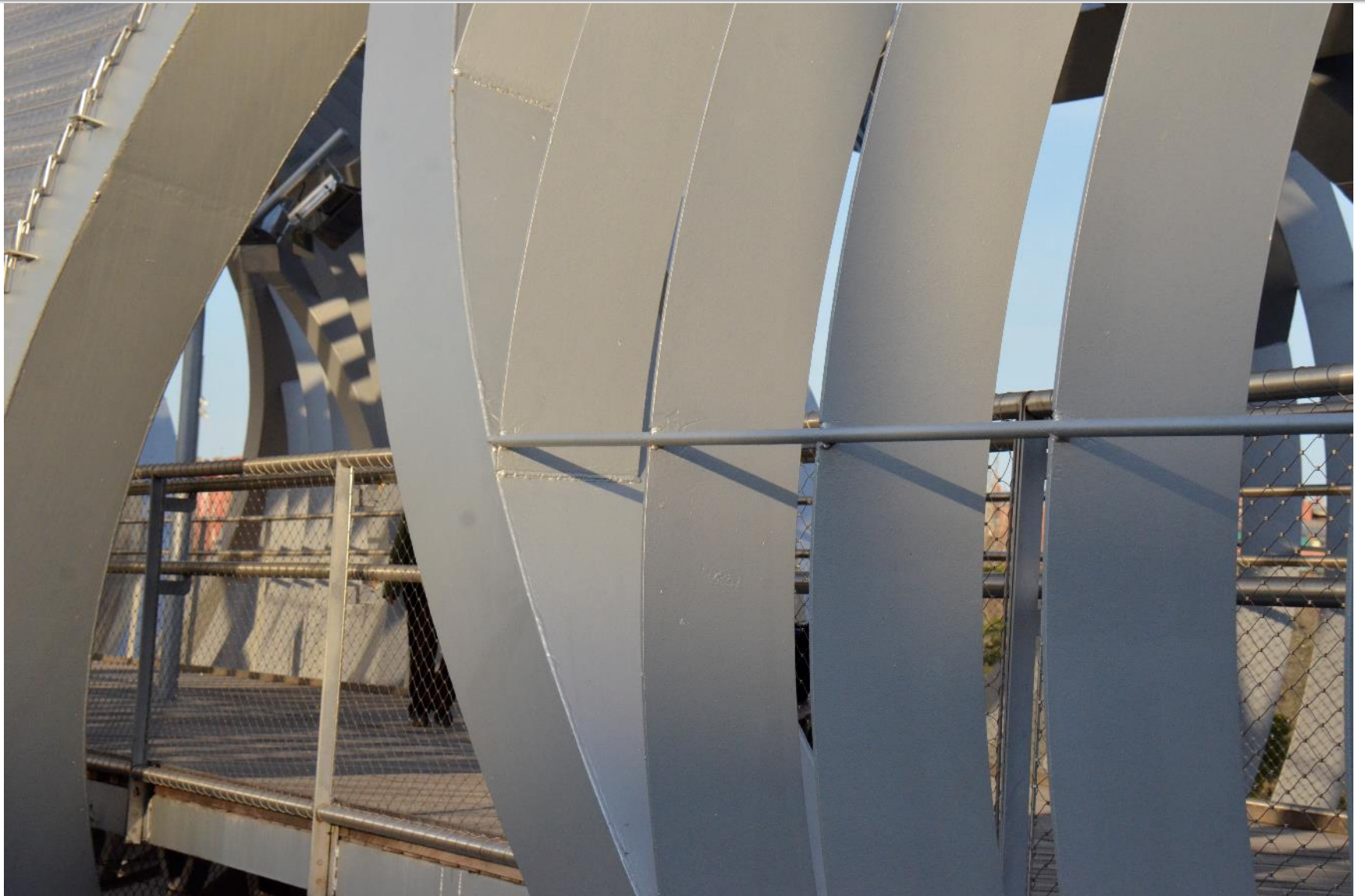
Structure of the deck support













Bolted connections for the fins

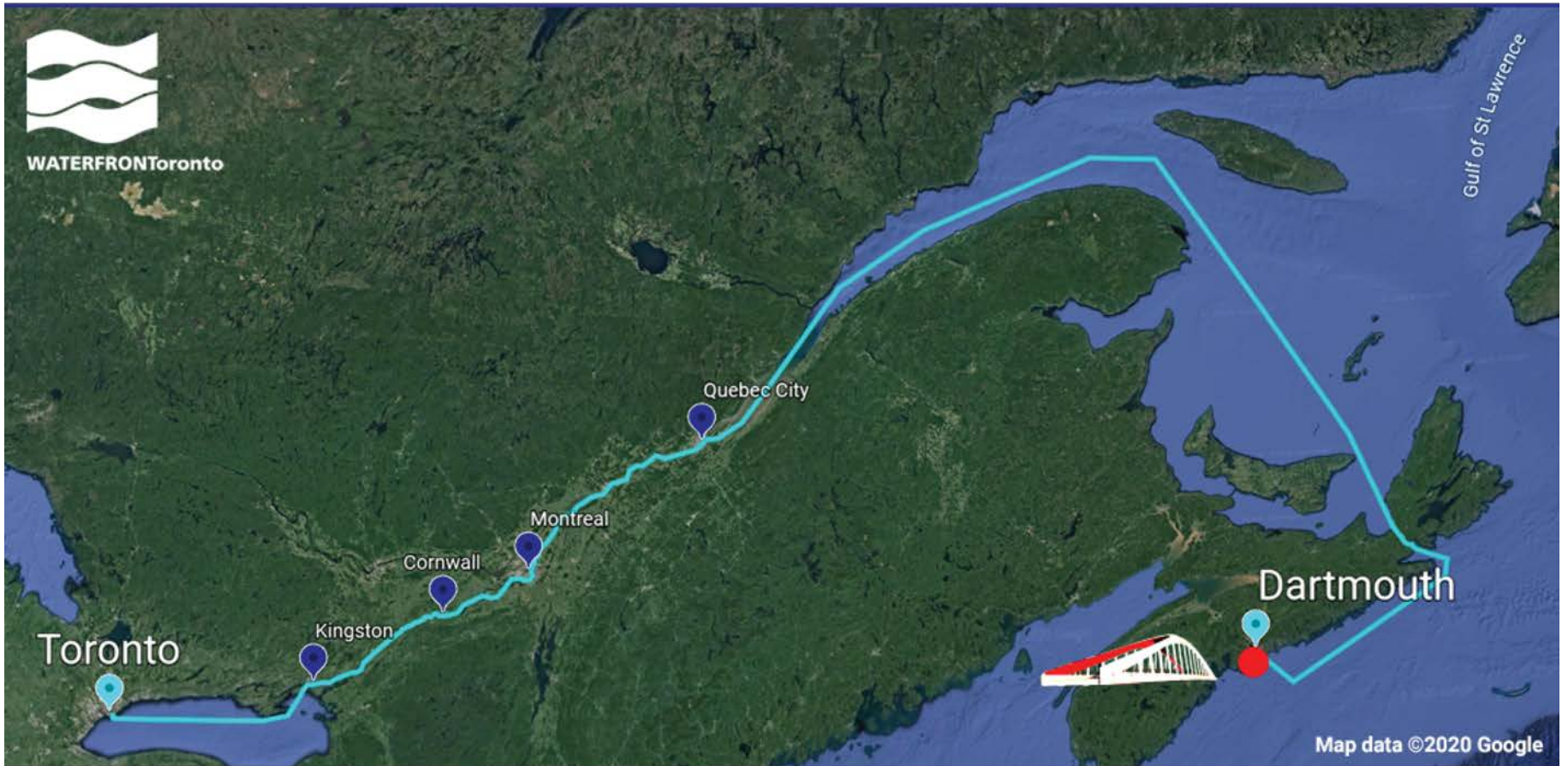


Port Lands Bridges Toronto





WATERFRONToronto



 Barge Route



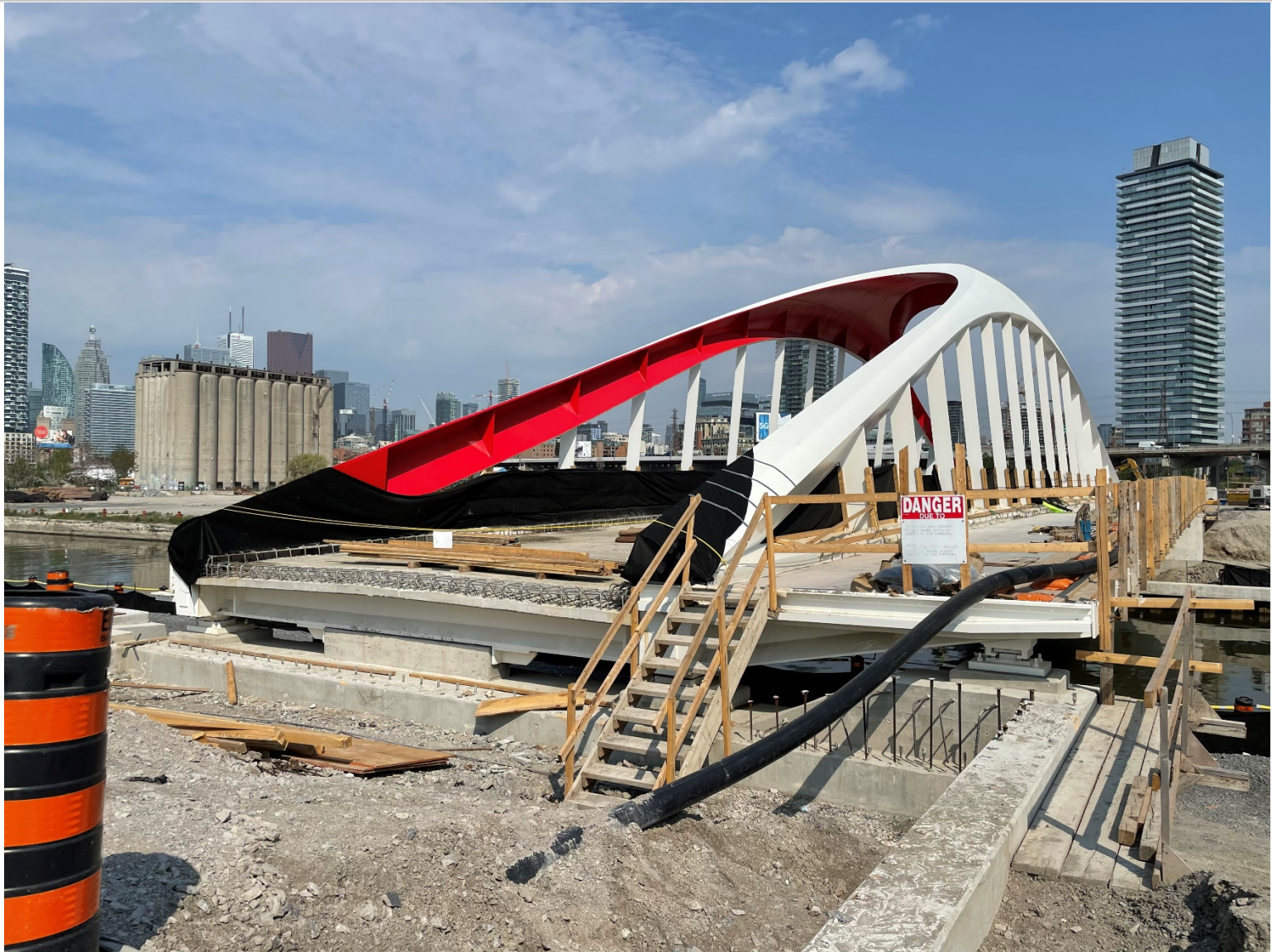
 Barge Location

#BridgeWatchTO









Cherry North - Alternative Axonometric

