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LIGNOALP
CityWave
MILANO
Ing. Claudio Bertagnolli

# Citylife - Mailand

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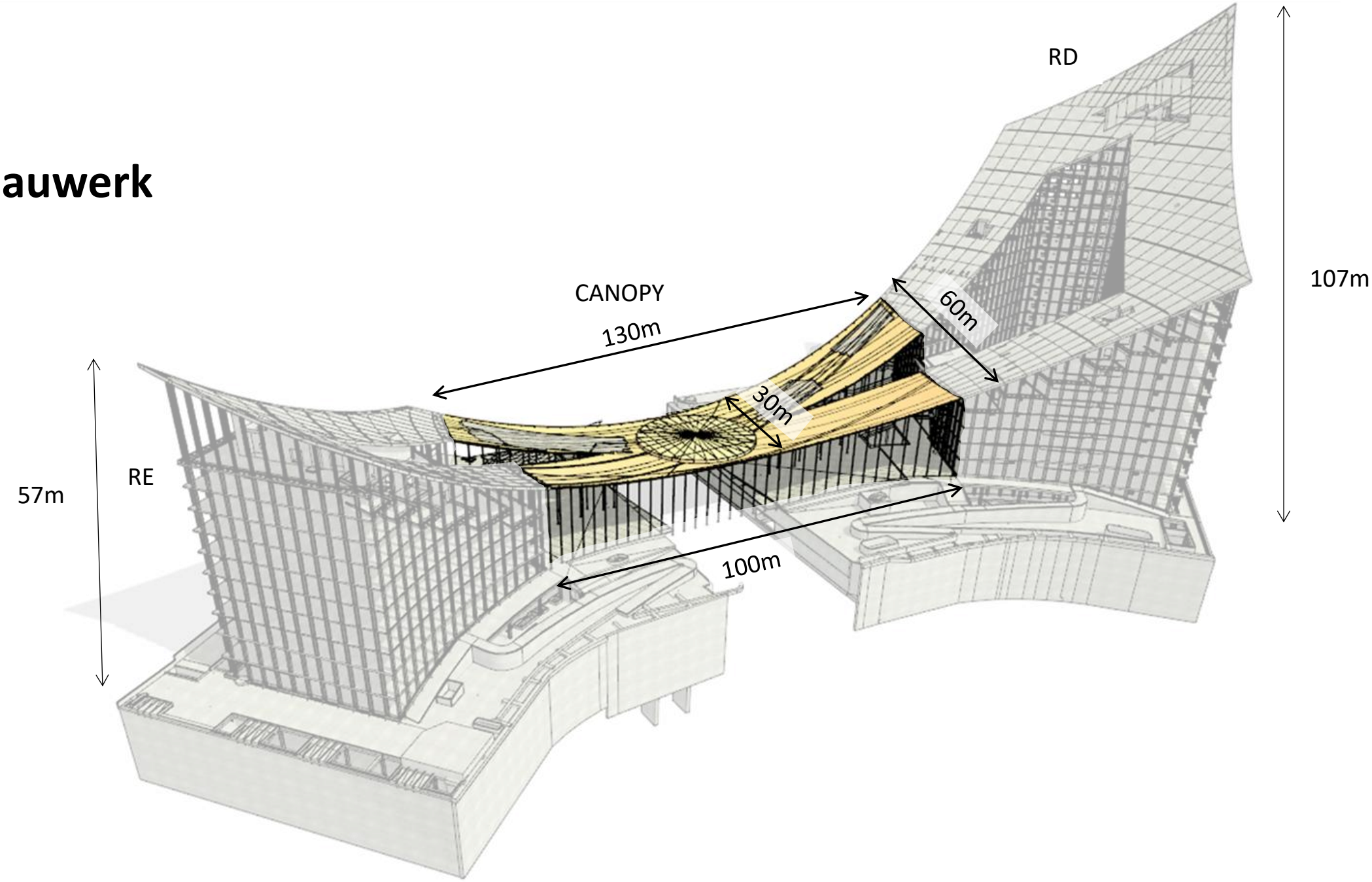
# Citylife - Mailand

## Citywave

**Arch. BIG**

**Bjarke Ingels**

# Das Bauwerk

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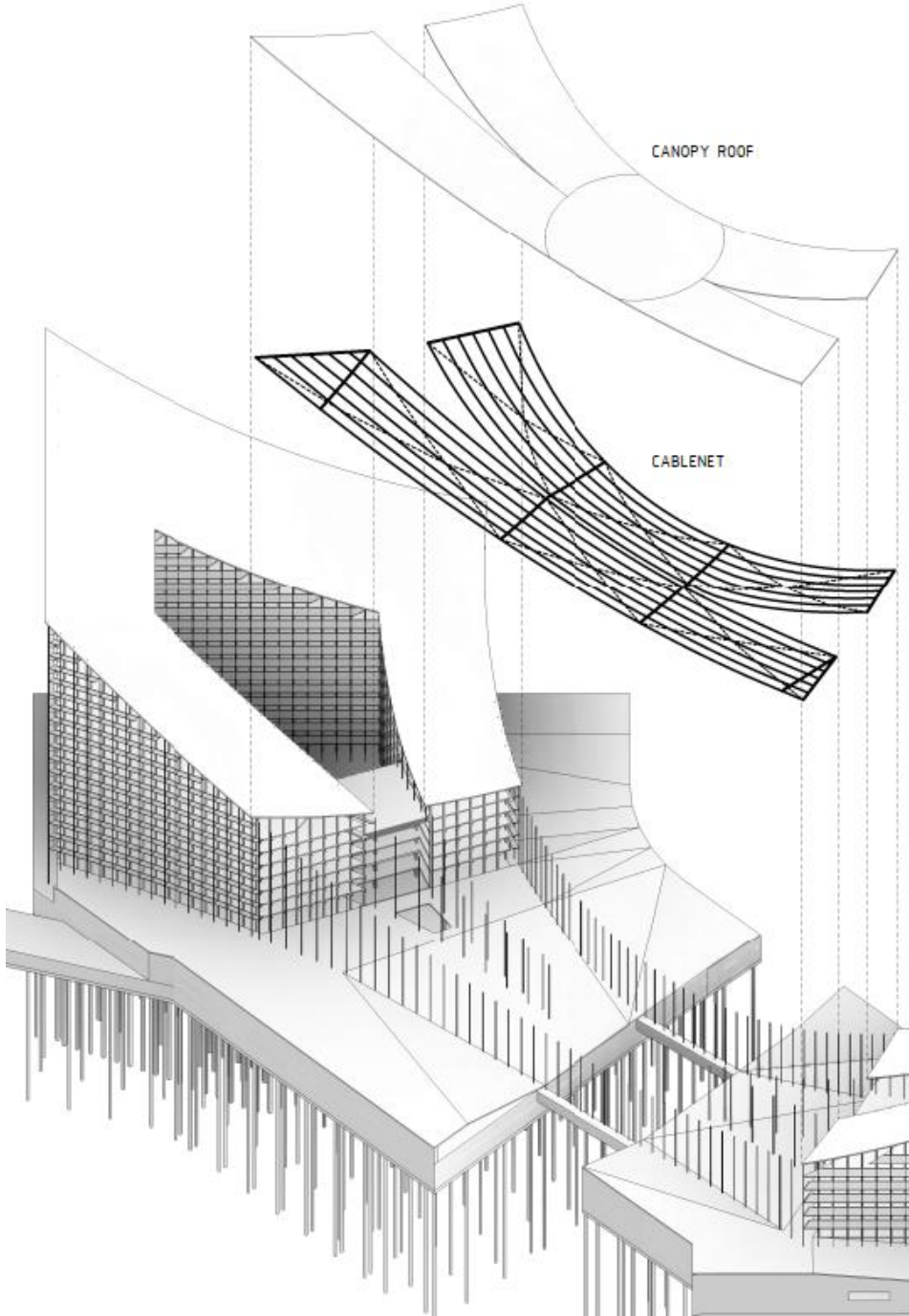
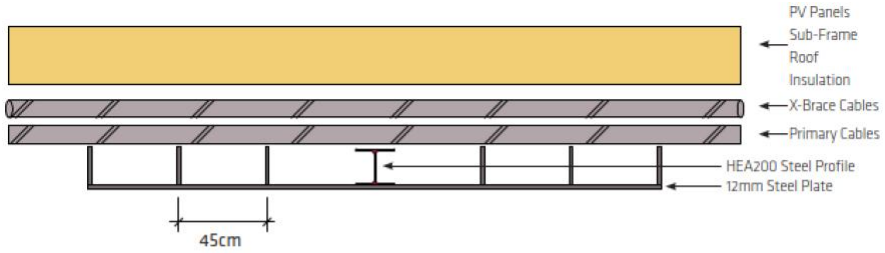
# Werdegang
# Struktur Canopy



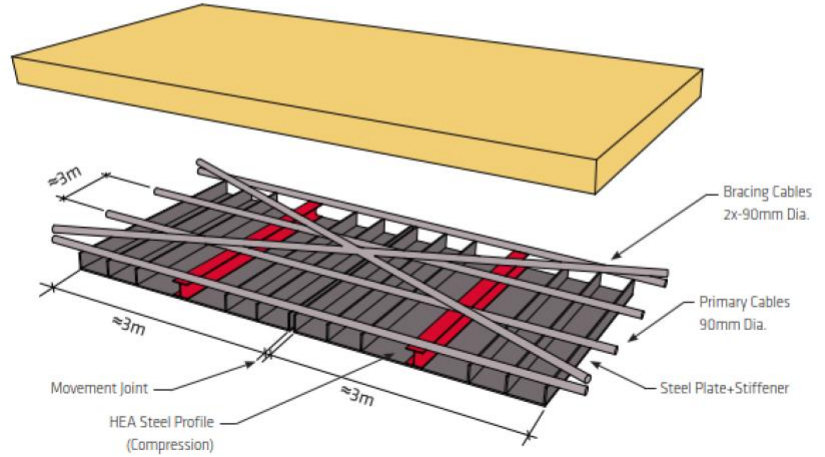




*Figure 44: Canopy System Build-Up. Compression*

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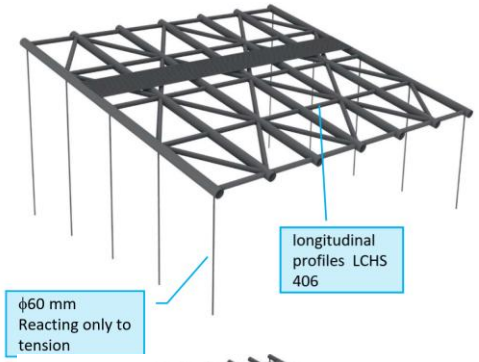
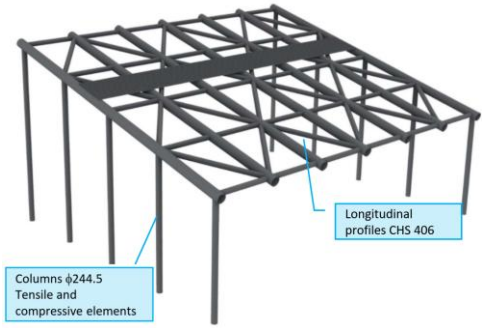
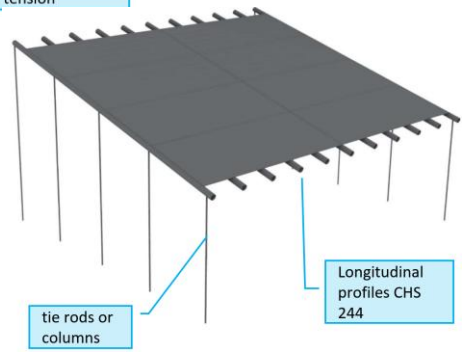
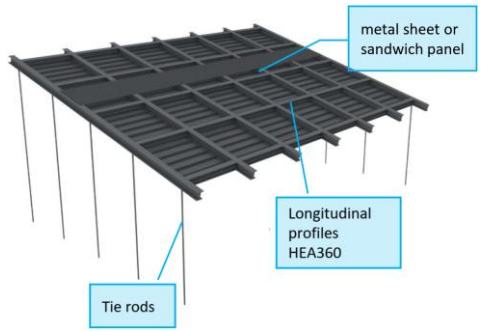
# Varianten Studie





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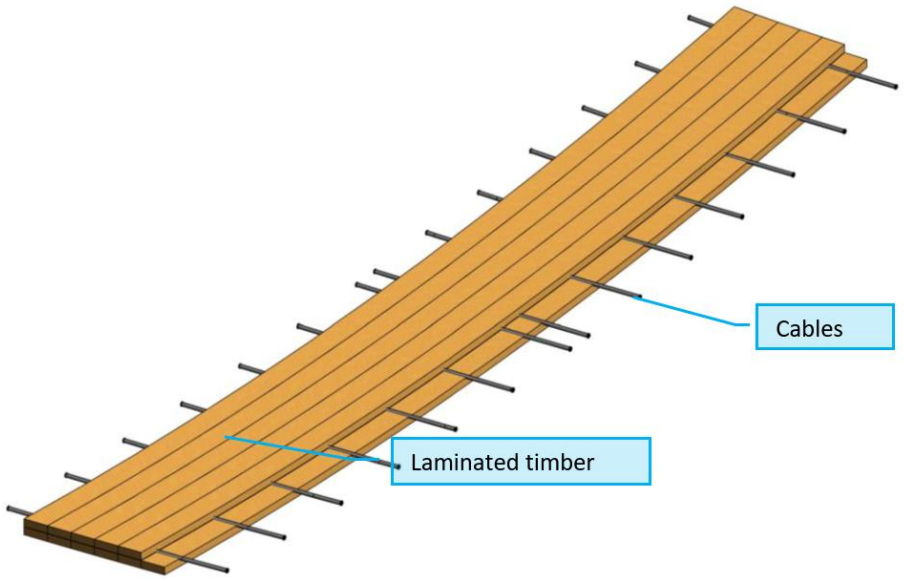
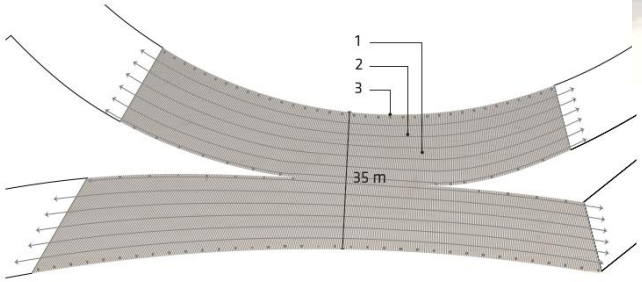
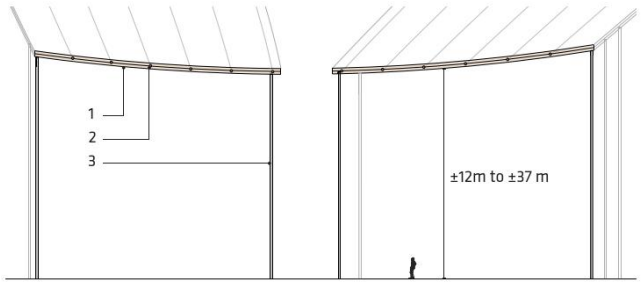
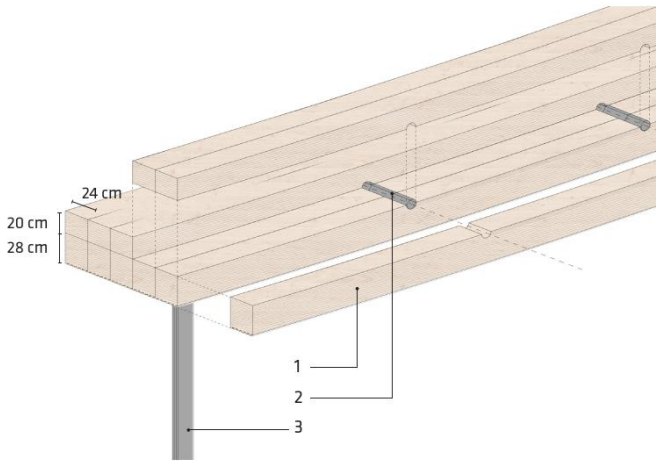


CANOPY

**CANOPY BUILD-UP AND STRUCTURAL PRINCIPLE**

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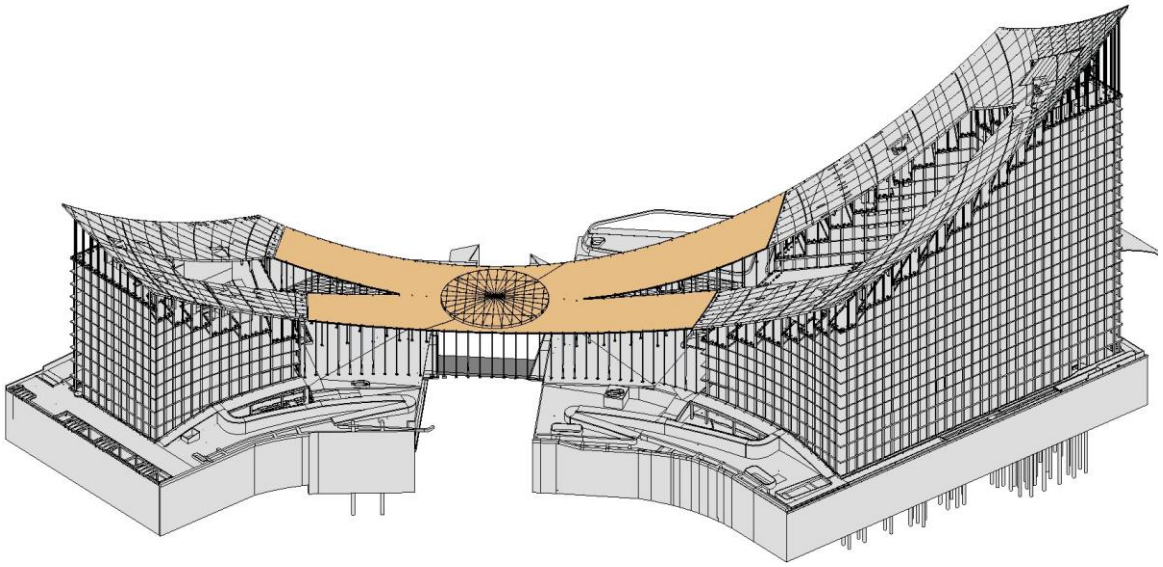
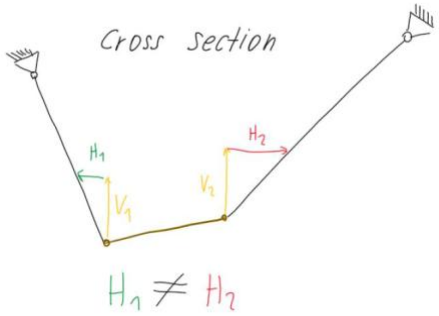
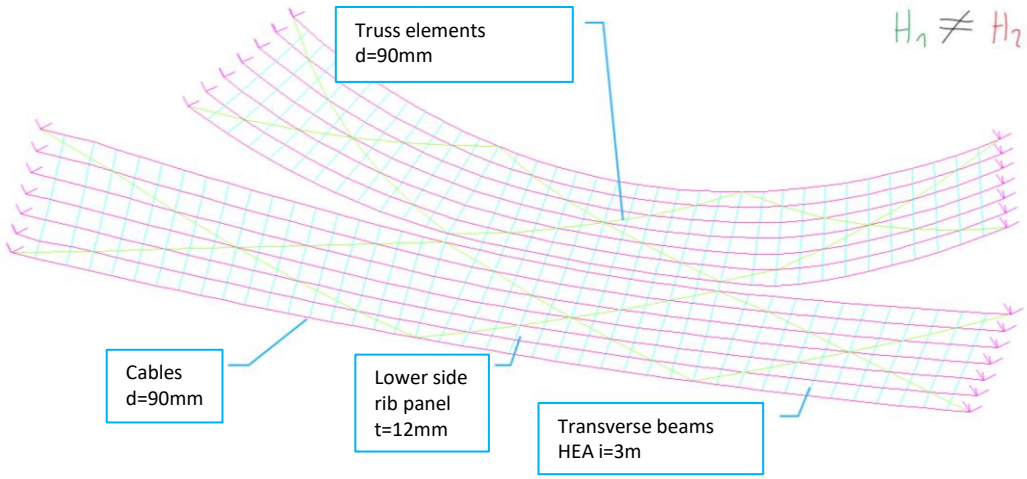
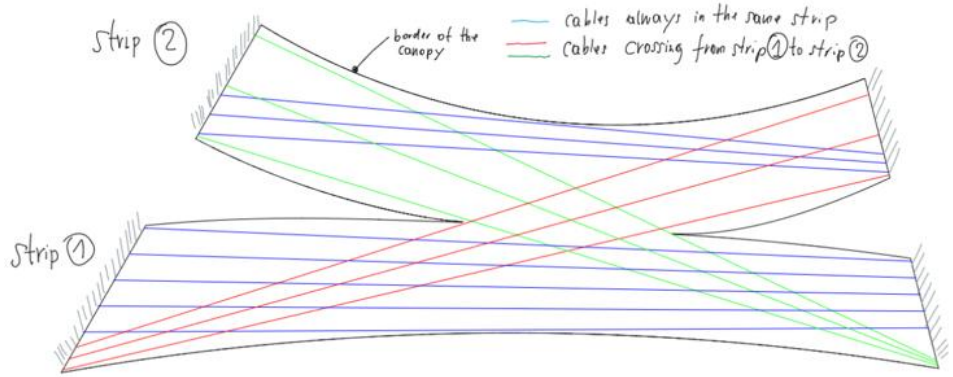
# Canopy
# Haupstruktur
# Kabel + Holzschale



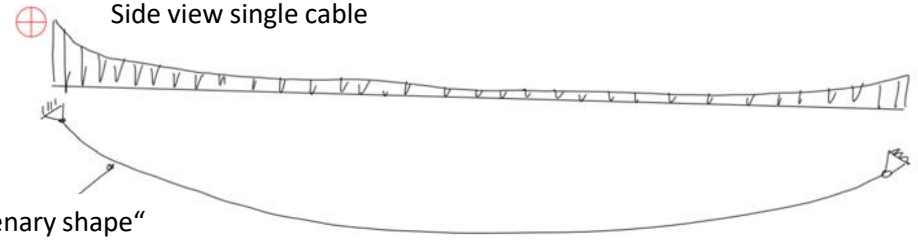



Top view – cable arrangement with straight cables in plane




Side view single cable



„catenary shape“

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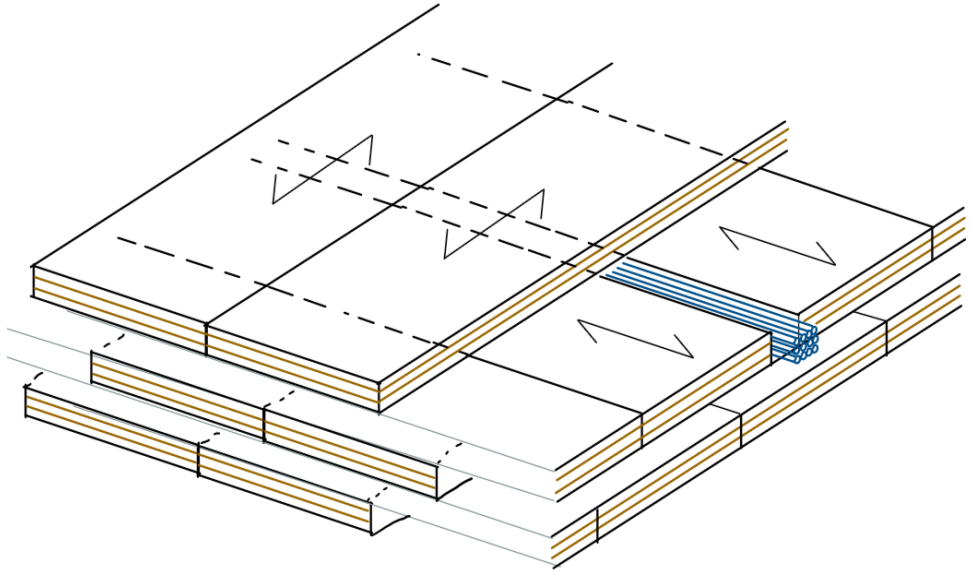
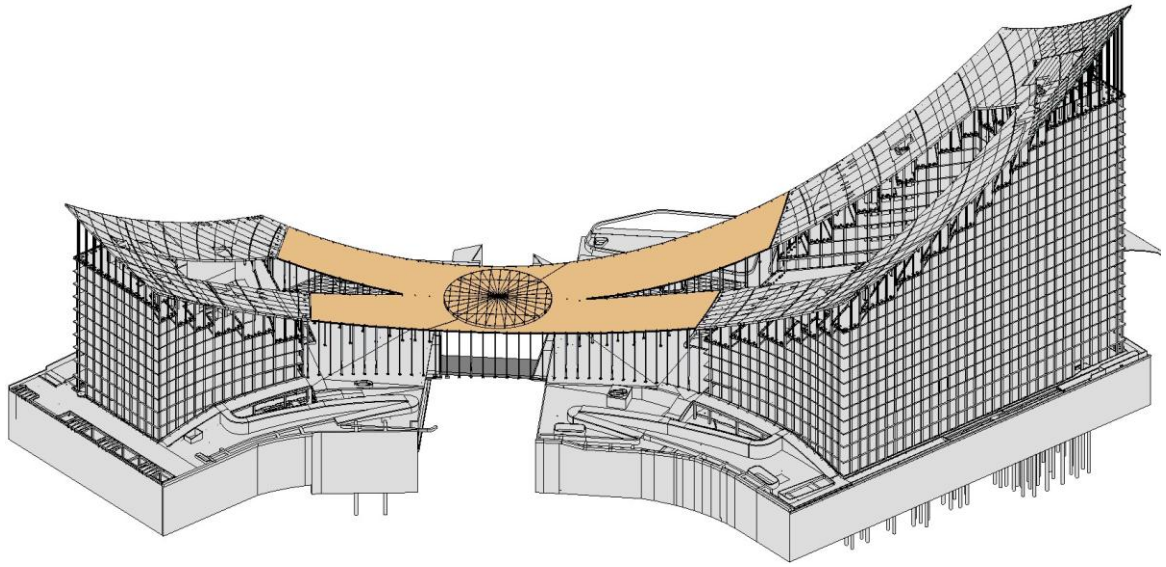
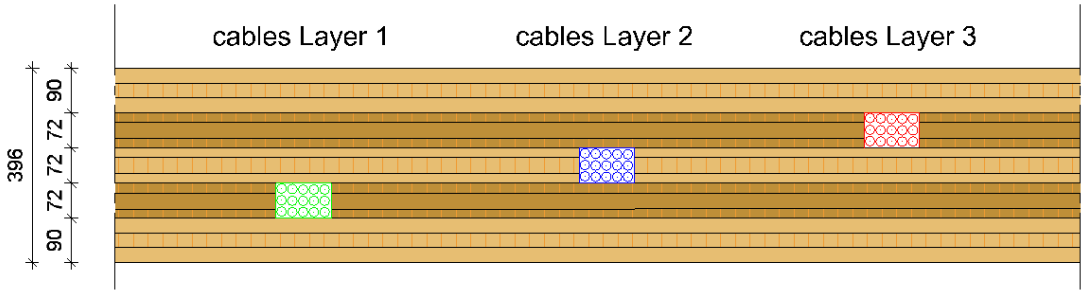


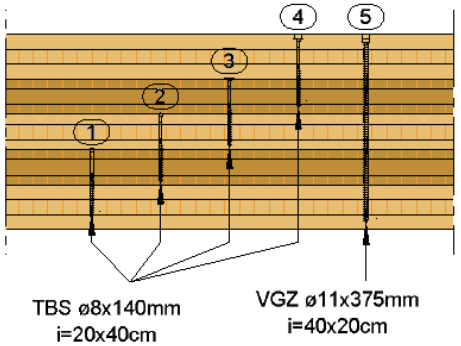


5 Layers clt panels
+
cables in between

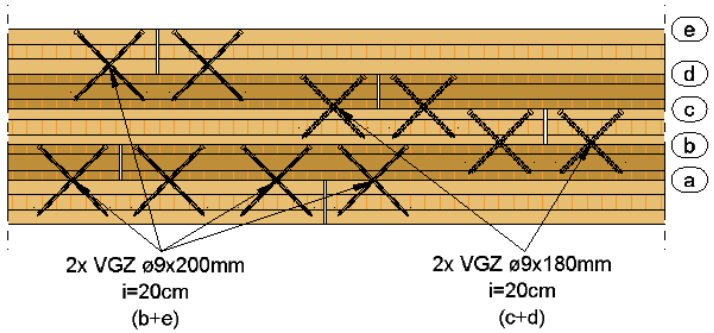



## Typical connections

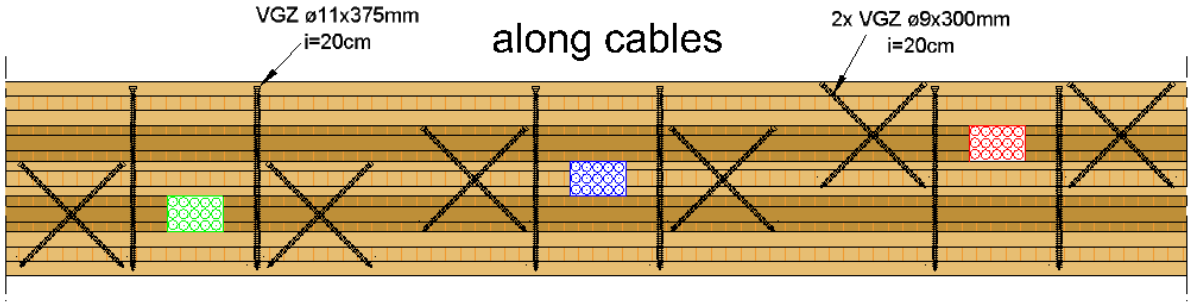
between panels




along borders




along cables

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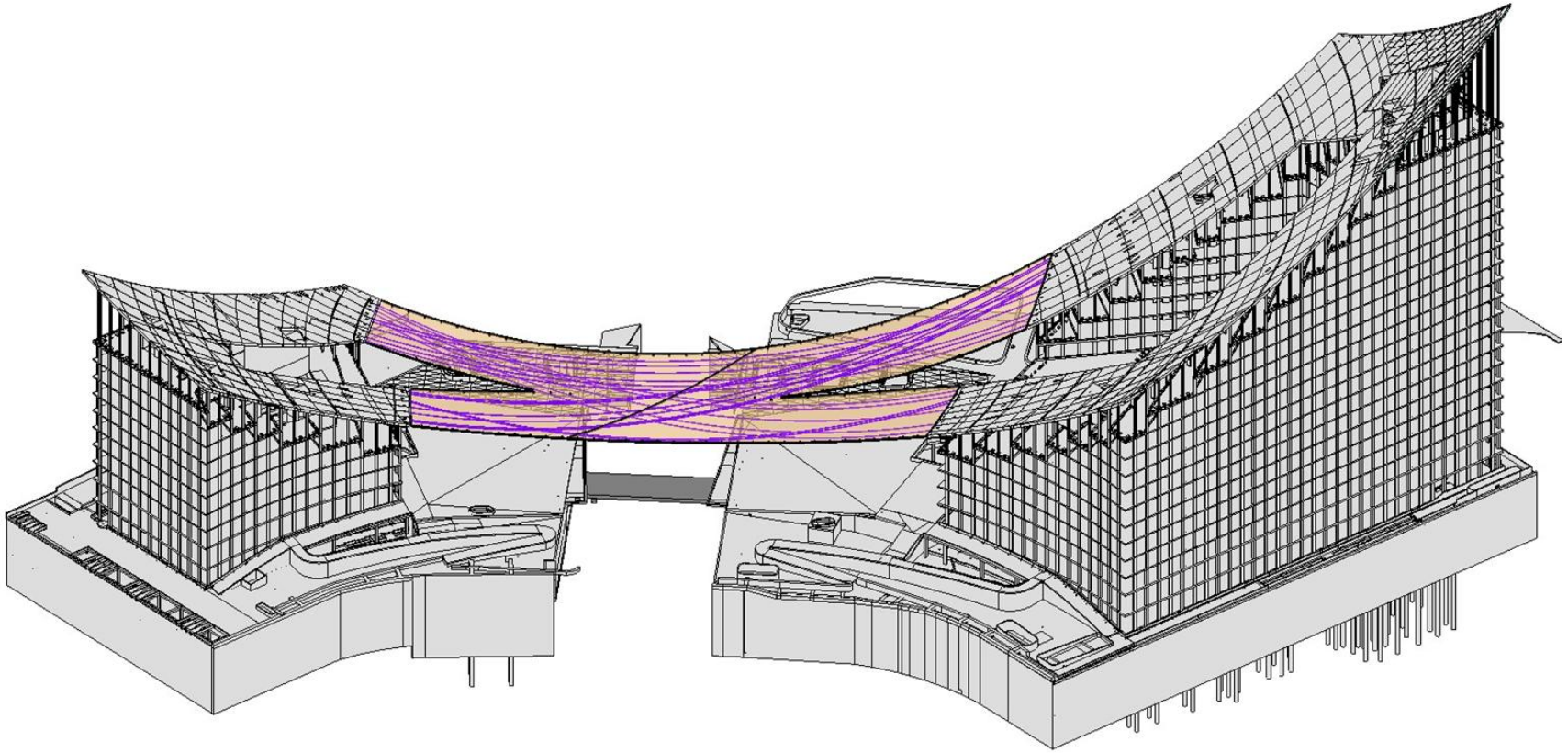
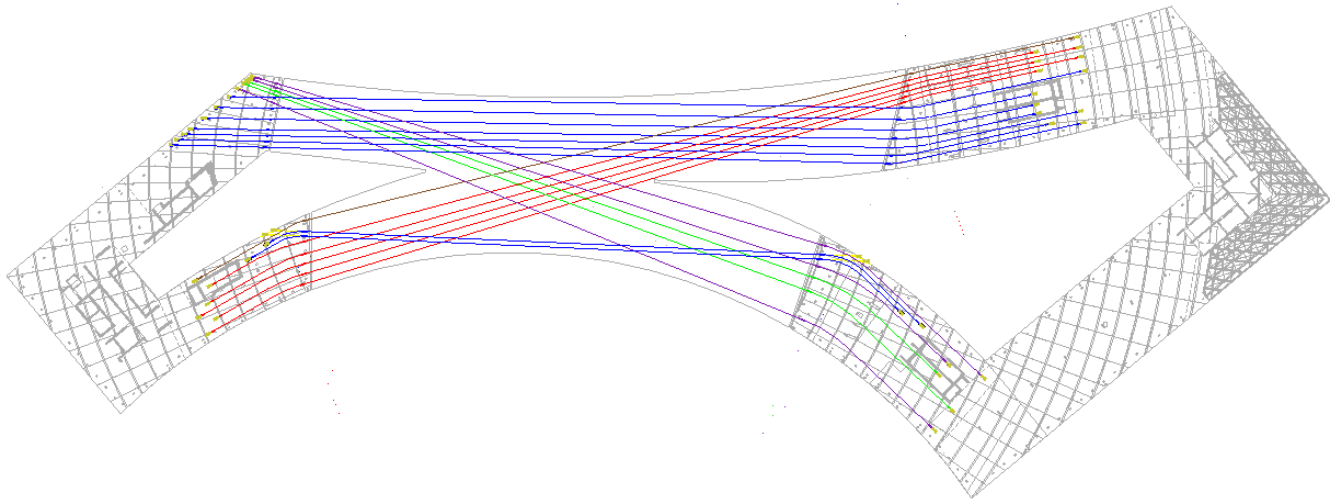
# Canopy
# Hauptstruktur:
# Kabel + Holzschale





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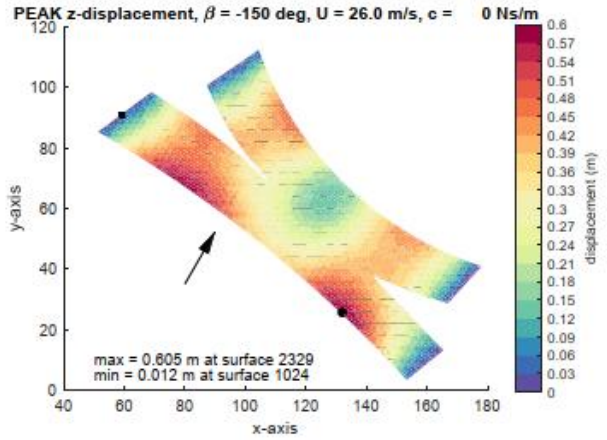
# Laborversuche
# an der Uni TN

**Lastproben**
**Steifigkeit**
**Dämpfungskontante**

# Laborversuche

# Windkanaltests



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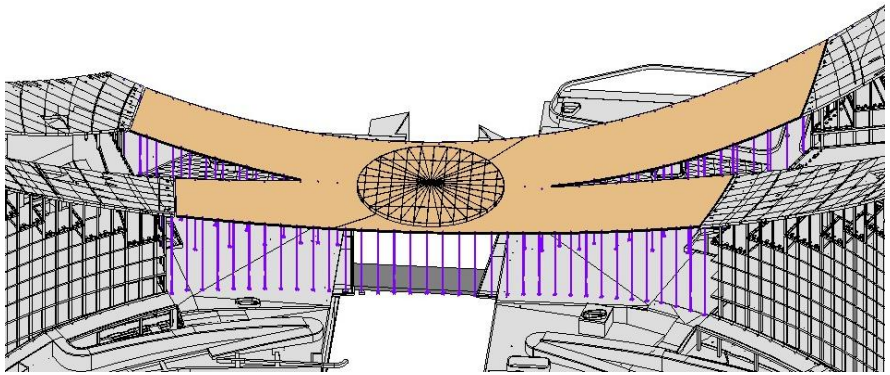
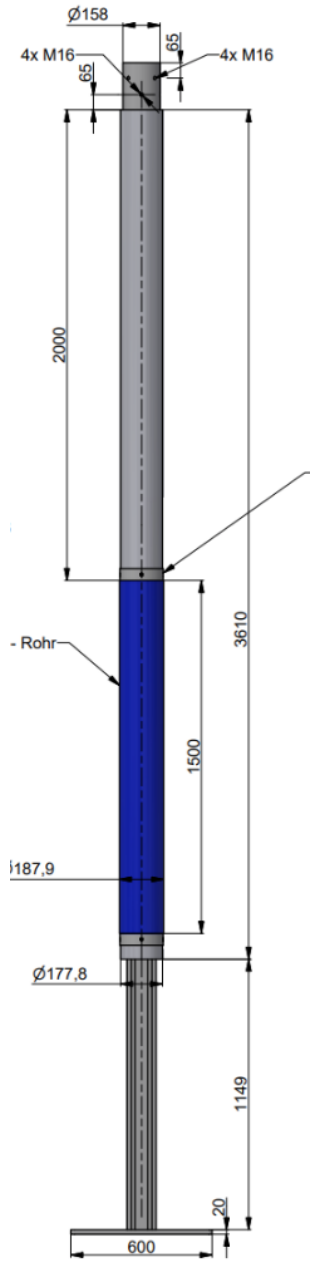
# FINS
# Schwingungsdämpfer
# oder Regenabflüsse



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# Stand der Arbeiten

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Foto Drone - **THE WAVE SCARL GEXCEL** (August 2025)

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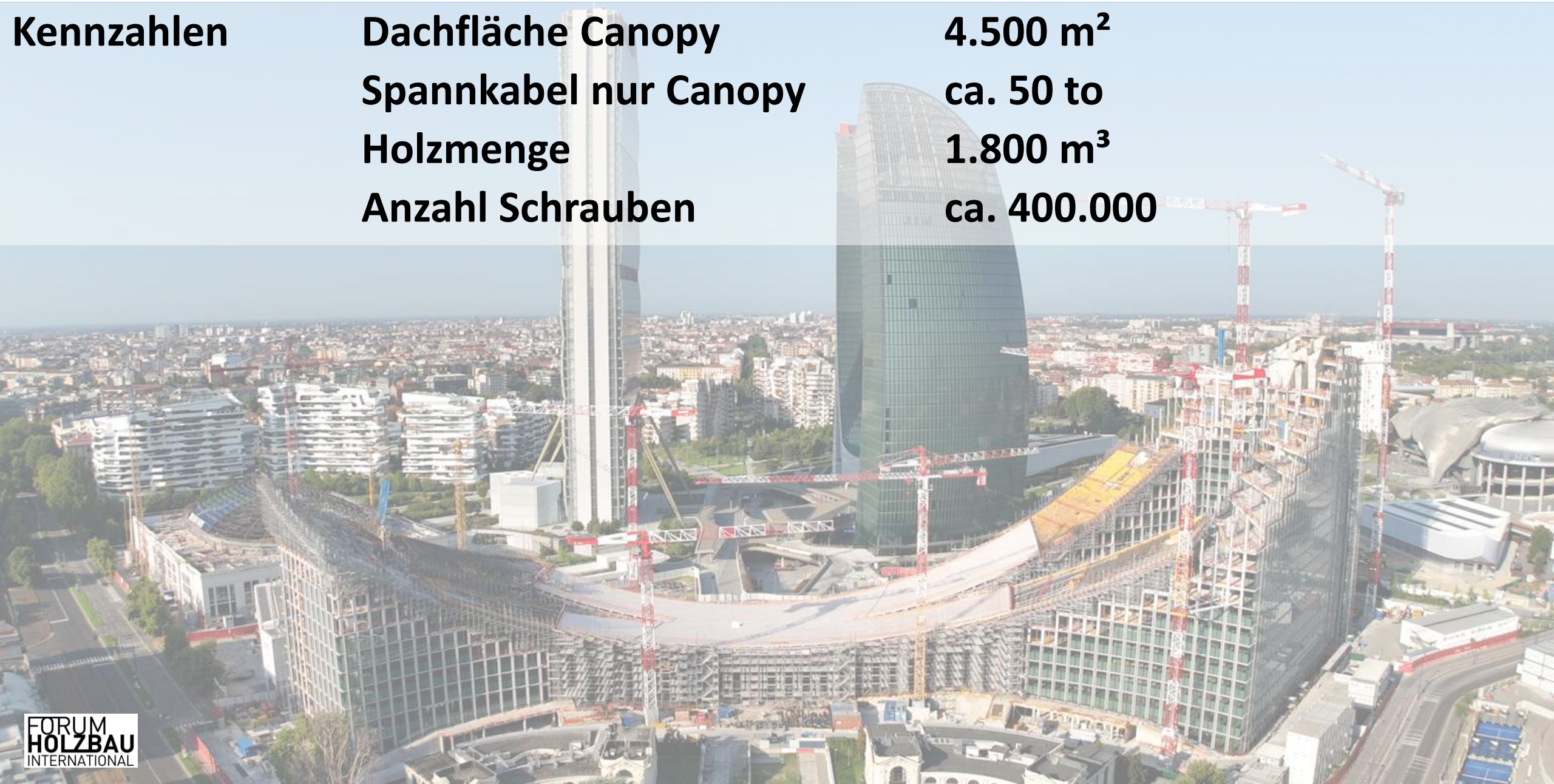
Foto Drone - **THE WAVE SCARL GEXCEL** (August 2025)

| Kennzahlen | | |
|---|---|---|
| | Dachfläche Canopy | 4.500 m² |
| | Spannkabel nur Canopy | ca. 50 to |
| | Holzmenge | 1.800 m³ |
| | Anzahl Schrauben | ca. 400.000 |



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# DANKE

Ing. Claudio Bertagnolli

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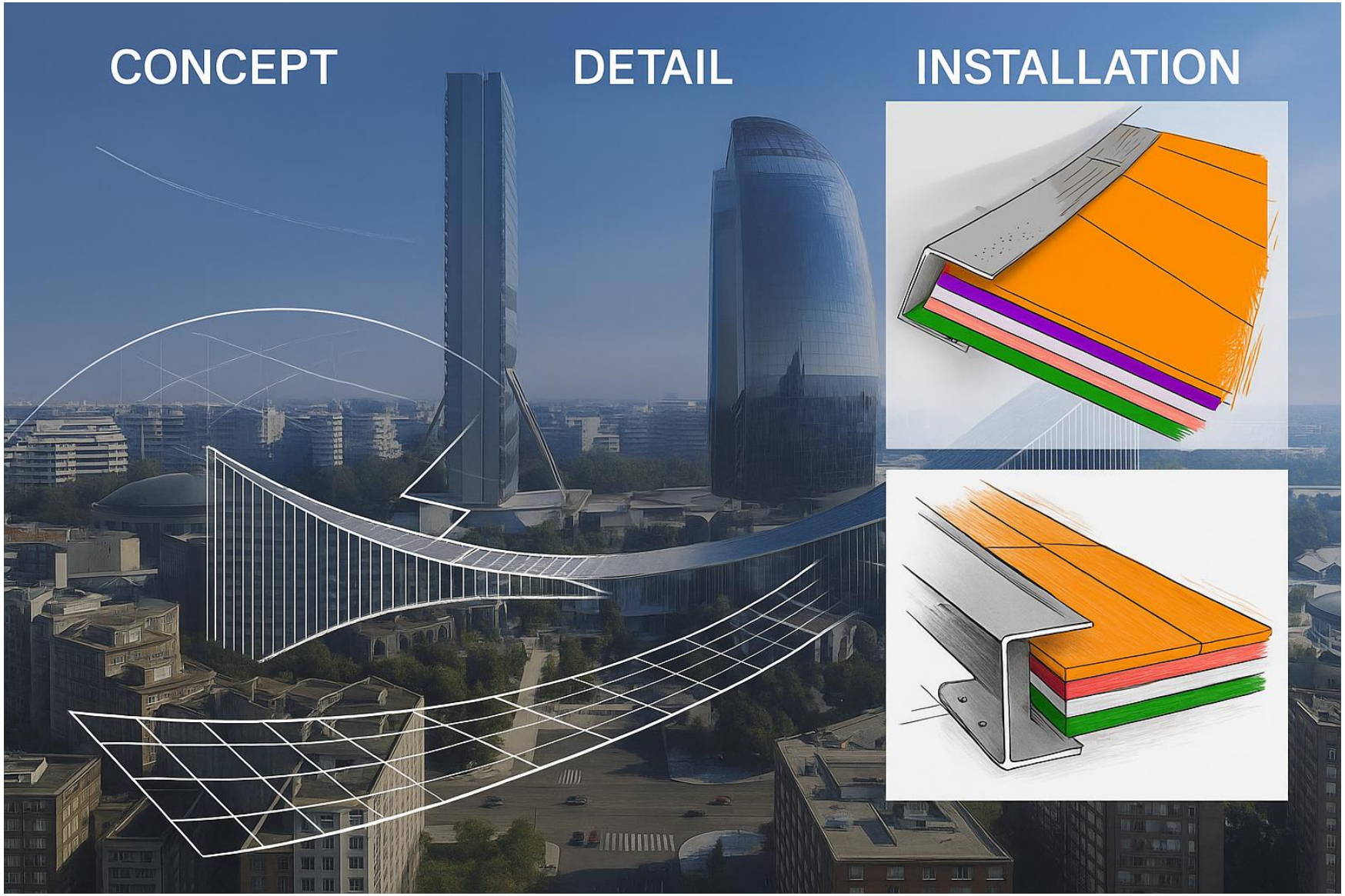
Ing. Francesco Marroni

# Parametric to Constructive Design Approach
# The Wave – Timber Canopy

## 1. Parametric System Recognition

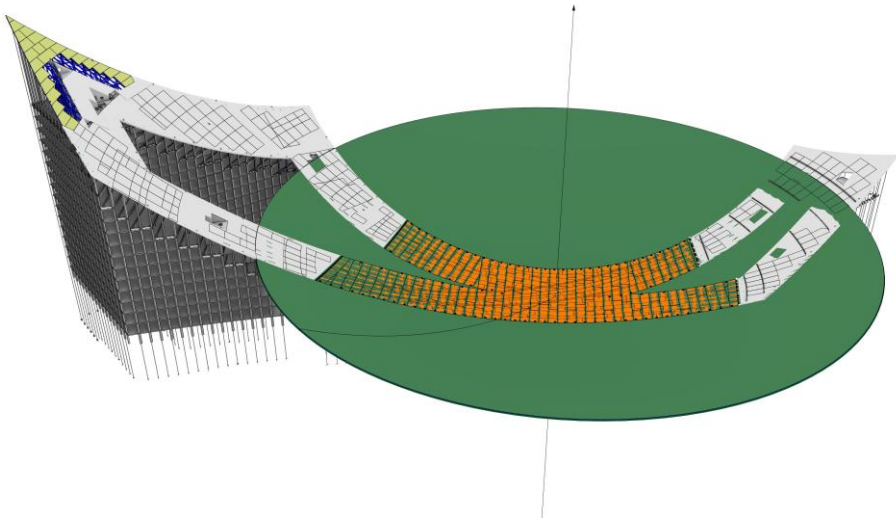
- Identification of the canopy as a parametric architectural system
- Top-down holistic workflow: Concept → Coordination → Detail
- 360° assessment prevents early-stage design drift

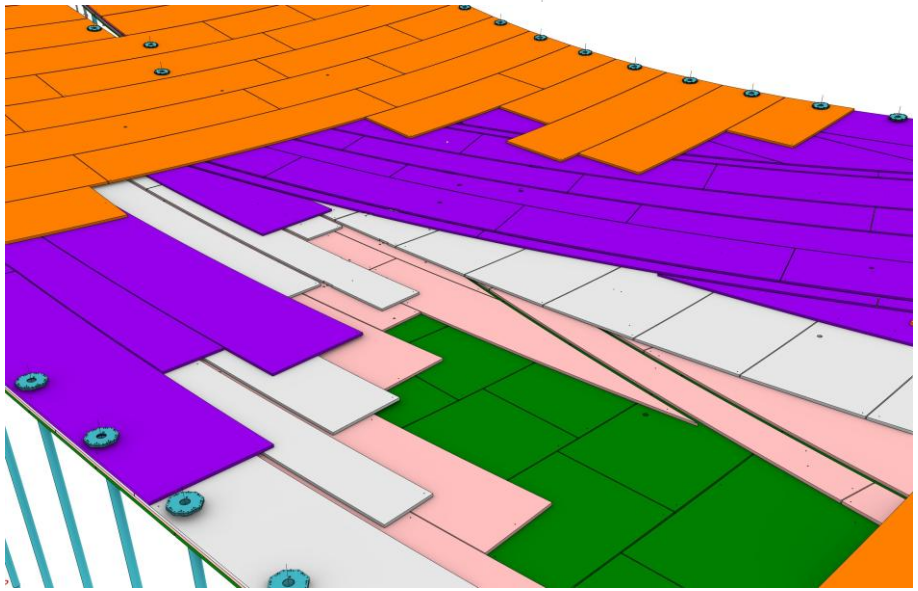


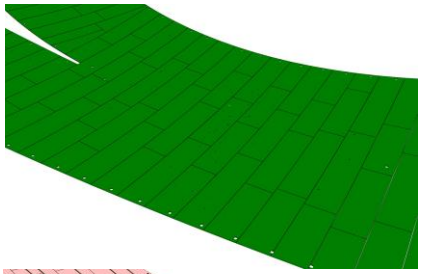
# Parametric to Constructive Design Approach
# The Wave – Timber Canopy

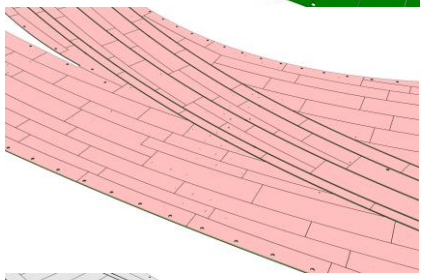
## 2. From Executive to Constructive Design

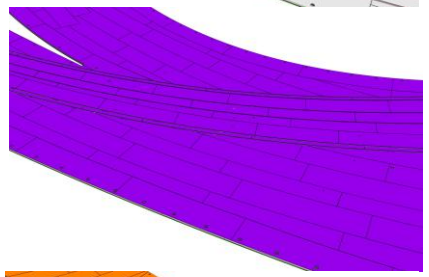
- Implementation of fastening rules and CLT base panels
- Double-curved geometry translated into manufacturable elements
- Integration of production constraints and site installation logic

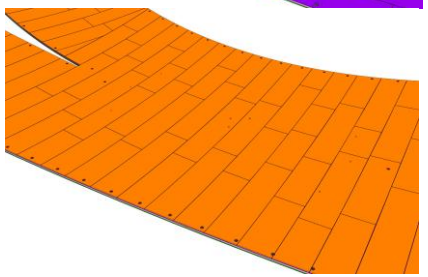








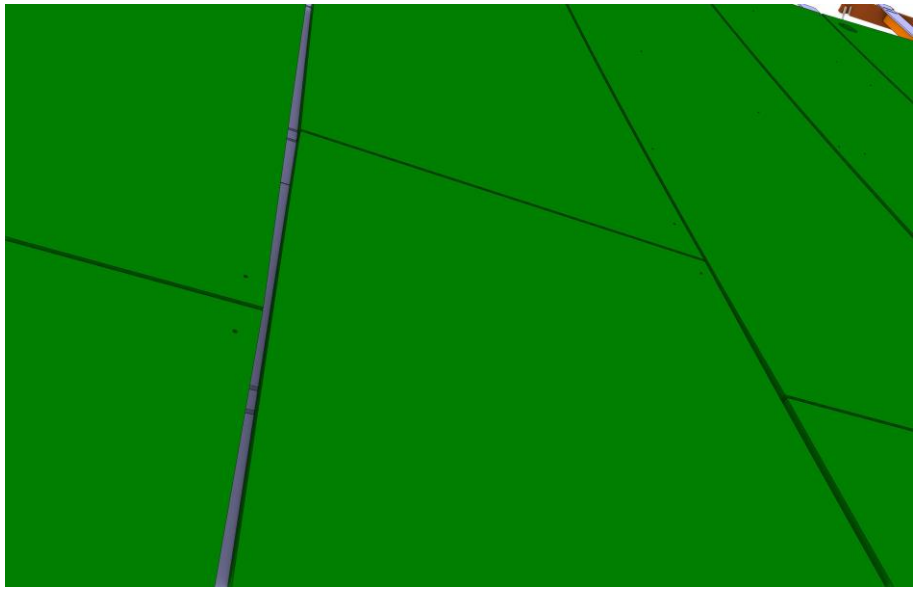


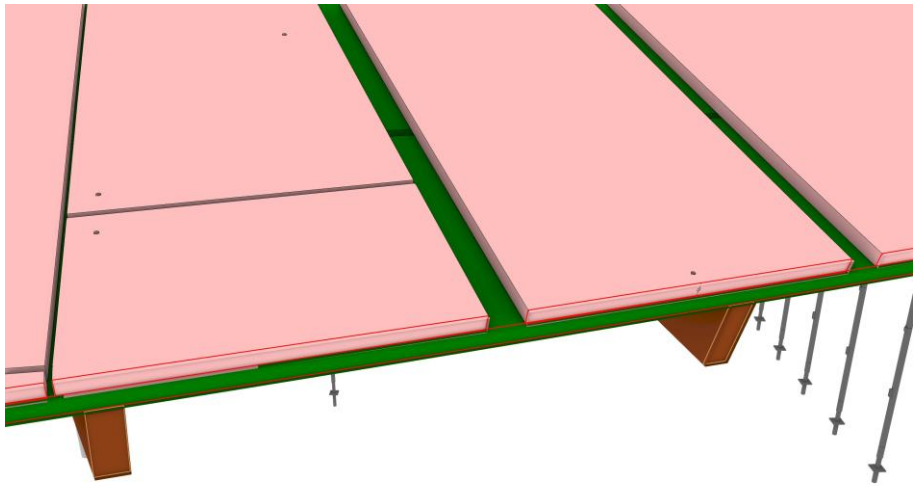


# Parametric to Constructive Design Approach
# The Wave – Timber Canopy

## 3. Timber System Optimization

- Manufacturing speed and workflow refinement
- Tolerance strategy for intersecting geometries
- Iterative segmentation of layers aligned with assembly constraints





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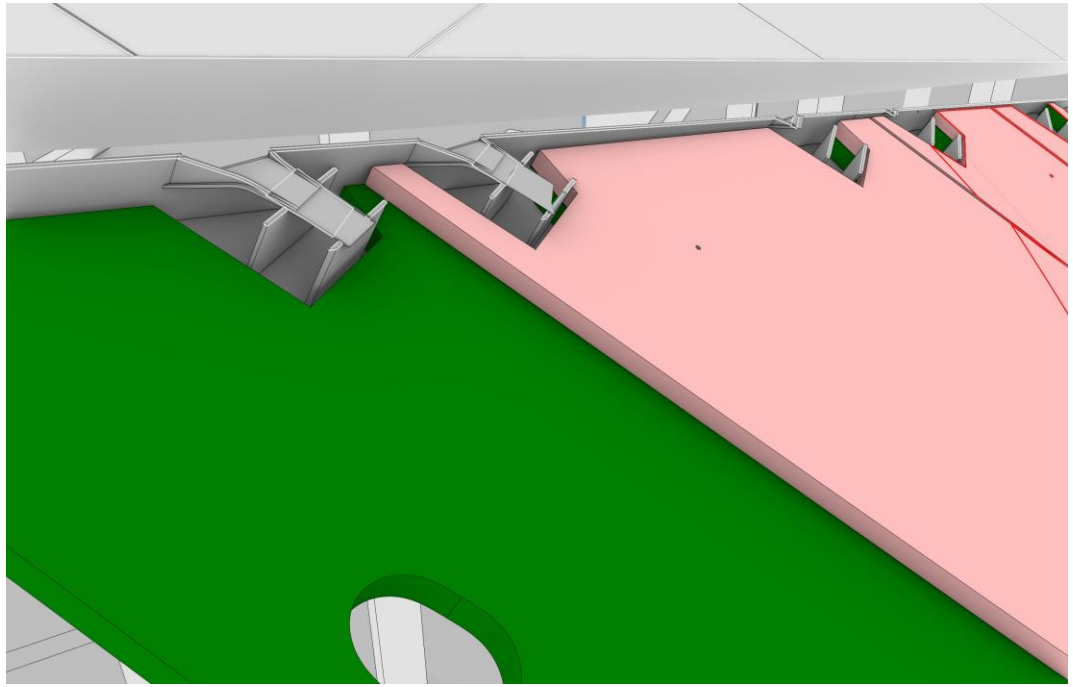
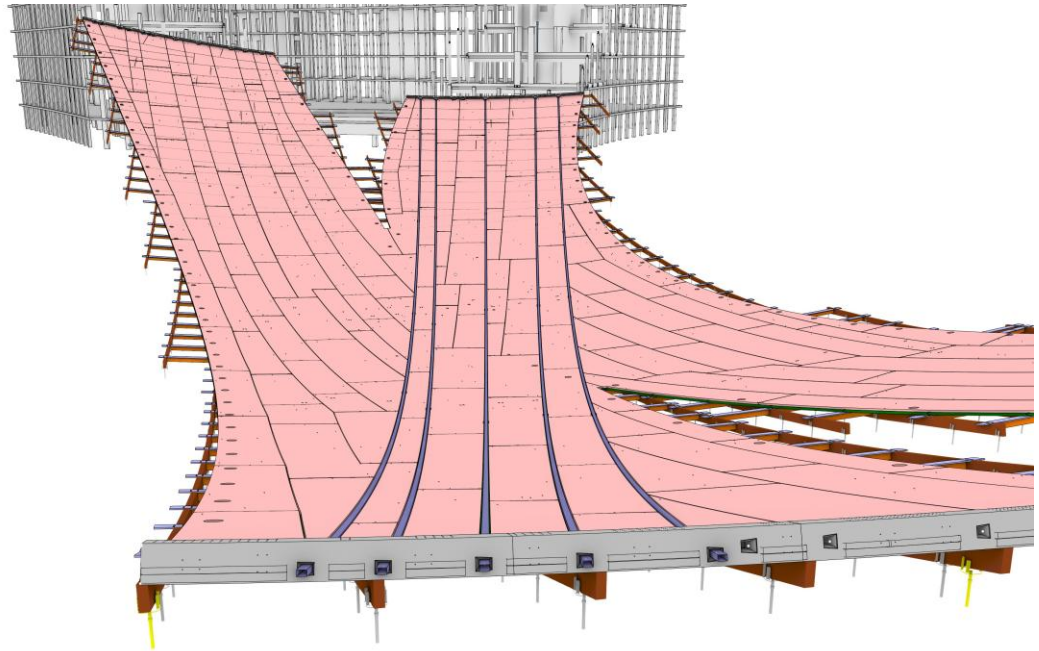
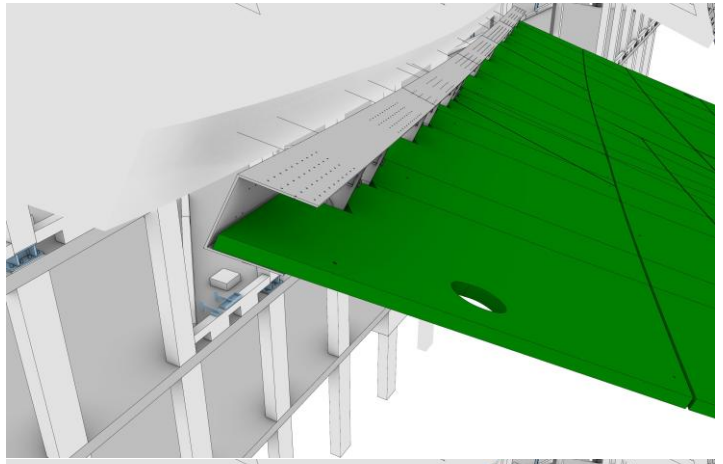
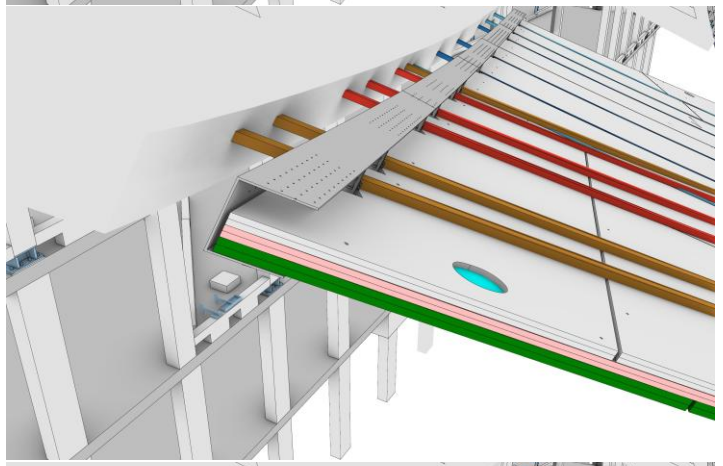
# 4. Detail Design Phase

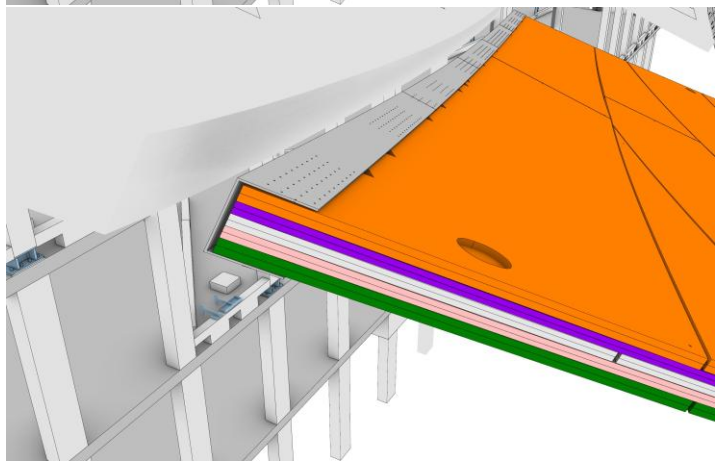
- Final tuning of construction elements
- Structural–production–installation integration
- Predictable costs, timing, and accuracy











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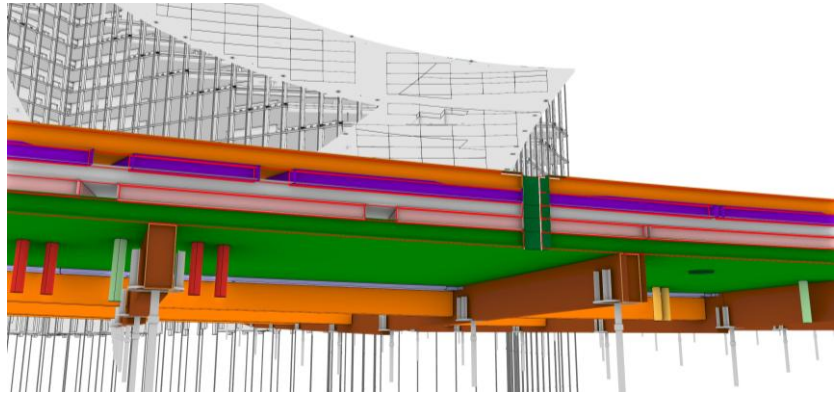
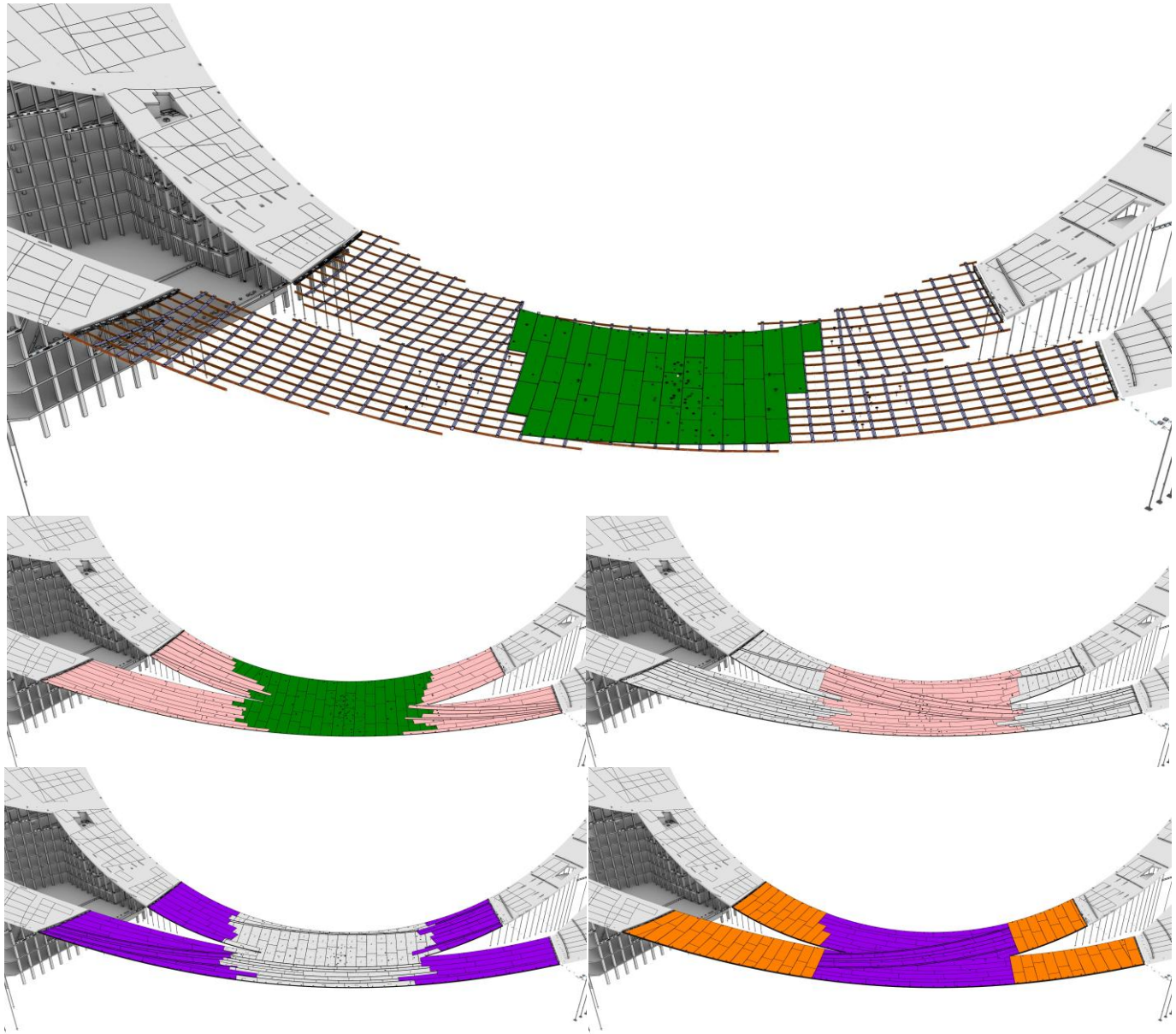
# 5. Installation Logic Shift

- Discovery: temporary support structure becomes primary geometric reference
- Inversion of the installation sequence
- Early-stage precision enables orientation on 4350 m² open square





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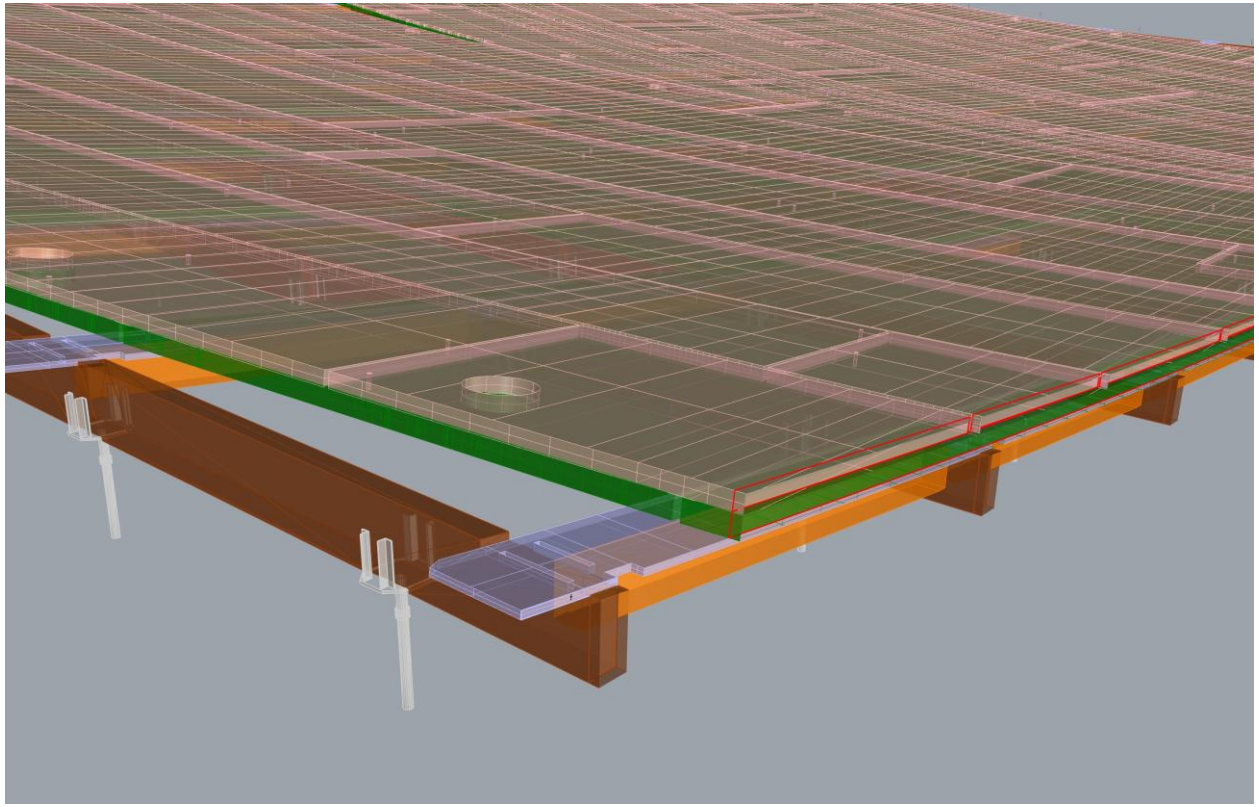
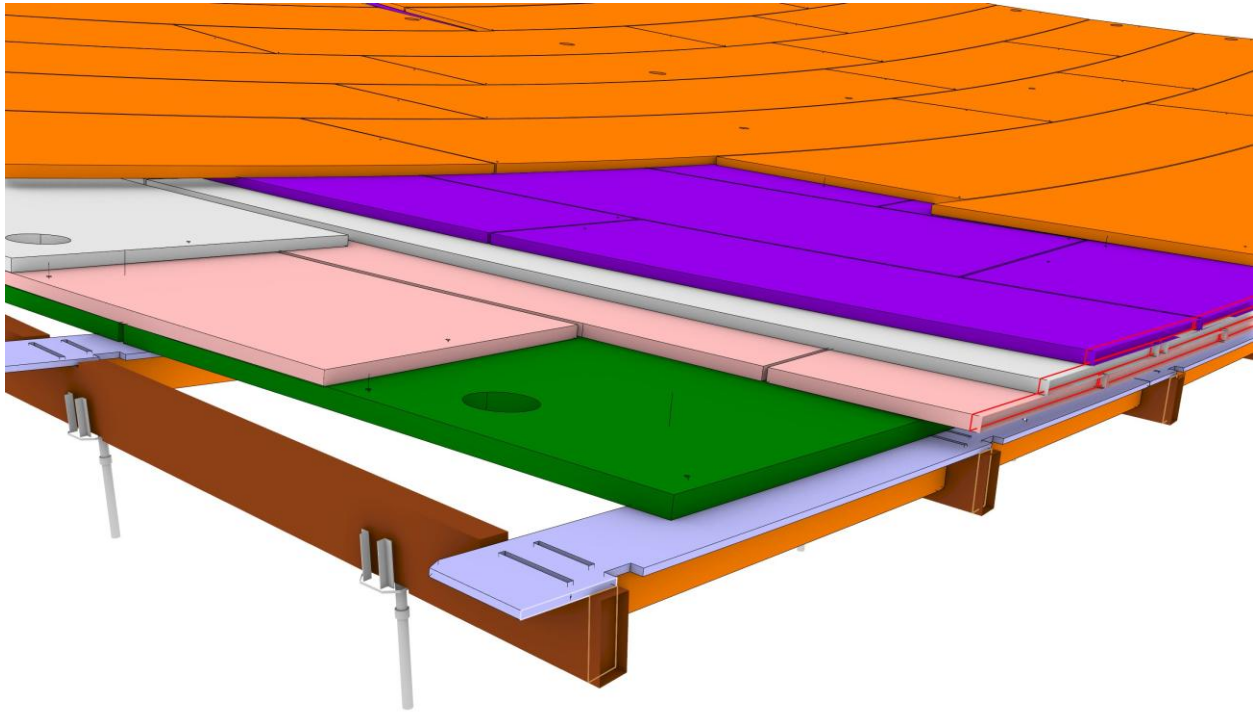
# Parametric to Constructive Design Approach
# The Wave – Timber Canopy

## 5. Installation Logic Shift





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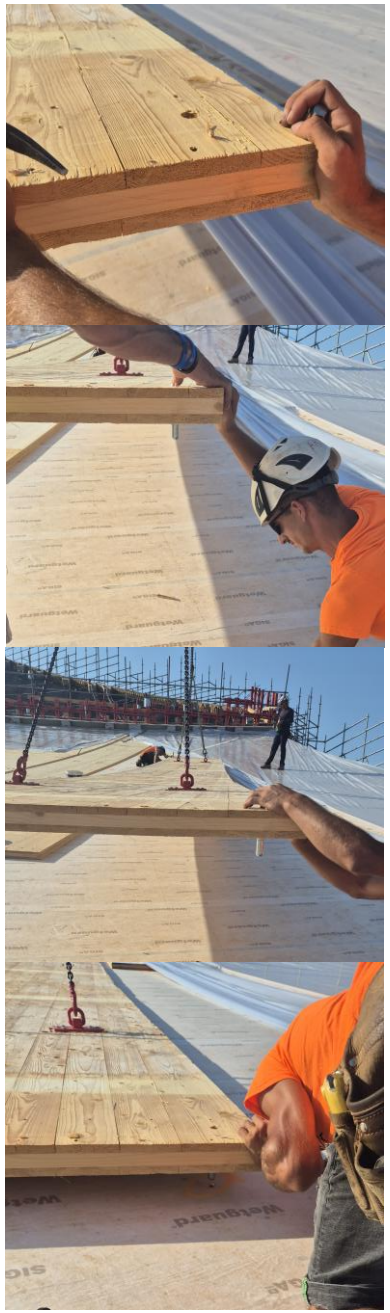
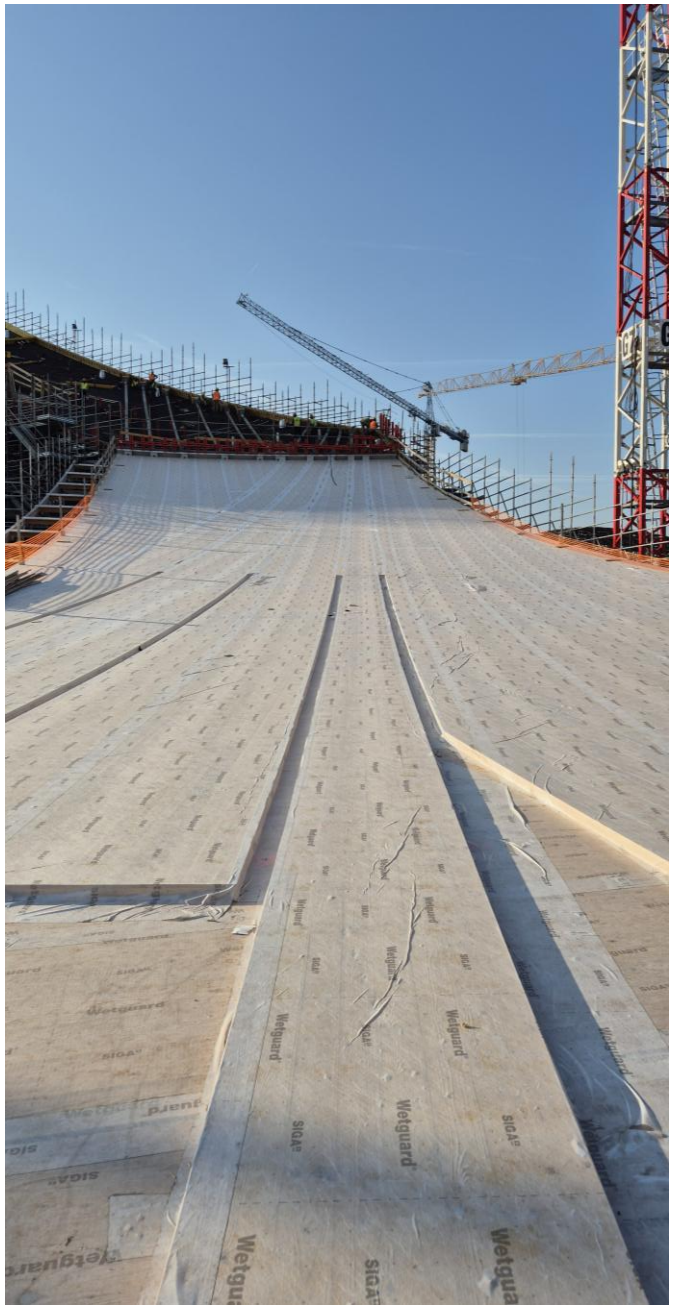
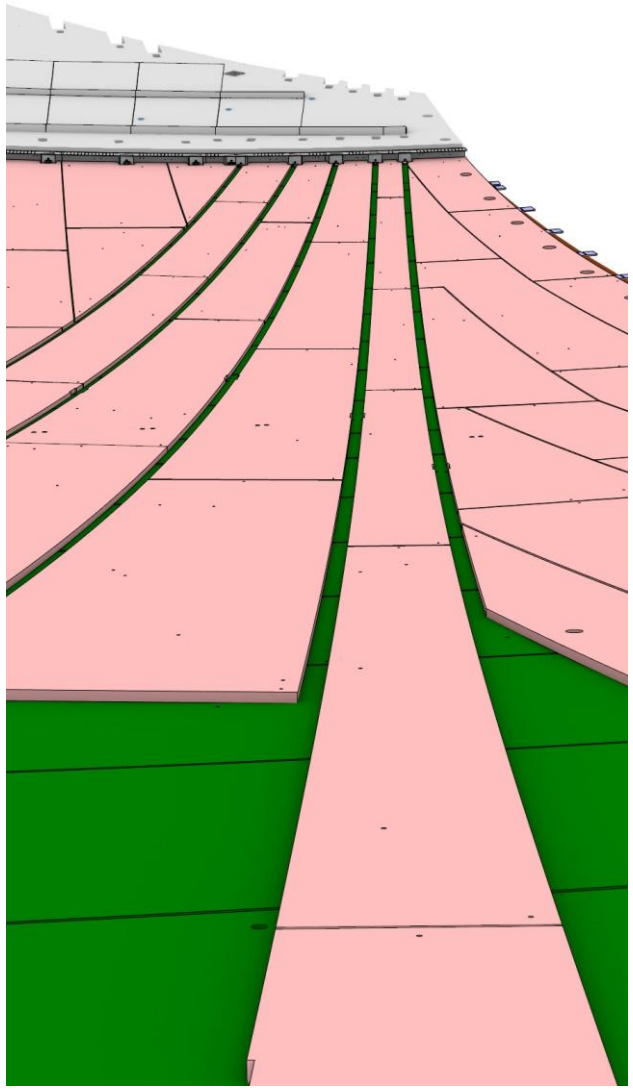
# KEY DRIVERS

- Holistic DMFA workflow linking geometry to construction
- Double-curvature requires parametric–constructive integration: geometry-to-construction integration
- Interdisciplinary coordination
- Iterative optimization of tolerances and connections to define Segmentation
- Installation-driven design: design reshaped entire workflow
- Water & moisture control as a critical success factor







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# KEY DRIVERS

- Holistic DMFA workflow linking geometry to construction
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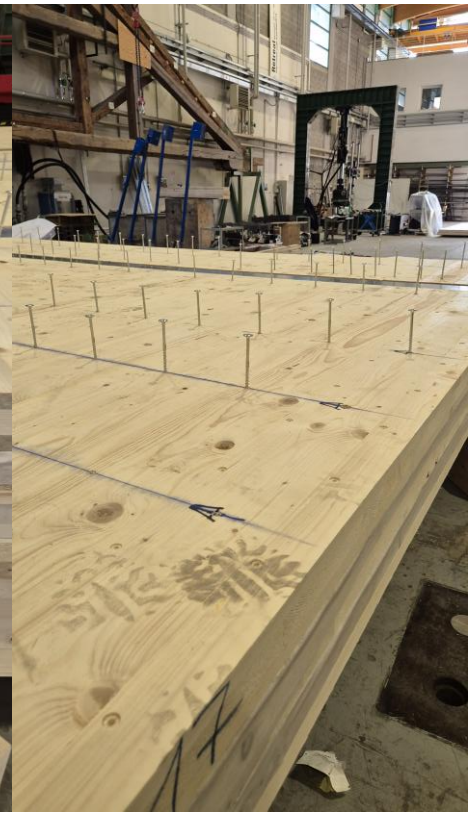
- Interdisciplinary coordination
- Iterative optimization of tolerances and connections to define Segmentation
- Installation-driven design: design reshaped entire workflow
- Water & moisture control as a critical success factor



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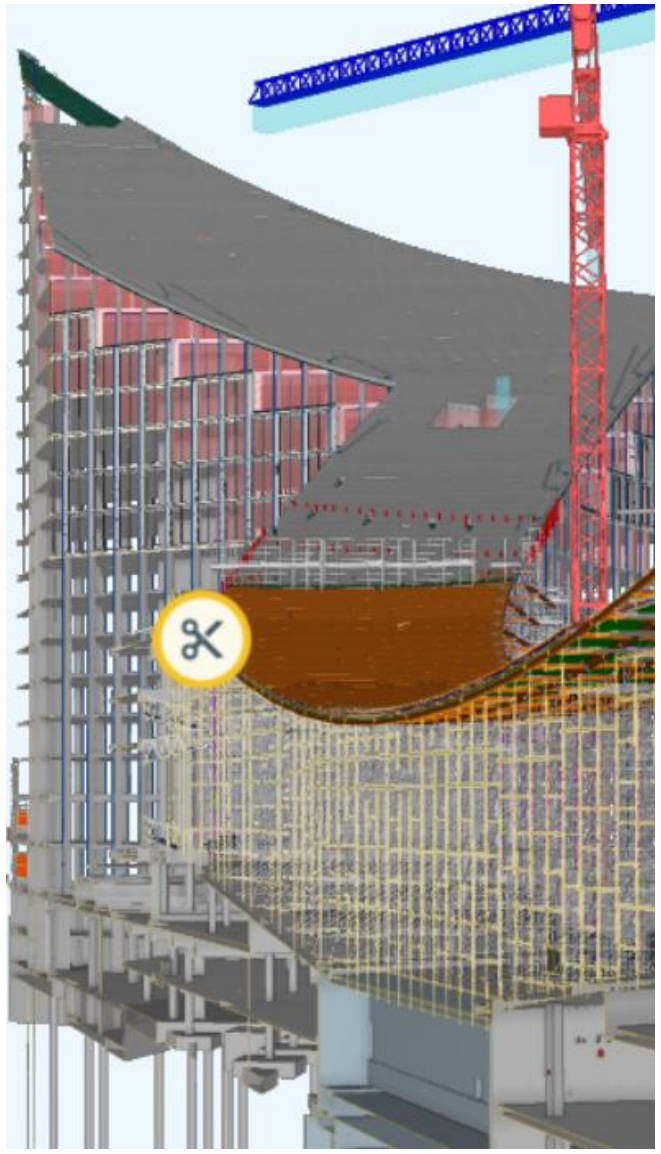

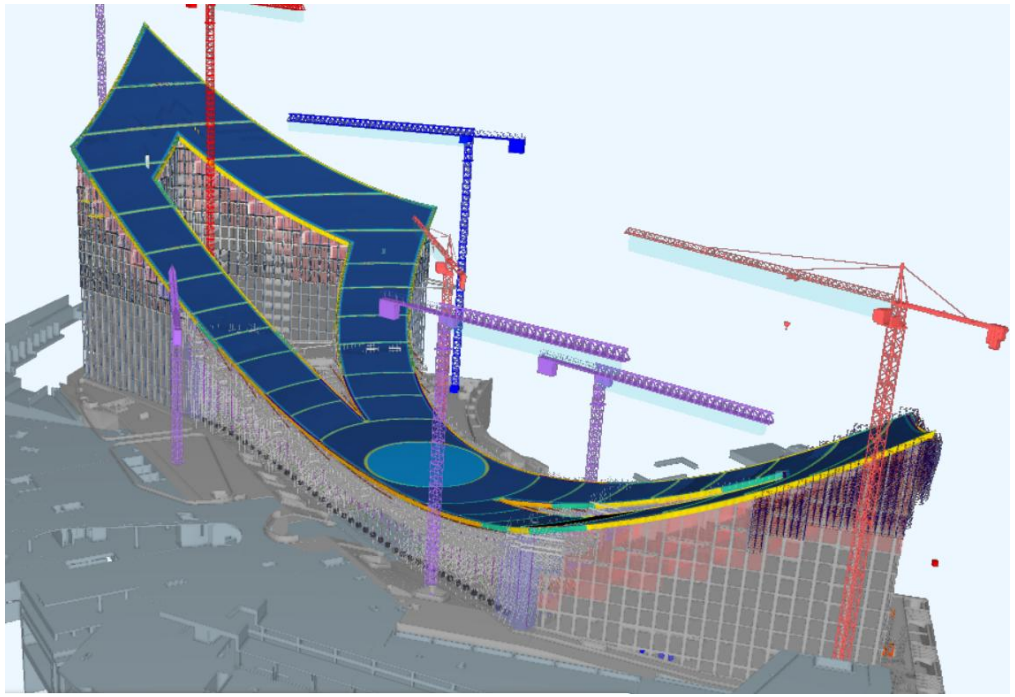

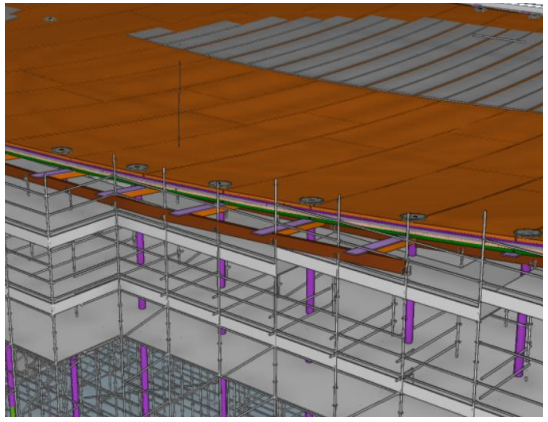

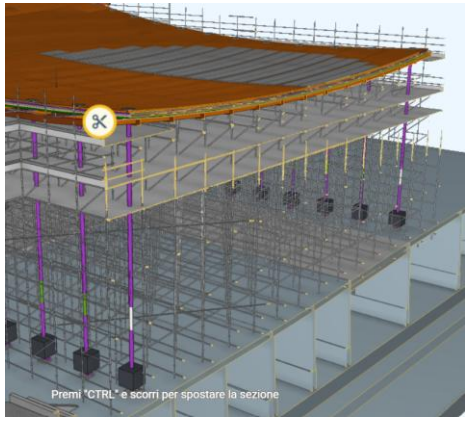


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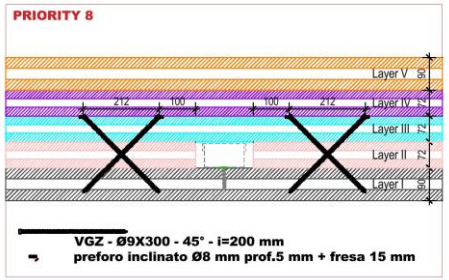


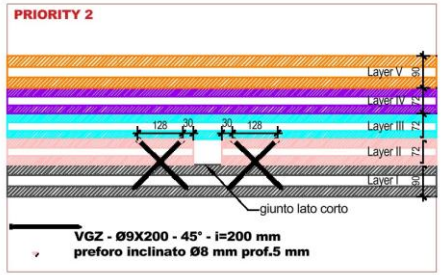


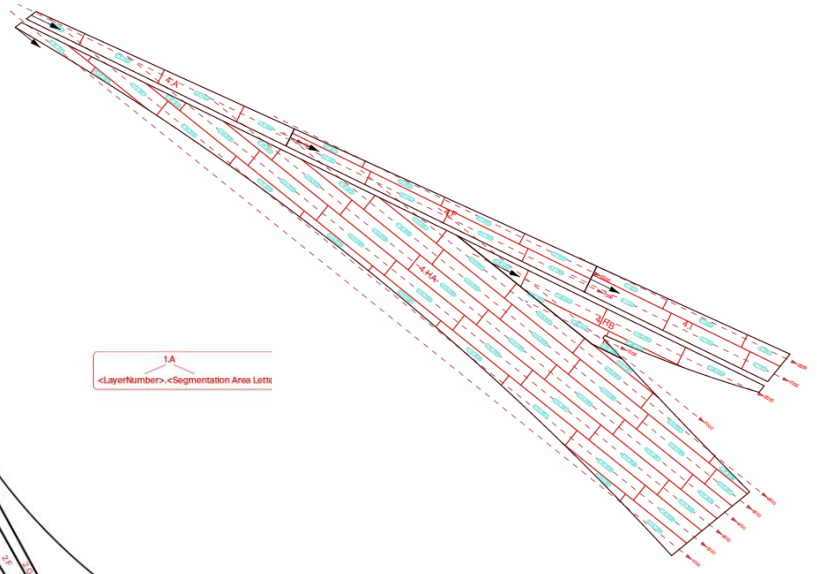

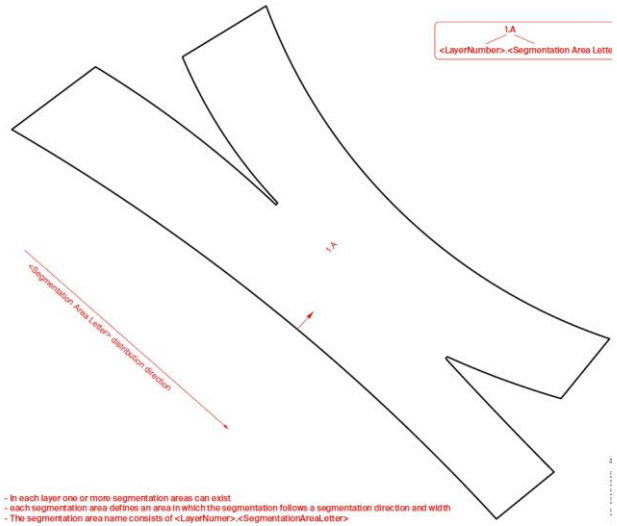


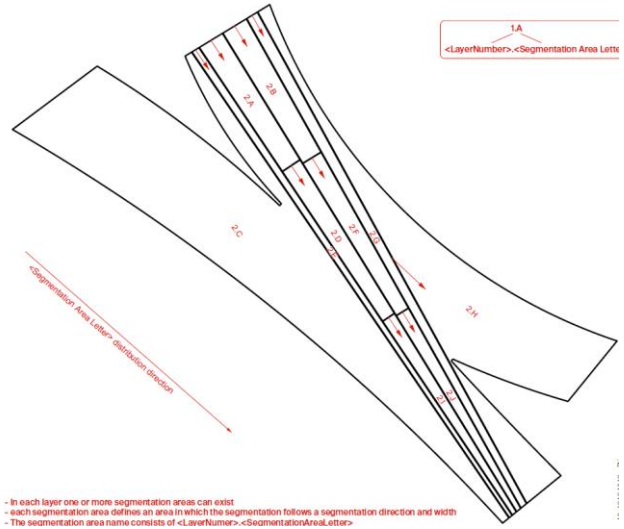


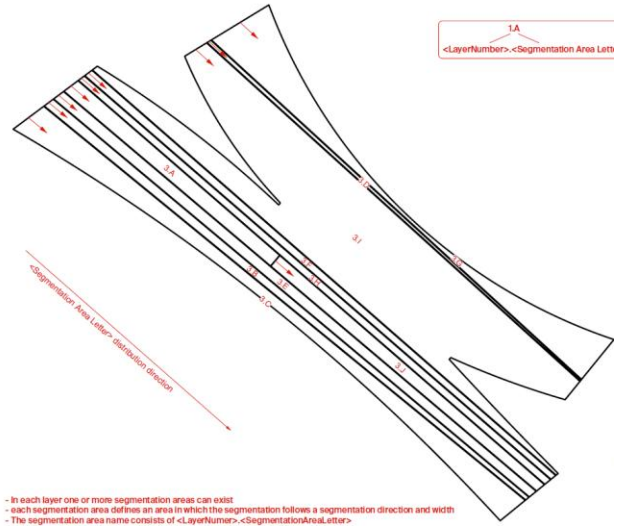


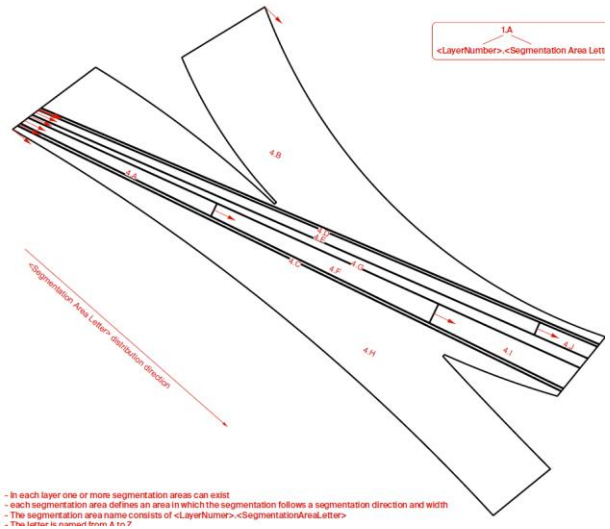


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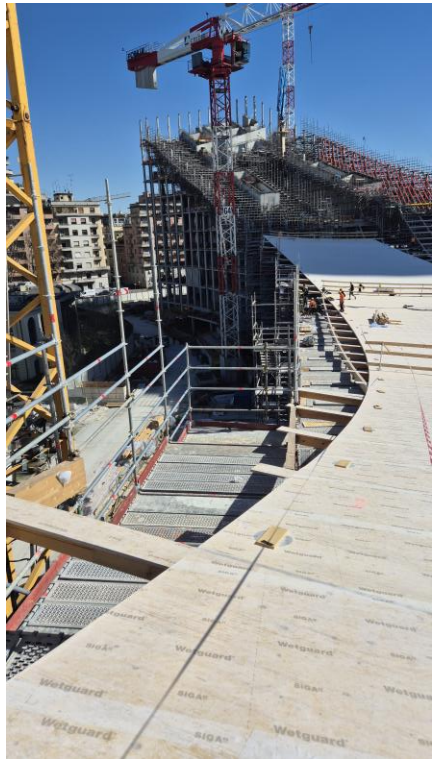

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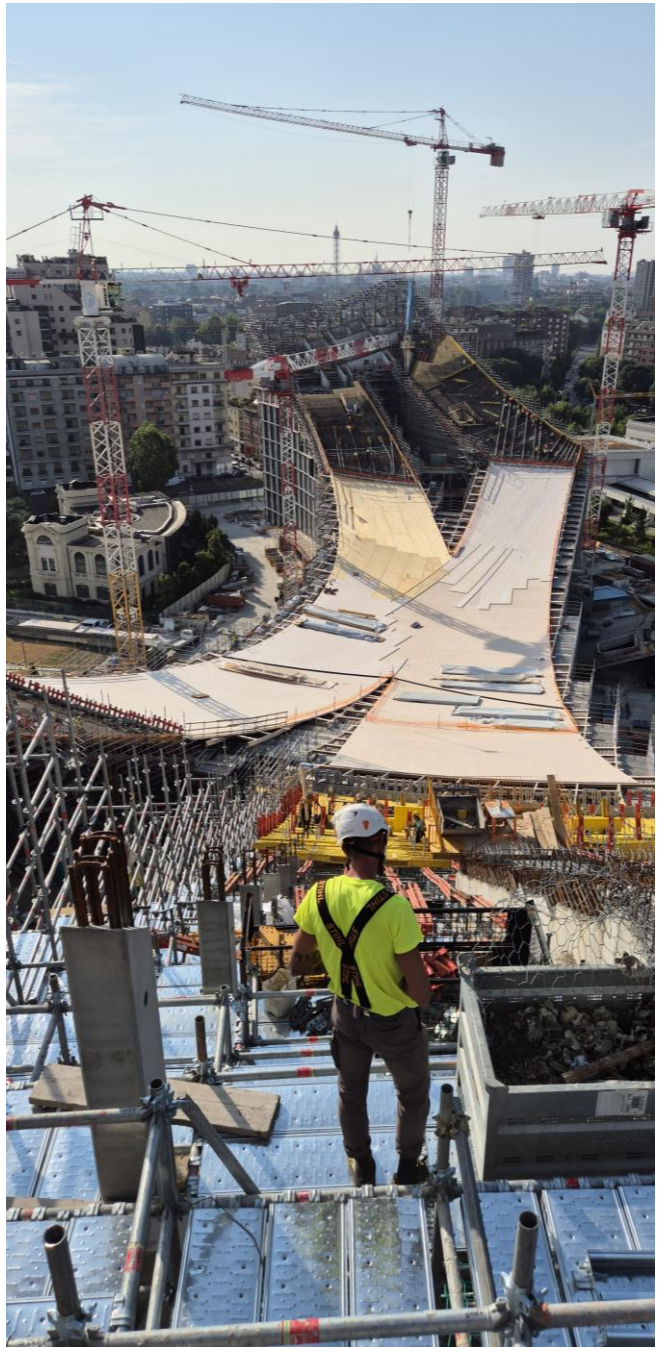

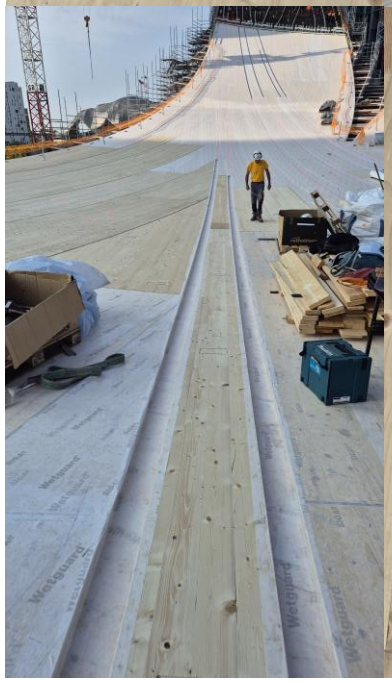

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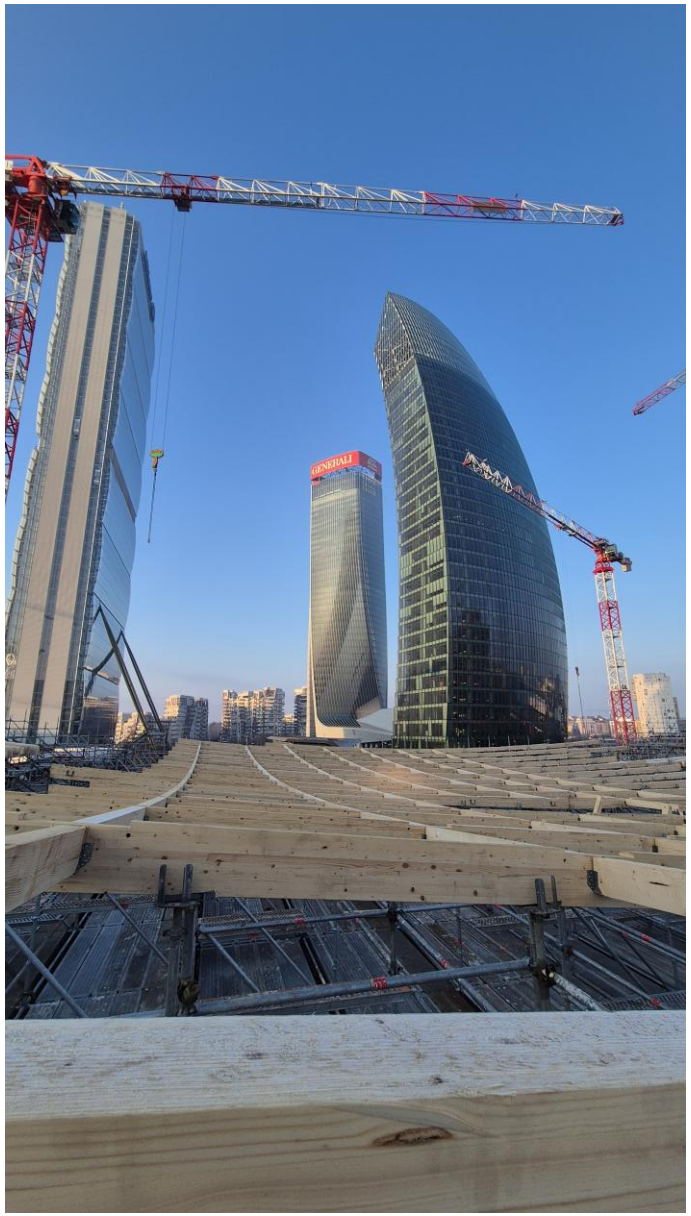
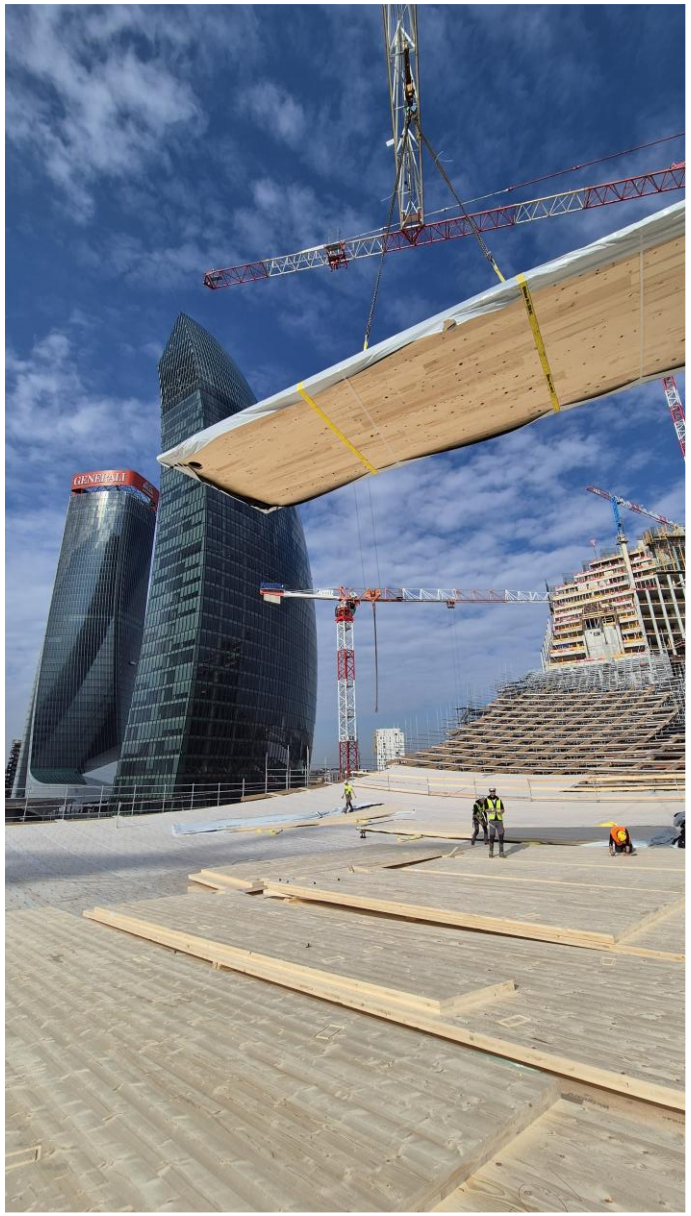
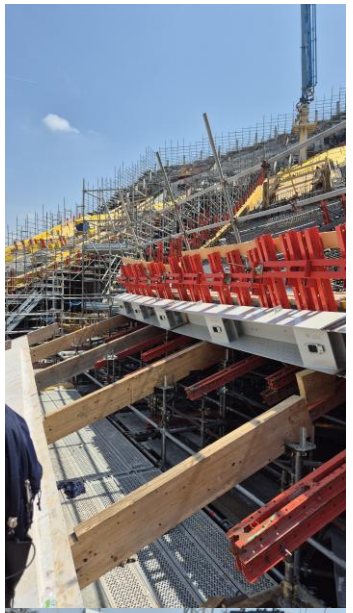
# INSTALLATION KEY MOMENTS



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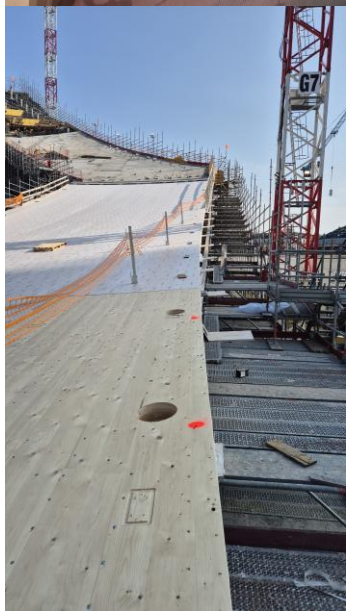

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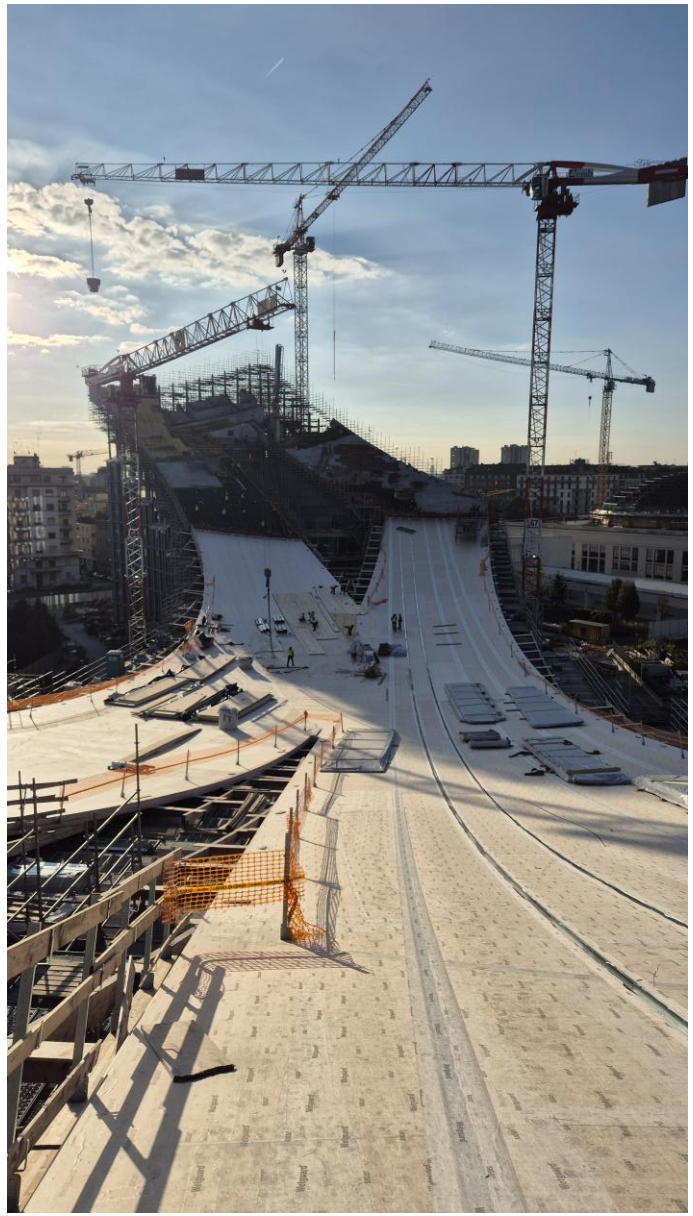
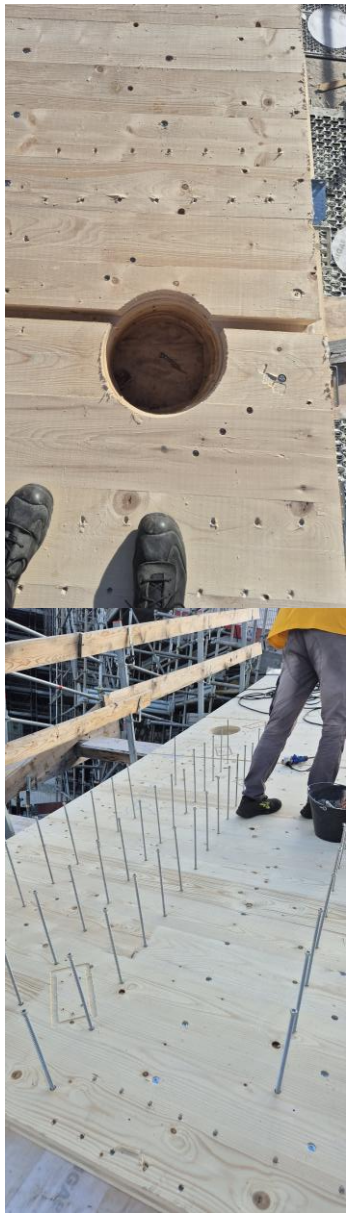
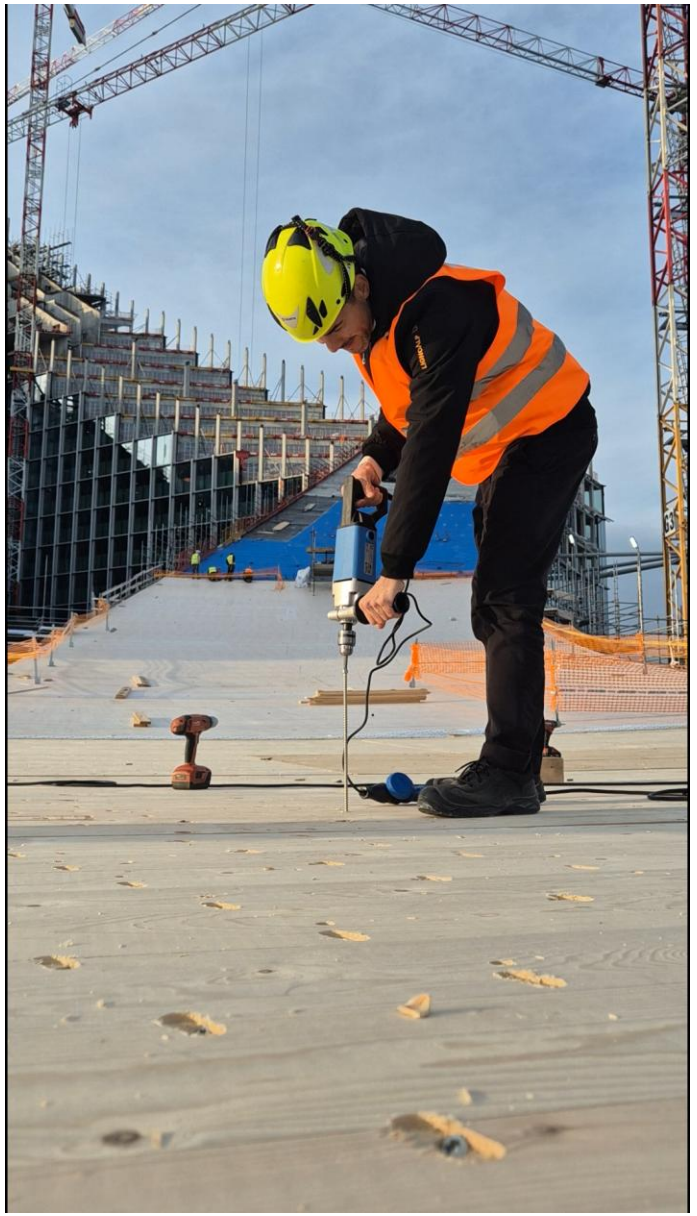
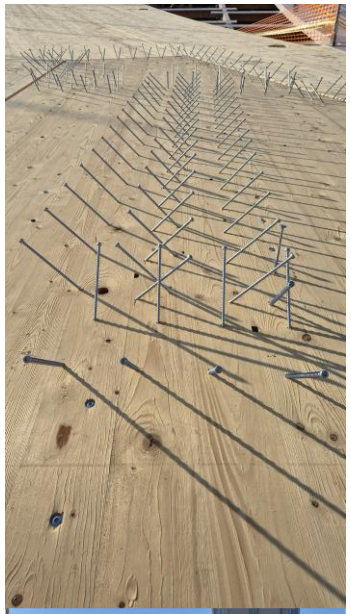
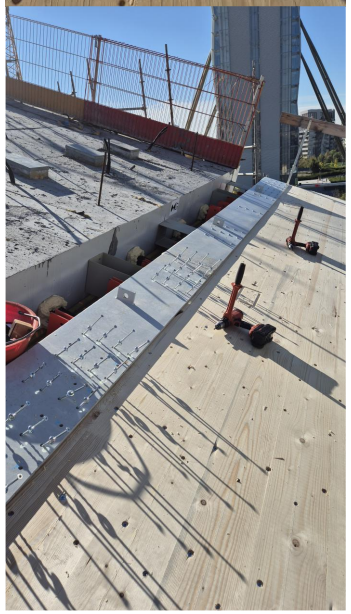

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Thank you
Ing. Francesco Marroni
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