

PROGETTO CITYWAVE, MILANO

COLOMBO COSTRUZIONI

cmb®

Indice:

- Il progetto
- Sviluppi costruttivi e modelli BIM
- Prototipi e sperimentazioni
- Monitoraggi
- Campo prove e gestione delle emergenze

CITYWAVE
IL PROGETTO

COLOMBO COSTRUZIONI

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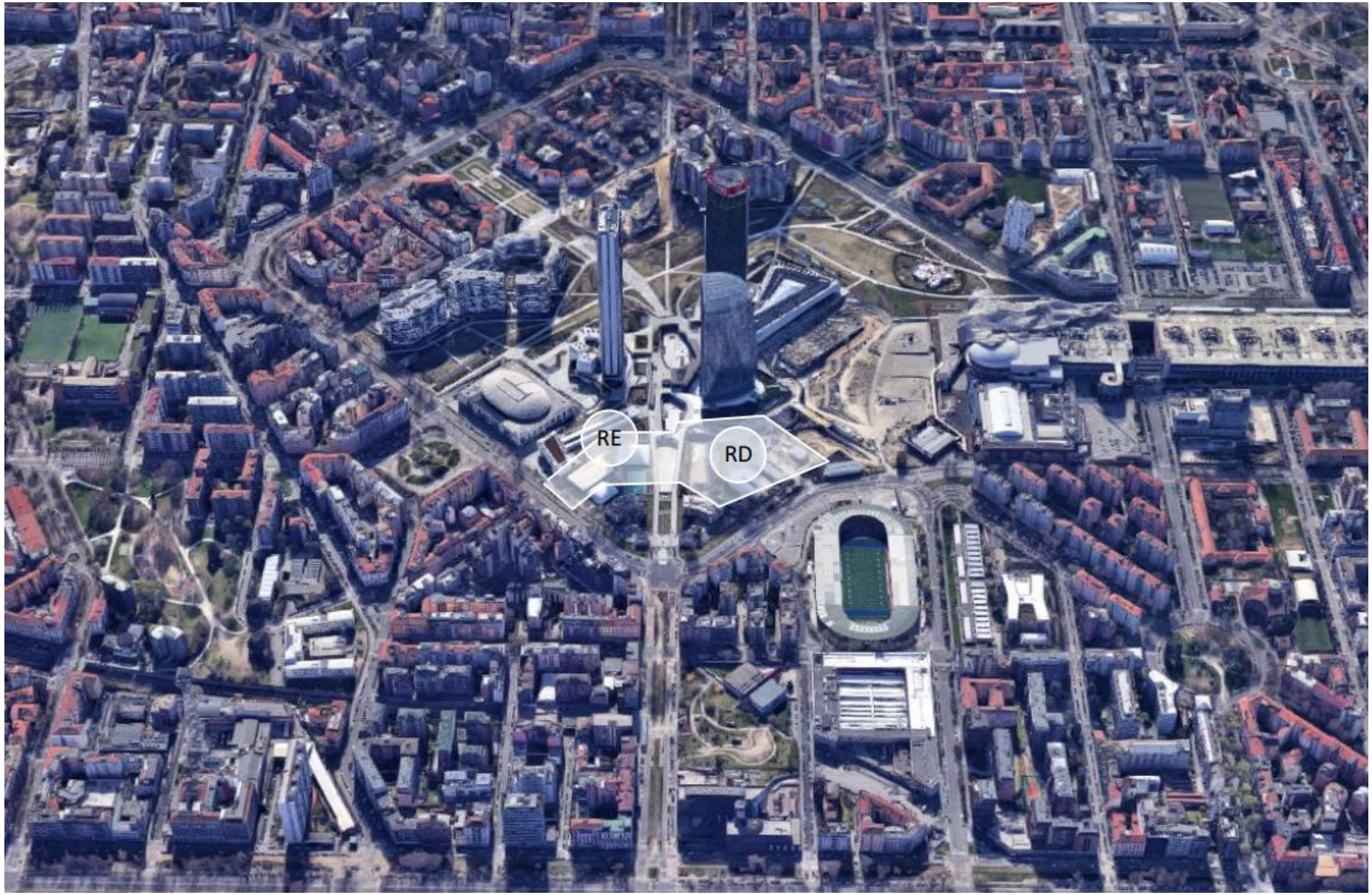
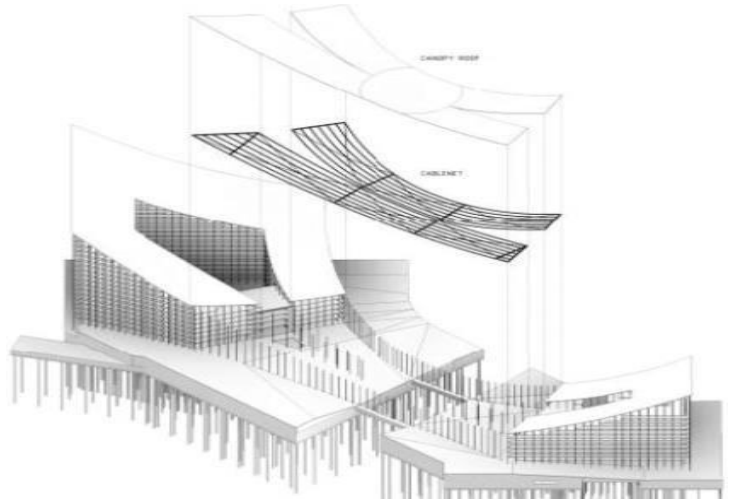
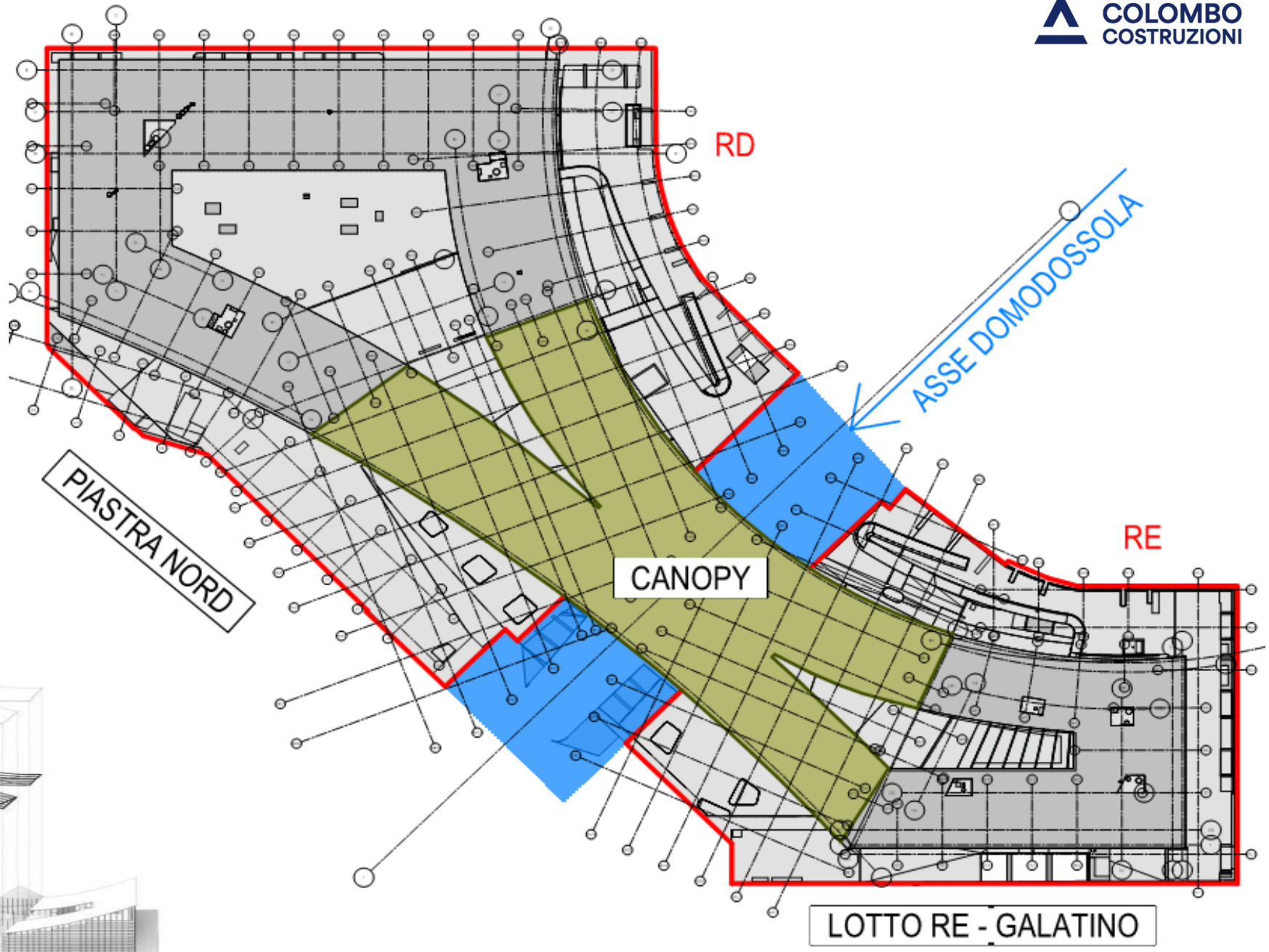
GENERALI

CityWave, Milano



Il progetto




RD
ASSE DOMODOSSOLA
PIASTRA NORD
CANOPY
RE
LOTTO RE - GALATINO



Committente:	Citylife - Generali
Designer:	Bjarke Ingels Group
Livelli edificio:	3 IN / 20 FT (RD) 3 IN / 10 FT (RE)
Altezza totale edificio:	108 m da p.d.c. (RD) 57m da p.d.c. (RE)
Volume complessivo:	475.000 m3
Superficie Lorda di sito:	56.000 m2
Superficie fuori terra:	89.000 m2
Superficie interrati:	27.000 m2
Area coperture:	12.000 m2
Lunghezza massima sospesa canopy:	147 m
Superficie complessiva facciate:	40.000 m2
n. Pannelli fotovoltaici attivi:	11.000
Potenza massimo di picco	1,41 Mwp
Calcestruzzo armato:	84.100 m3
Acciaio d’armatura in barre:	12.000 ton
Cavi di post tensione:	450 ton













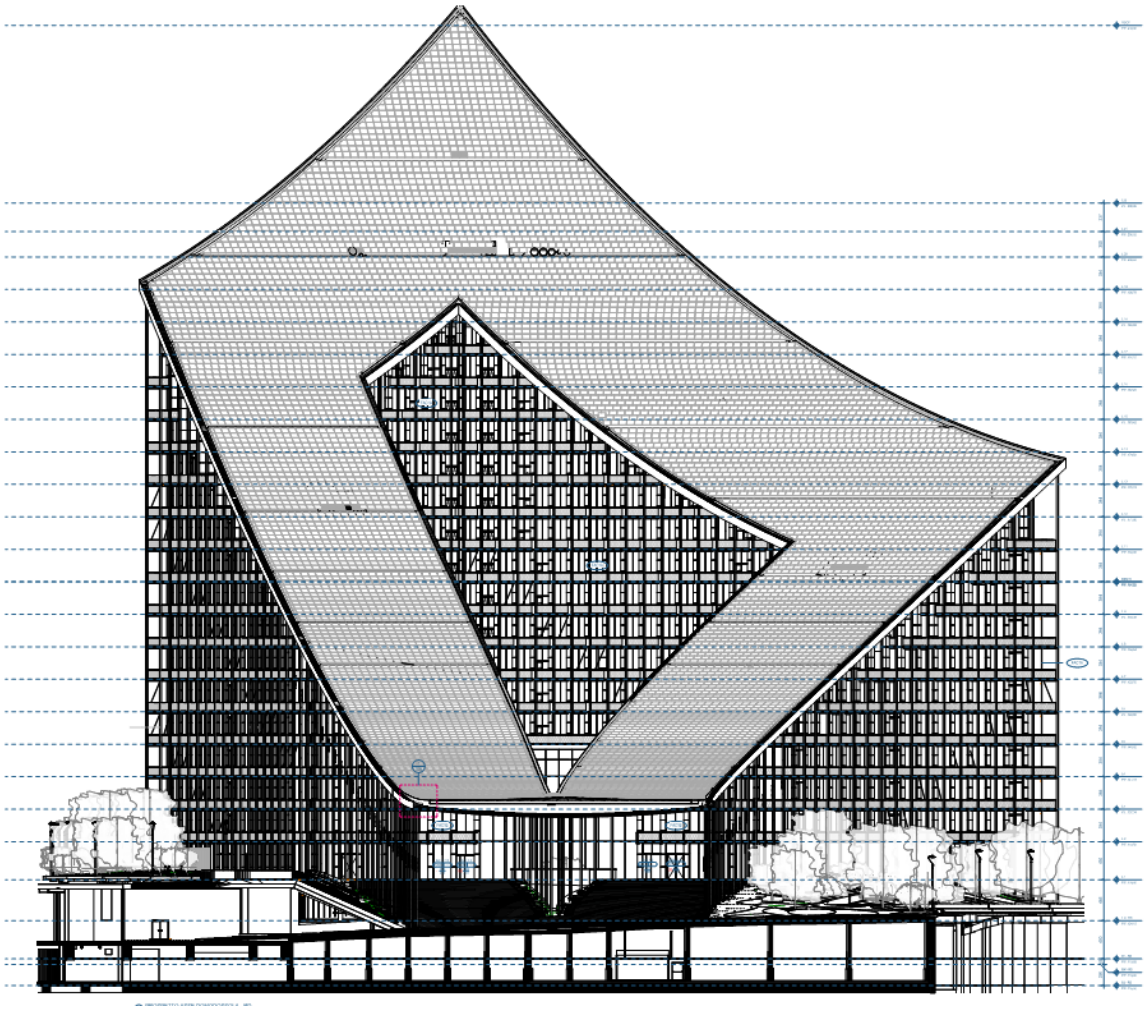


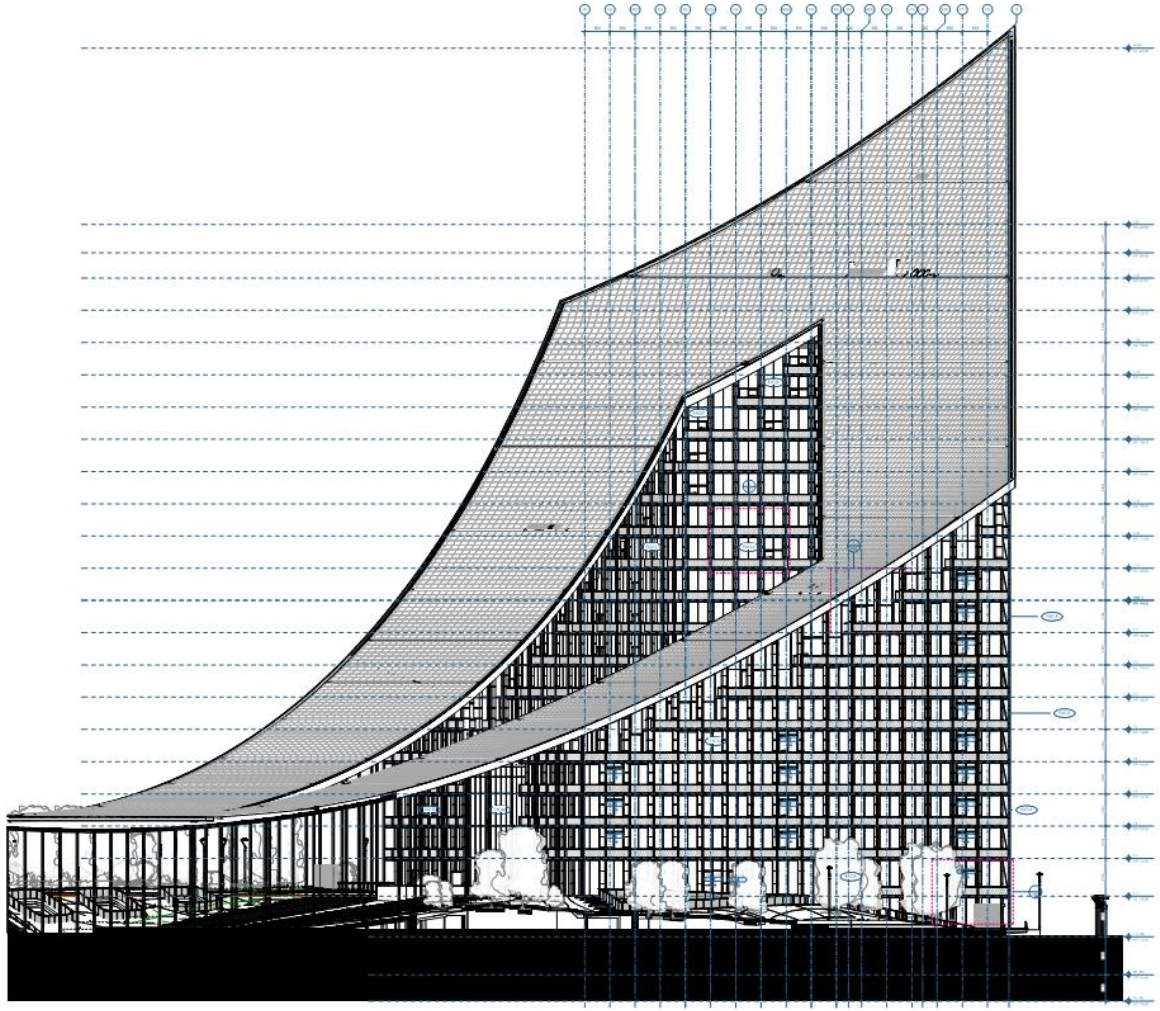






Il progetto





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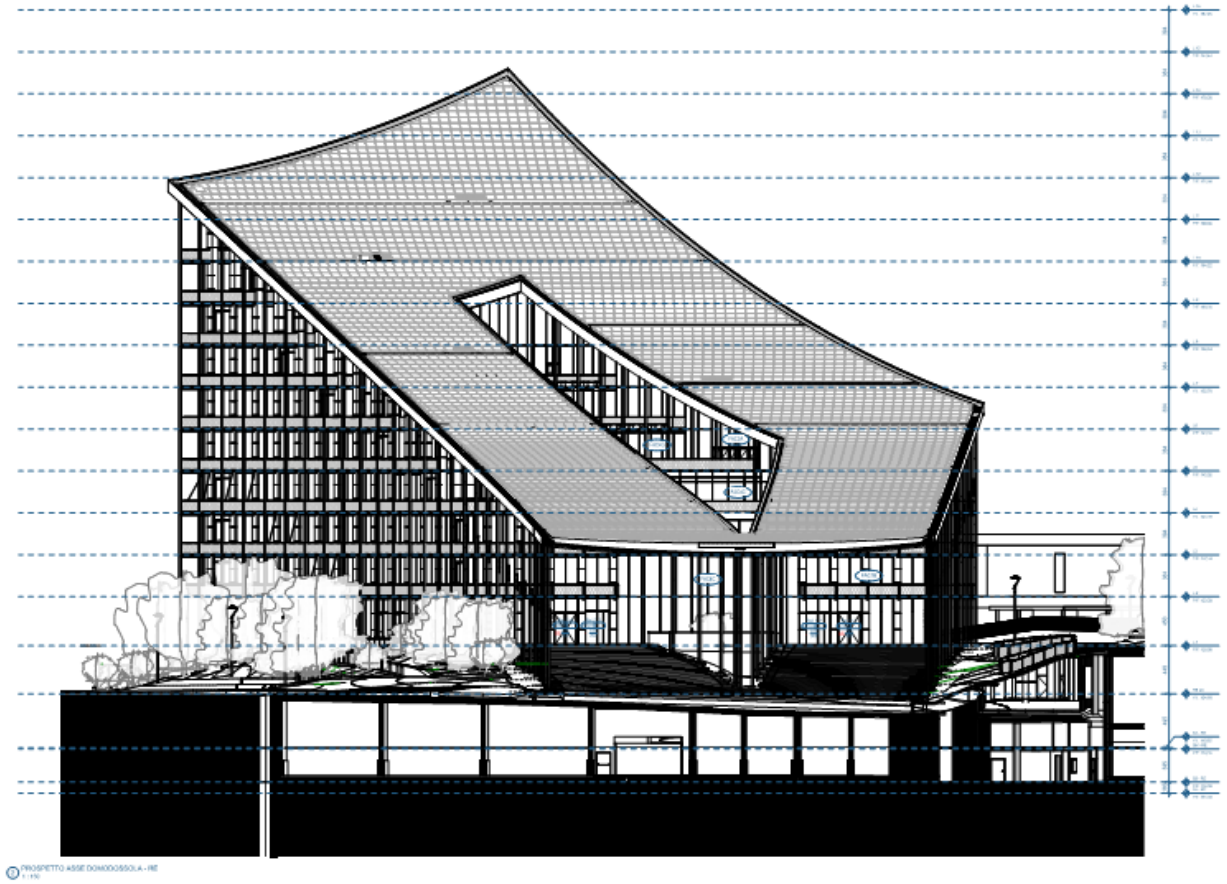

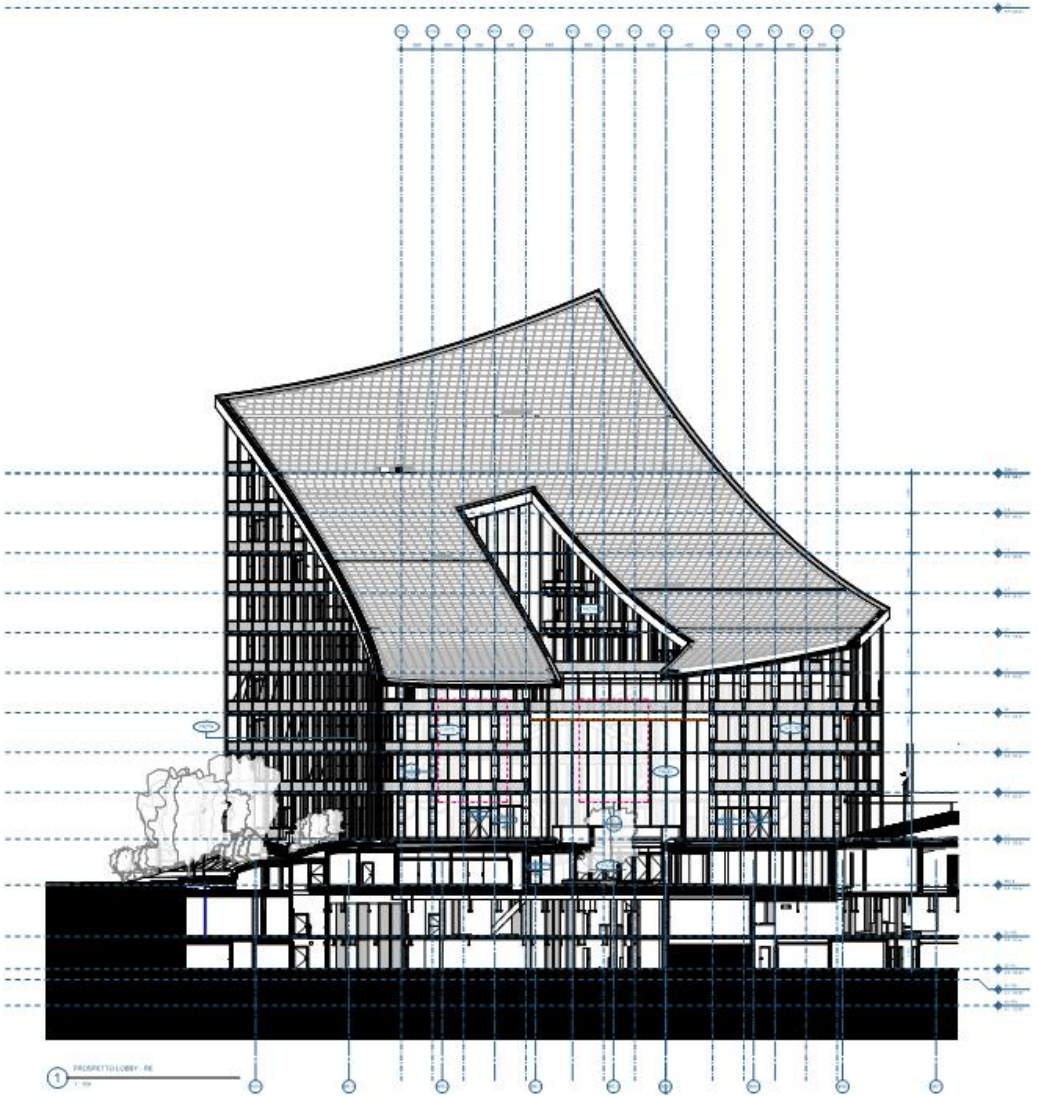

Il progetto



SISTEMI COSTRUTTIVI
MODELLAZIONE BIM

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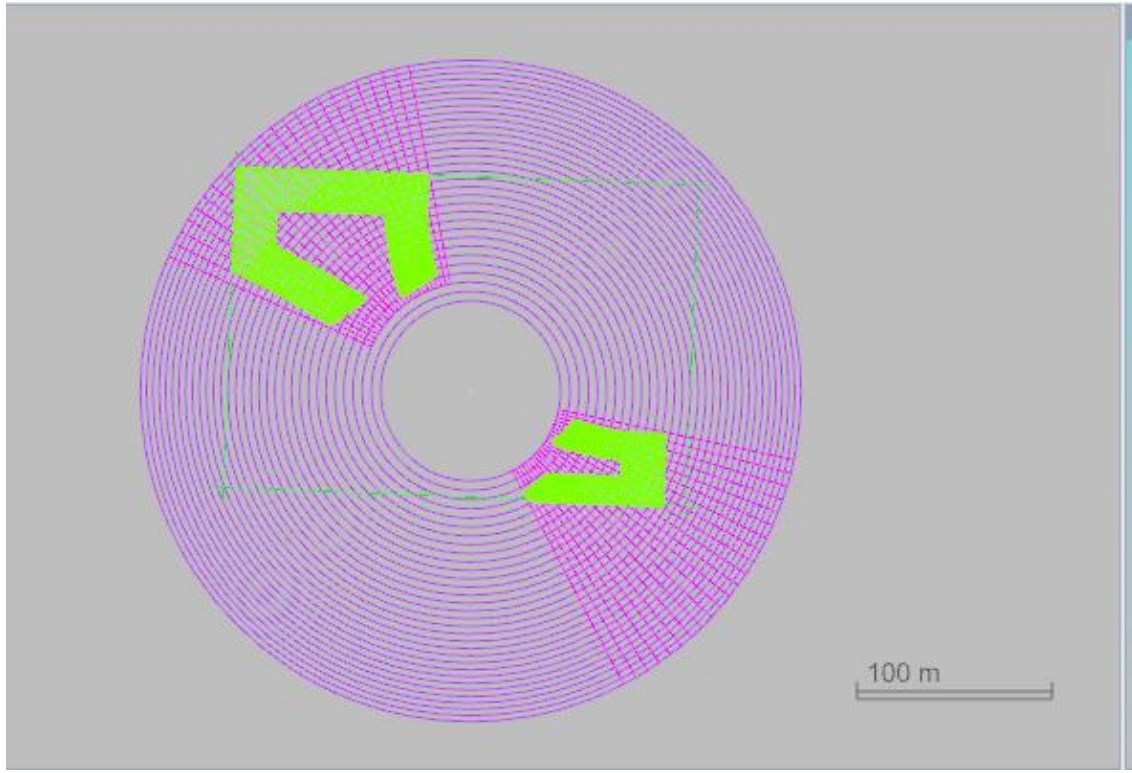
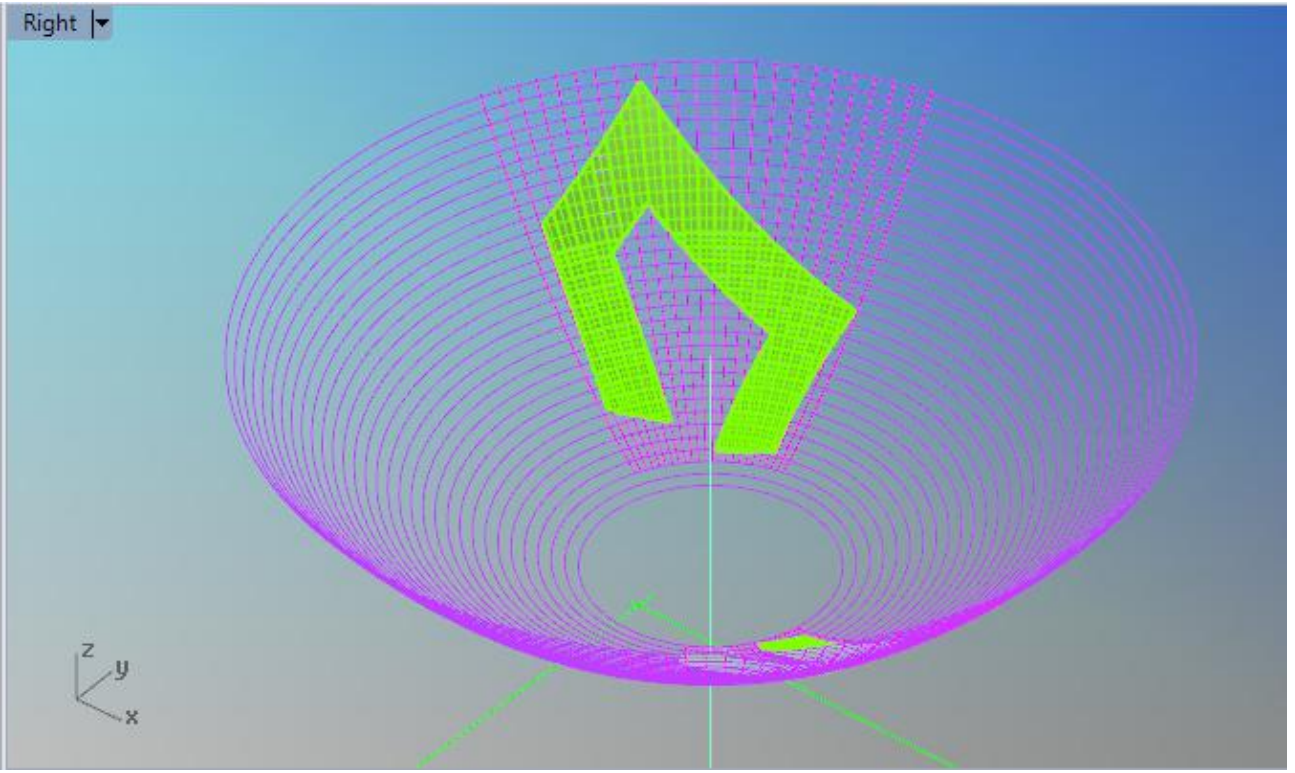
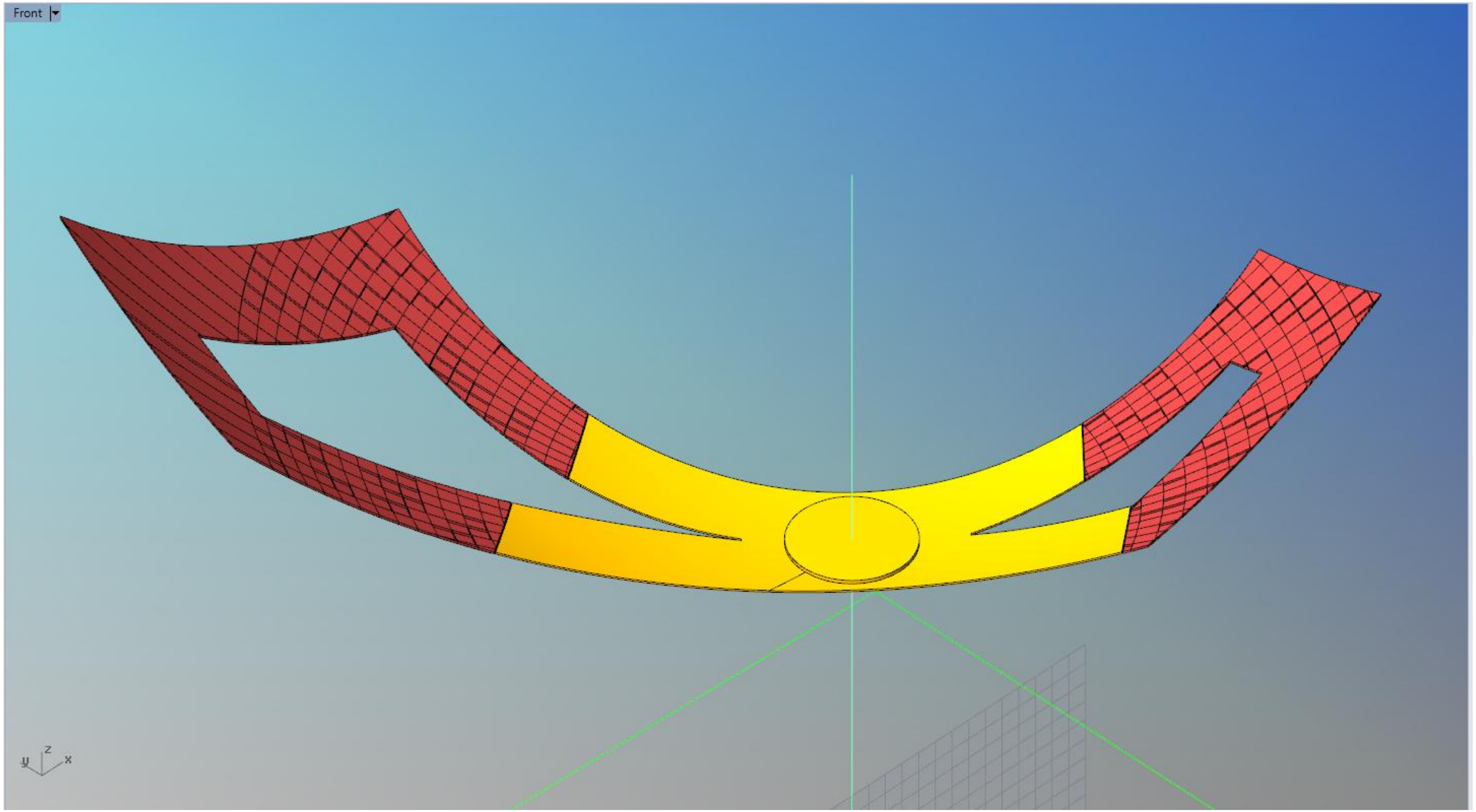
Modellazione BIM





Modellazione BIM



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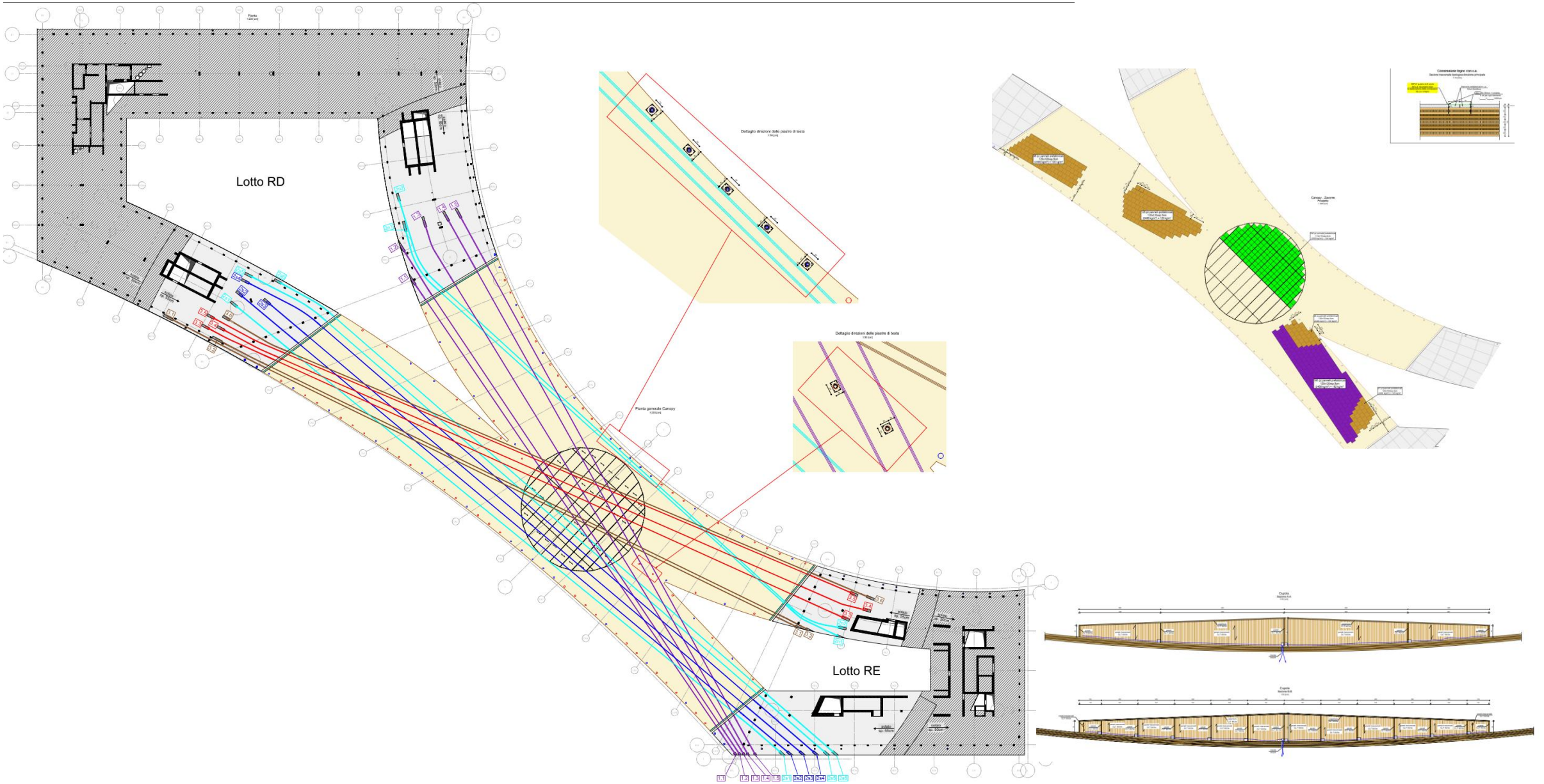

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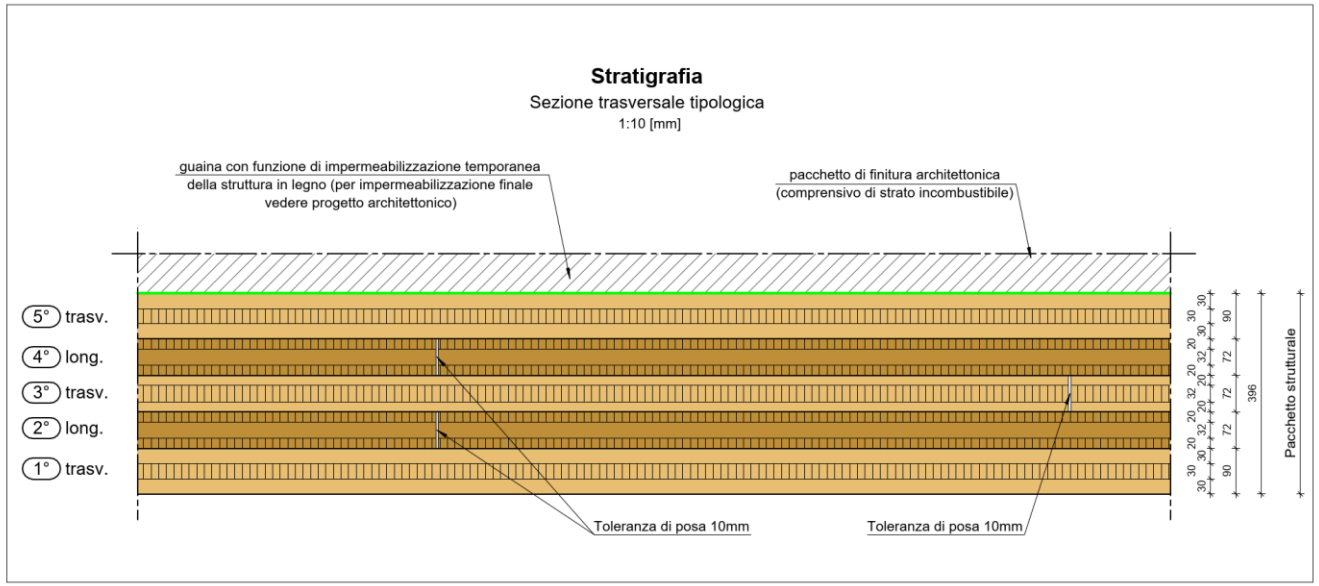

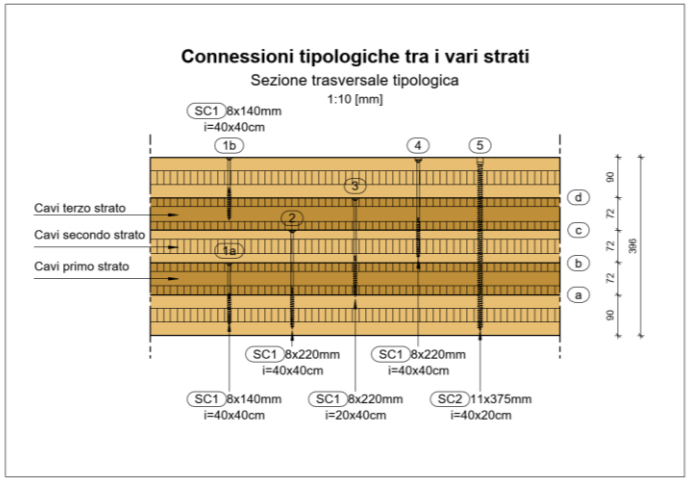

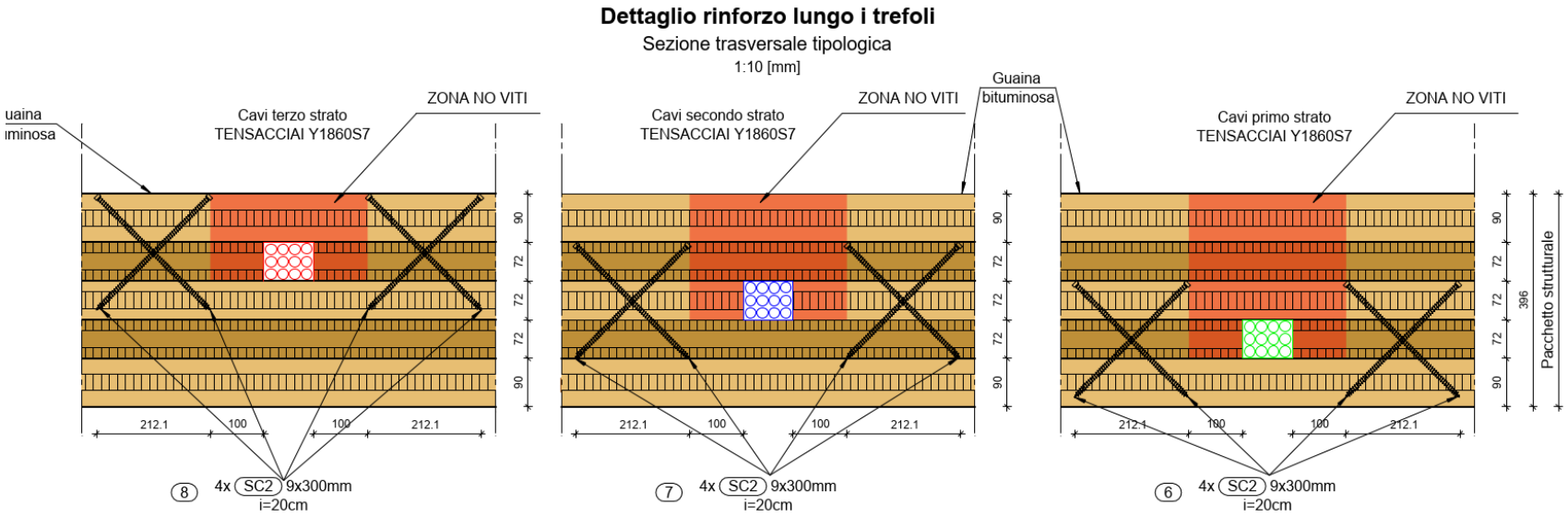

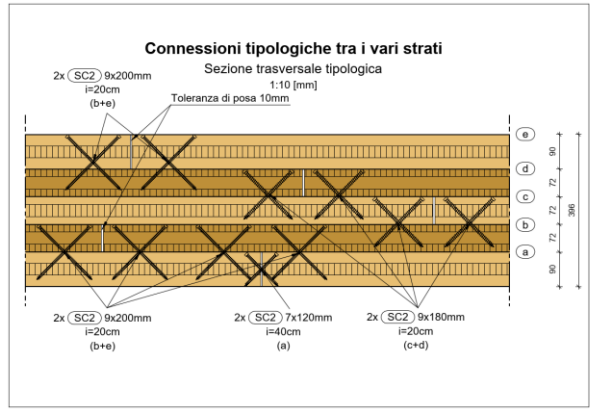

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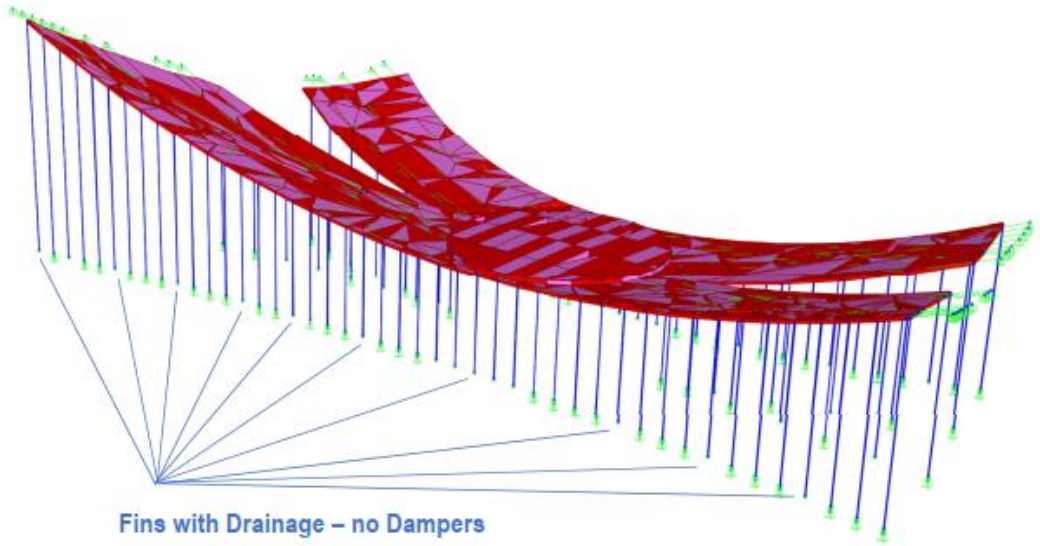
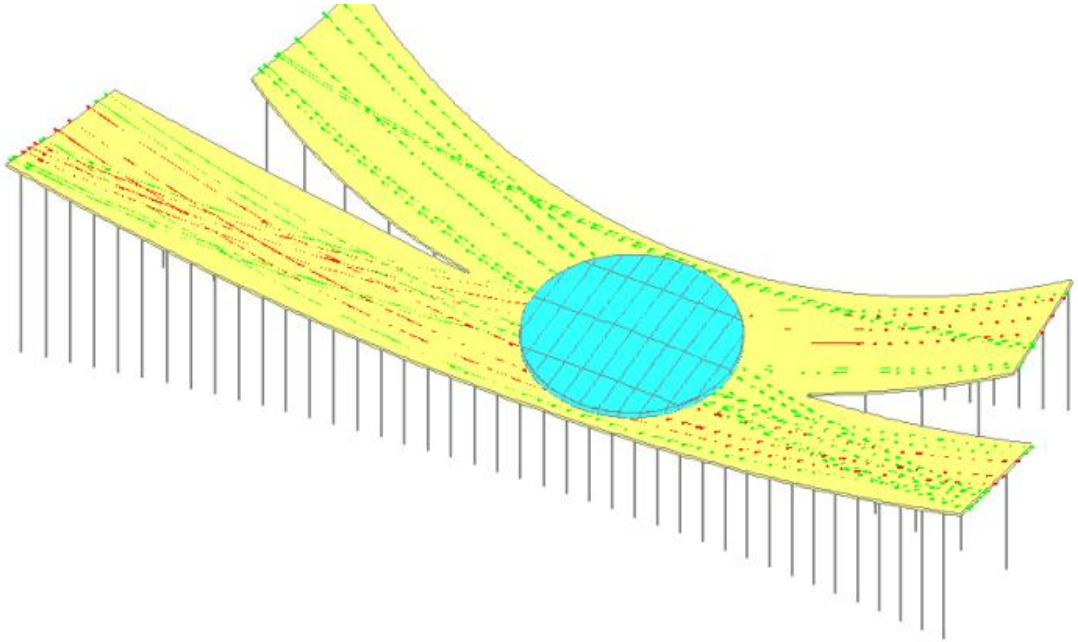
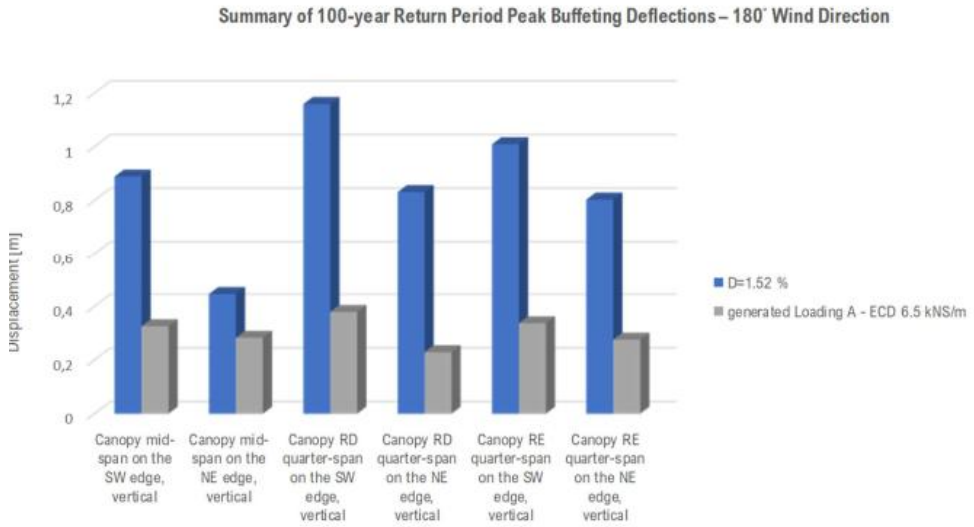
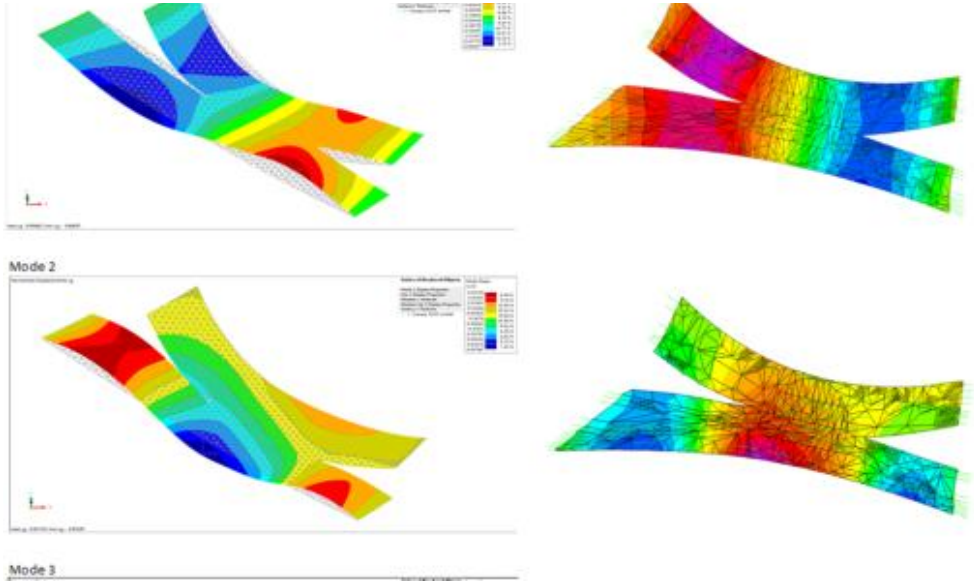


Fins with Drainage – no Dampers







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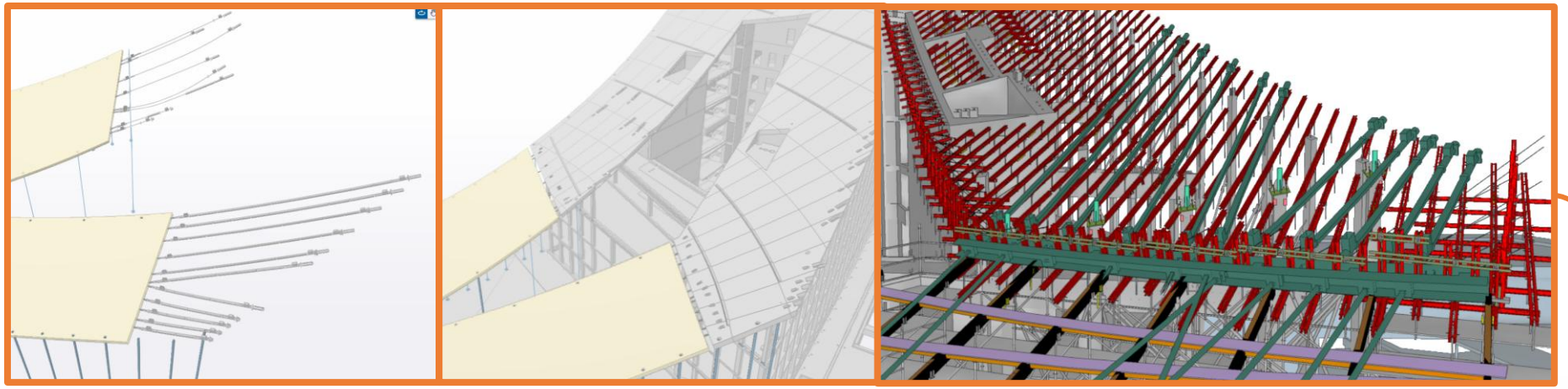

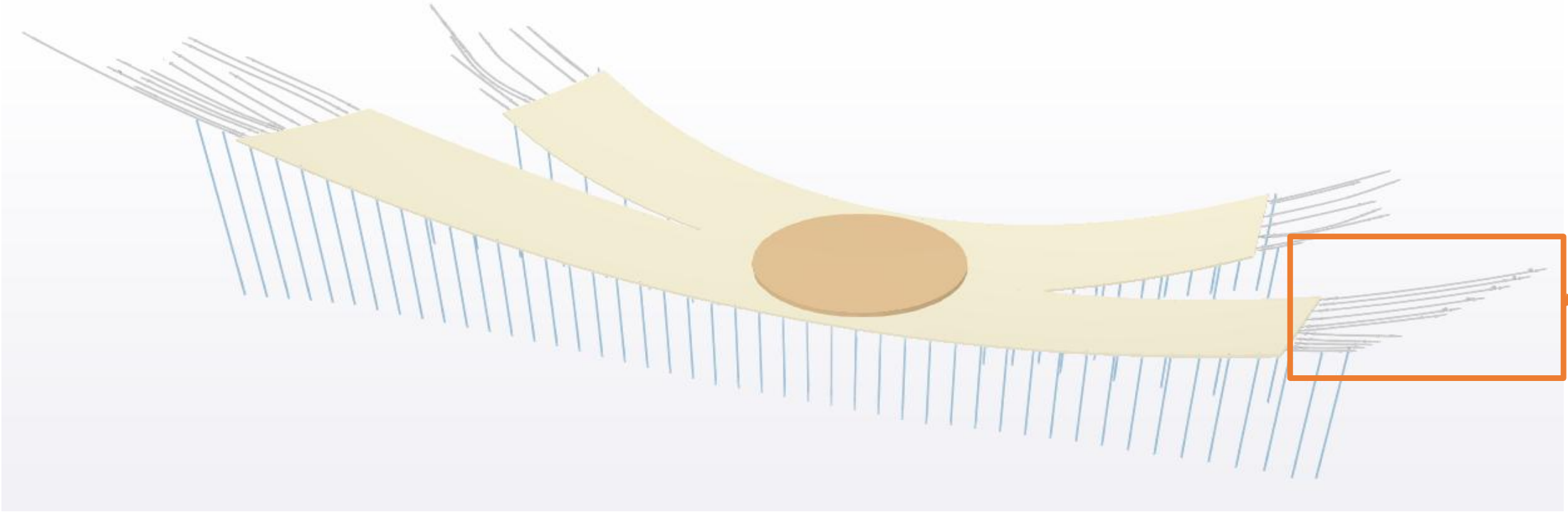

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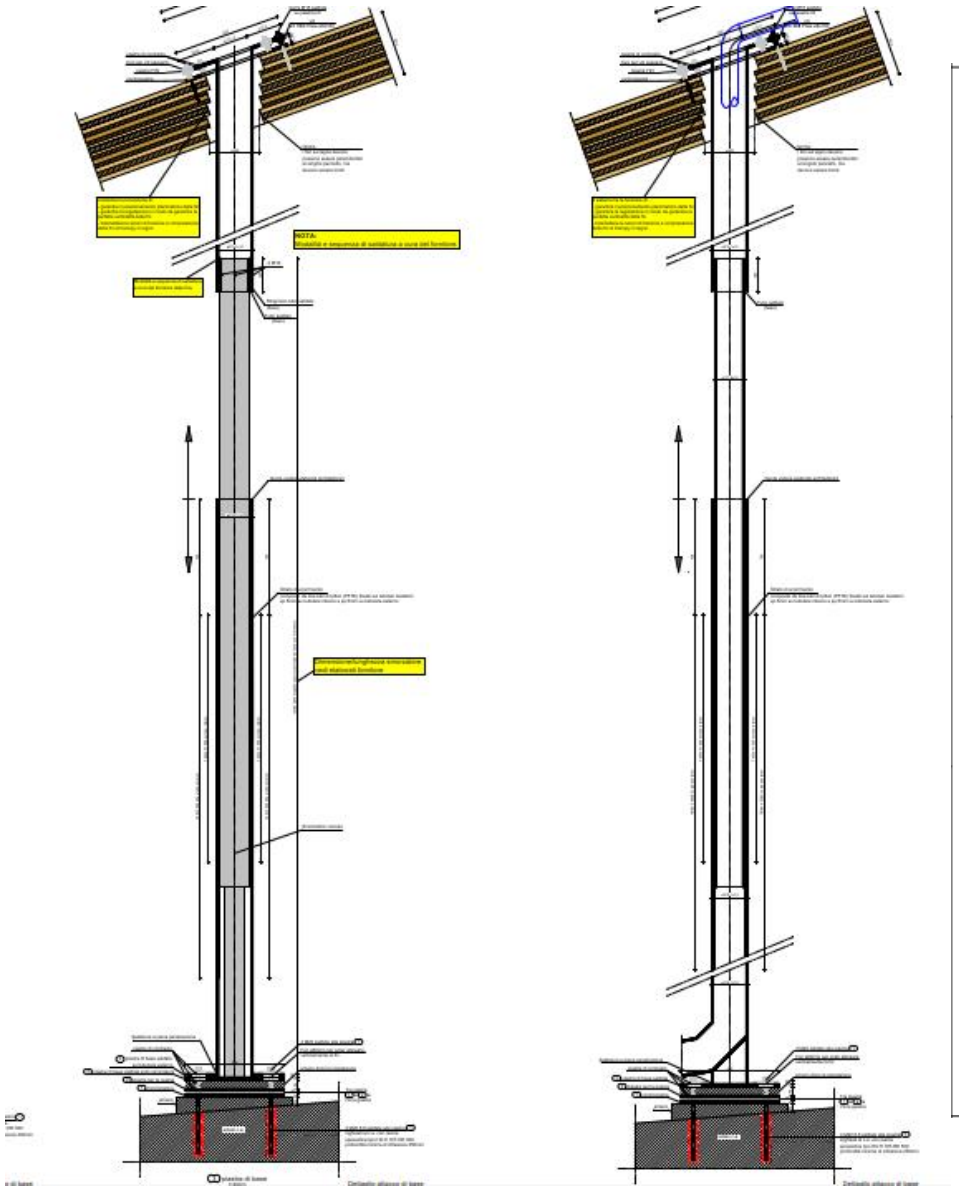
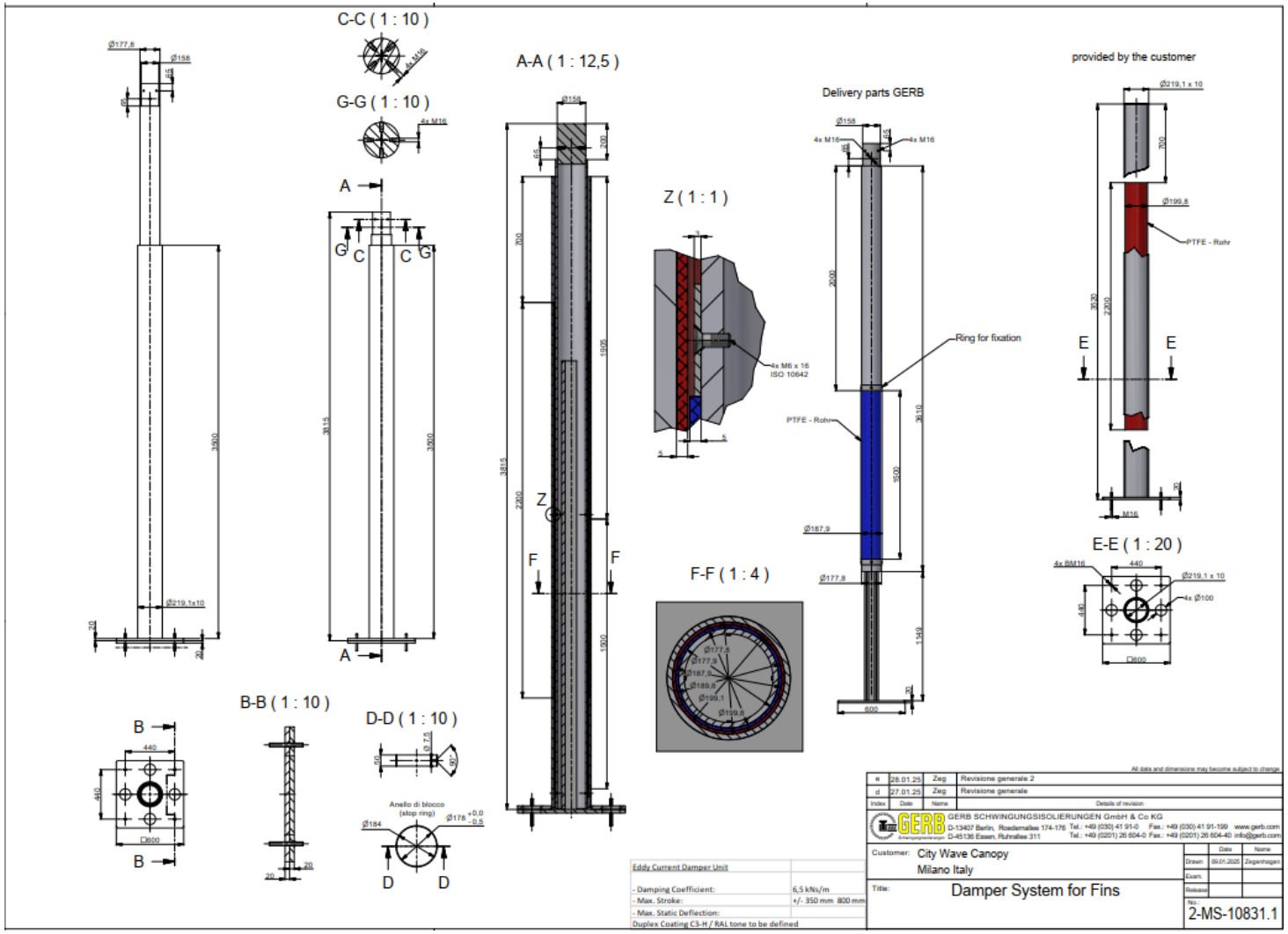
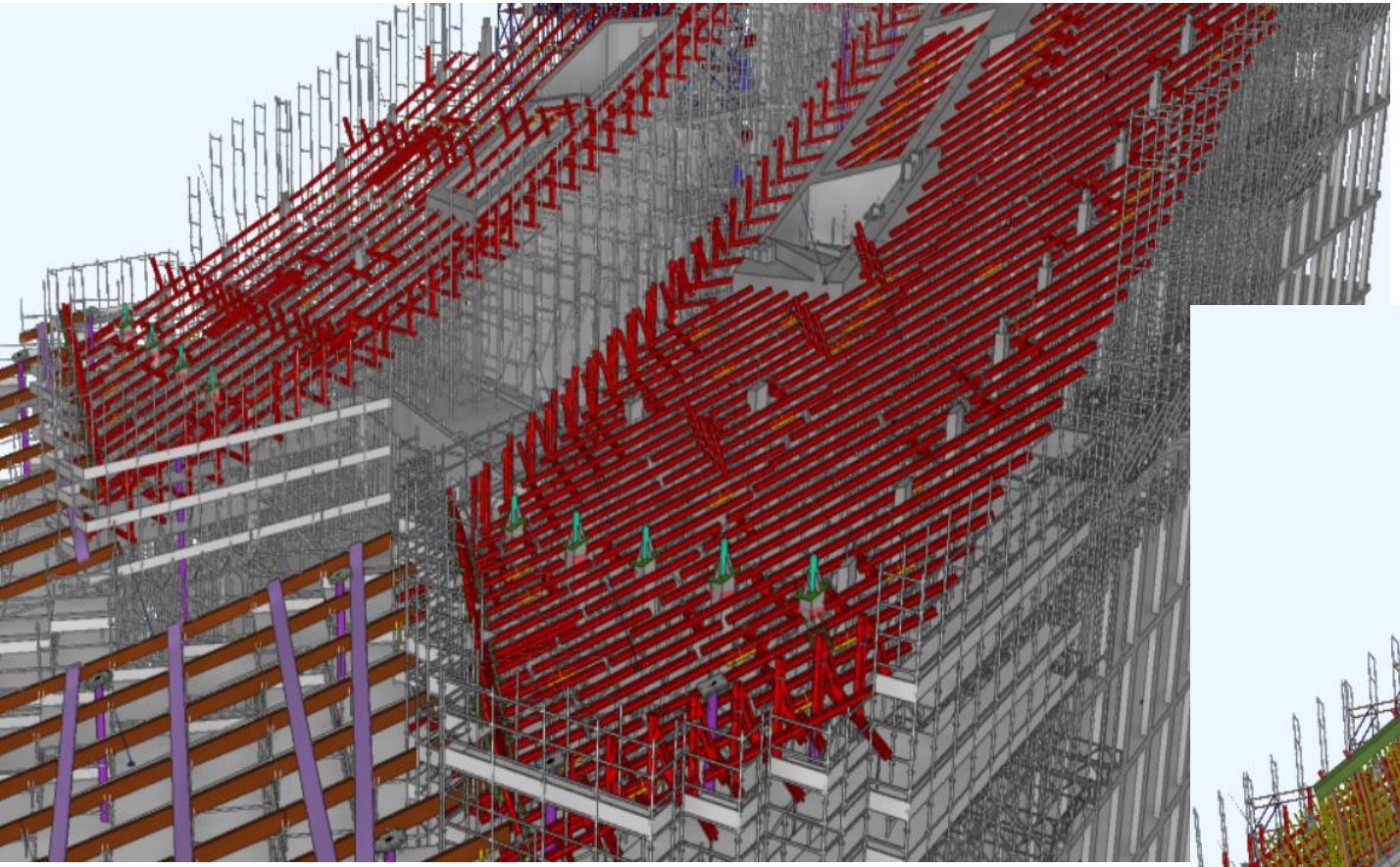
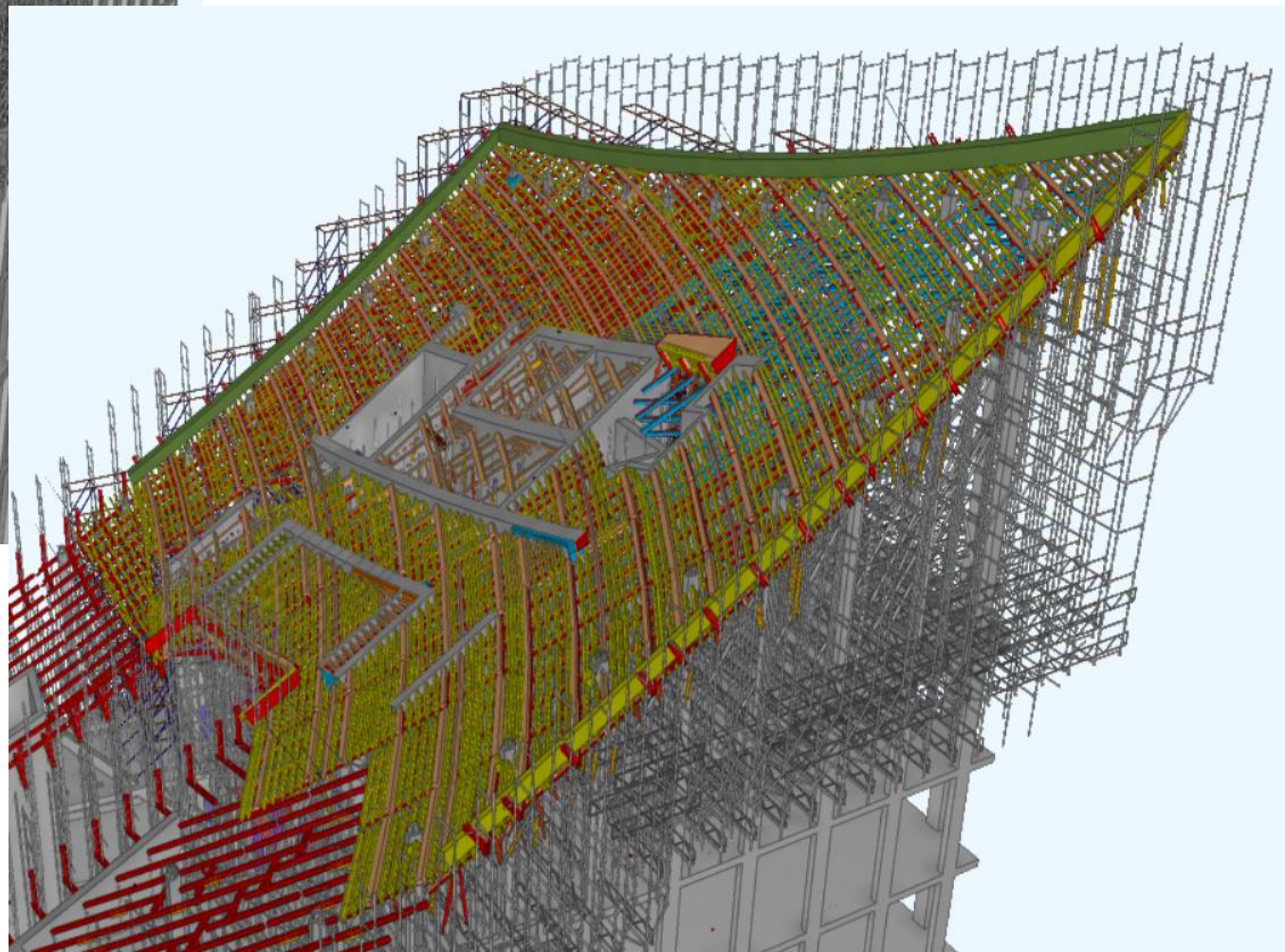


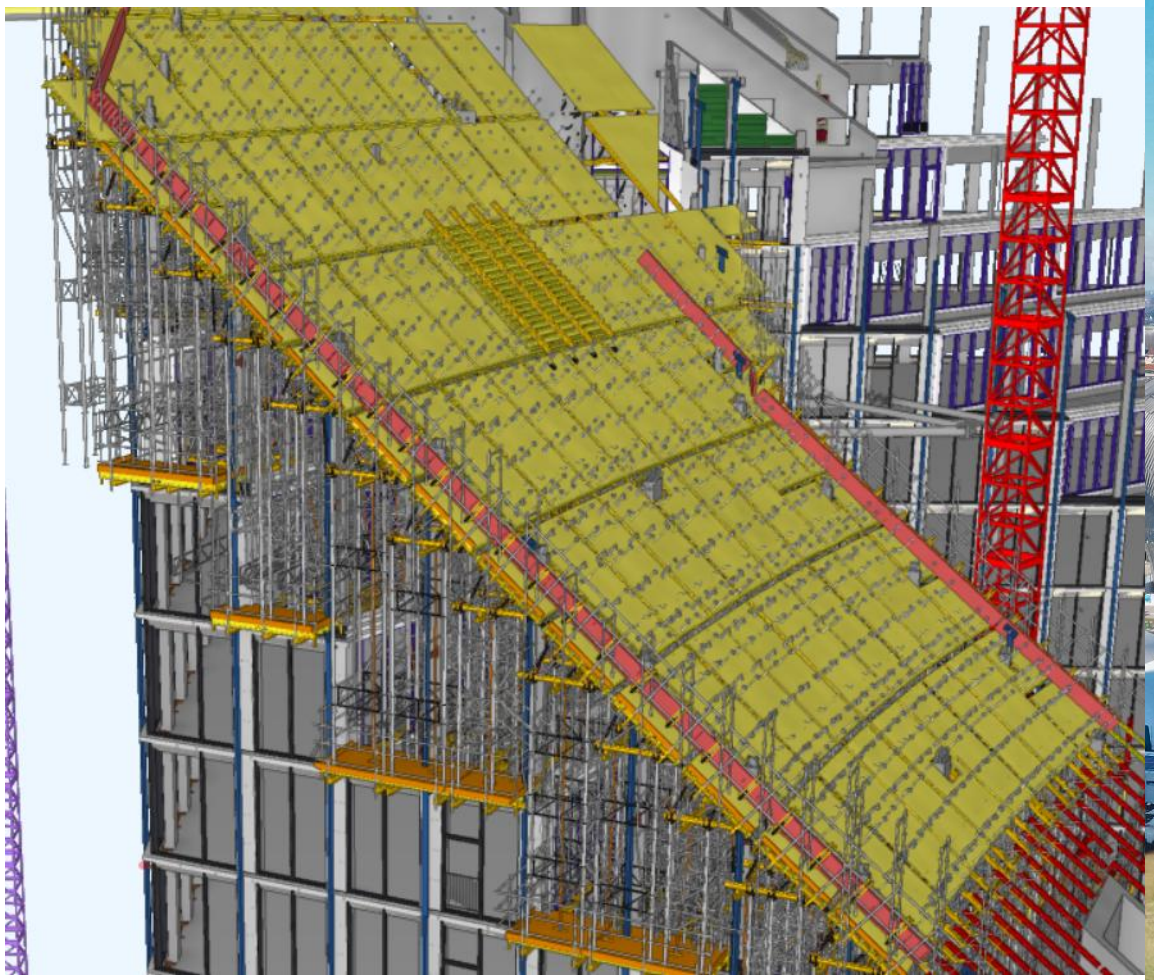


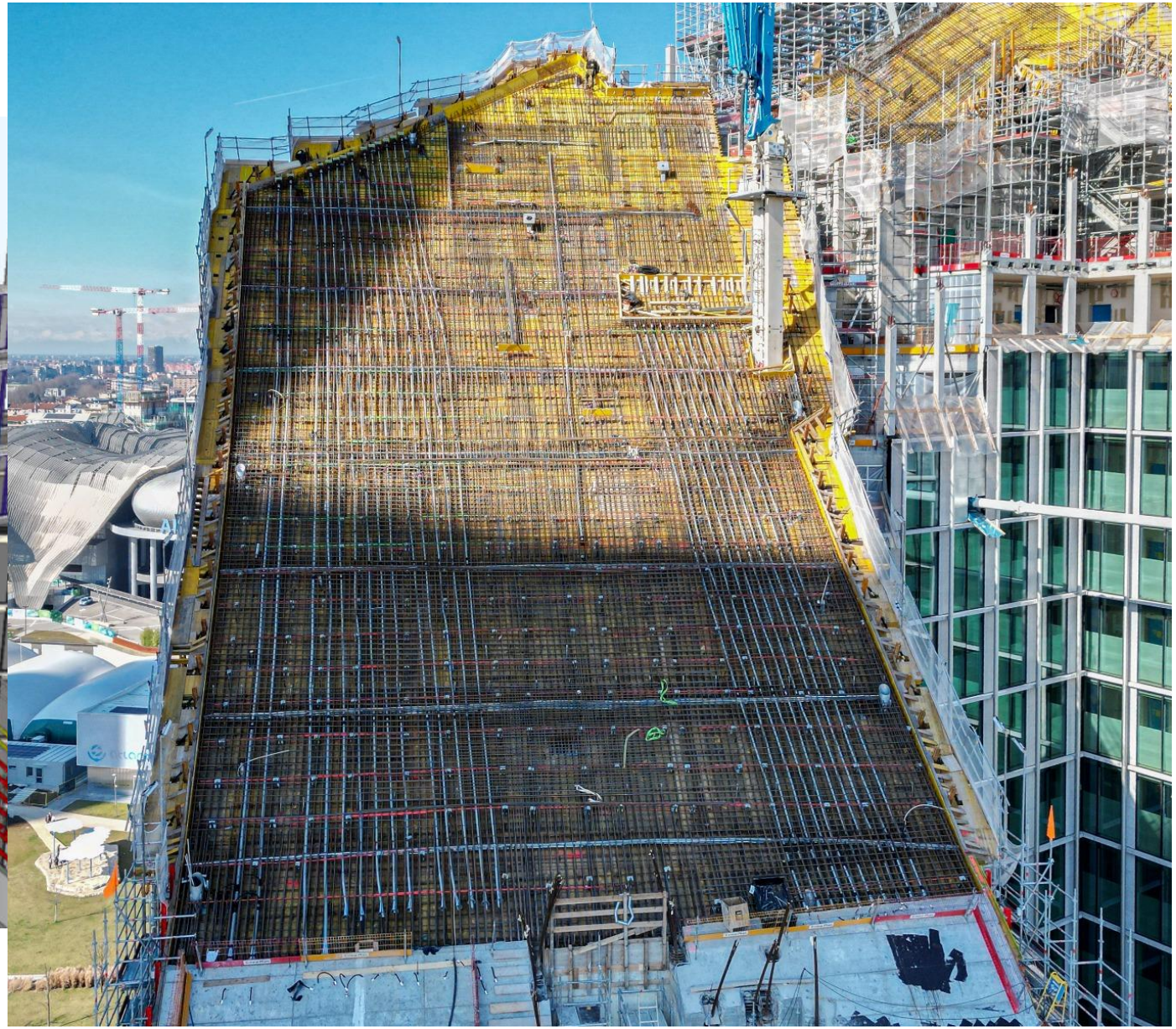
Casseratura coperture in c.a.



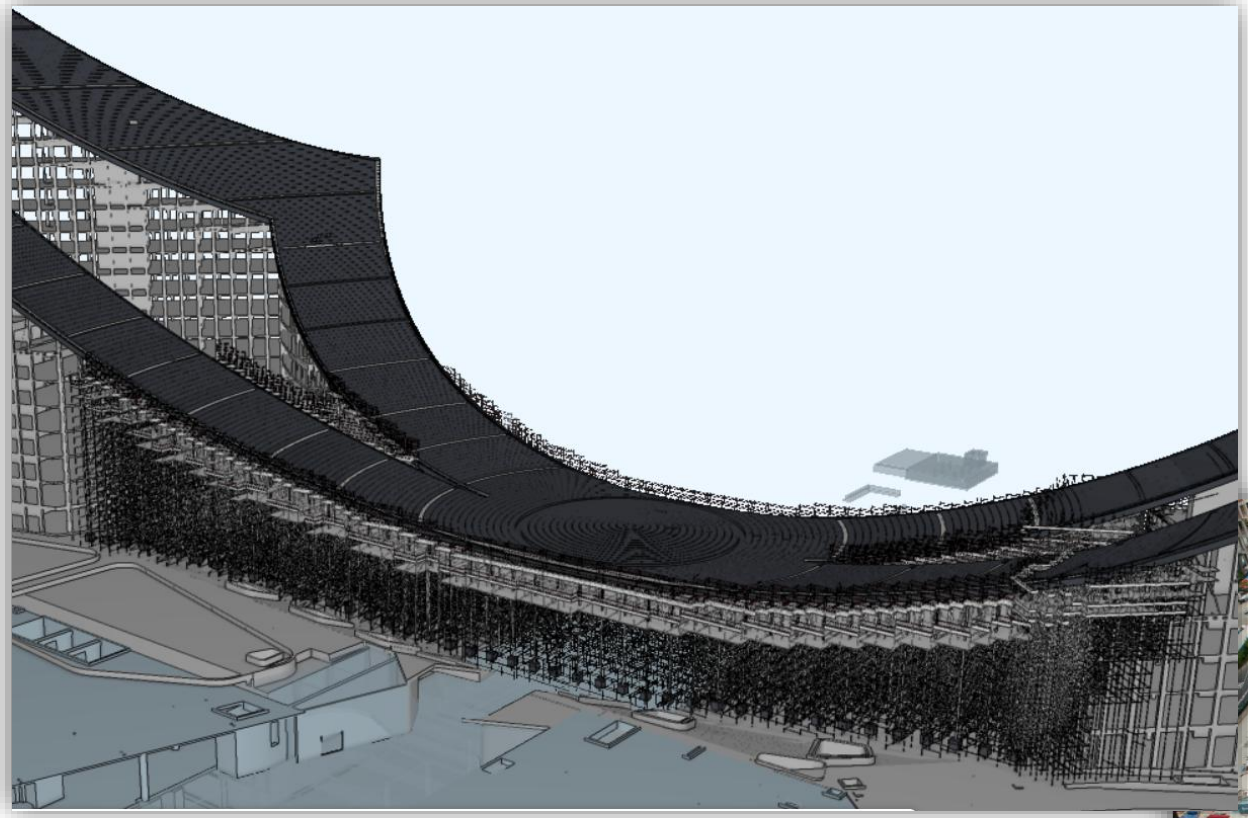


La casseratura



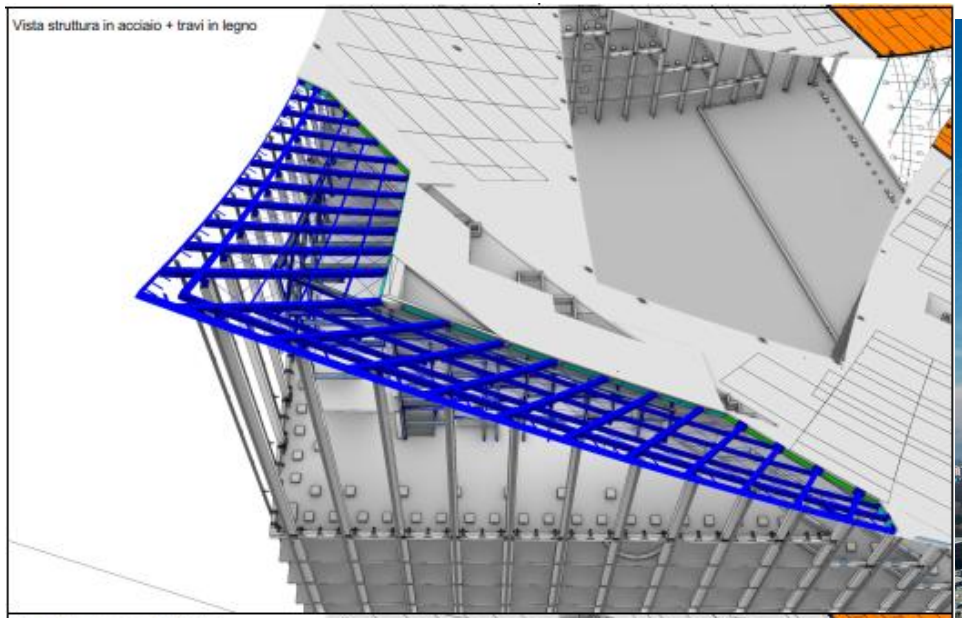


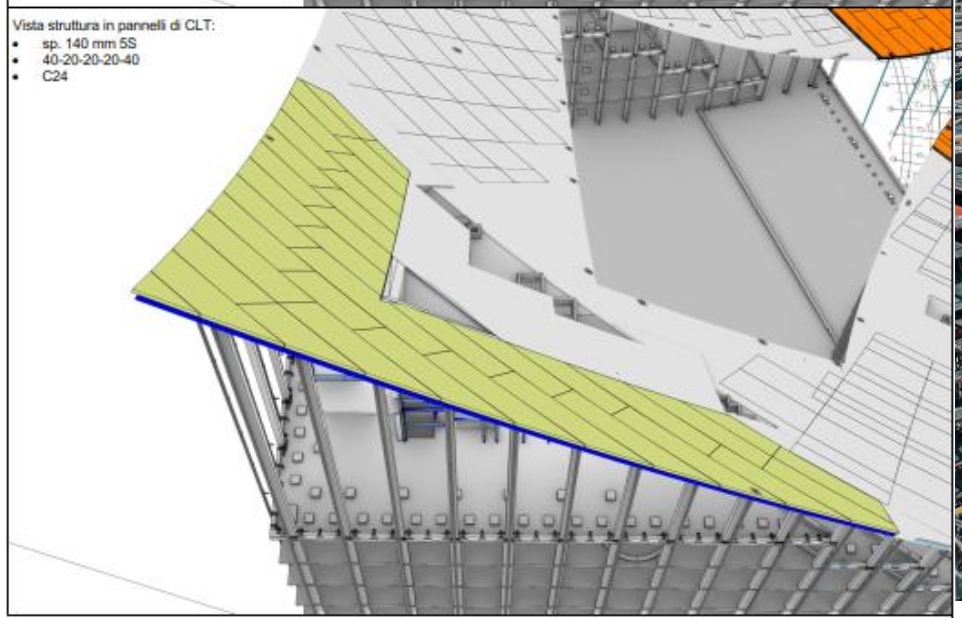
Coperture e canopy: sistemi di sostegno





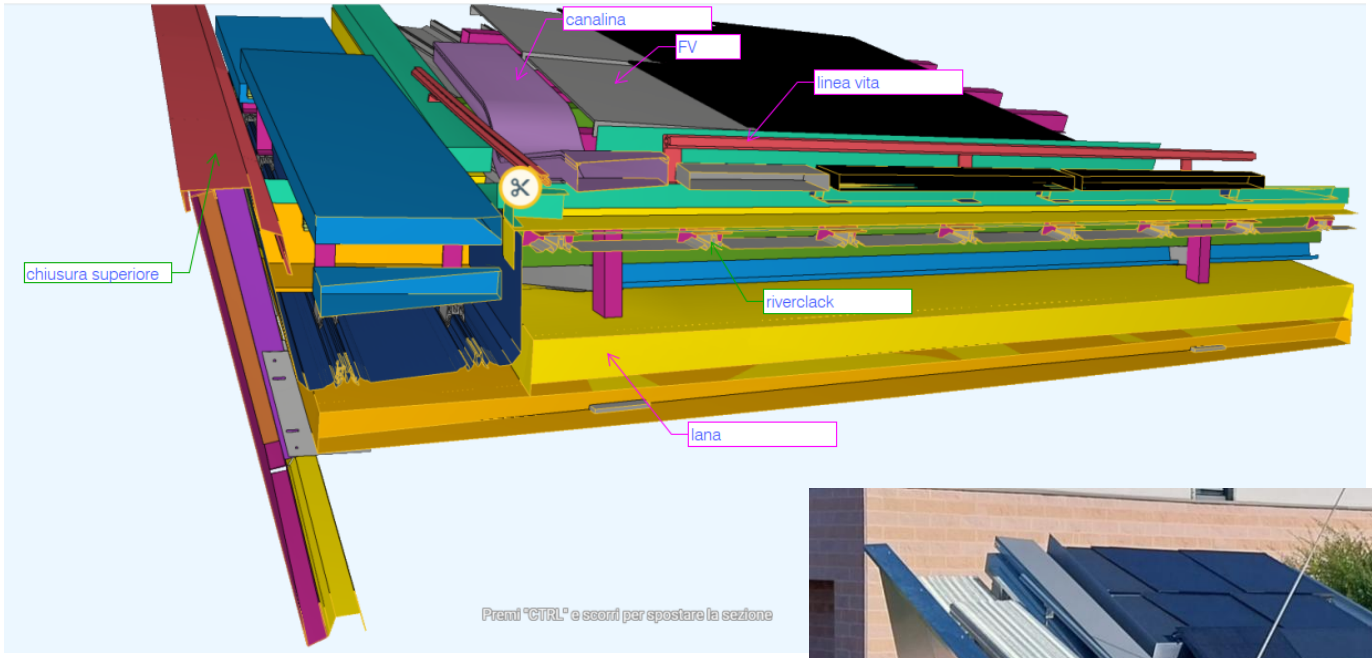
Coperture e canopy: cuspide lotto RD

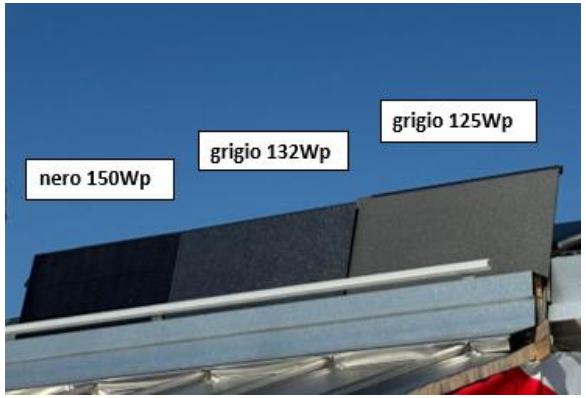






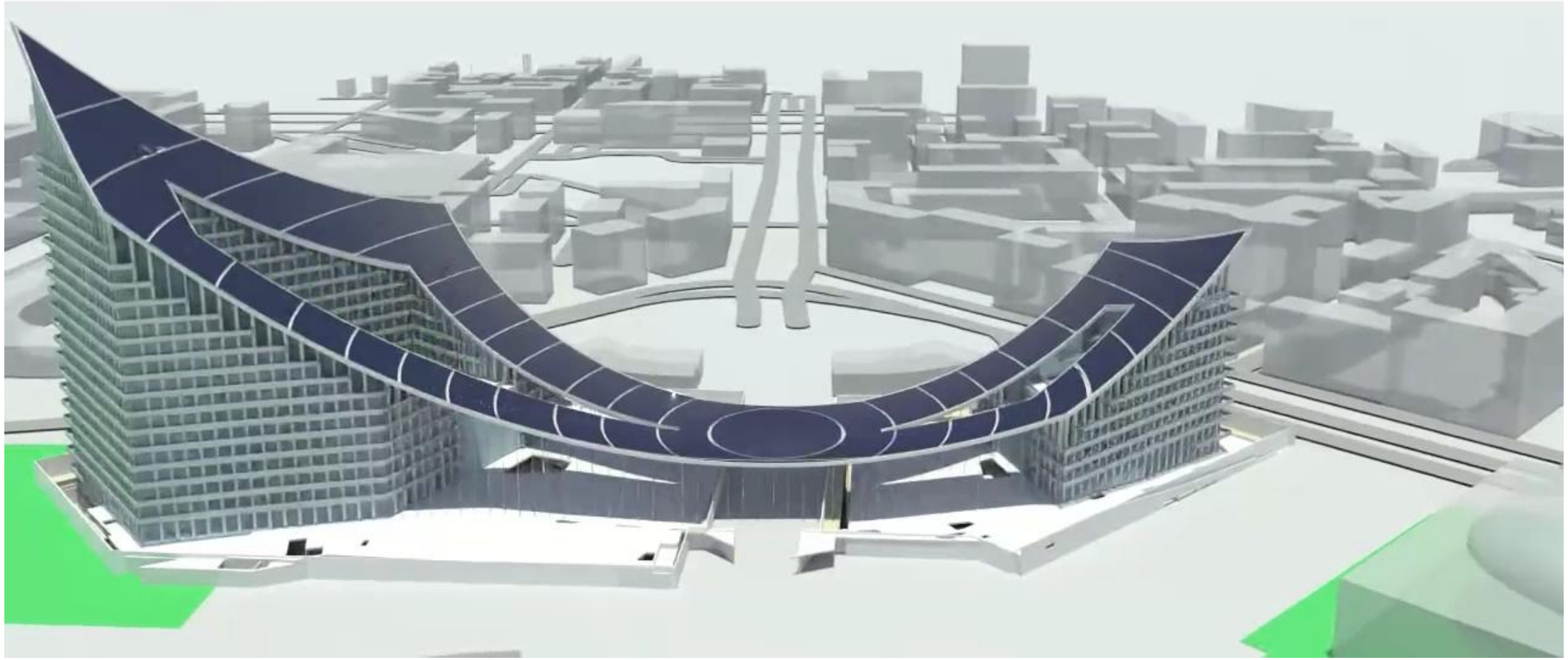
La copertura fotovoltaica







Canopy: sequenza costruttiva



PROTOTIPI E PROVE SPERIMENTALI

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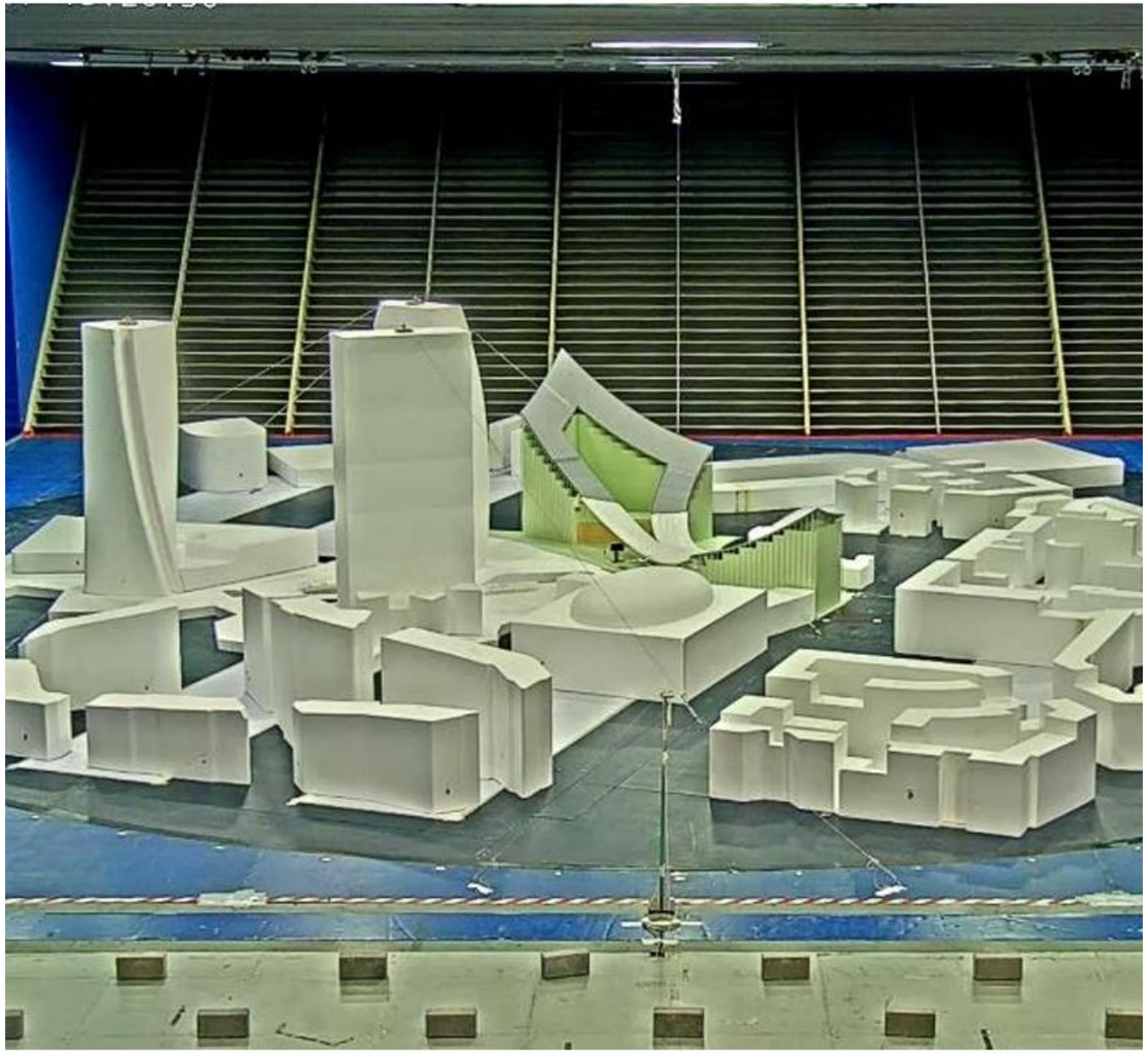
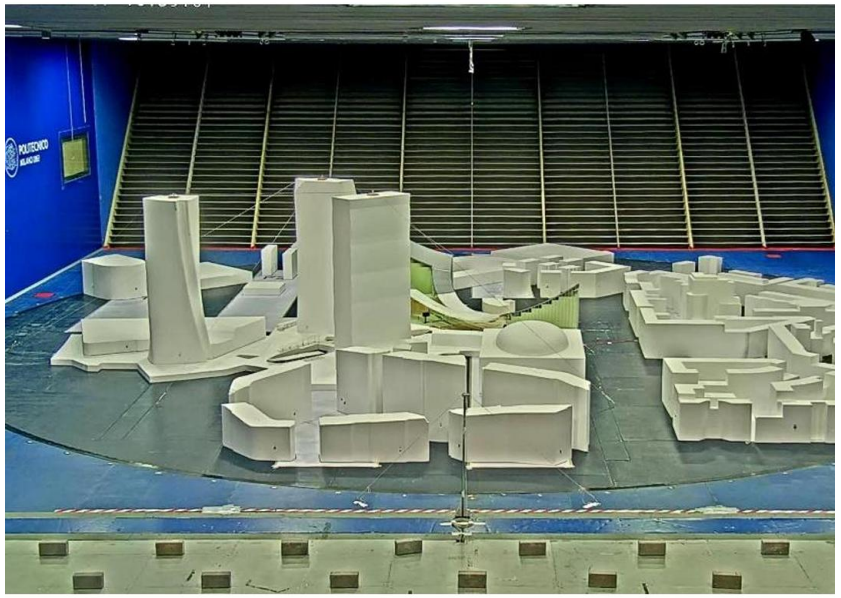
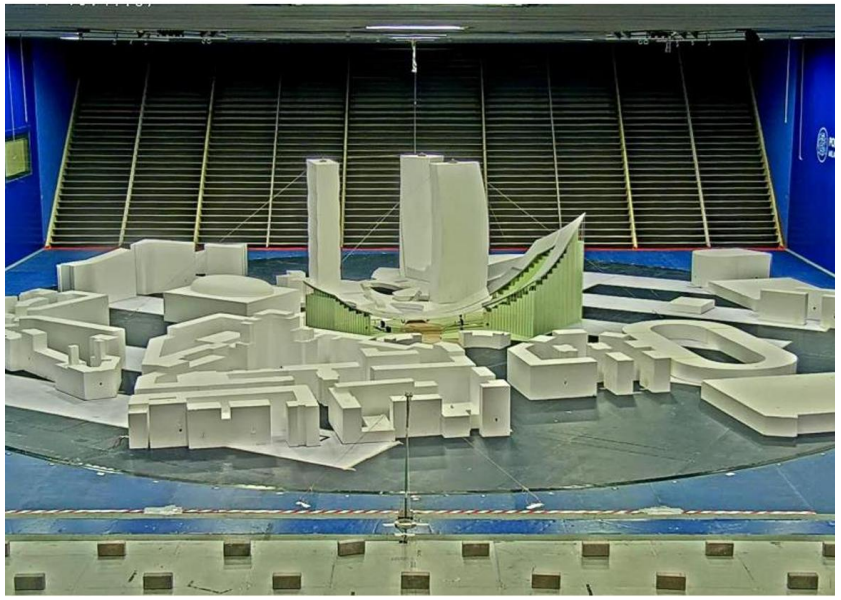
Wind tunnel test







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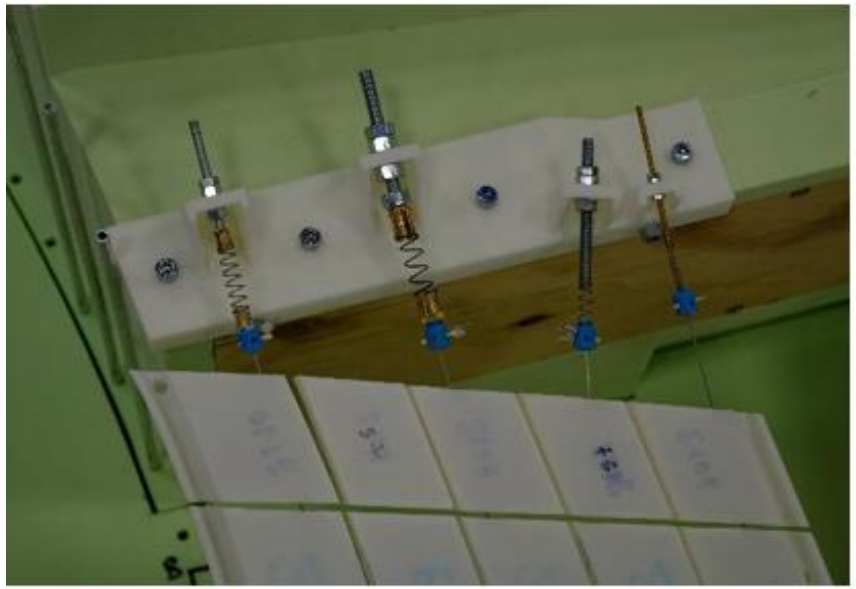
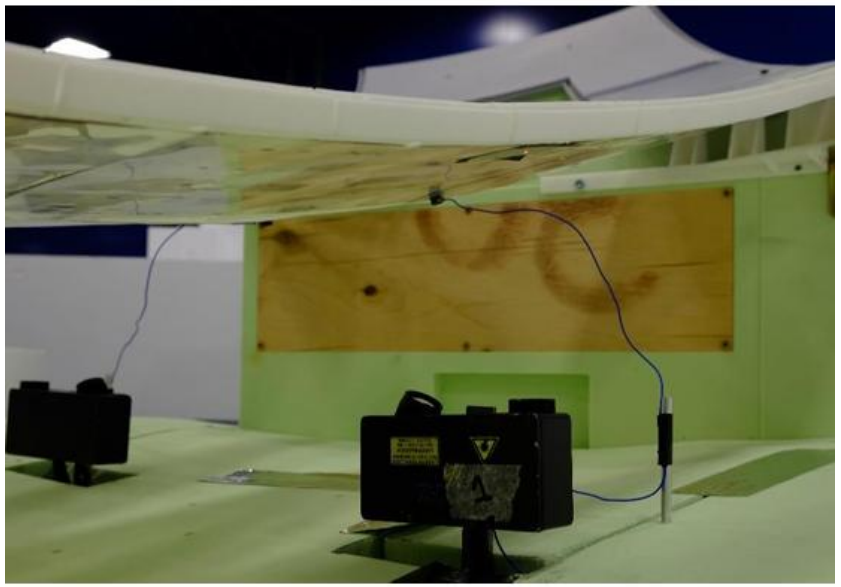












Wind tunnel test



Test materiali: XLAM

UNIVERSITA' DI TRENTO

Test su un campione bidimensionale 7,5 x 7,5 m, per verificare la resistenza, la rigidezza, lo smorzamento effettivo intrinseco ed eseguire una prova di montaggio

Test resistenza delle connessioni con viti – 50 campioni coinvolti





Figura 2. Campioni consegnati



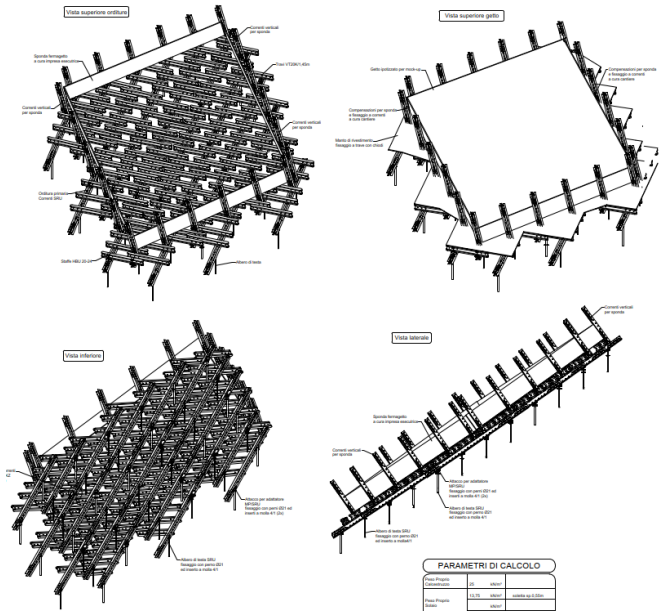
Test dispositivi: dampers

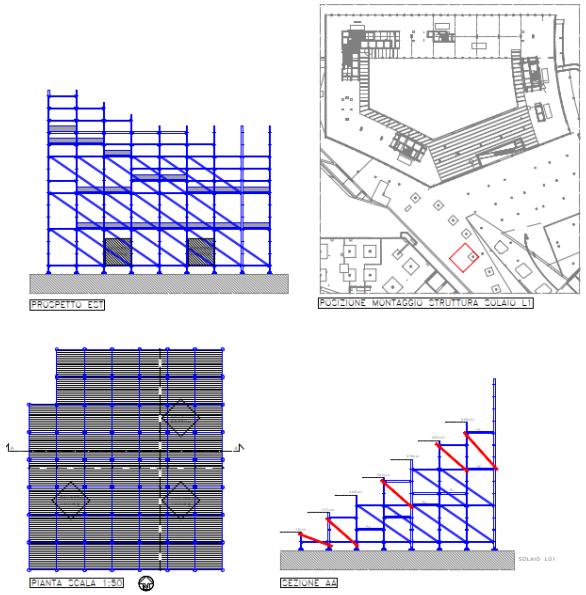




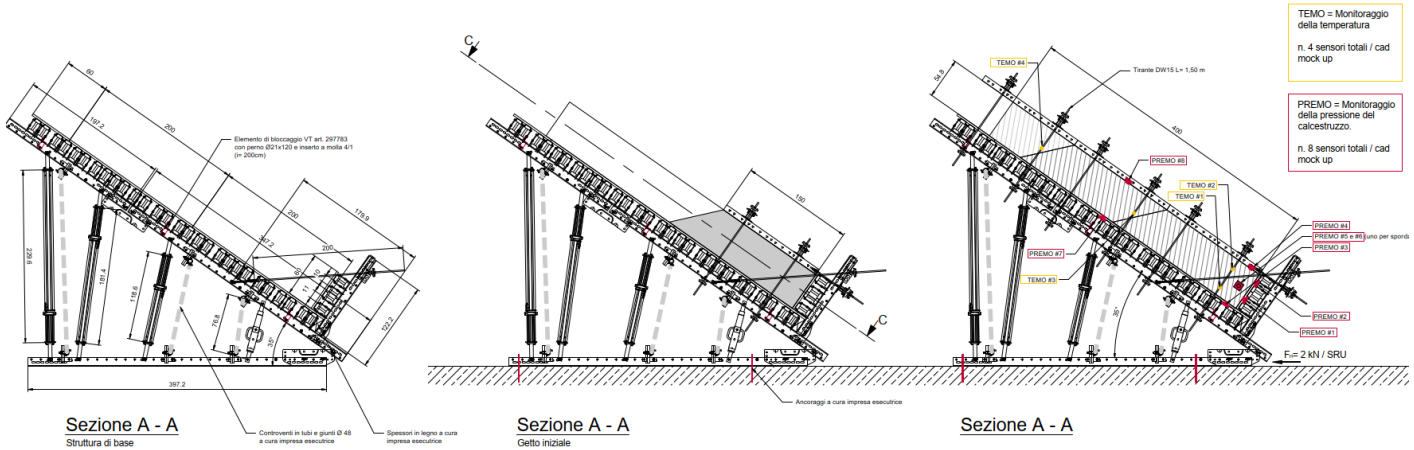


Mock-up


Vista superiore orditura
Vista superiore getto
Vista inferiore
Vista laterale
PARAMETRI DI CALCOLO


PROSPETTO EST
POSIZIONE MONTAGGIO STRUTTURA SOLAIO L1
PIANTA SCALA 1:50
SEZIONE AA




Elemento di bloccaggio VT art. 297783 con perno Ø21x120 e inserto a molla 4/1 (i= 200cm)
Controventi in tubi e giunti Ø 48 a cura impresa esecutrice
Spessori in legno a cura impresa esecutrice
Ancoraggi a cura impresa esecutrice
Tirante DW15 L= 1,50 m
TEMO = Monitoraggio della temperatura
n. 4 sensori totali / cad mock up
PREMO = Monitoraggio della pressione del calcestruzzo.
n. 8 sensori totali / cad mock up
TEMO #4
TEMO #2
TEMO #1
TEMO #3
PREMO #8
PREMO #7
PREMO #4
PREMO #5 e #6 uno per sponda
PREMO #3
PREMO #2
PREMO #1
F= 2 kN / SRU
Sezione A - A
Struttura di base
Sezione A - A
Getto iniziale
Sezione A - A



Mock-up



MONITORAGGI

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Monitoraggio canopy in fase di costruzione

Monitoraggio topografico dei bordi del Canopy da stazioni fisse esterne: Stazionando con lo strumento di misura topografica su caposaldi fissi (permanenti e removibili) individuati all'esterno dell'impronta del Canopy a terra, effettuiamo la misura periodica di mini-riflettori di precisione predisposti sul bordo esterno del portico (fianco visibile del cassero).

Strumentazione: Stazione totale di precisione, mini-prismi topografici completi di staffa di fissaggio.

Periodicità Verifica preliminare dell'as built del cassero, verifica periodica nel corso della posa (alla fine della posa di ogni layer del legno), monitoraggio in tempo reale o differito al termine di ogni step di tesatura (possibilità di riposizionamento in itinere).

GEXCEL GEOMATICS & EXCELLENCE



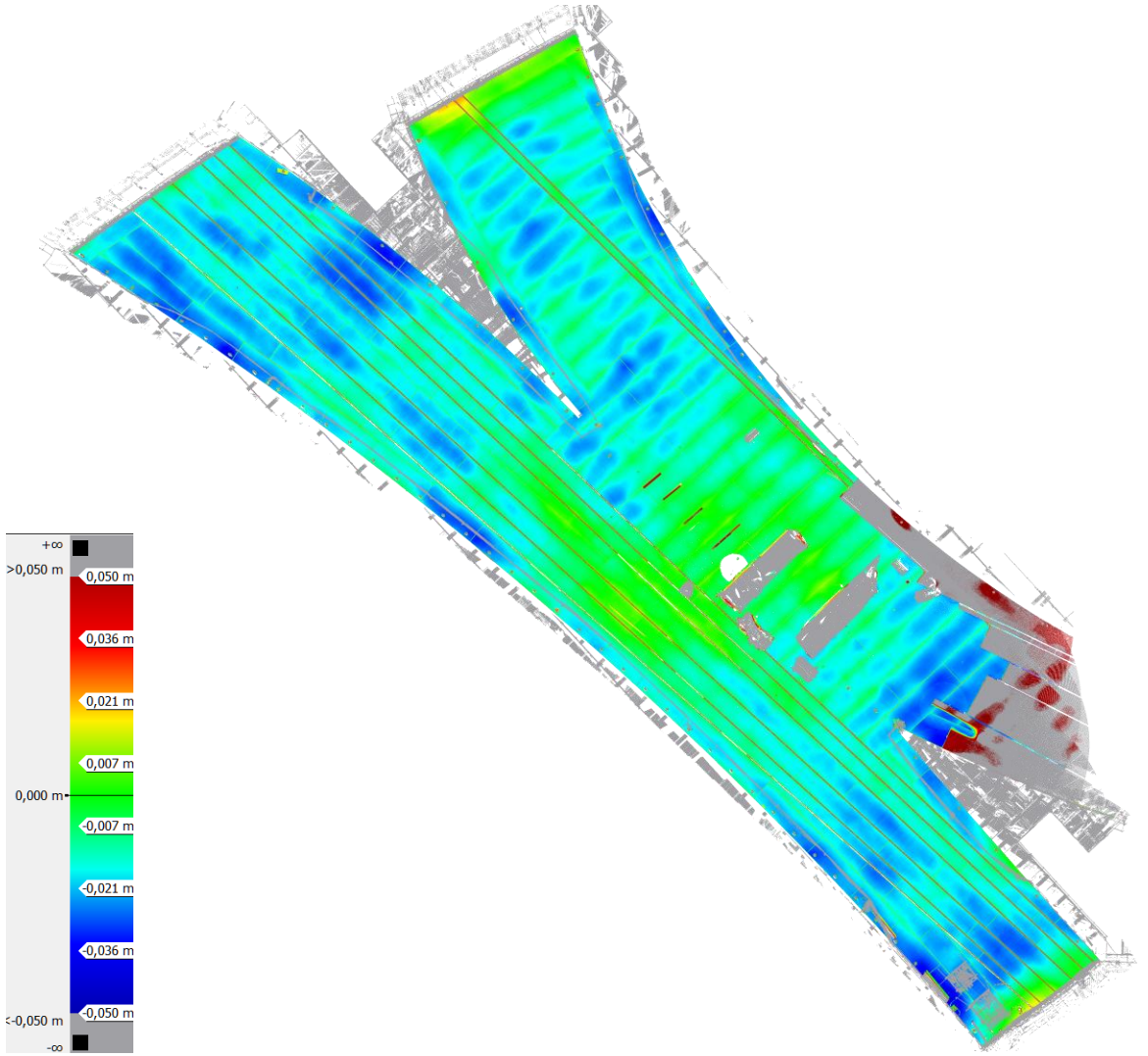
Figura 18 - Posizione teorica dei punti di monitoraggio interessati dalla attività descritte ai precedenti punti 3.1, 3.2, 3.3. Ipotesi da verificare in situ.

- Zona interessata da monitoraggio topografico dei bordi del Canopy da stazioni fisse esterne (rif. 3.1)
- Zona interessata da monitoraggio topografico dei bordi interni del Canopy da stazioni fisse poste in quota su RD e RE (rif. 3.2)
- Zona interessato da monitoraggio topografico dell'intradosso del Canopy da stazioni fisse poste sotto copertura (rif. 3.3)

L'effettiva estensione dell'area di influenza delle attività di monitoraggio topografico dovrà essere verificata nello scenario reale in funzione della disponibilità delle visuali sui bersagli e sui riferimenti esterni.

Monitoraggio canopy in fase di costruzione

A lato si riporta esempio di'analisi di variazione eseguita sull'estradosso del Layer 3 della canopy mediante scansione 3D come modello di riferimento il file IFC Layer 3 di progetto costruttivo.
L'analisi di variazione è mappata sulla nuvola di punti può essere letta attraverso la scala colore consueta con ampiezza +-5 cm. Come si evince dalla lettura le tolleranze rientrano nella quasi totalità nelle tolleranze di costruzione di +- 2 cm dal teorico.
Questa modalità di monitoraggio consente di controllare in tempo reale gli eventuali scostamenti dal teorico di progetto e di intervenire in caso di scostamenti oltre i limiti di progetto.



Concrete roof slabs

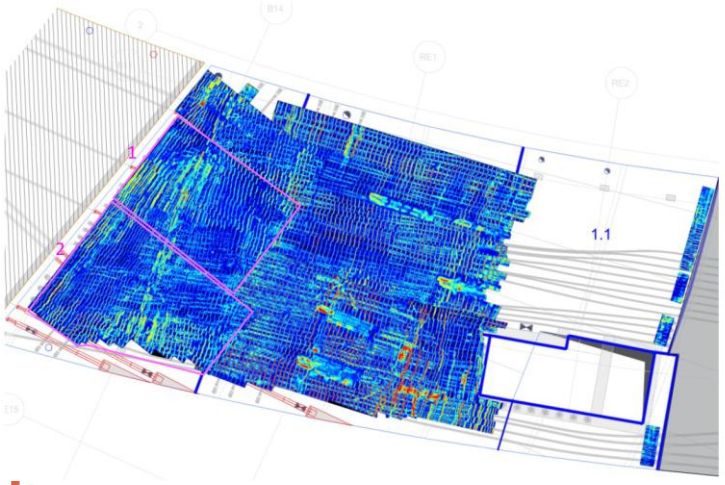
Construction quality assurance



Due to the very high reinforcement ratio, the dense arrangement of prestressing tendons, and the very challenging concreting conditions, the roof slabs were extensively examined after concreting:

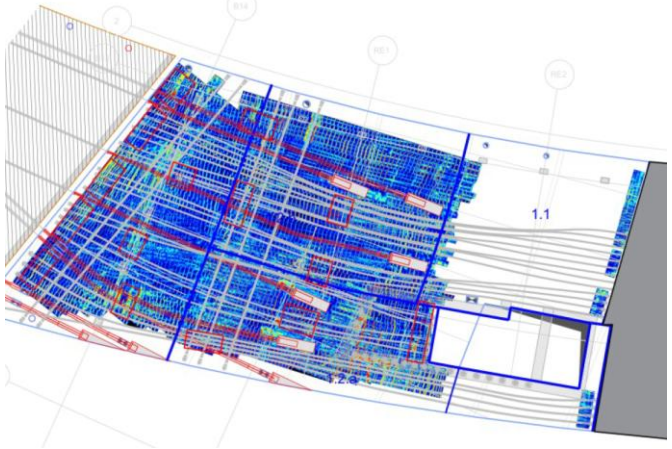
1) Large-area ground-penetrating radar (GPR) surveys
2) Local ultrasonic tomography
3) Local impact-echo testing





Ground-penetrating radar (GPR) results: areas of potential defects

Definition of areas for detailed assessment using tomography or impact-echo



CAMPO PROVE GESTIONE DELLE EMERGENZE

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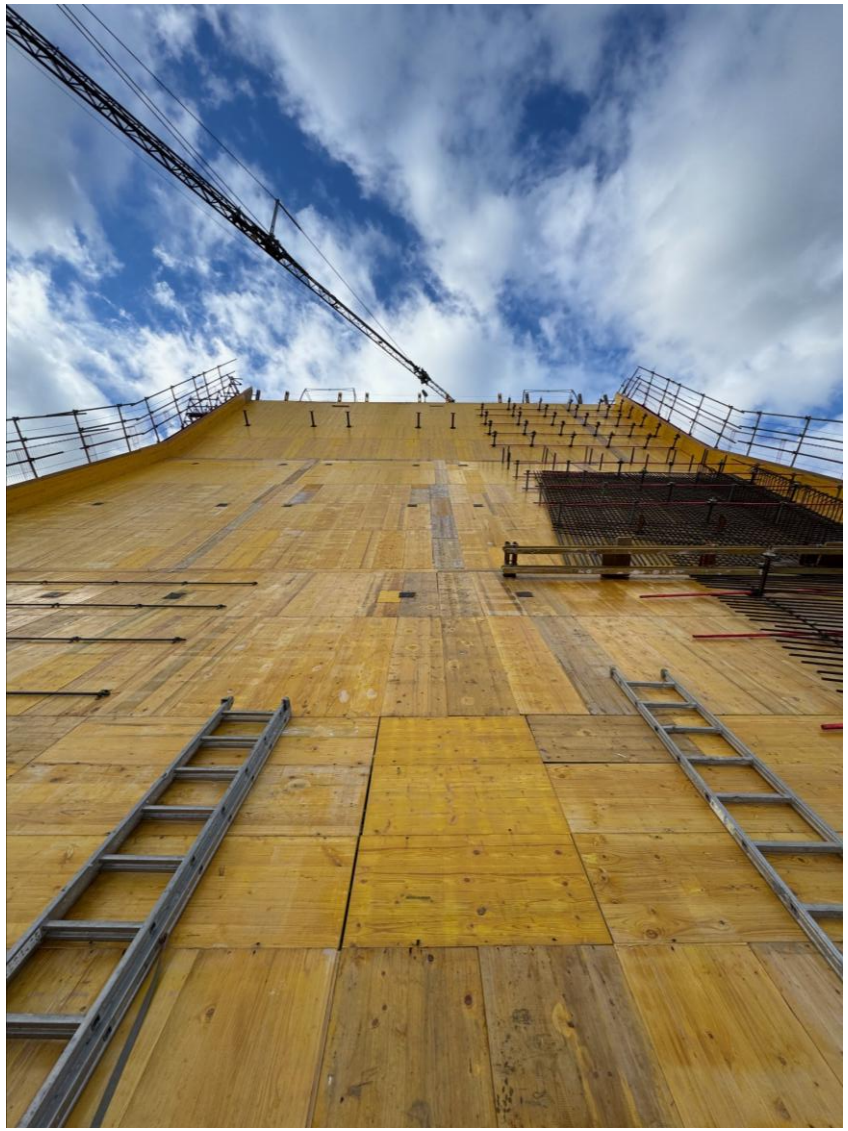
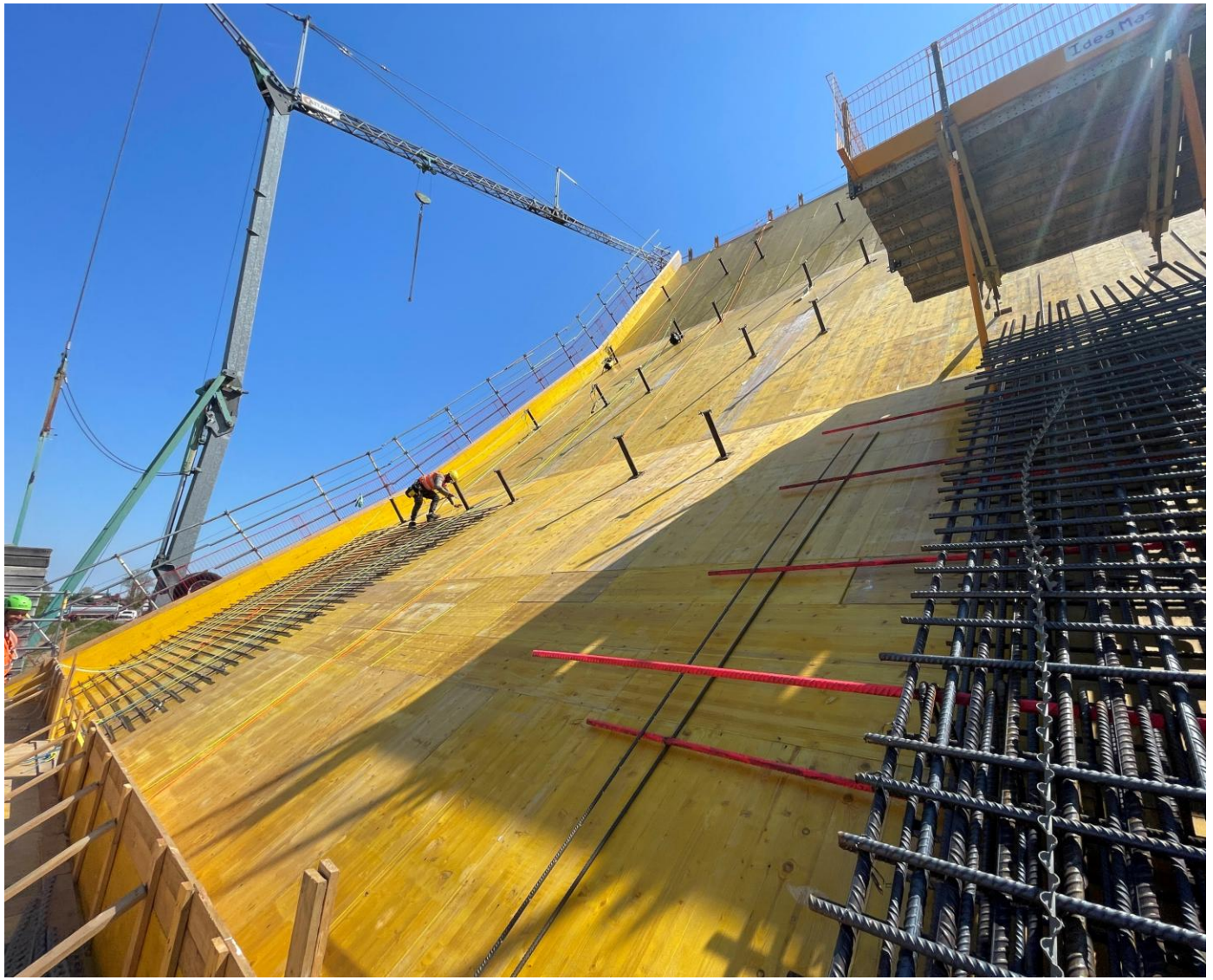
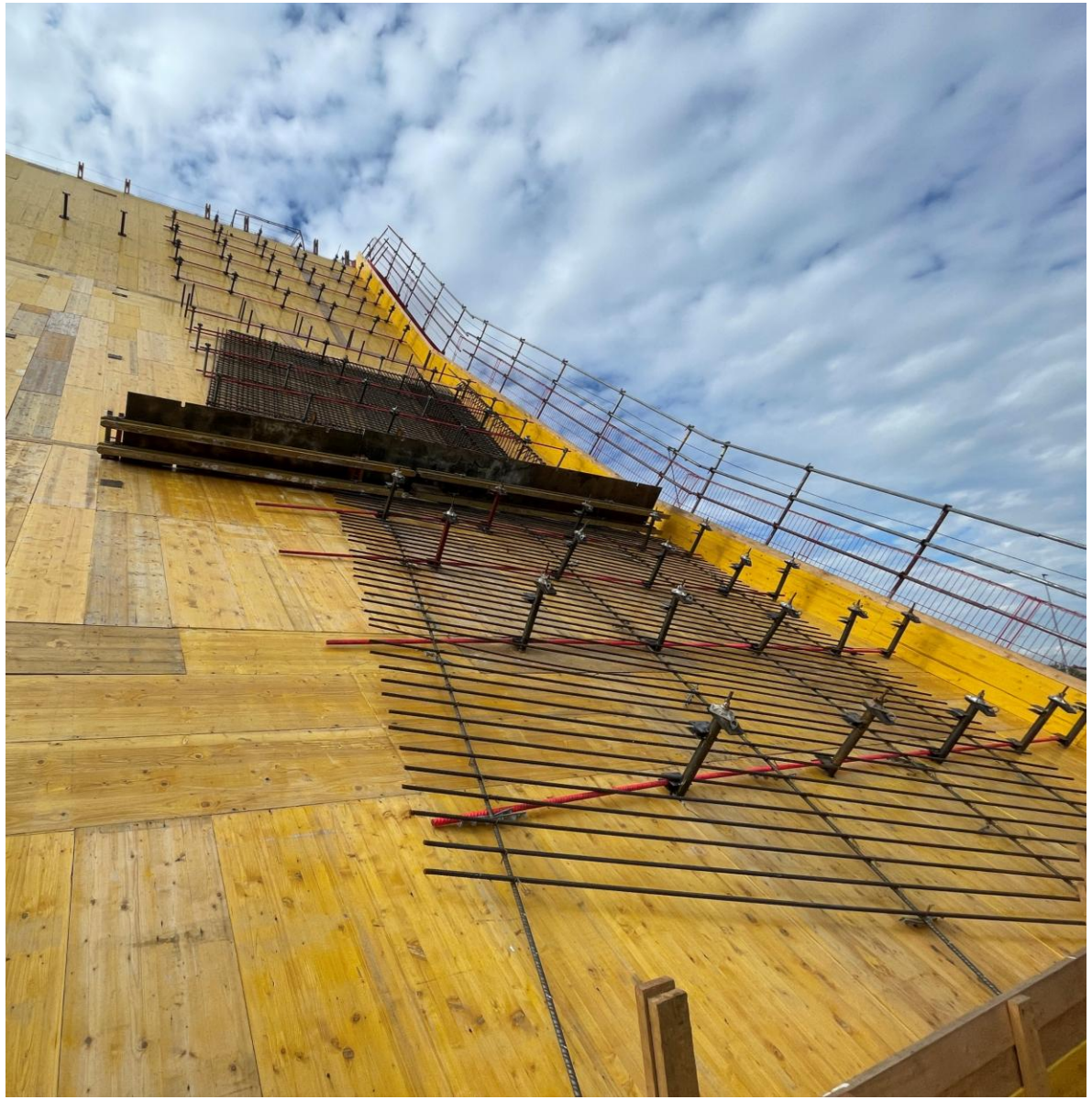
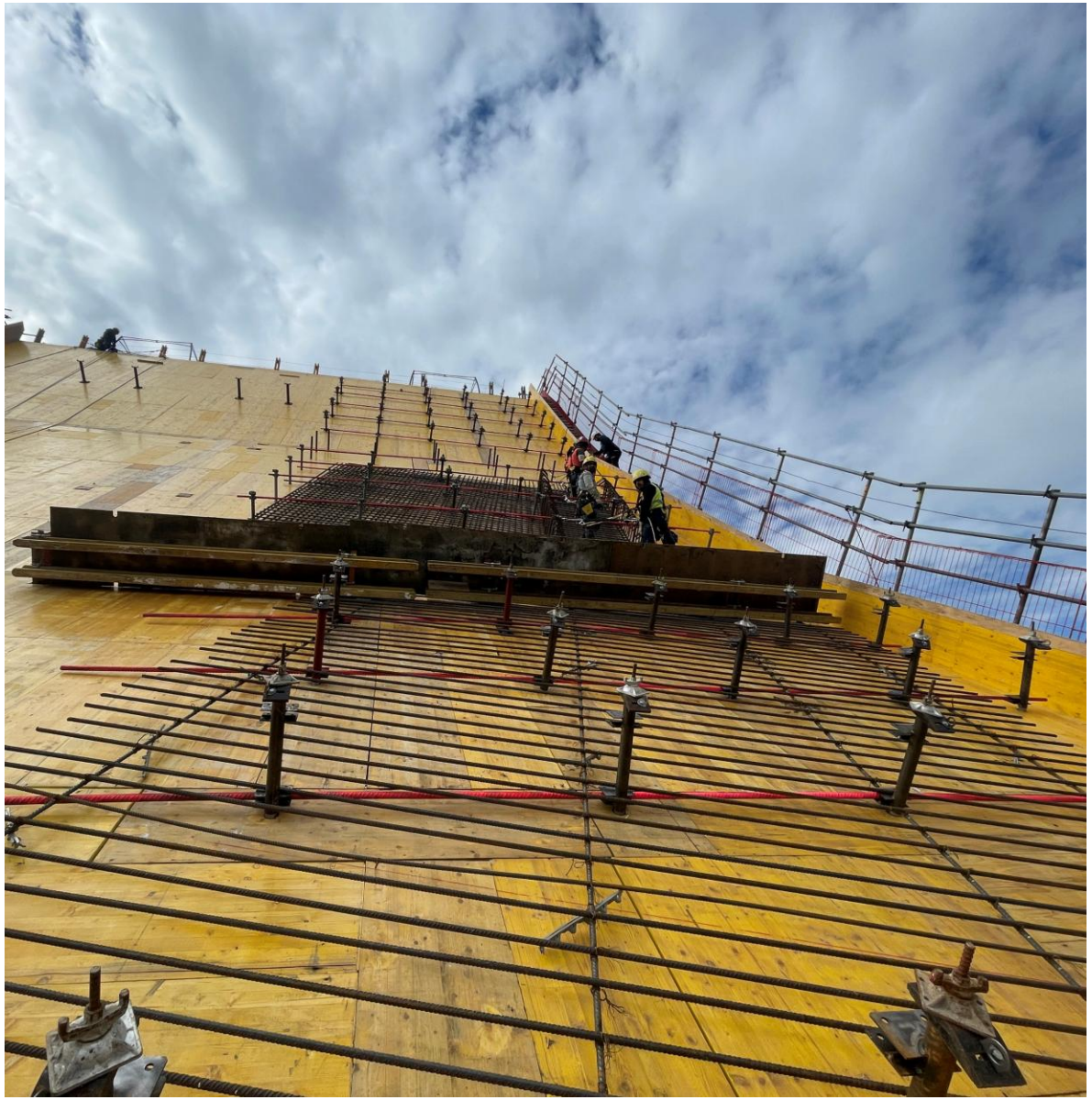
Campo prove





Campo prove





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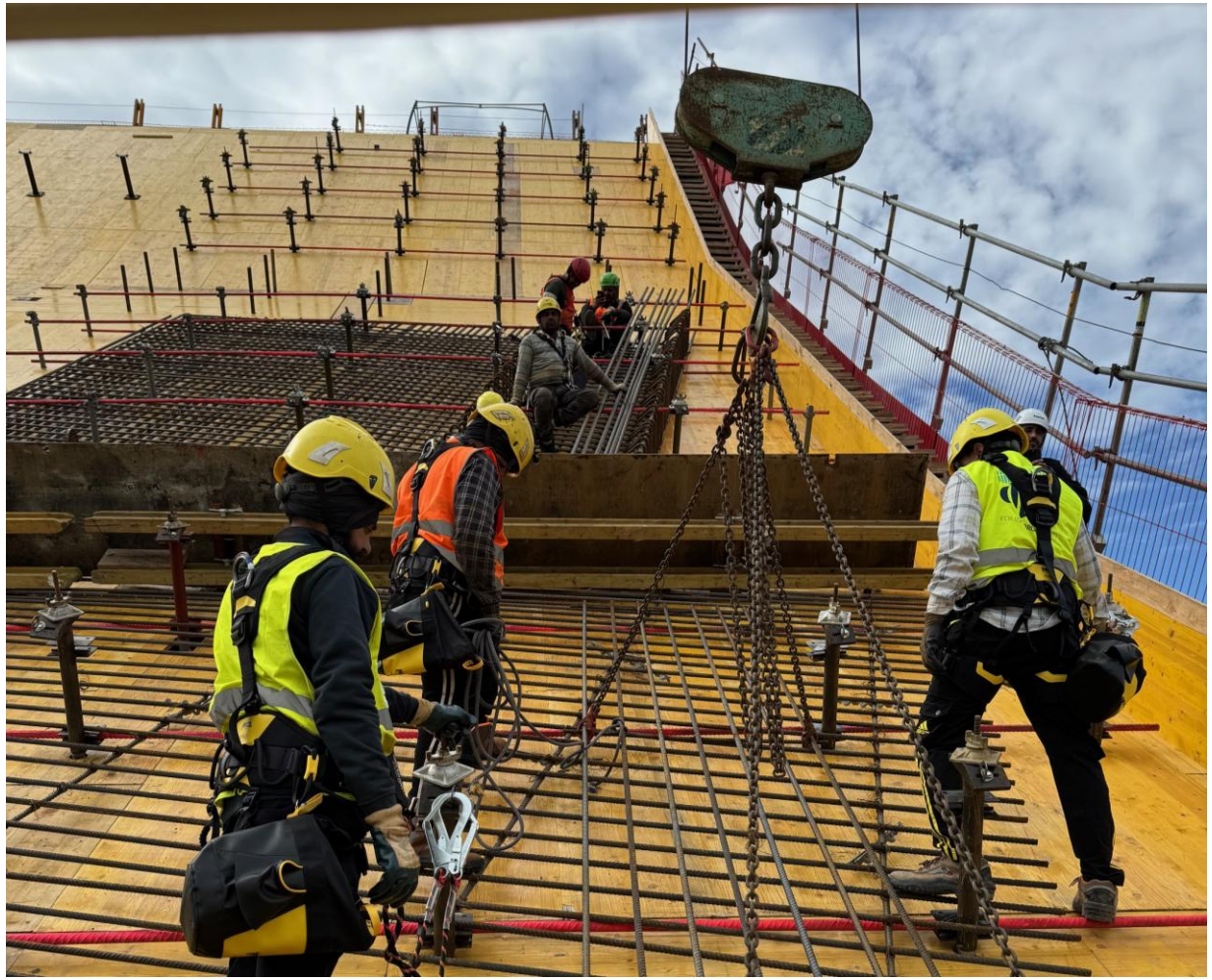
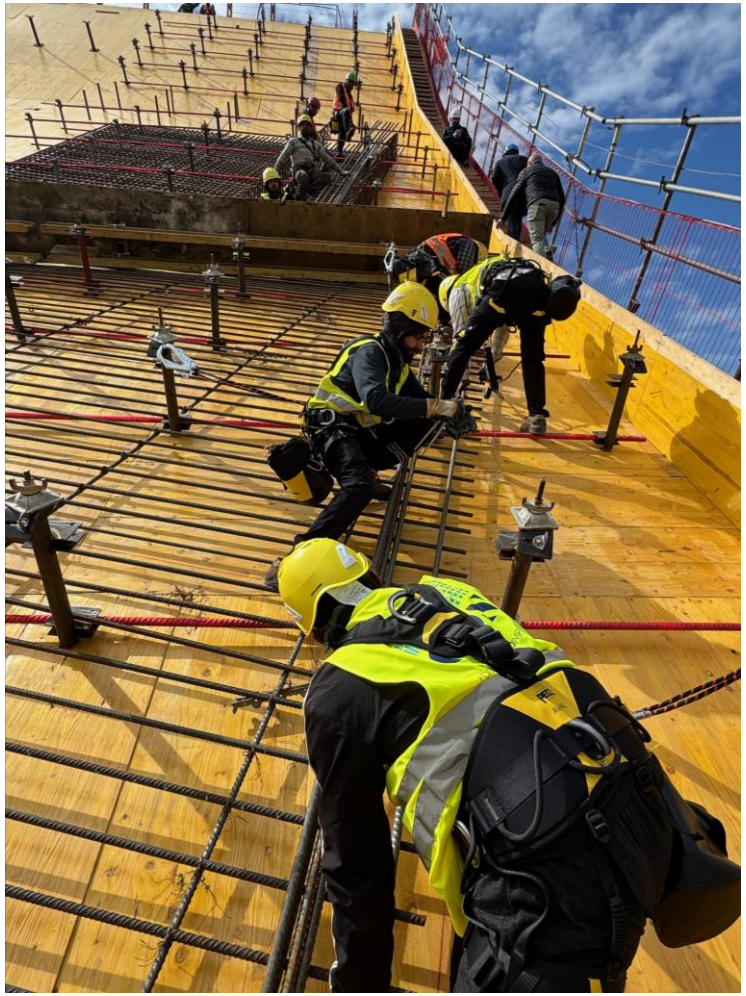
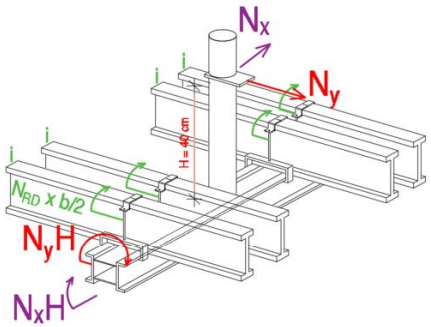
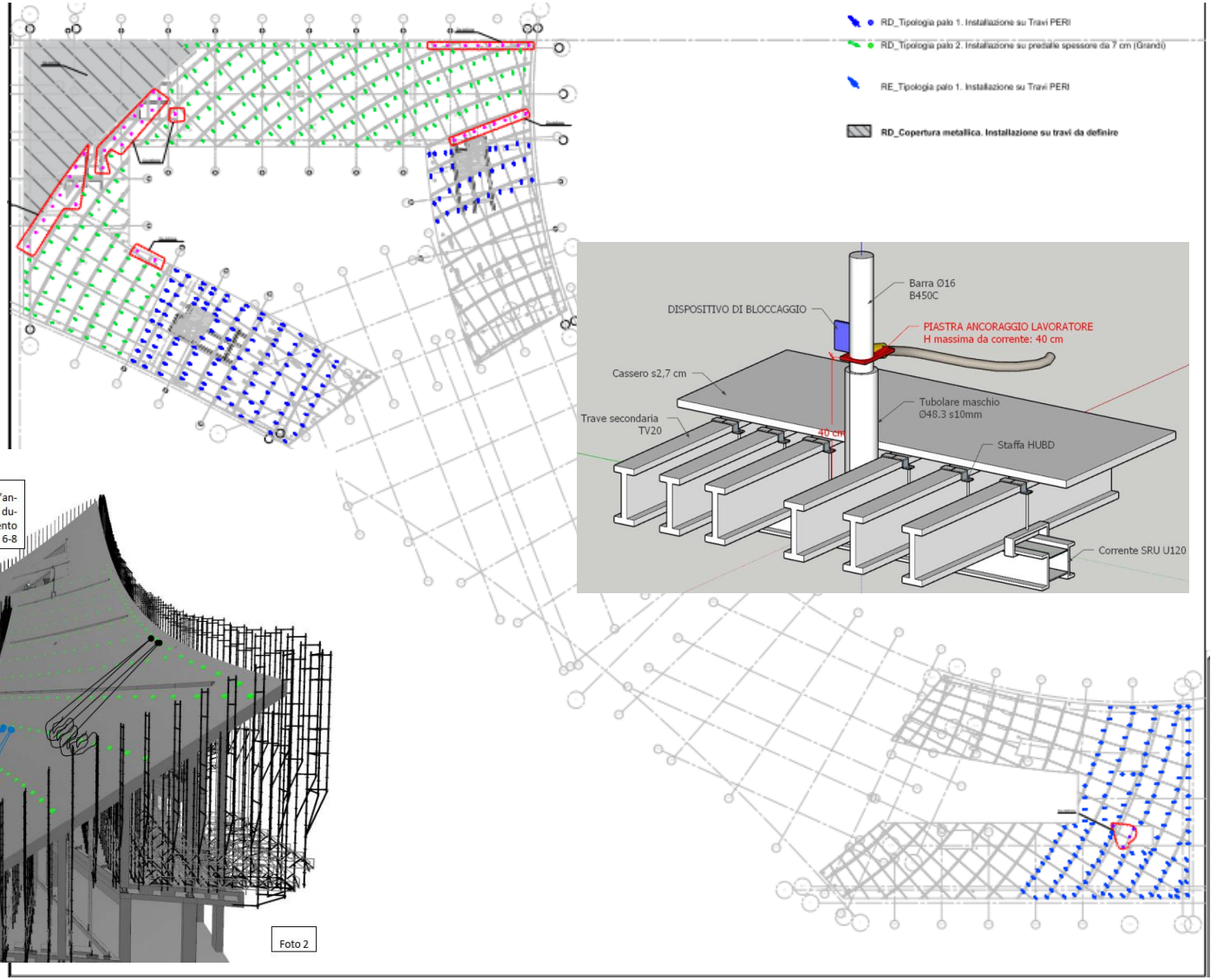
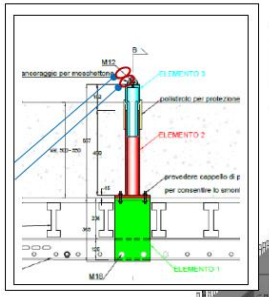




Sistemi di accesso alle coperture in sicurezza







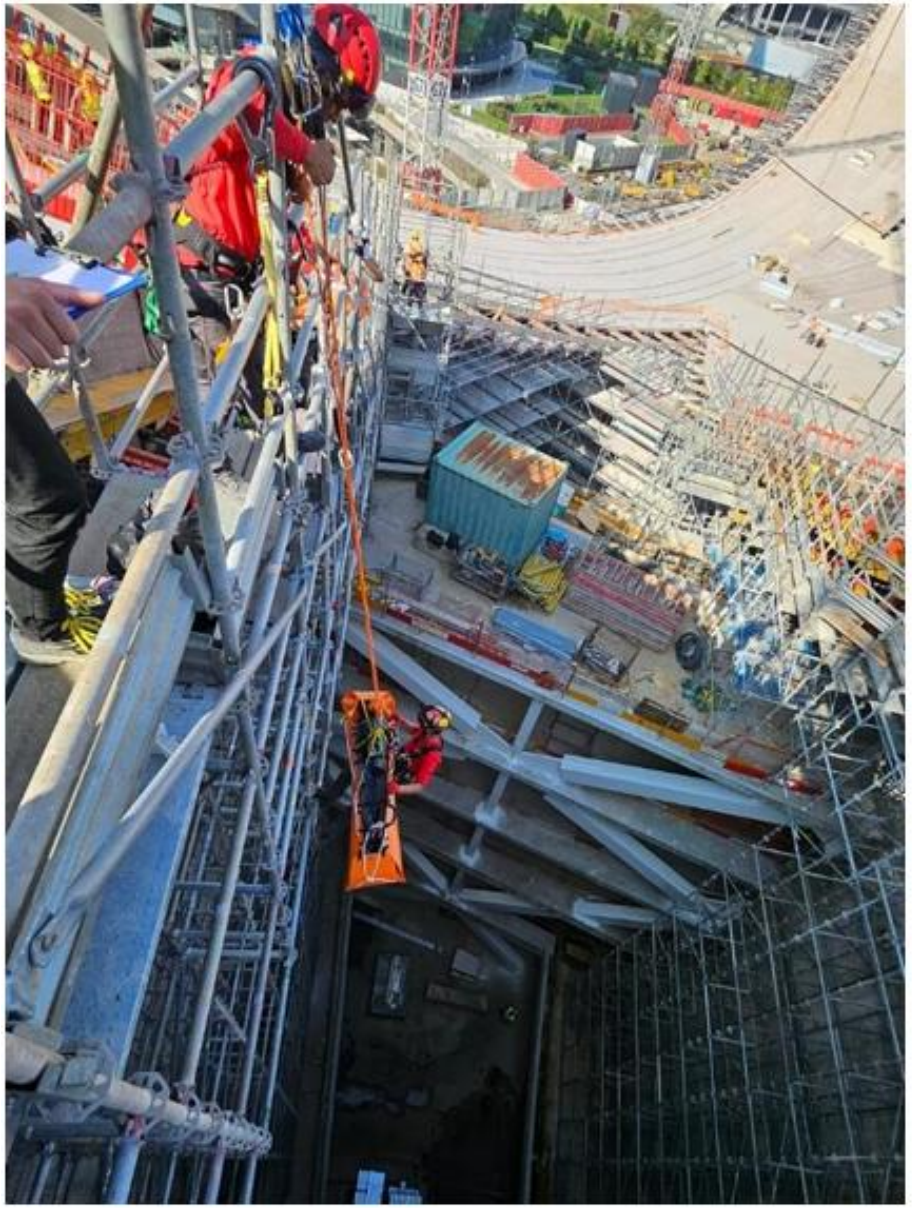
Le Funi EN 1891 A fissate all'ancoraggio verranno arretrate durante le opere di sollevamento e posa dei fasci conteneti 6-8

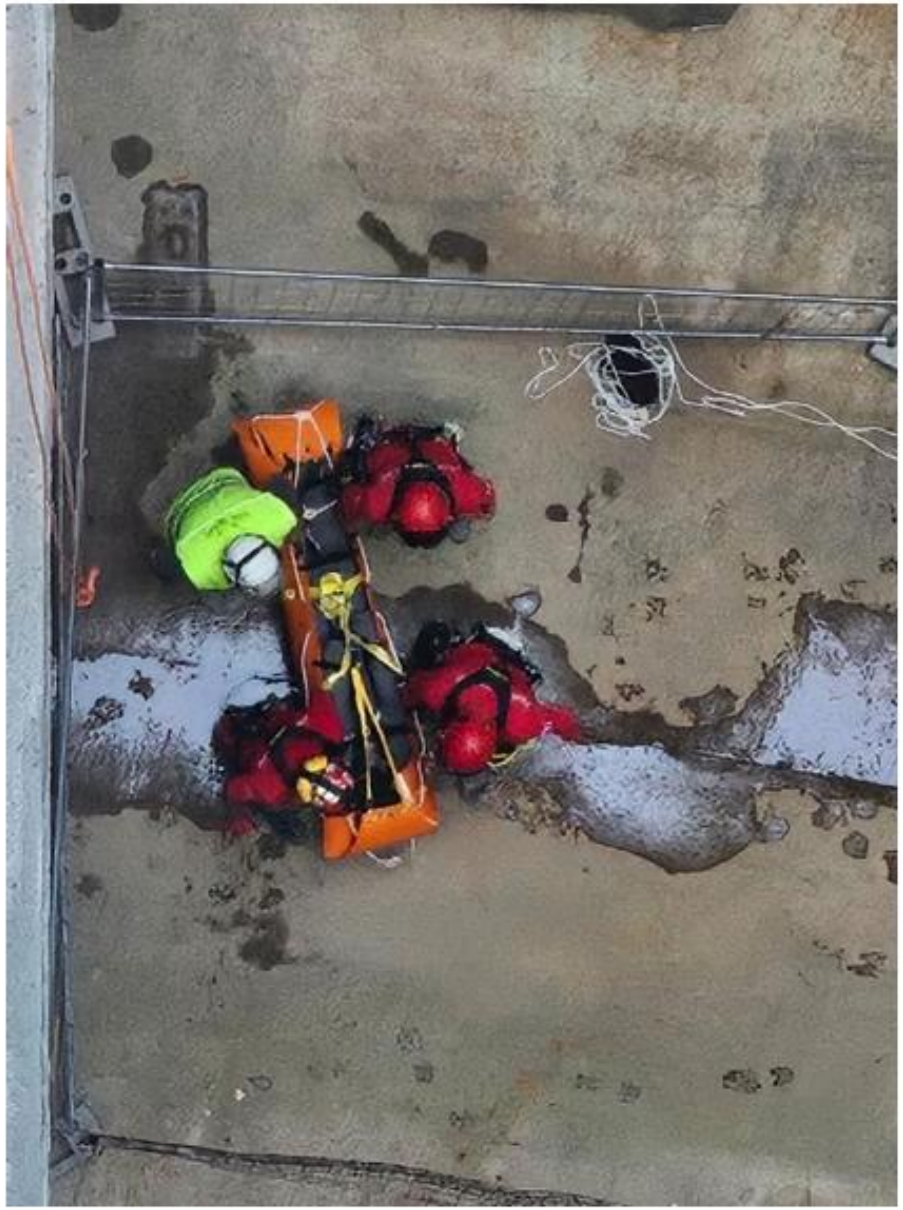
Foto 2

Gestione delle emergenze



Gestione delle emergenze





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