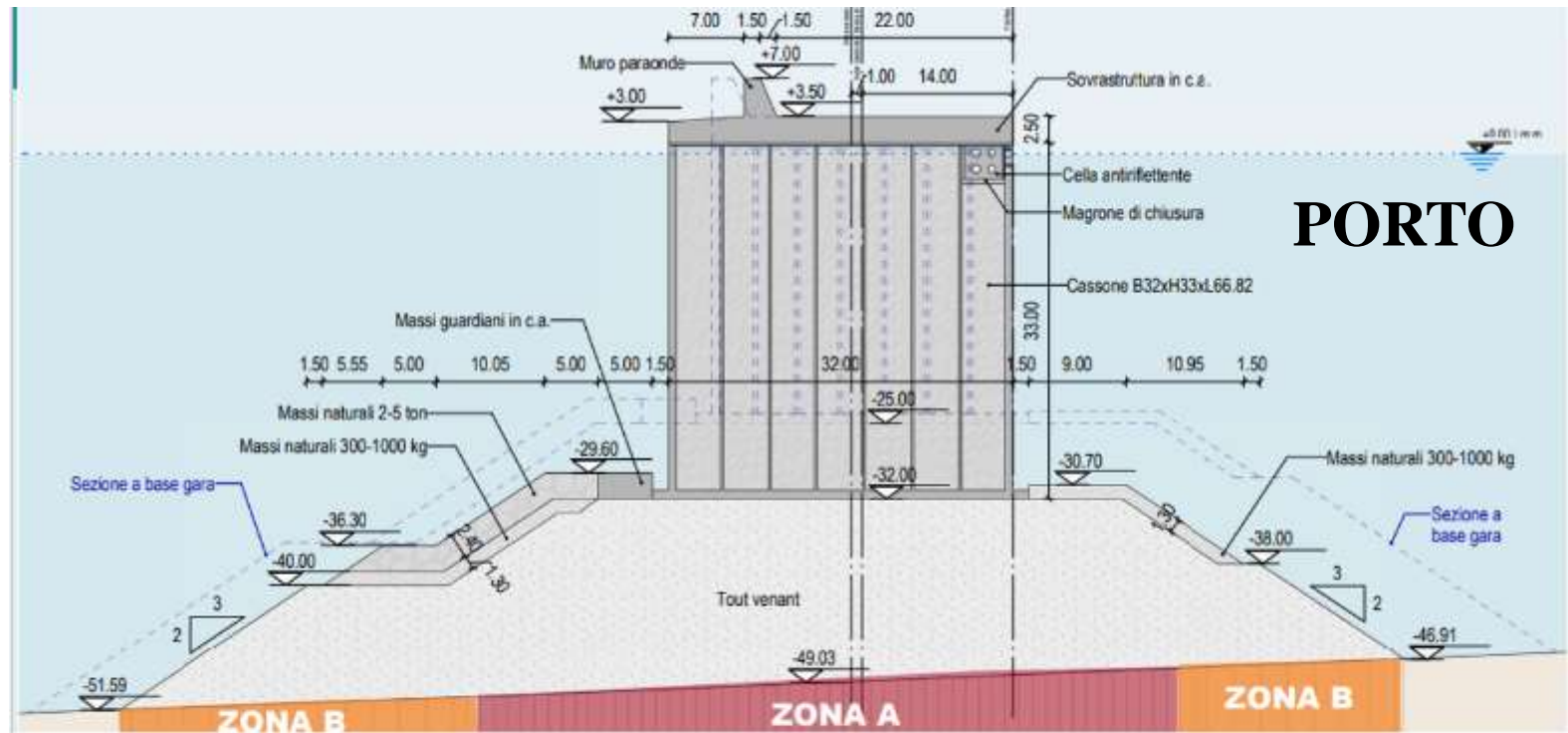


COSTRUZIONI EXTRA LARGE: LA DIGA DI GENOVA E IL PONTE SULLO STRETTO LAMBERTO BRISEGHELLA GIA' UNIPD E IUAV COLLEGIO INGEGNERI VENEZIA 6 OTTOBRE 2023

LA DIGA DI GENOVA



**CONSOLIDAMENTO BLANKET METHOD
70 MILA PALI DI GHIAIA IN ZONA A E B**

1. IL PONTE SULLO STRETTO

LAMBERTO BRISEGHELLA GIA' UNIPD E IUAV

COLLEGIO INGEGNERI VENEZIA, 6 OTTOBRE 2023

LUCE TRA LE TORRI 3300 m

LUNGHEZZA DECK 3660 m

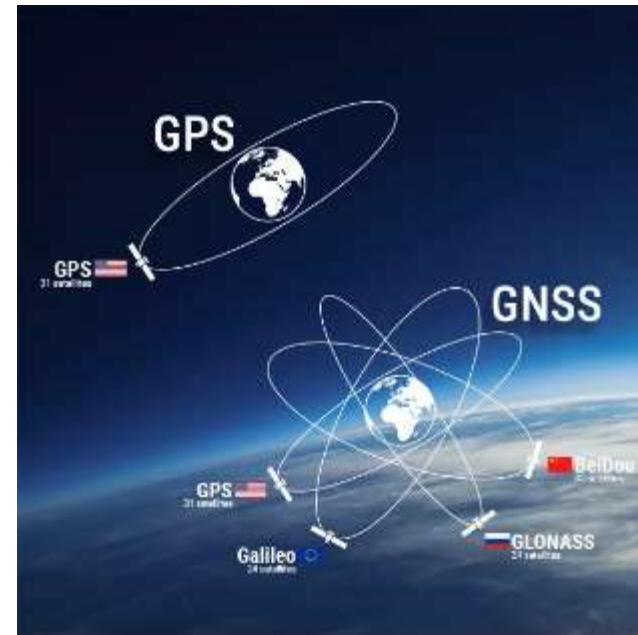
LARGHEZZA DECK 60 m

ALTEZZA TORRI 499 m

LUNGHEZZA CAVO (x DUE)

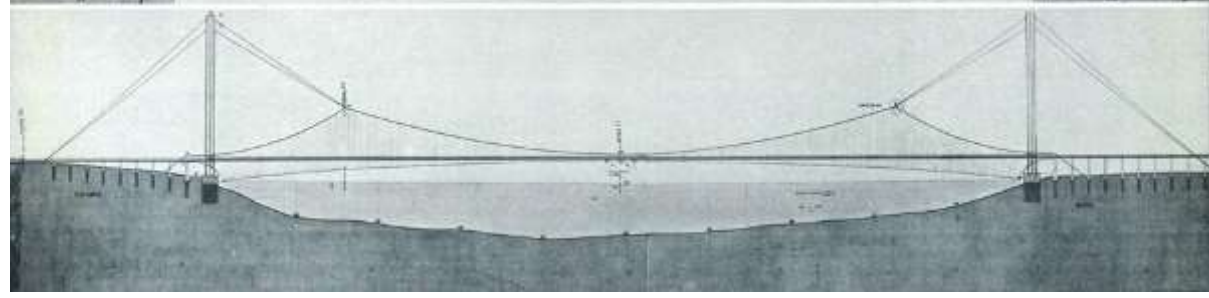
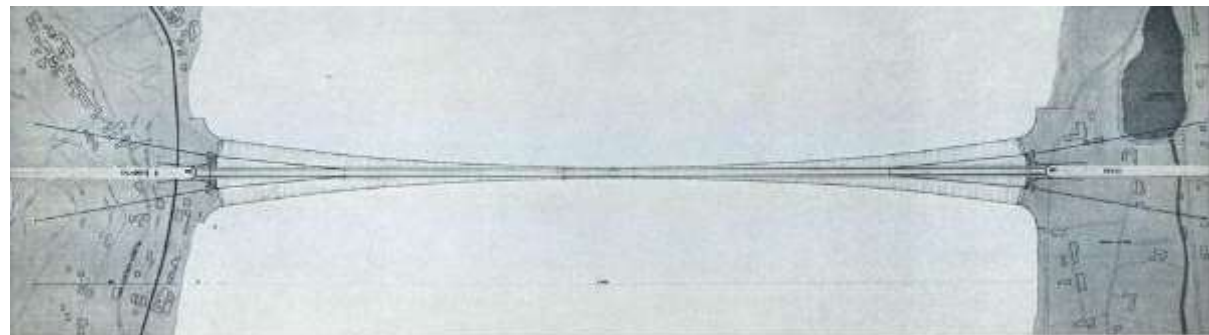
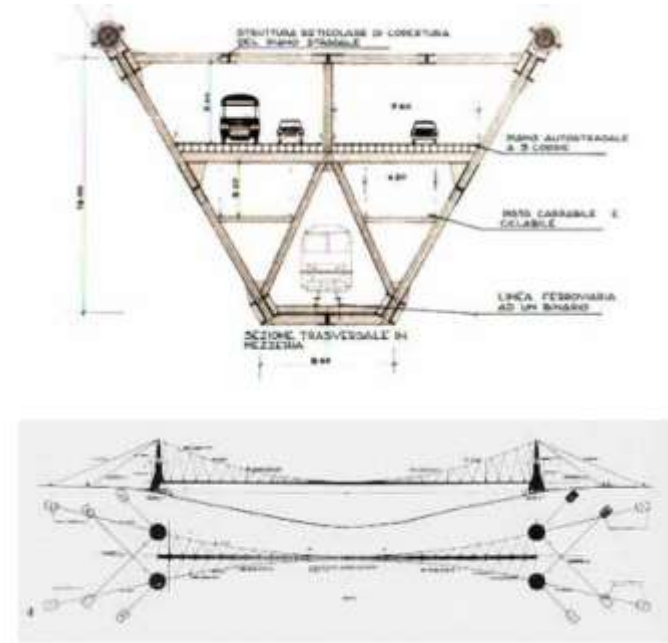
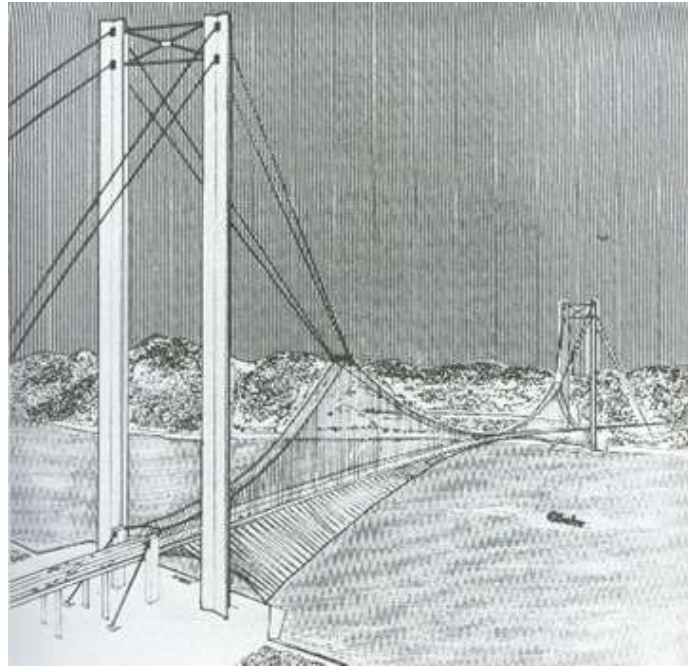
5320 m d 126 cm

44323 fili d 5.7 mm



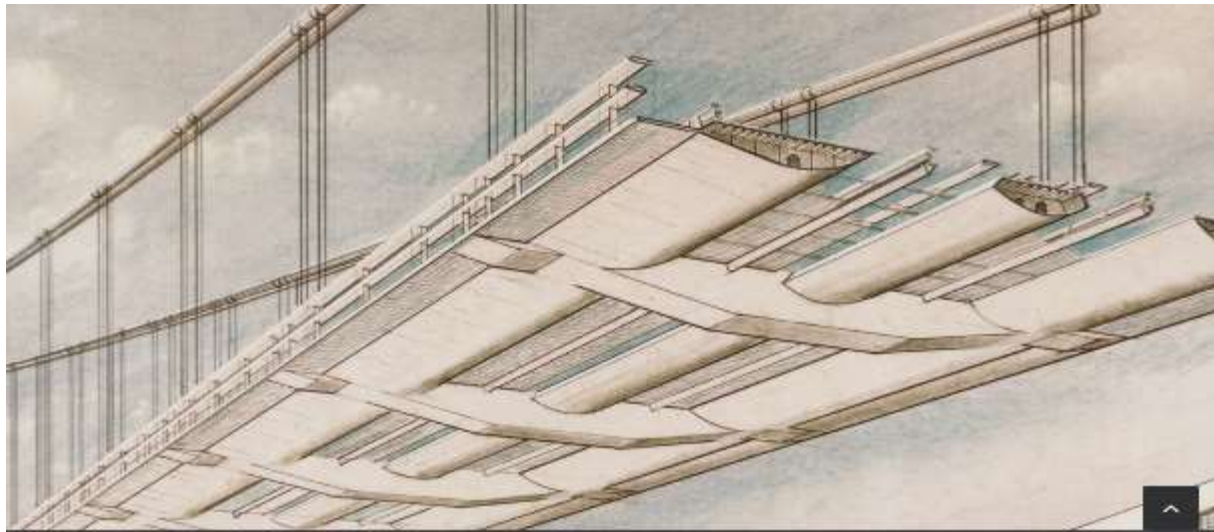
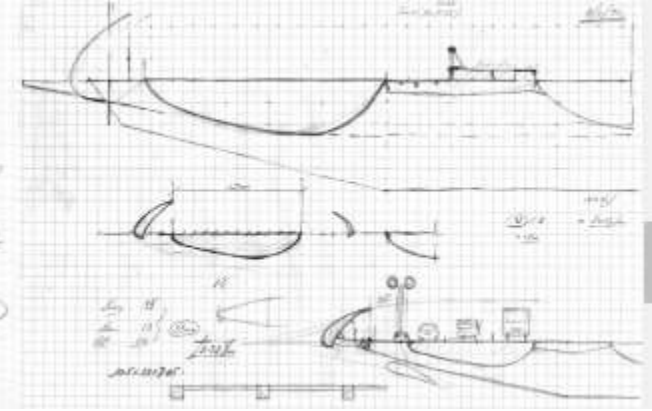
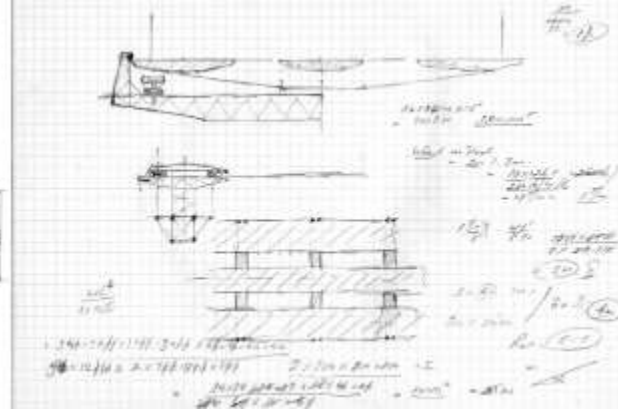
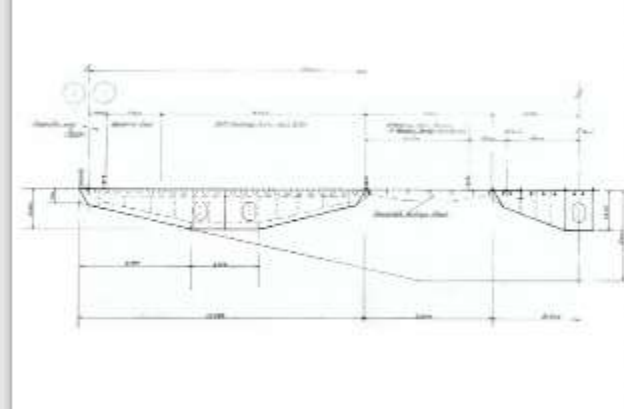
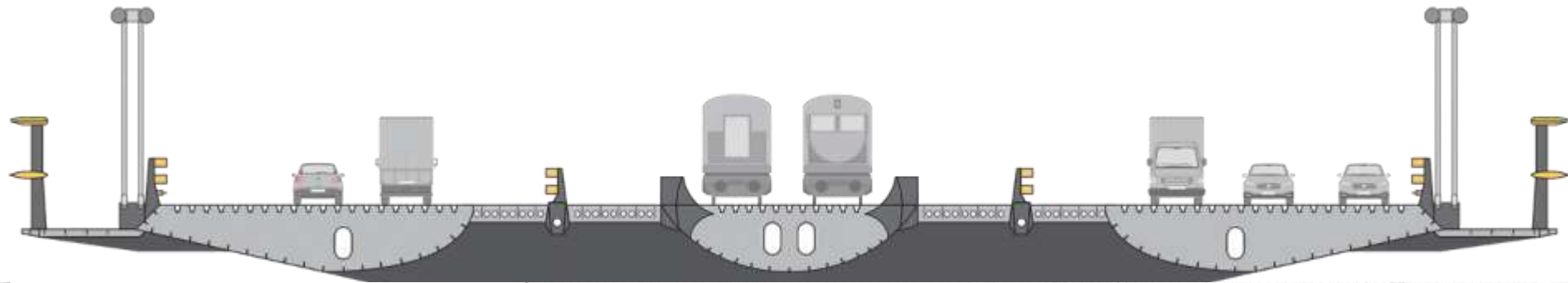
CONCORSO 1970 MUSMECI

NERVI



WILLIAM BILL BROWN 1992

B2





Concessionaria per la progettazione, realizzazione e gestione del collegamento stabile tra la Sicilia e il Continente
Organismo di Diritto pubblico
(Legge n° 1158 del 17 dicembre 1971, modificato dal D.Lgs. n° 114 del 24 aprile 2003)



PONTE SULLO STRETTO DI MESSINA



PROGETTO DEFINITIVO 2011

**2023 LEGGE SOCIETA': MEF, MIT, REGIONI SICILIA
CALABRIA, RFI, ANAS**

**PROGETTO ESECUTIVO 2024
INIZIO LAVORI LUGLIO 2024**

IL PONTE SOSPESO SULLO STRETTO



VISTA DAL BARO DI PUNTA PEZZO

PONTE STRALLATO CABLE-STAYED SU YANGTZE RIVER





BOSPHORUS III 1404 m (2016) ASTALDI HYBRID STRALLATO/SOSPESO





Bridge Engineering

CCCC is the largest bridge design and construction enterprise in the world, with complete design and construction technical systems. It has designed and built the world top 10 stayed-cable bridges, the world top 10 suspension bridges, 6 of the world top 10 arch and canyon bridges, and the world top 10 crossing bridges.

VIVACITA'

INNOVAZIONE

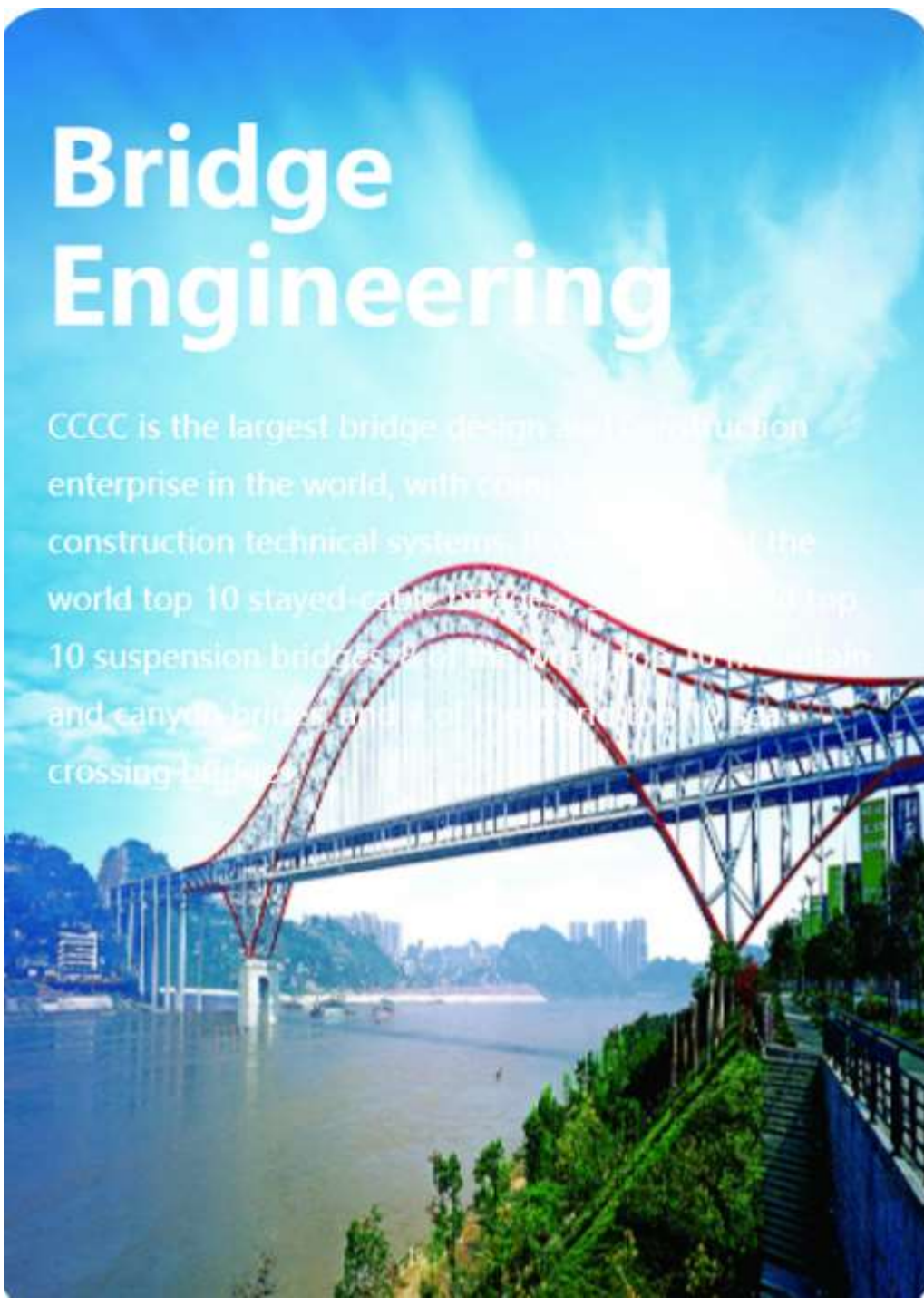
SOSTENIBILITA'

BELLEZZA

SVILUPPO SOCIALE

ECONOMICO

AMBIENTALE

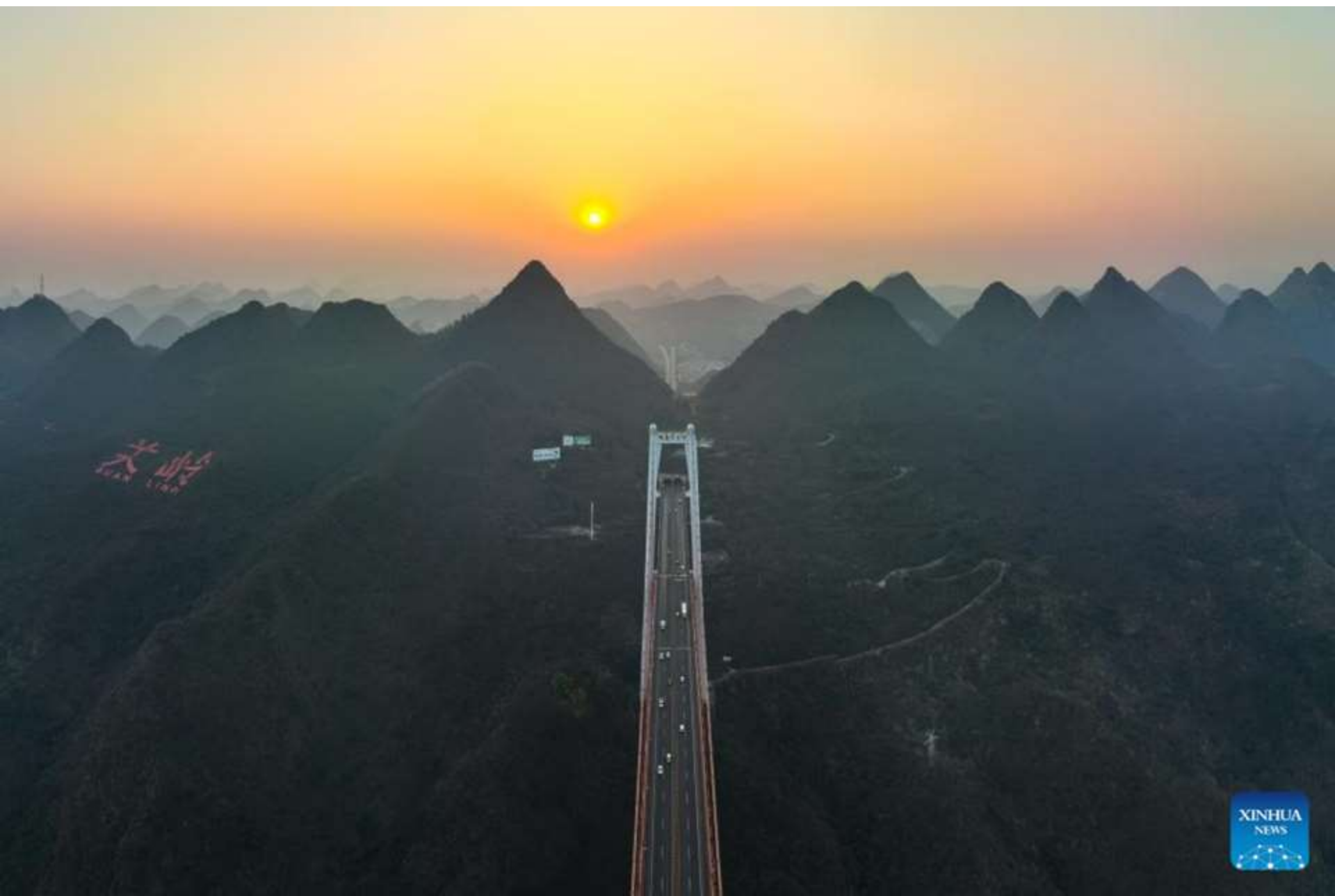






CHONGQING BRIDGE CAPITAL CHINA





SOSPESO STRALLATO IBRIDO

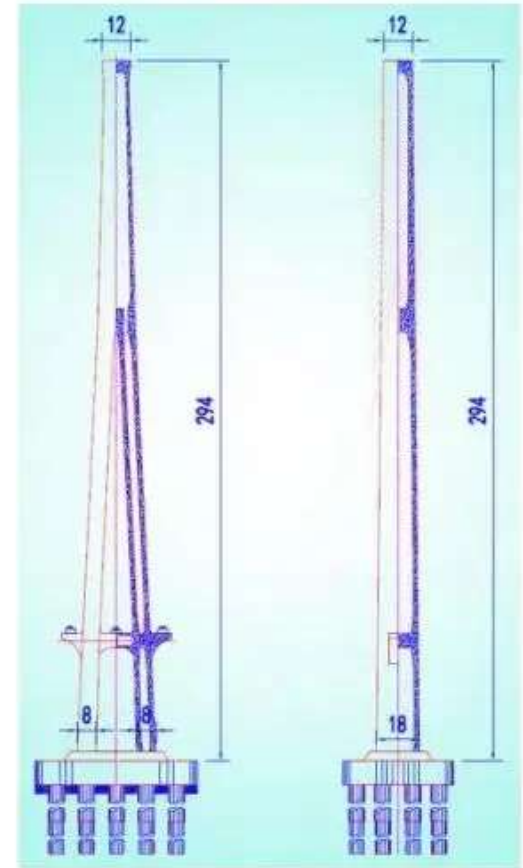
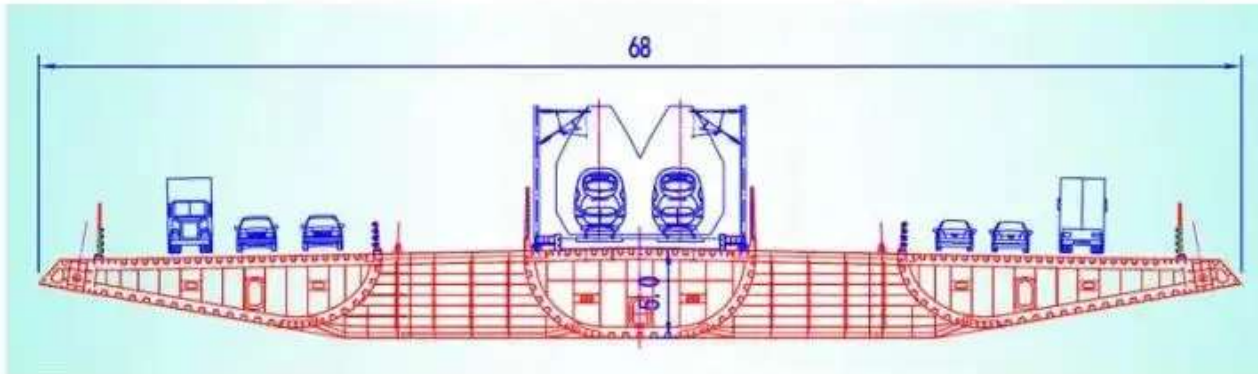


Construction of the Xihoumen railway-highway dual-use bridge, a key project of the Ningbo-Zhoushan Railway, is ongoing in Zhoushan, East China's Zhejiang Province on August 6, 2023. (Photo/Screenshot from website)

CABLE-STAYED SUSPENSION BRIDGE (1488 m) ROADCUMRAIL

- 主梁：分离式钢箱梁，梁宽68m，梁高5m。
- 主塔：为钢筋混凝土结构，塔身采用C60混凝土，A型塔，塔高294m。

XIHOUMEN BRIDGE 68m



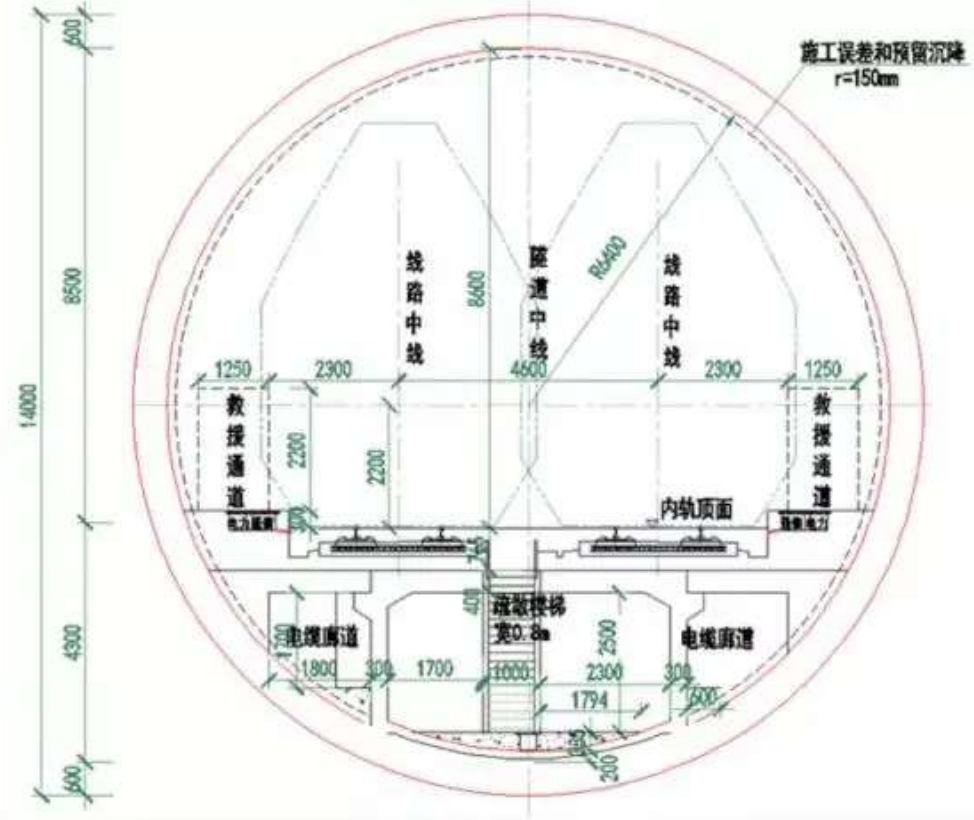
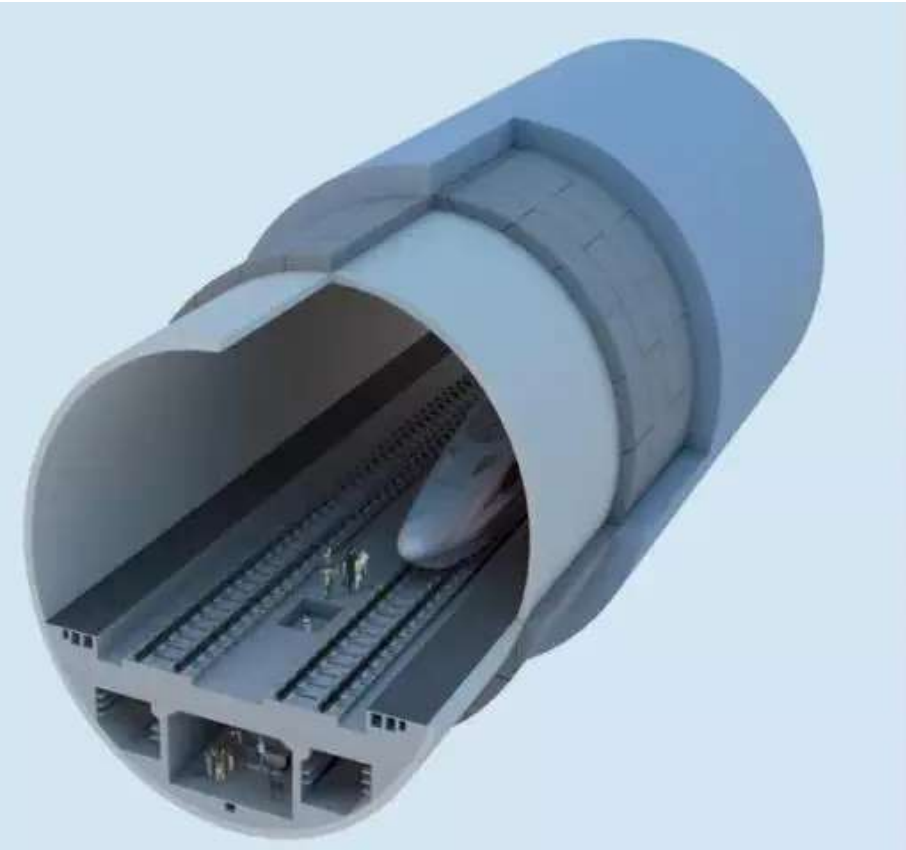
PIATTAFORMA X PALI



FINO A -60 m

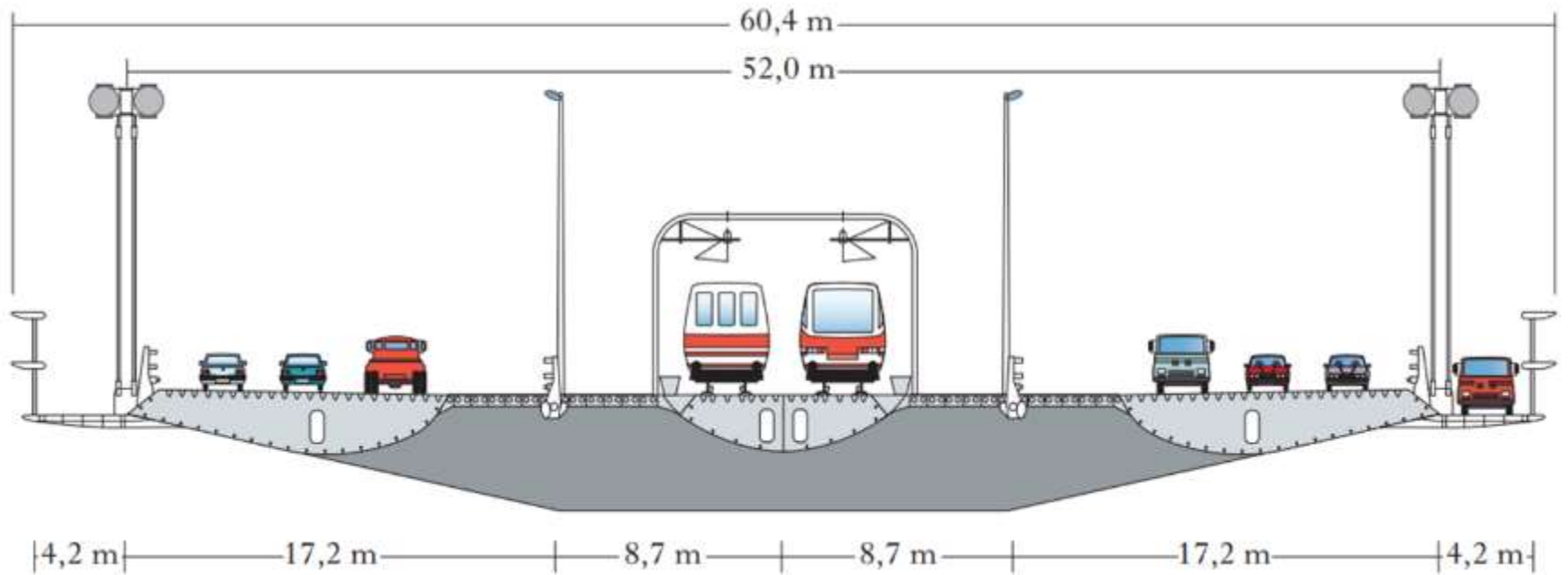
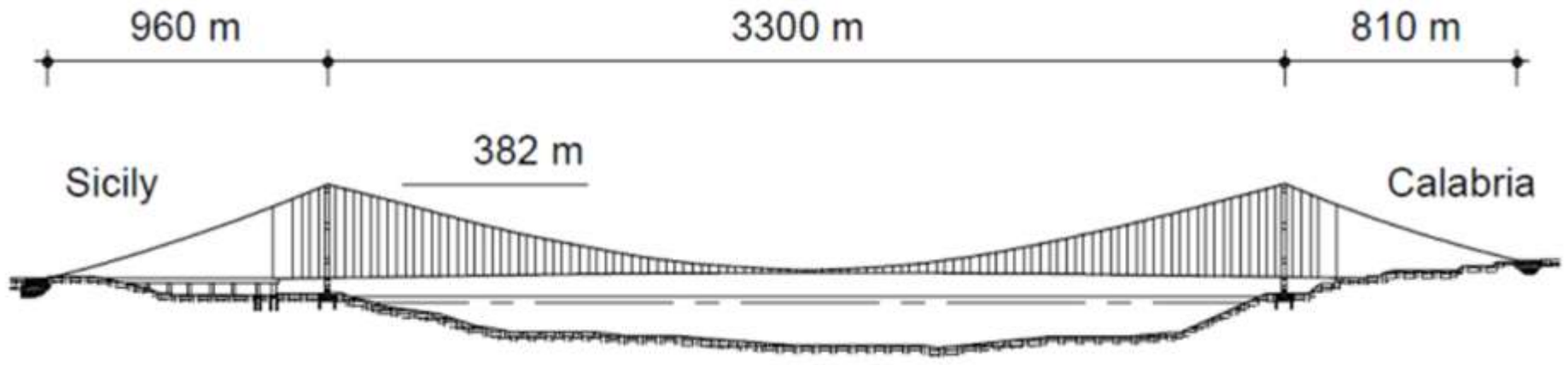


JINGTANG SUBMARINE TUNNEL L. 16.64 km



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- 1. INTRODUZIONE**
- 2. SOTTOSTRUTTURA FONDAZIONI ANCORAGGI**
- 3. TORRI**
- 4. CATWALK SKY LADDER VIA DEL GATTO**
- 5. CAVO PRINCIPALE**
- 6. PENDINI HANGERS**
- 7. DECK**
- 8. MONTAGGIO DECK**
- 9. STABILITA' VENTO MODELLI**
- 10. SISMA**
- 11. ARTICOLAZIONI DAMPERS GIUNTI**
- 12. MANUTENZIONE BRIM CORROSIONE**





1915 CANAKKALE' BRIDGE L 2023 m IN ESERCIZIO







LINGDINGYANG L 1666 m IN APERTURA



LINGDINGYANG BRIDGE UNDER CONSTRUCTION







ZHANGJINGGAO YANGTZE RIVER IN COSTRUZIONE

1220-2300-660 m

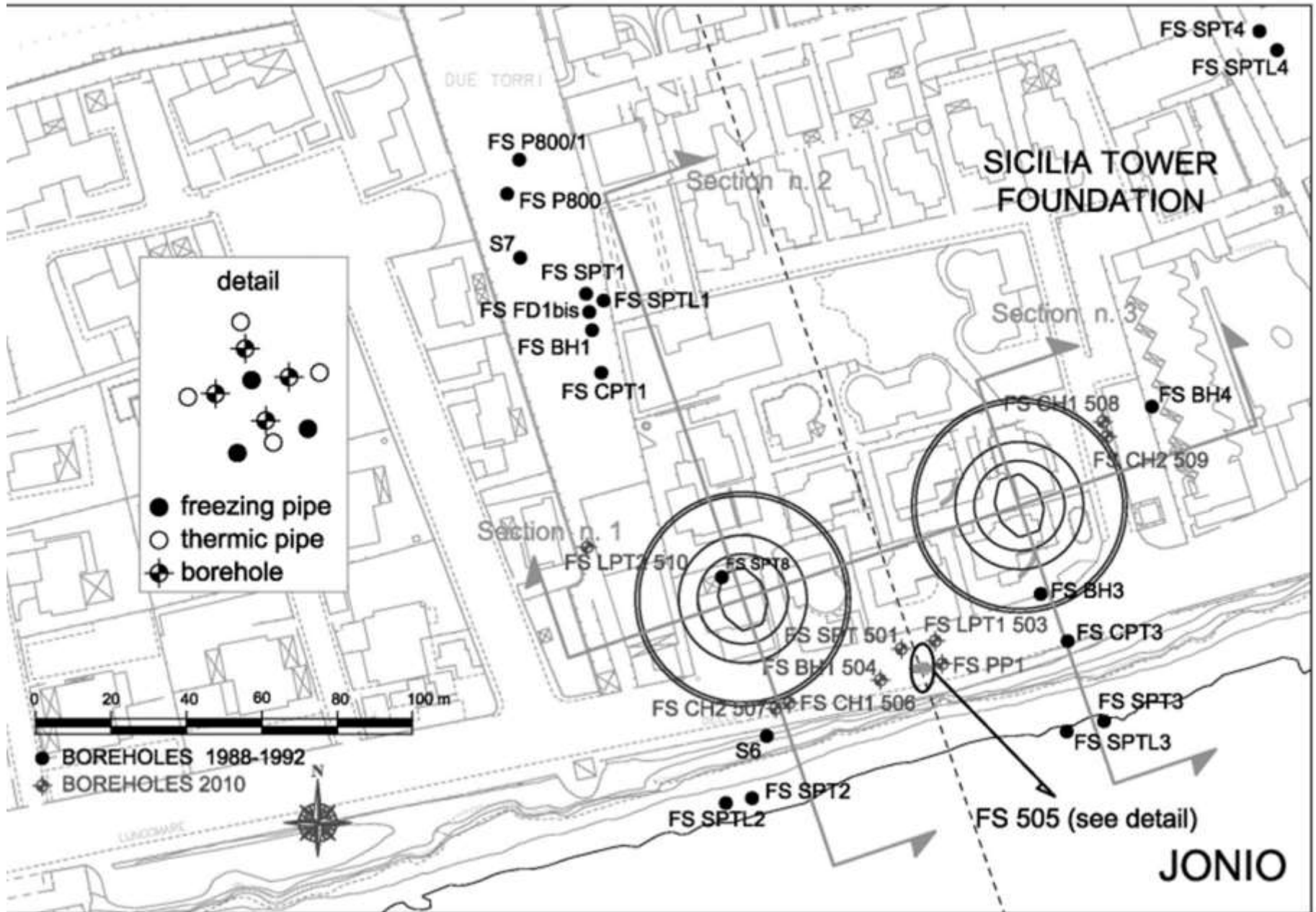




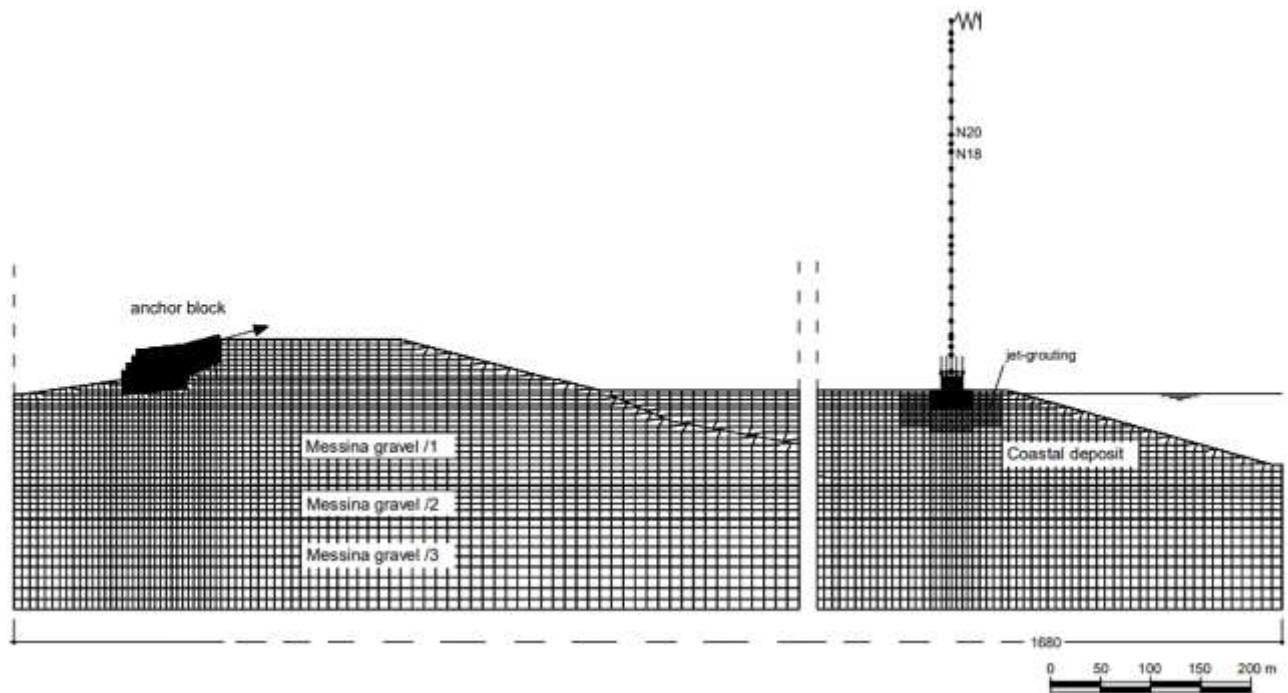
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2. SOTTOSTRUTTURA

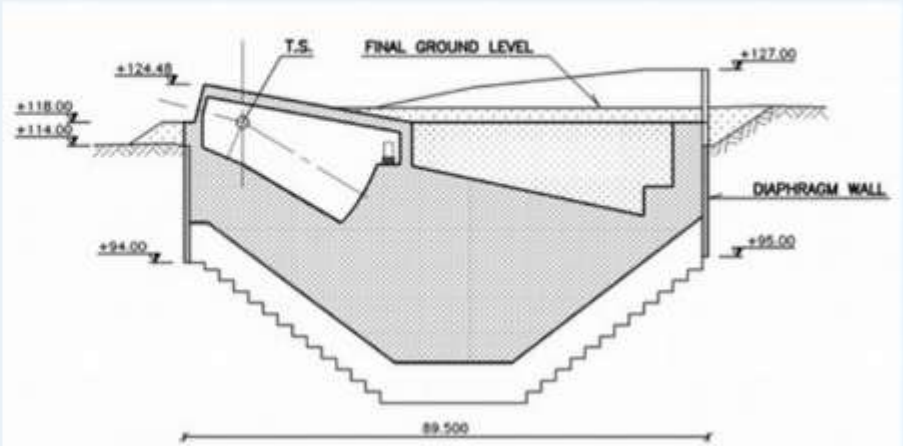
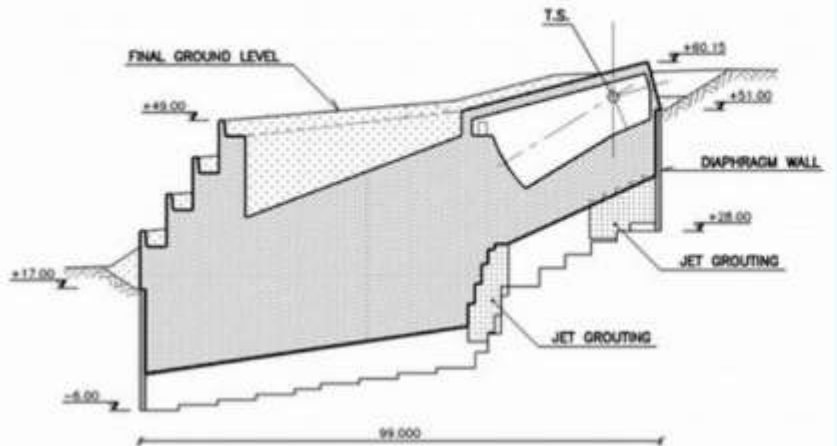


SOTTOSTRUTTURA FONDAZIONE ANCORAGGI



CLS SICILIA 315.000 m3

CALABRIA 220.000 m3



ANCORAGGIO SICILIA





CCTV 10

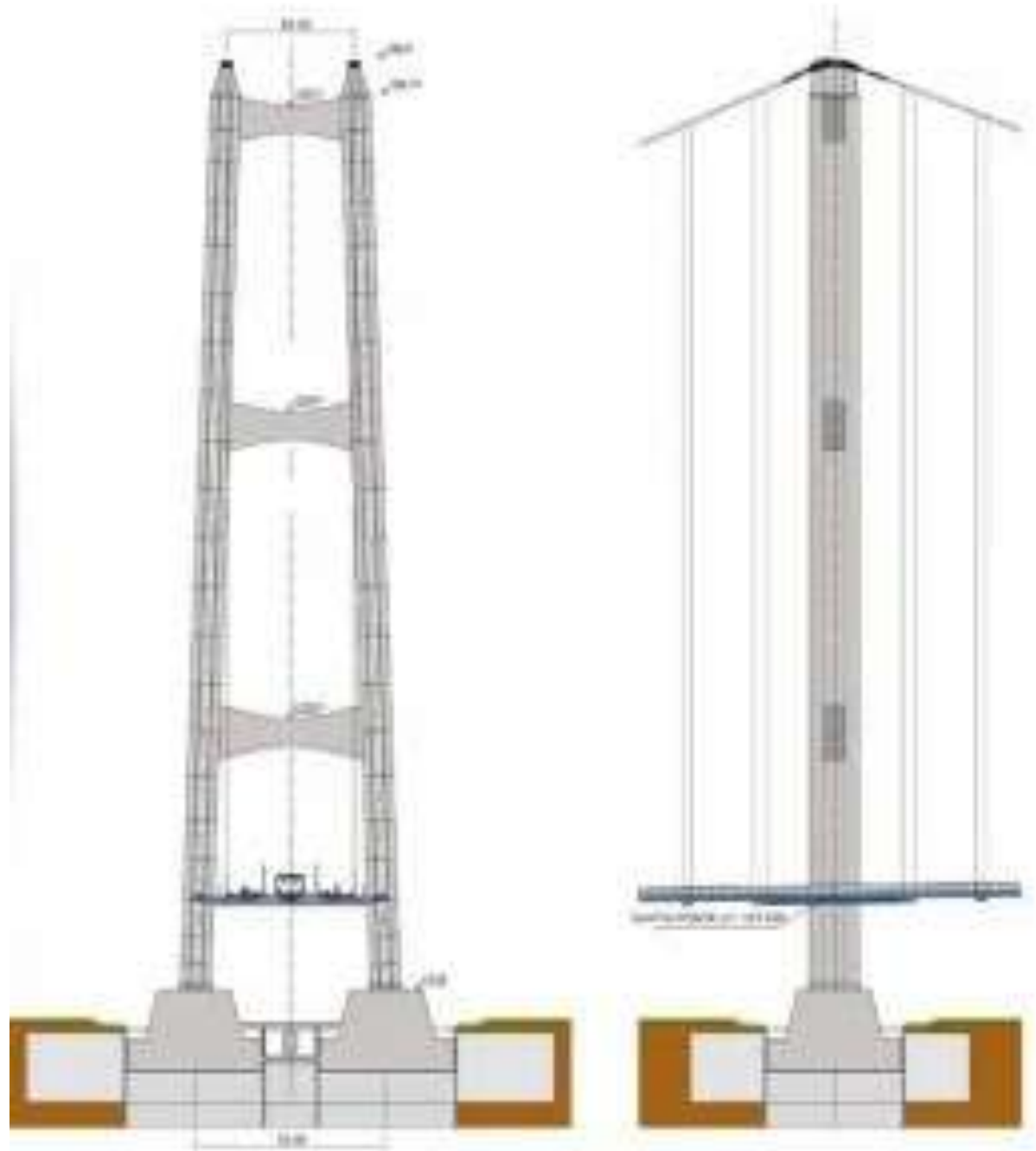
科技

走近科学
CCTV.com

杨泗港长江大桥

其所用钢丝长度可绕地球3圈半

3. TORRI



TORRI SDM

ALTEZZA 499m

FORMA RETTANGOLARE SMUSSATA

LASTRA ORTOTROPA CON STIFFNERS E DIAFRAMMI

COLLEGAMENTI

ORIZZONTALI SALDATI VERTICALI BULLONATI

SFORZO NORMALE DAL PESO PROPRIO PONTE TRAMITE CAVO

MOMENTO LONGITUDINALE DA TRAFFICO E SISMA

MOMENTO TRASVERSALE DA VENTO E SISMA

DEUMIDIFICAZIONE

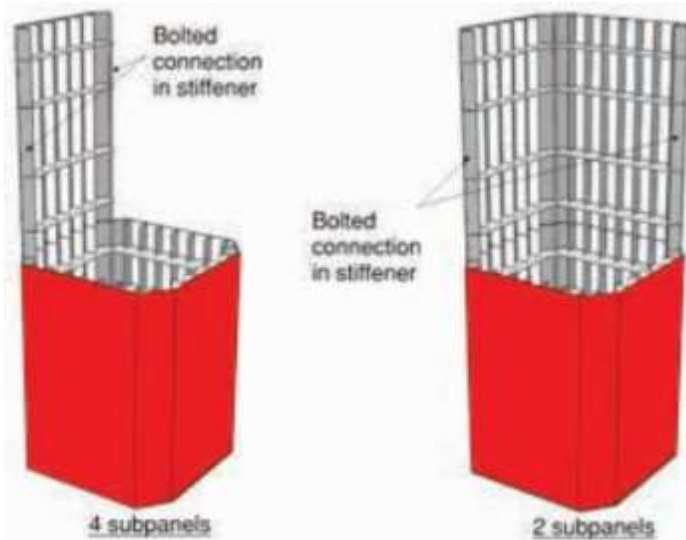


Figure 5: Division of blocks in two or four subpanels and bolted panel connection

SÜ

AKL



1915CANAKKALE BRIDGE TORRI



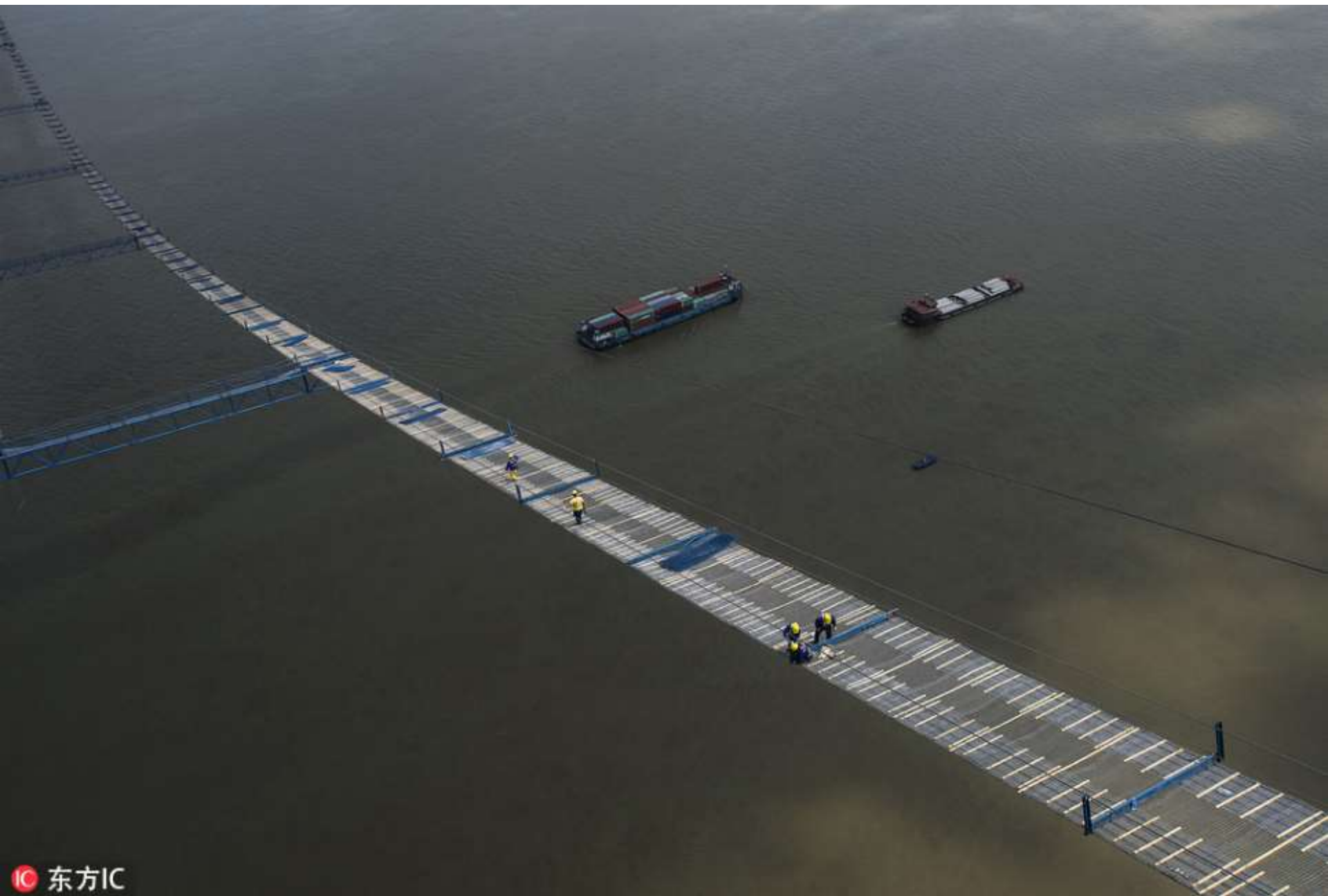
SELLA



4. CATWALK SKY LADDER VIA DEL GATTO

















gettyimages®
Credit: VCG

962797978

IZMIT BRIDGE 21 MARZO 2015 CROLLO GATTO OSMAN GAZI





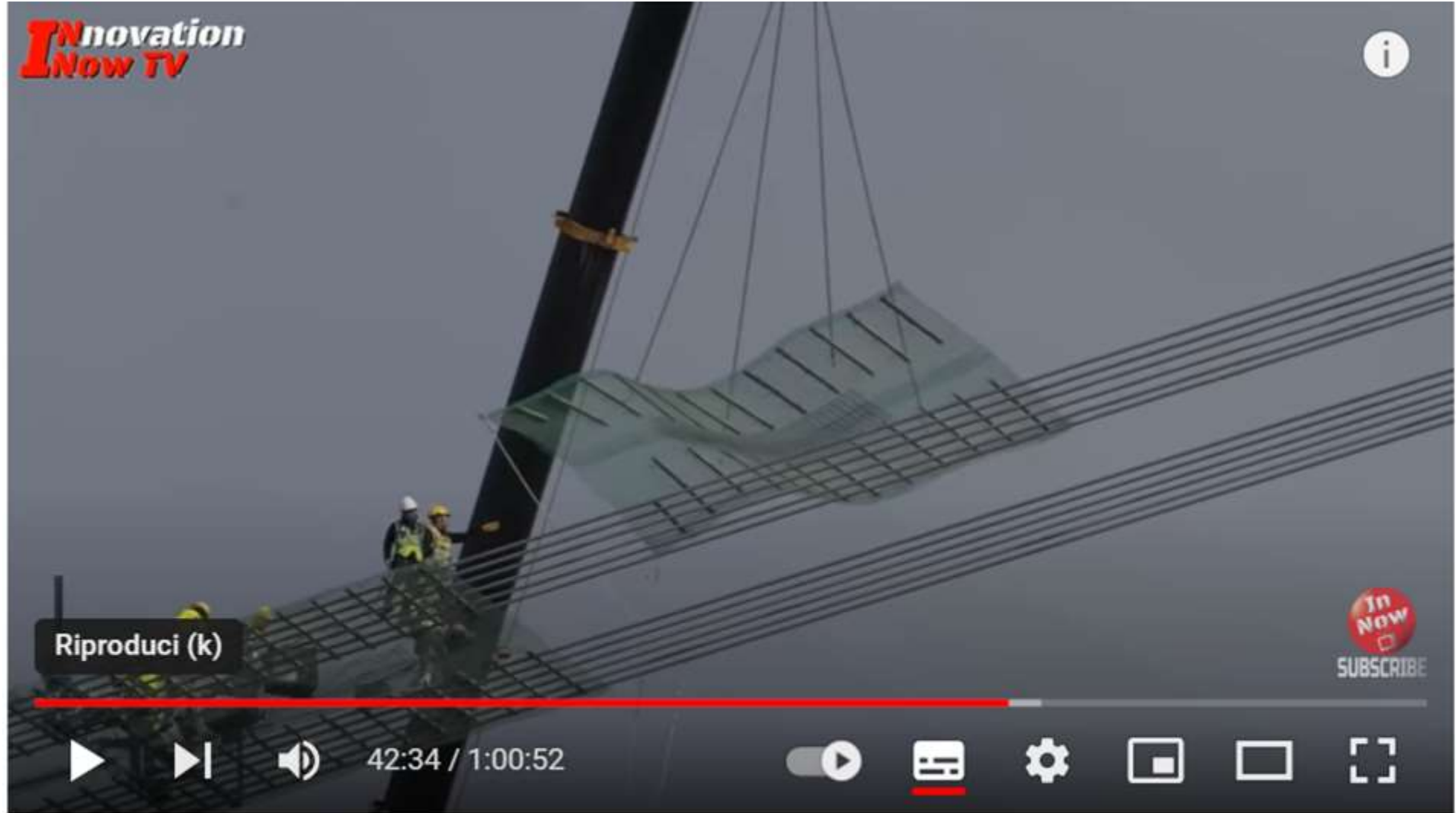


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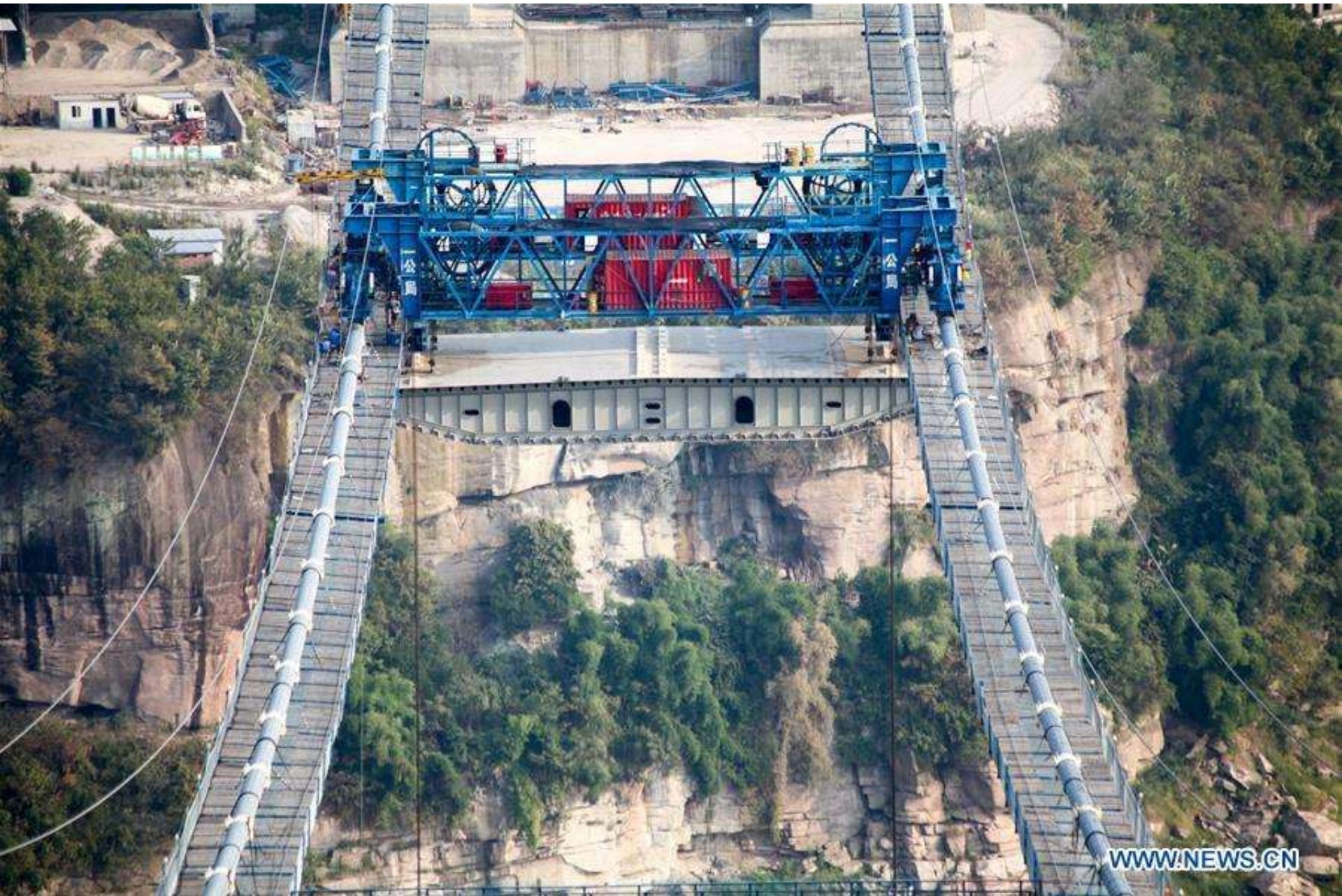
Modalità cinema (t)







LONGTAN GUANXI YANGTZE RIVER BRIDGE



GUOJIATUO YANGTZE RIVER BRIDGE CHONGQING





视觉中国







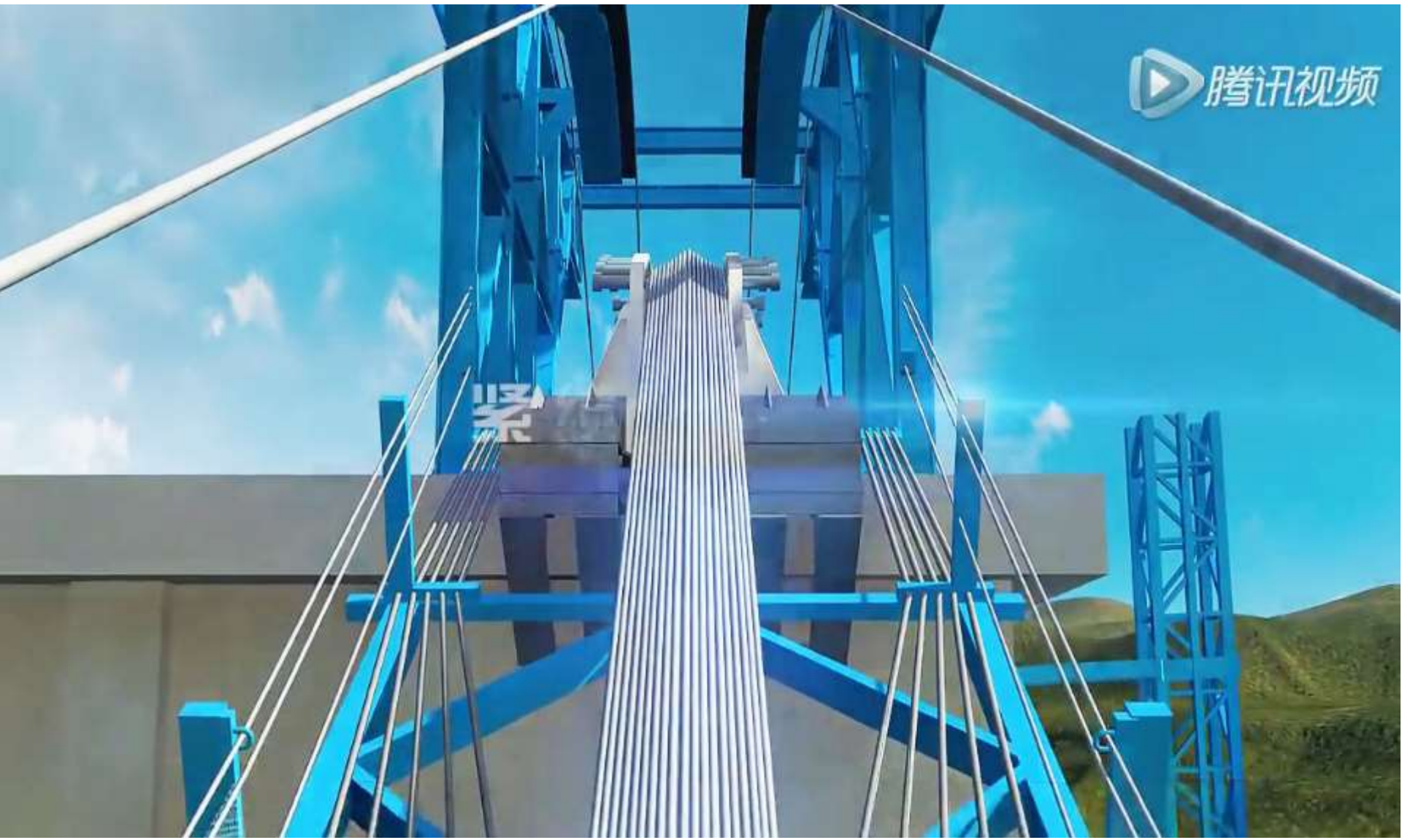
LONGTAN CHINA BRIDGE CATWALK





037

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A person is walking across a narrow wooden plank bridge. The bridge is supported by a metal railing on the left. To the right of the bridge is a red safety net. The person is wearing black pants and white sneakers. The background shows a blurred view of the bridge's structure and the surrounding environment.

CGTN

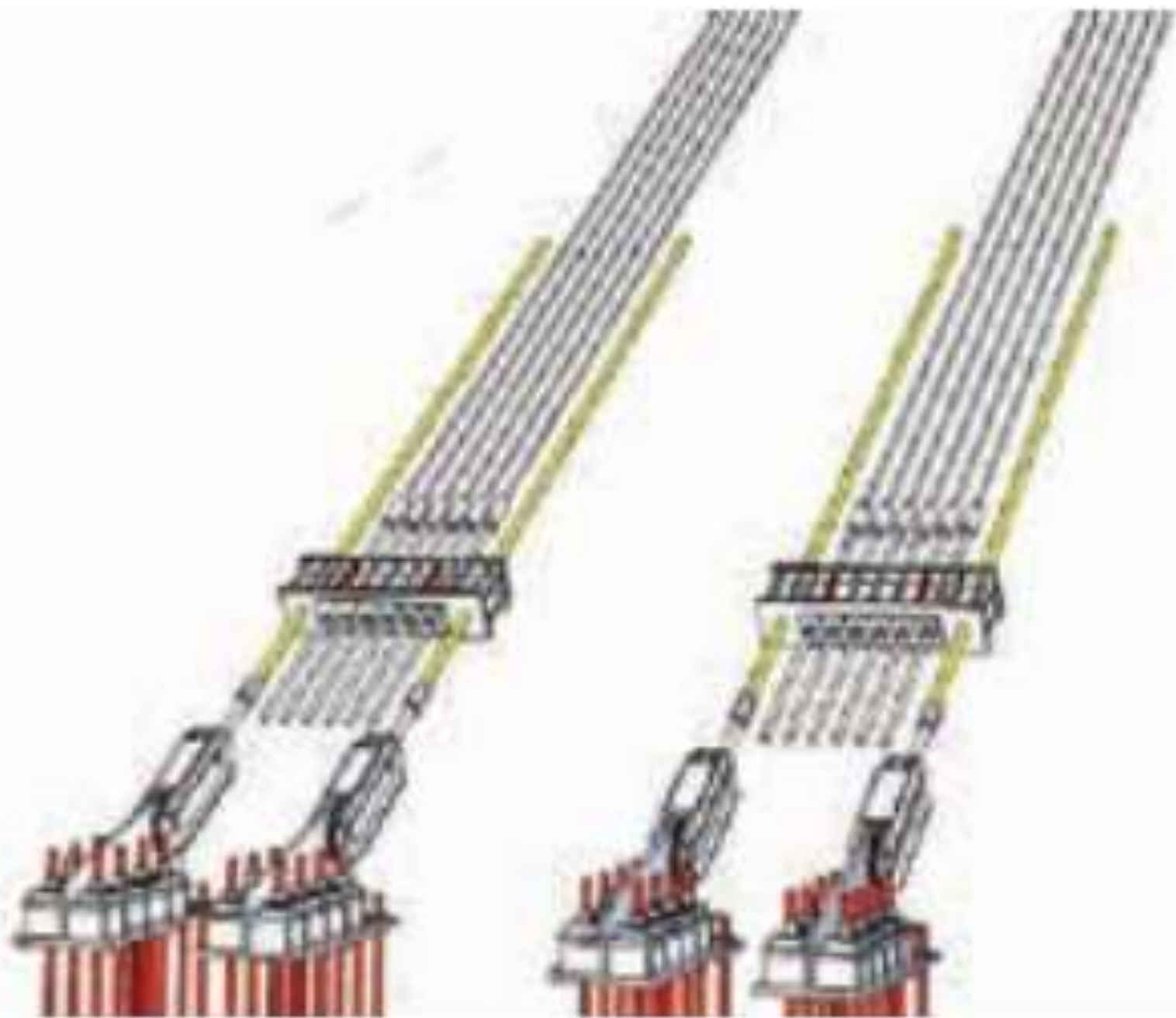
that is more than 200 meters high and 900 meters long, with a 30-degree slope.

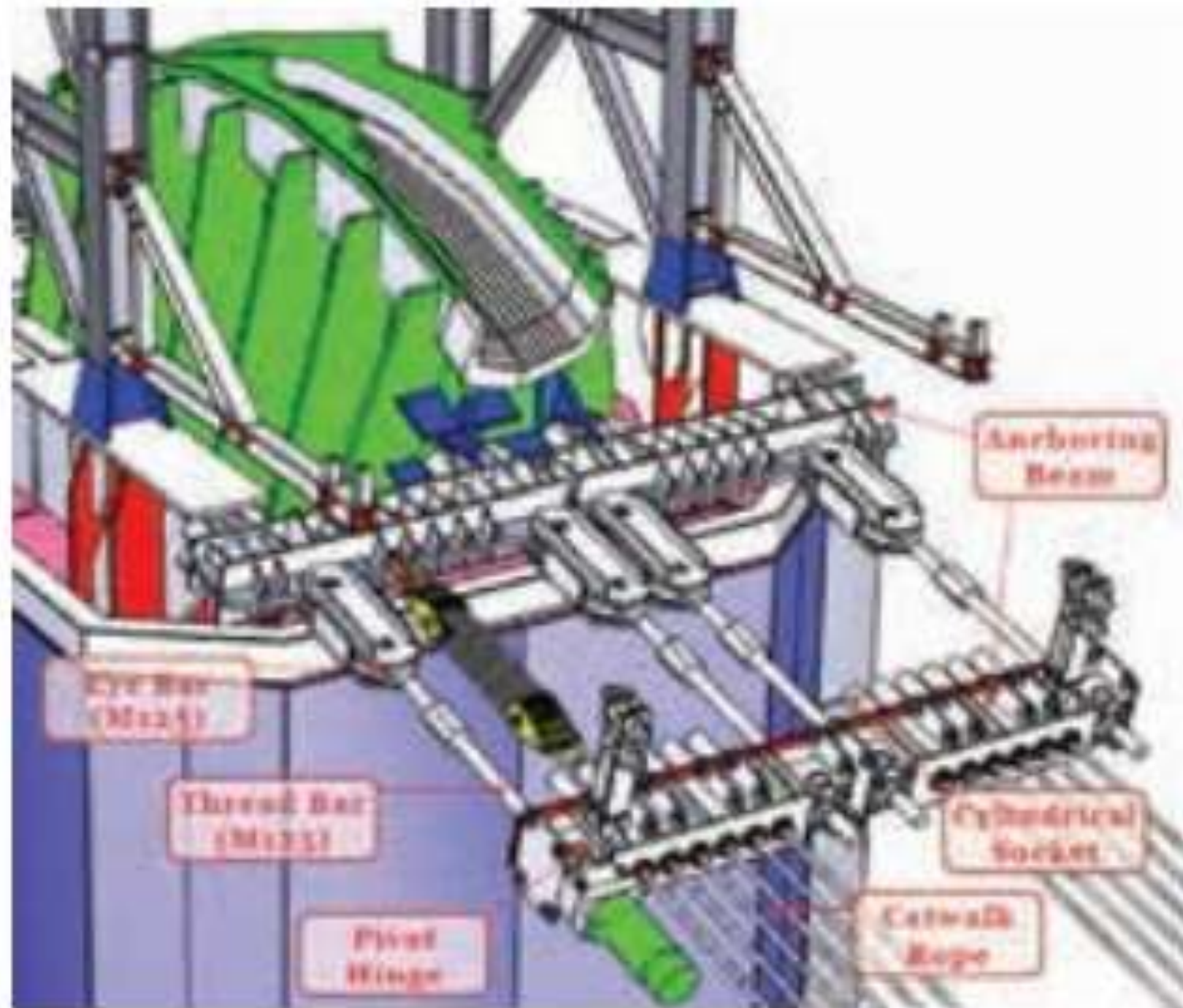


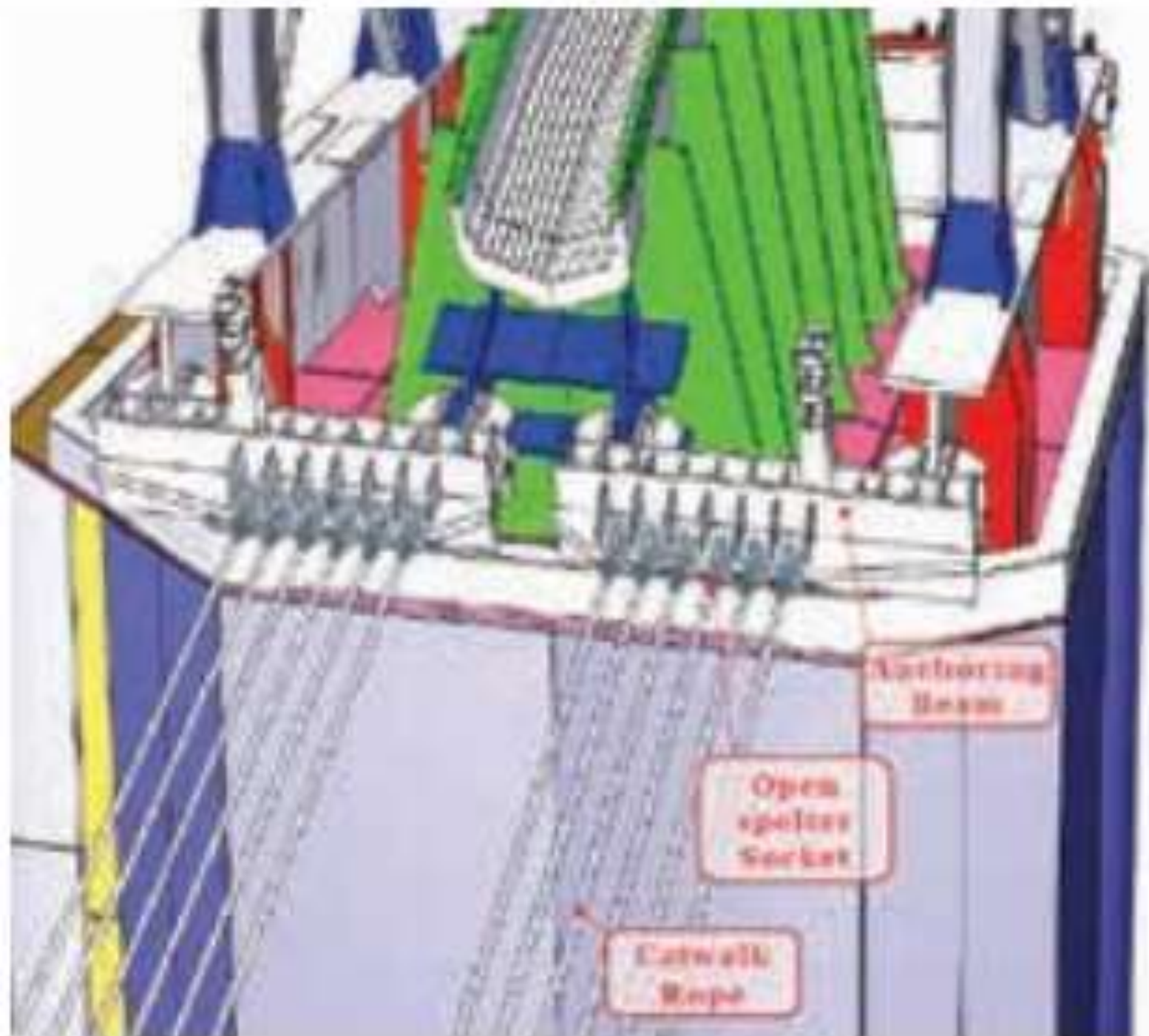
01:11

01:40













YANGSIGANG BRIDGE WUHAN YANGTZE RIVER





CATWALK LONGMEN BRIDGE



5.CAVO E SELLA

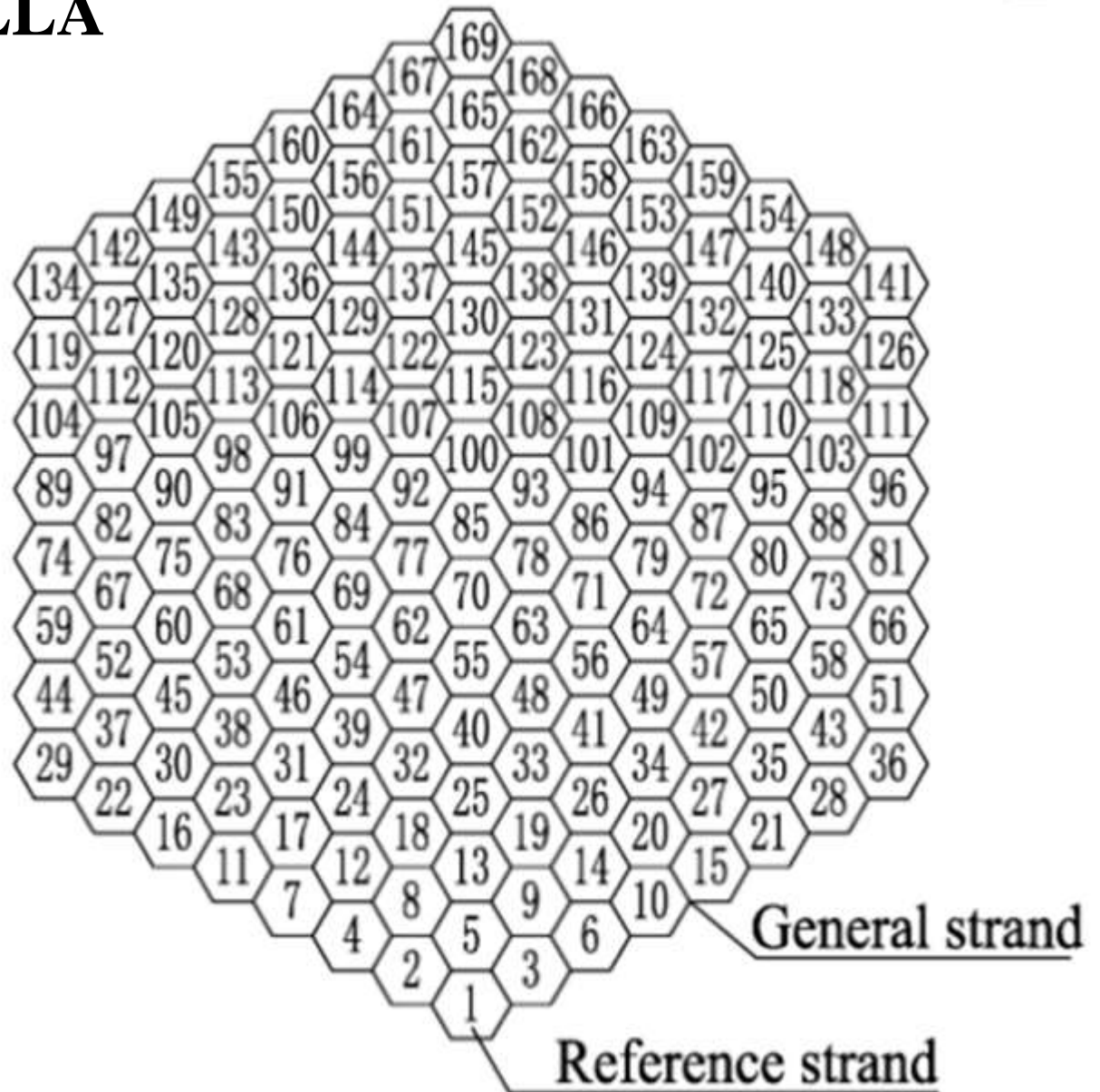


Figure 10. Space position of strands.

Figure 4-2

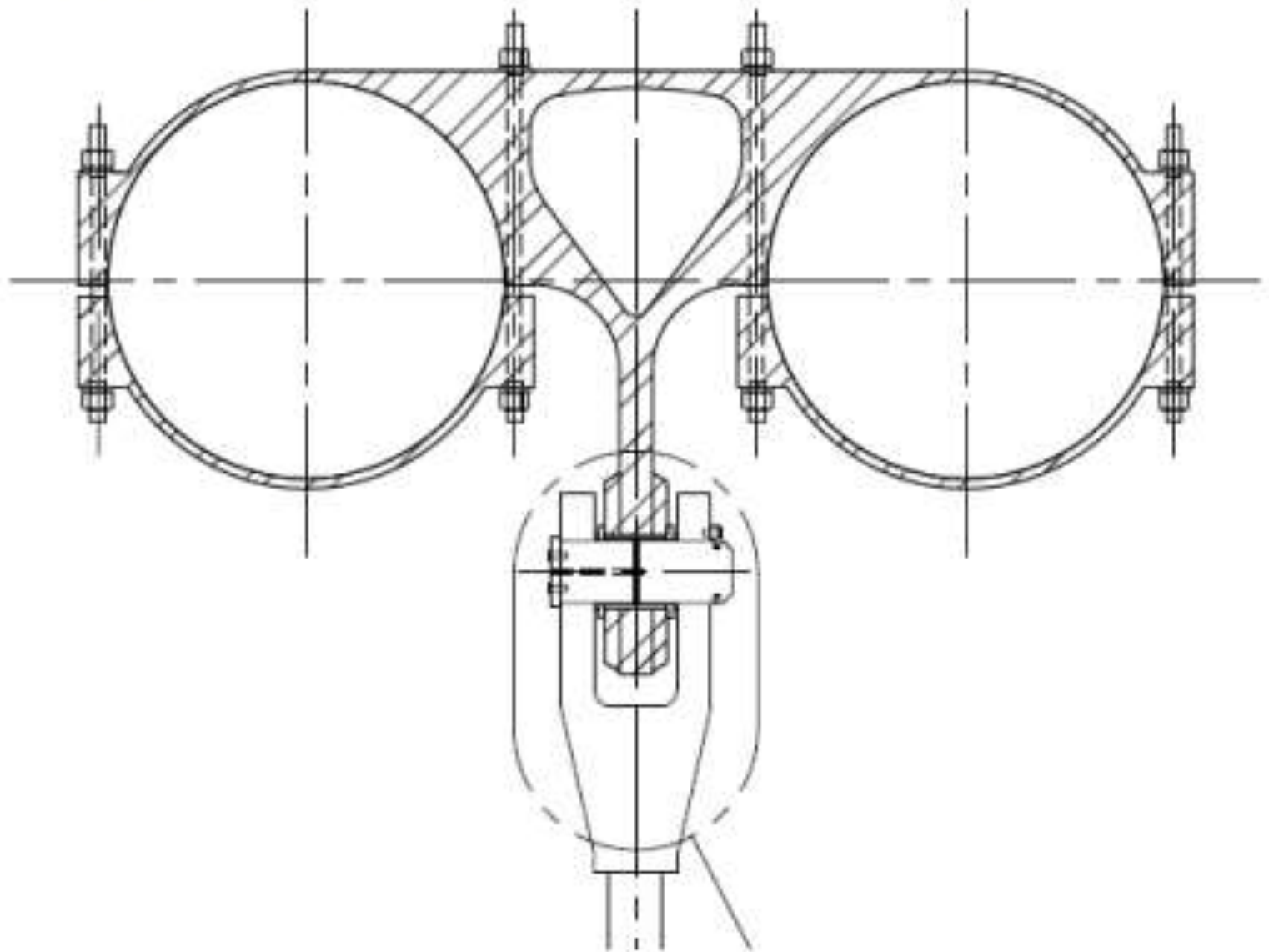
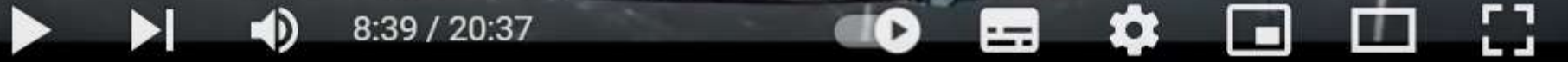


Figure 4-2. Messina Bridge cable clamp



ALTRI VIDEO





XinhuaVideo

2601



0:38 / 1:14

10 71



8:45 / 20:37









To advance construction, every day the workers must traverse a temporary "catwalk"...

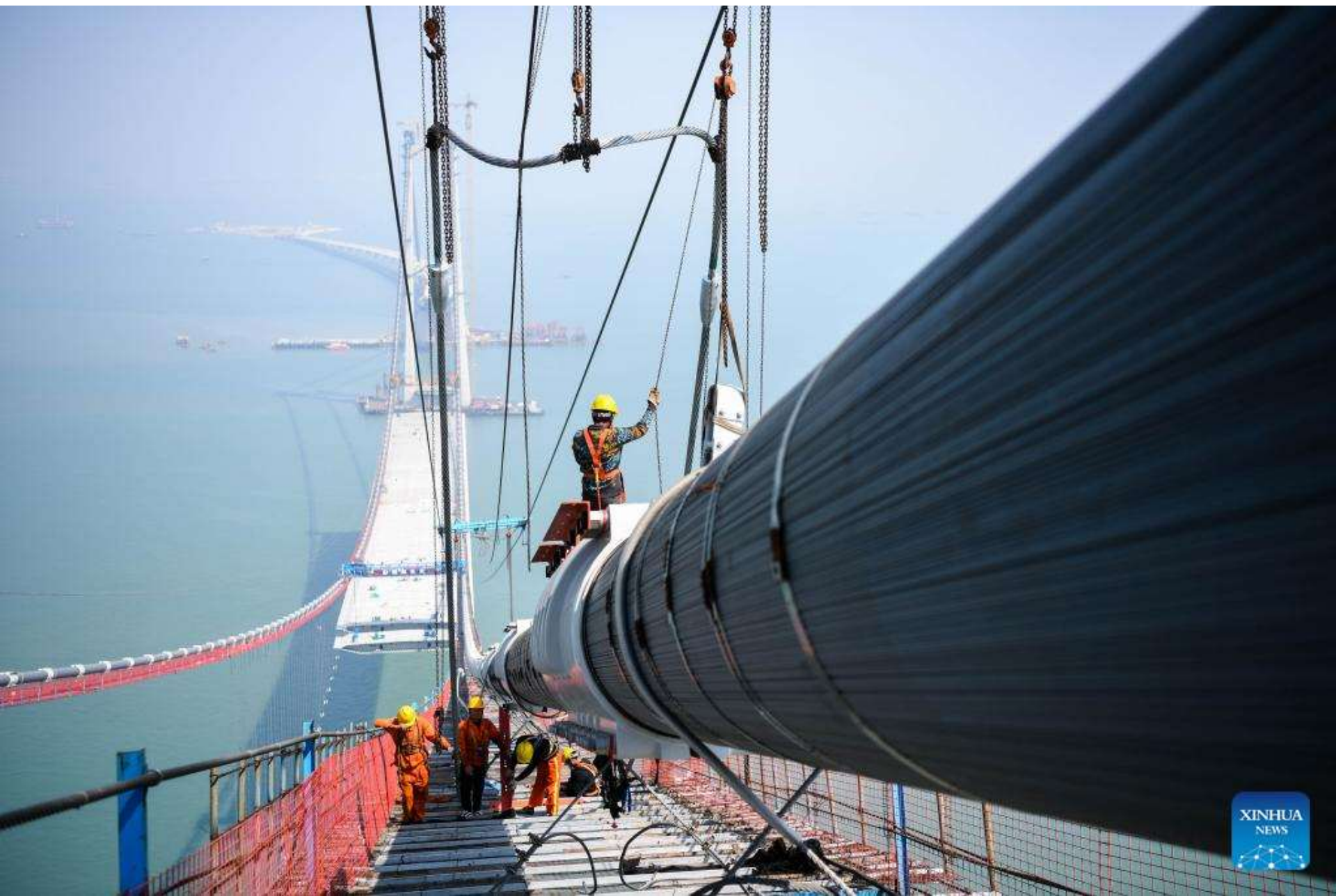


01:04



01:40









(a) PPWS un-coiler



(b) Pulling on catwalk



(c) Strand carrier



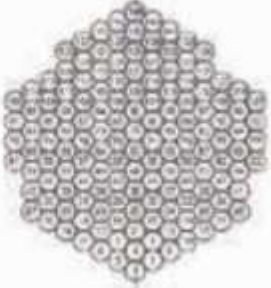

(d) Insertion into tower saddle

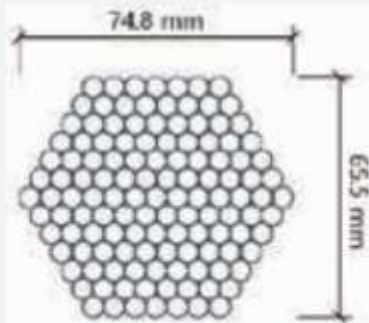


(e) Anchoring at anchor block

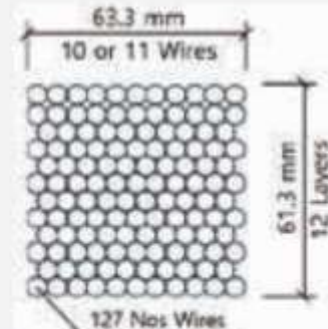


(f) Anti-rotation tool

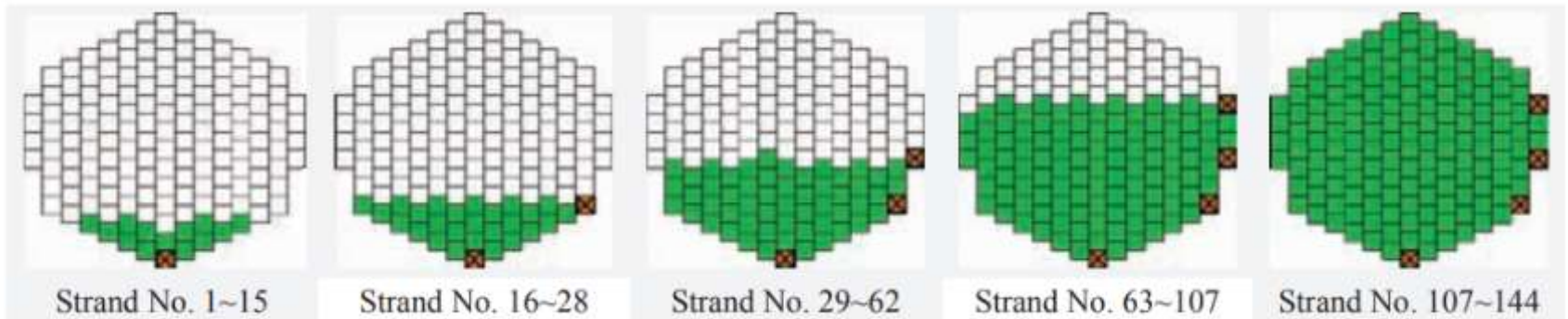
Item	Main Span	Side Span
Strand Arrangement		
Strand composition	1 strand = 5.75 mm wire × 127 nos	
No. of strand (/cable)	144 nos	148 nos
Cross sectional area	0.475 m ²	0.488 m ²
Diameter of cable	869 mm (void ratio: 20%)	881 mm (void ratio: 20%)



a. wire arrangement in general section



b. wire arrangement in saddle section



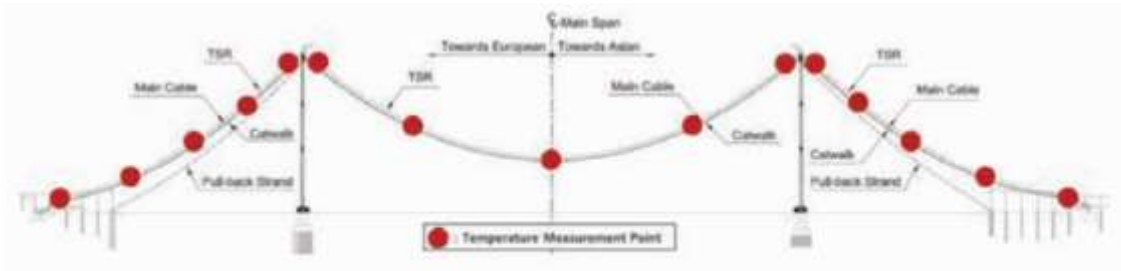


Figure 9: Temperature measurement points

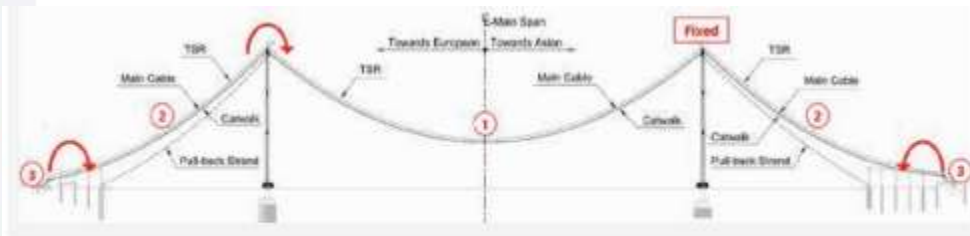
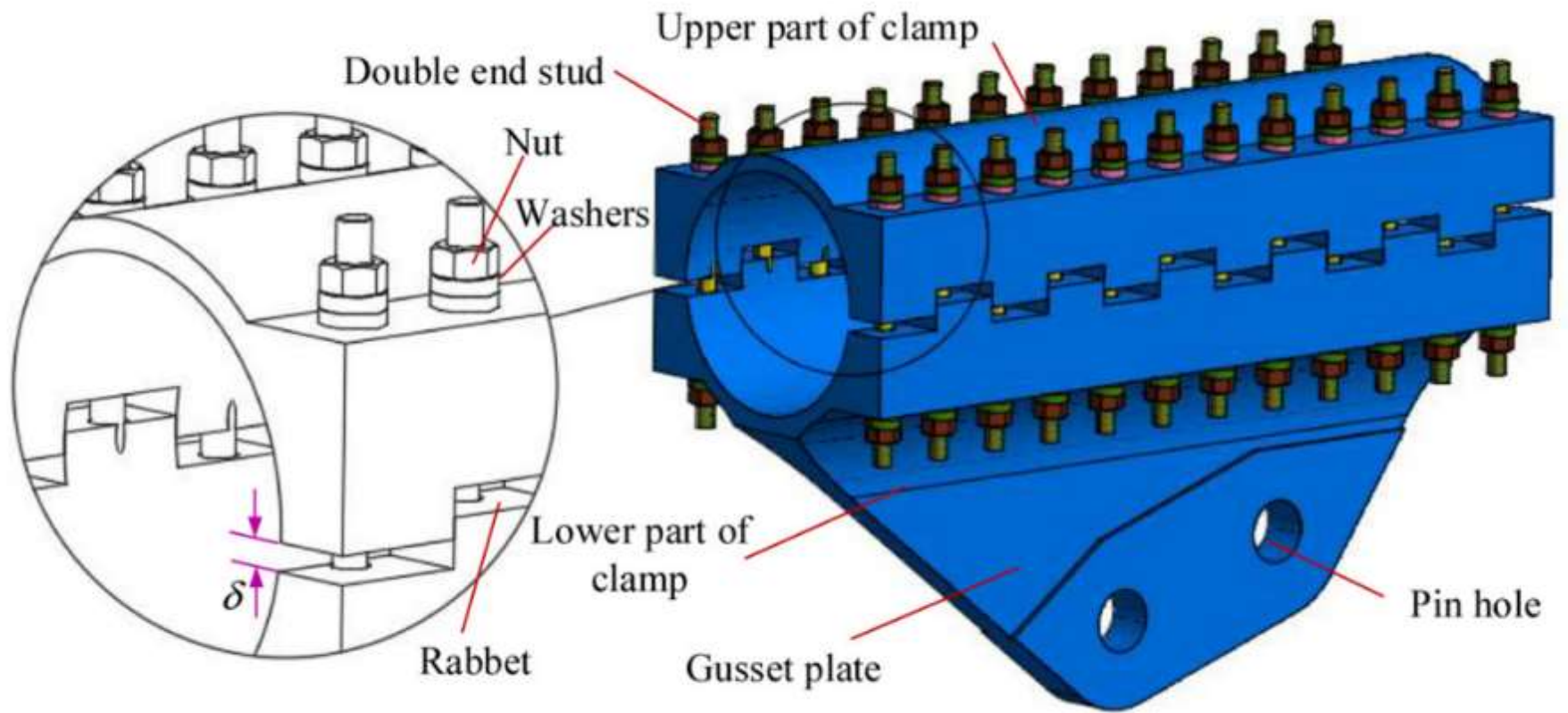


Figure 10: Sag Adjustment Procedure

6. PENDINI HANGERS







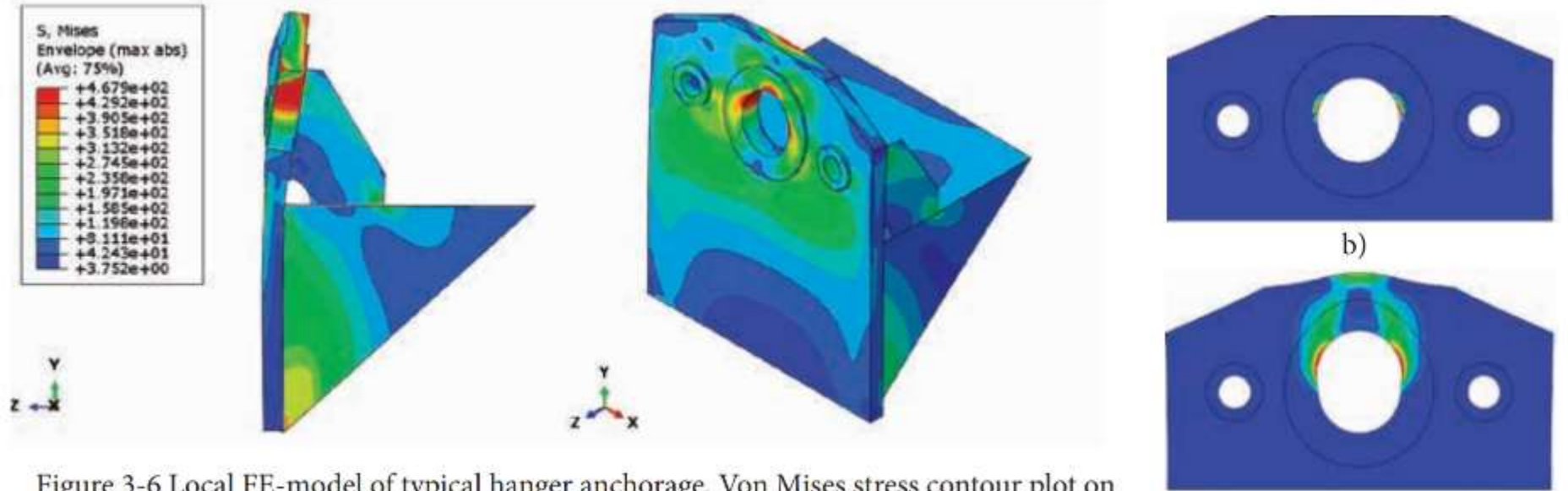


Figure 3-6 Local FE-model of typical hanger anchorage. Von Mises stress contour plot on deformed shape (scale factor: 15)

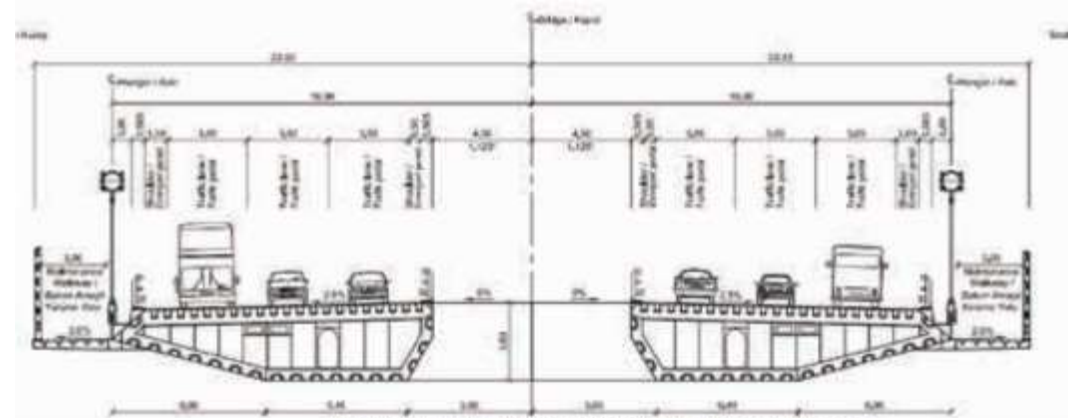


Figure 2-1: Girder cross-section at main span

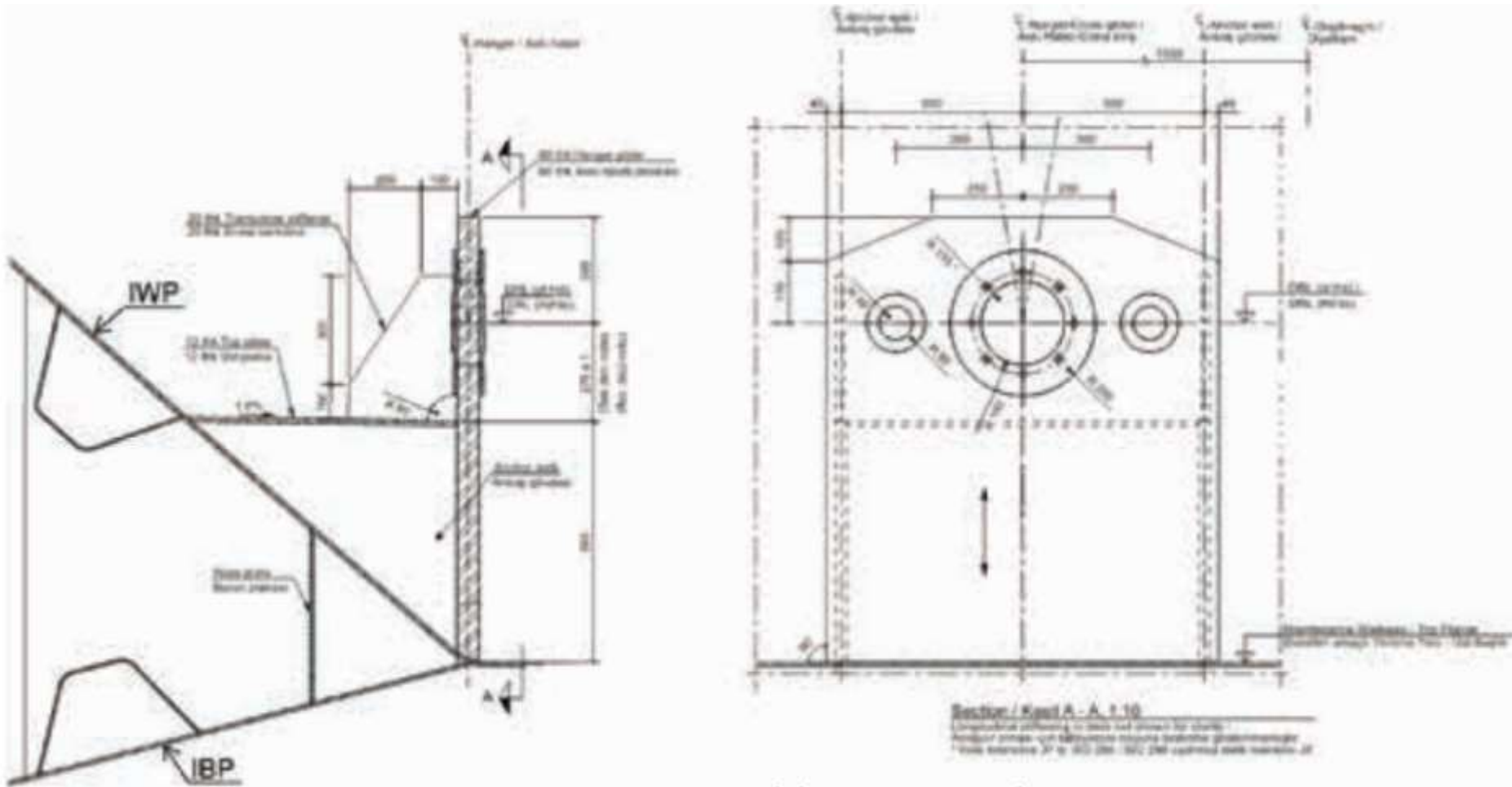


Figure 3-2: Typical hanger anchorage

VERIFICHE A FATICA: FATIGUE LOAD MODEL, GEOMETRY MODEL, FEM, FATIGUE DETAIL DEFINITION/PROPERTIES, DETAIL LOCATION, SN-CURVE, MATERIAL PARTIAL FACTOR, STRESS DIRECTION, EXTRAPOLATION STRATEGY TUTTO IN MODO AUTOMATICO DA PROGRAMMA



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7. DECK



Panel formation (5 panels)



Segment formation (24m)



Trial assembly & Block formation (48m)



Delivery



Stock yard



cimtas



asse cavi

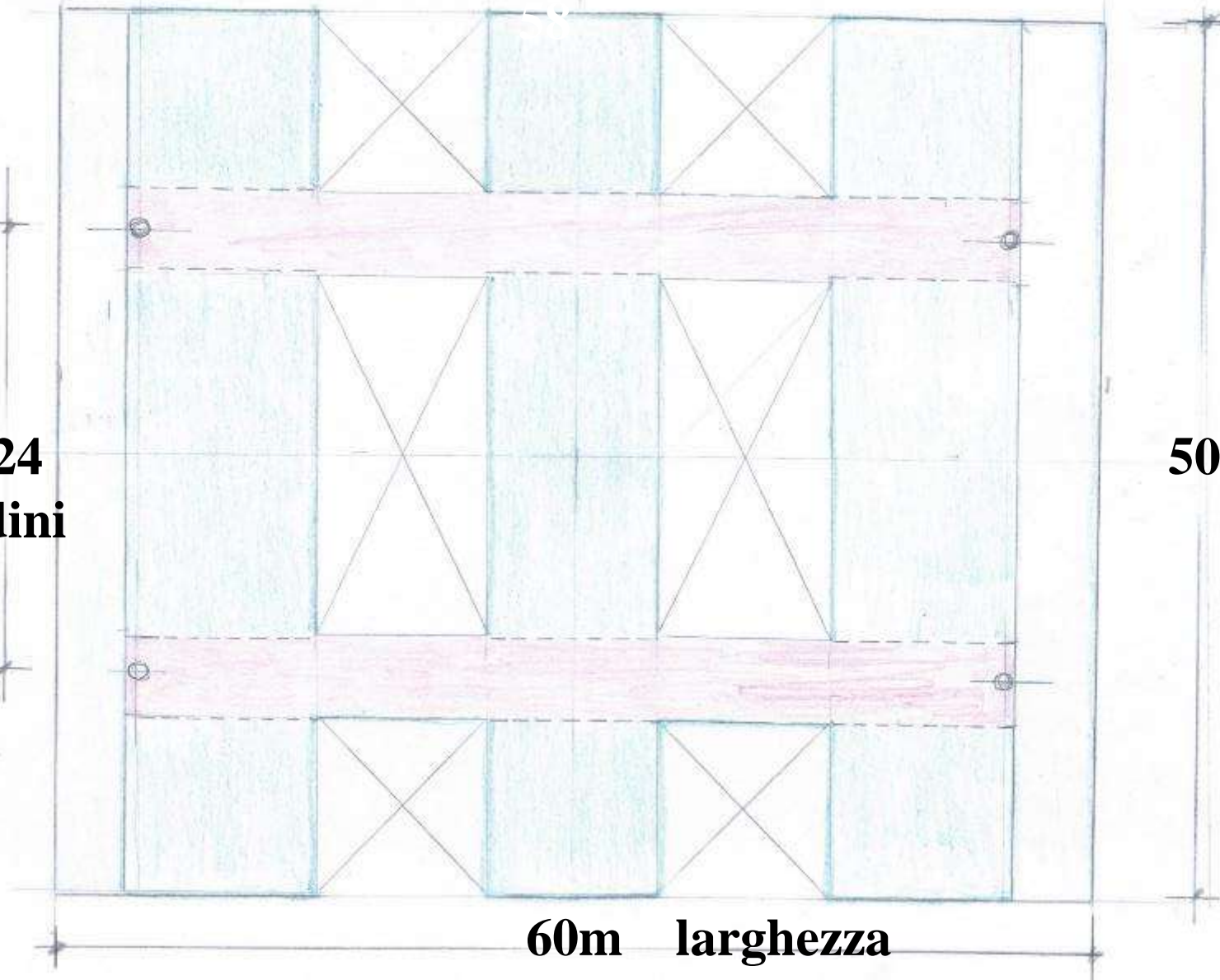
52

asse cavi

25/24
pendini

50

60m larghezza



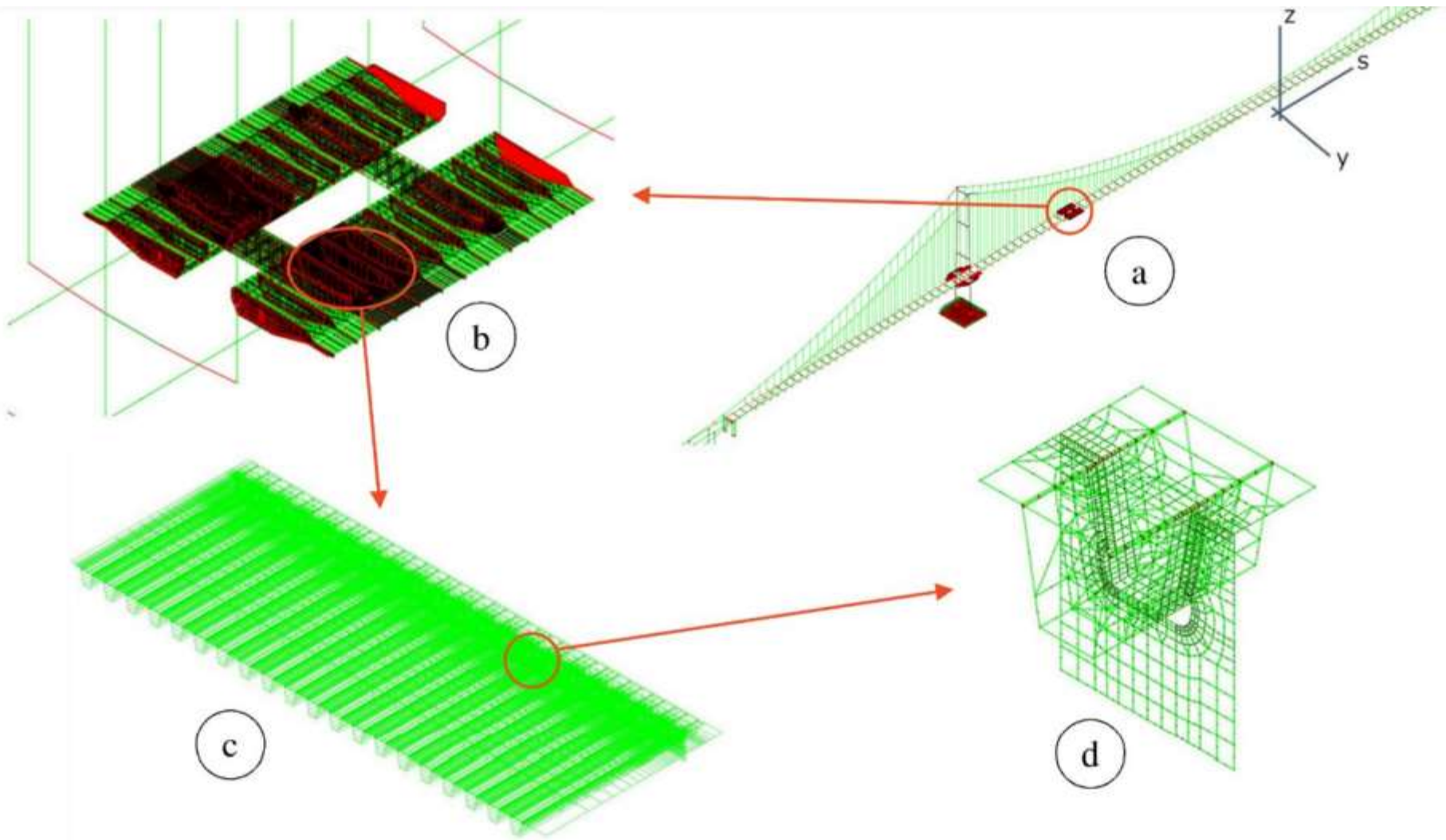


Figure 1 IBDAS global (a), semi-local (b) and local (c, d) finite element model

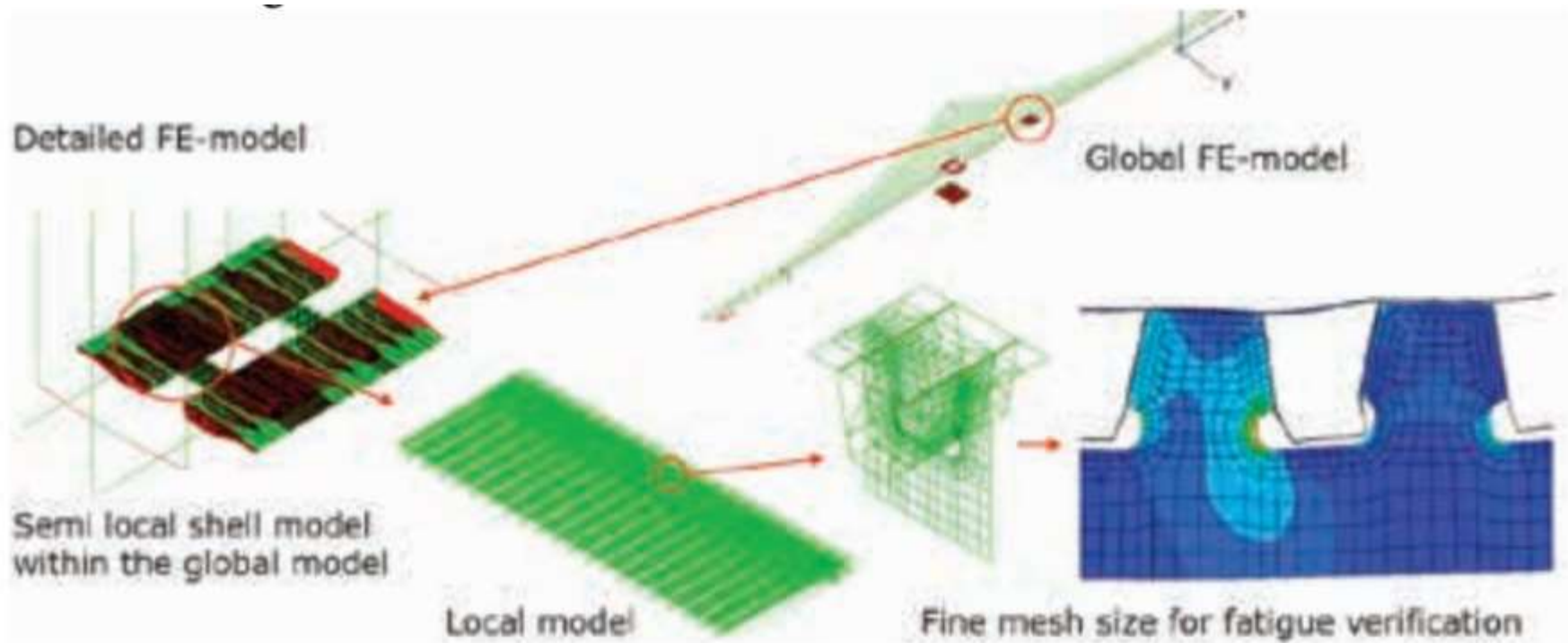
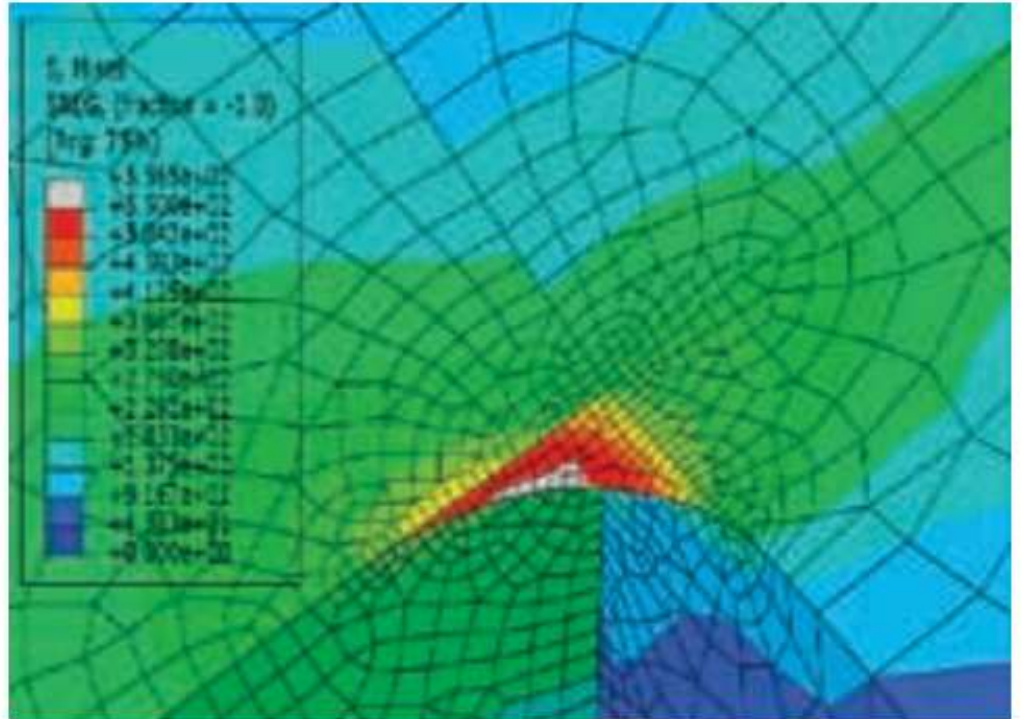
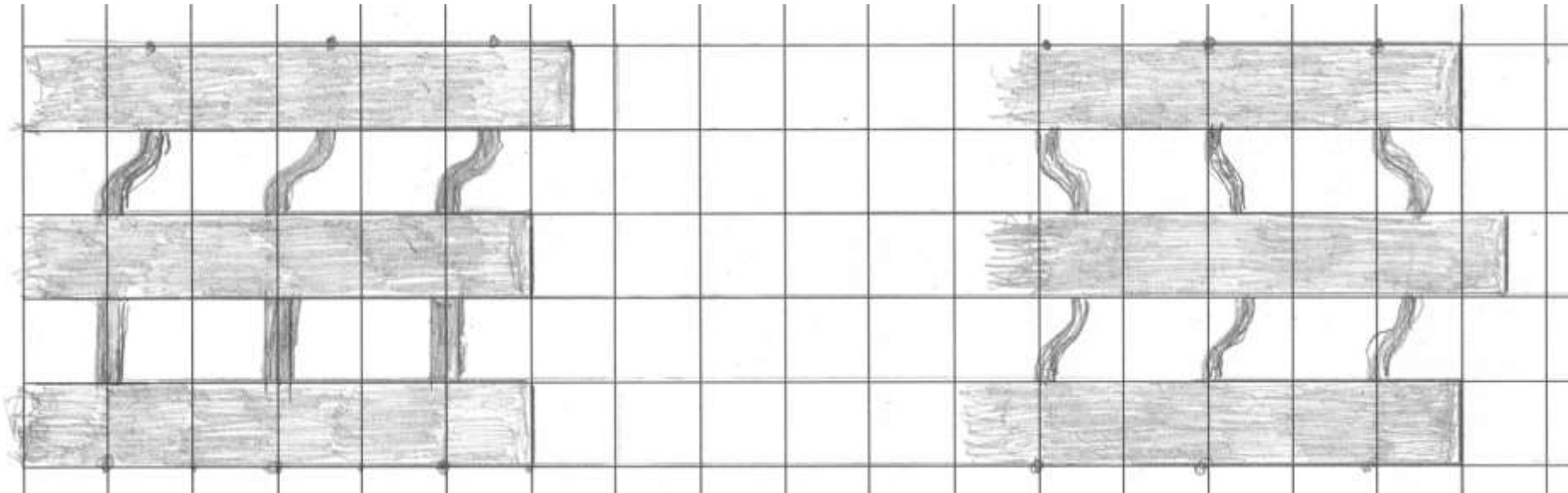


Figure 2-3 Local, semi-local and global analysis FE-model in IBDAS.

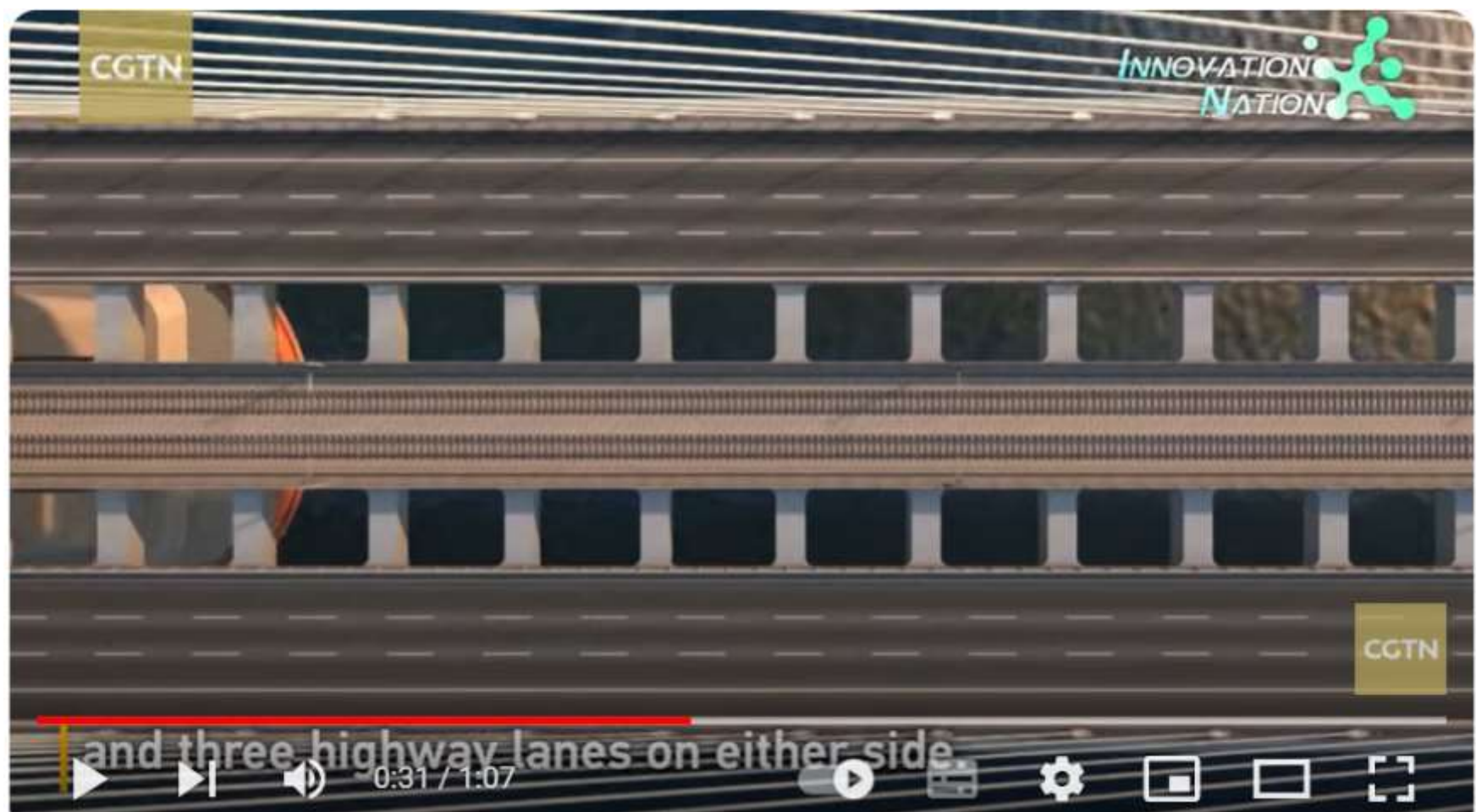


MOTI DELLE TRAVI DEL DECK

FATICA



XIHOUMEN BRIDGE HIBRID STAYED PART 3 BOX



DEPOSITO DECK

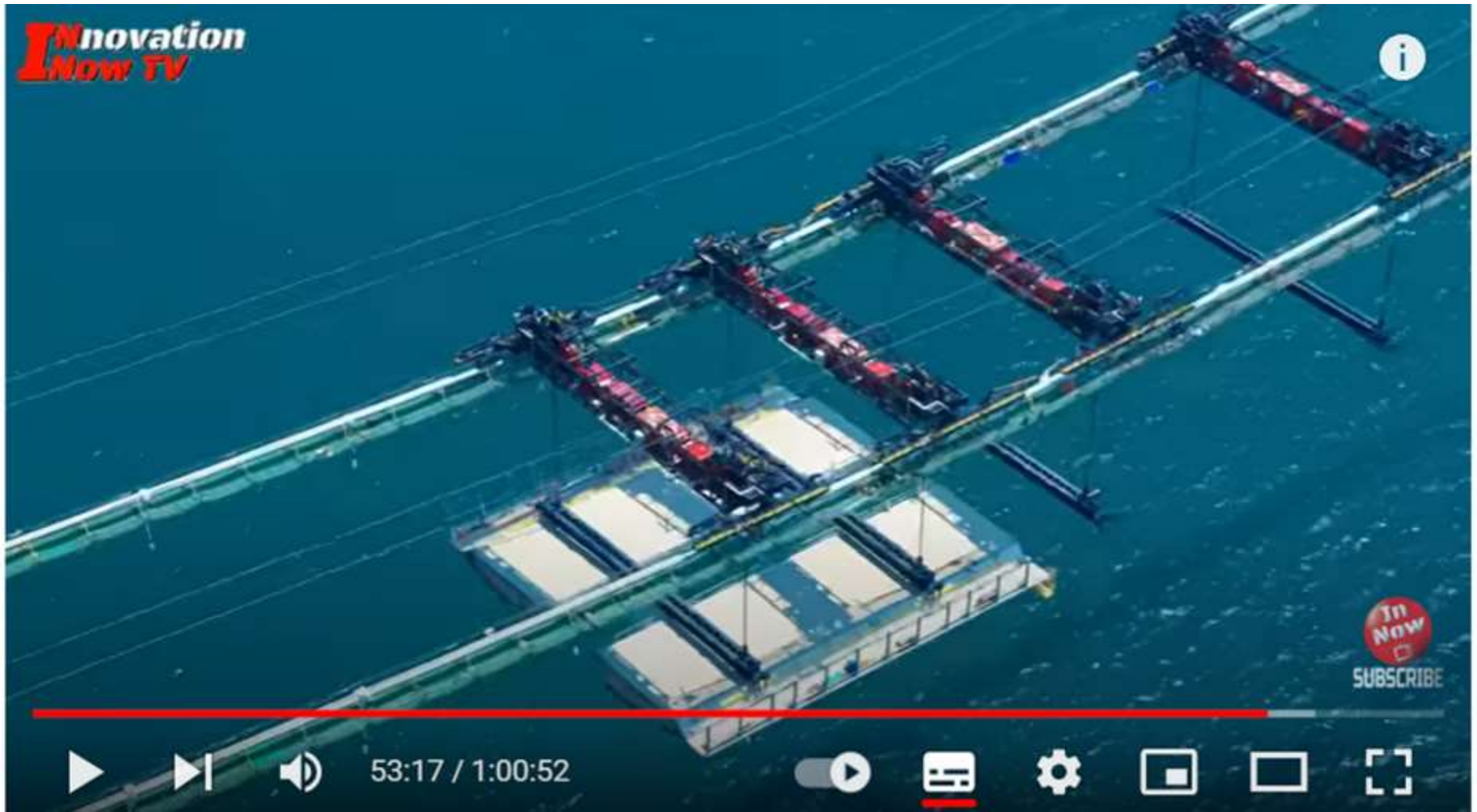


8. MONTAGGIO DECK





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FUMA YANGTZE RIVER BRIDGE (2017)

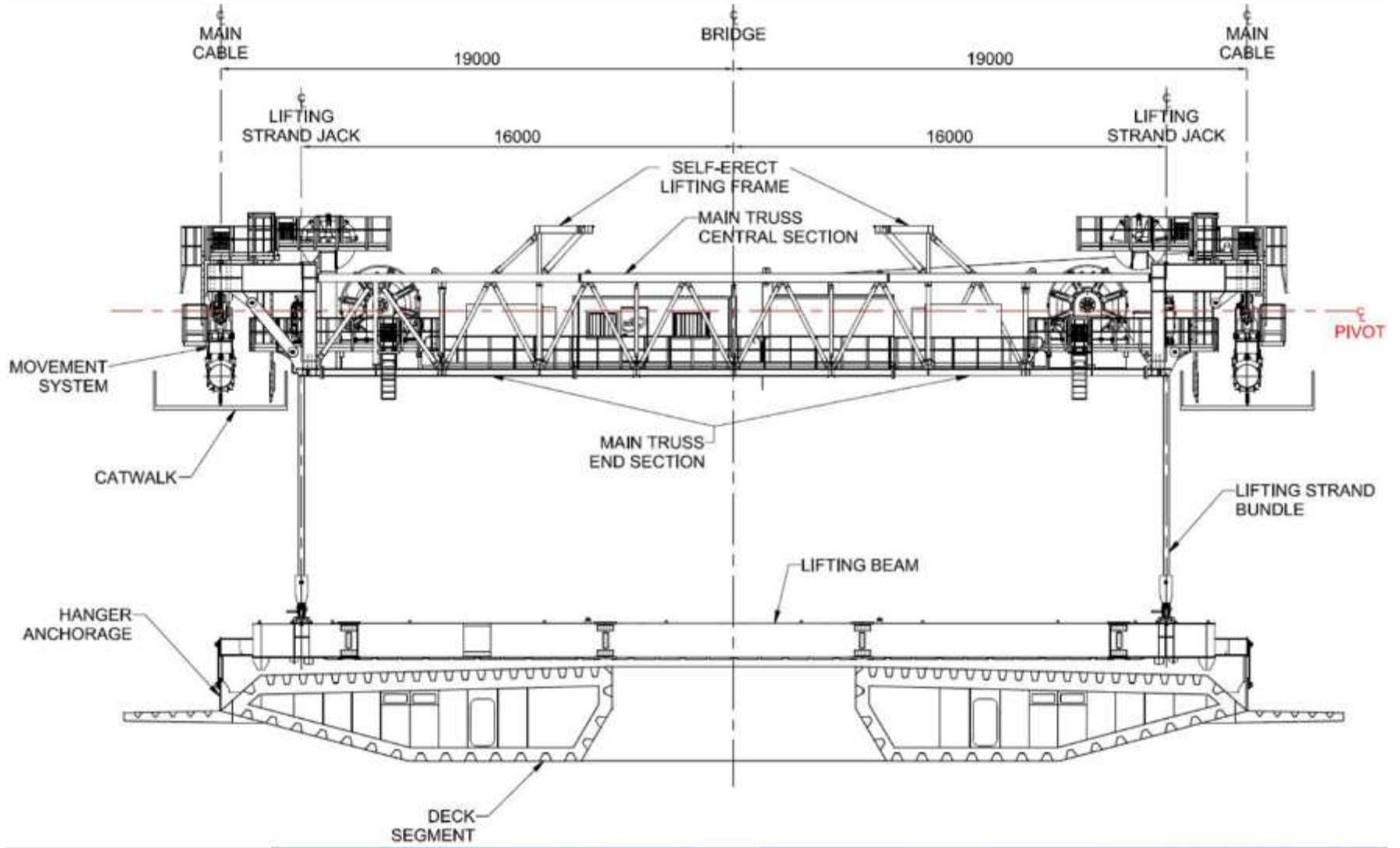


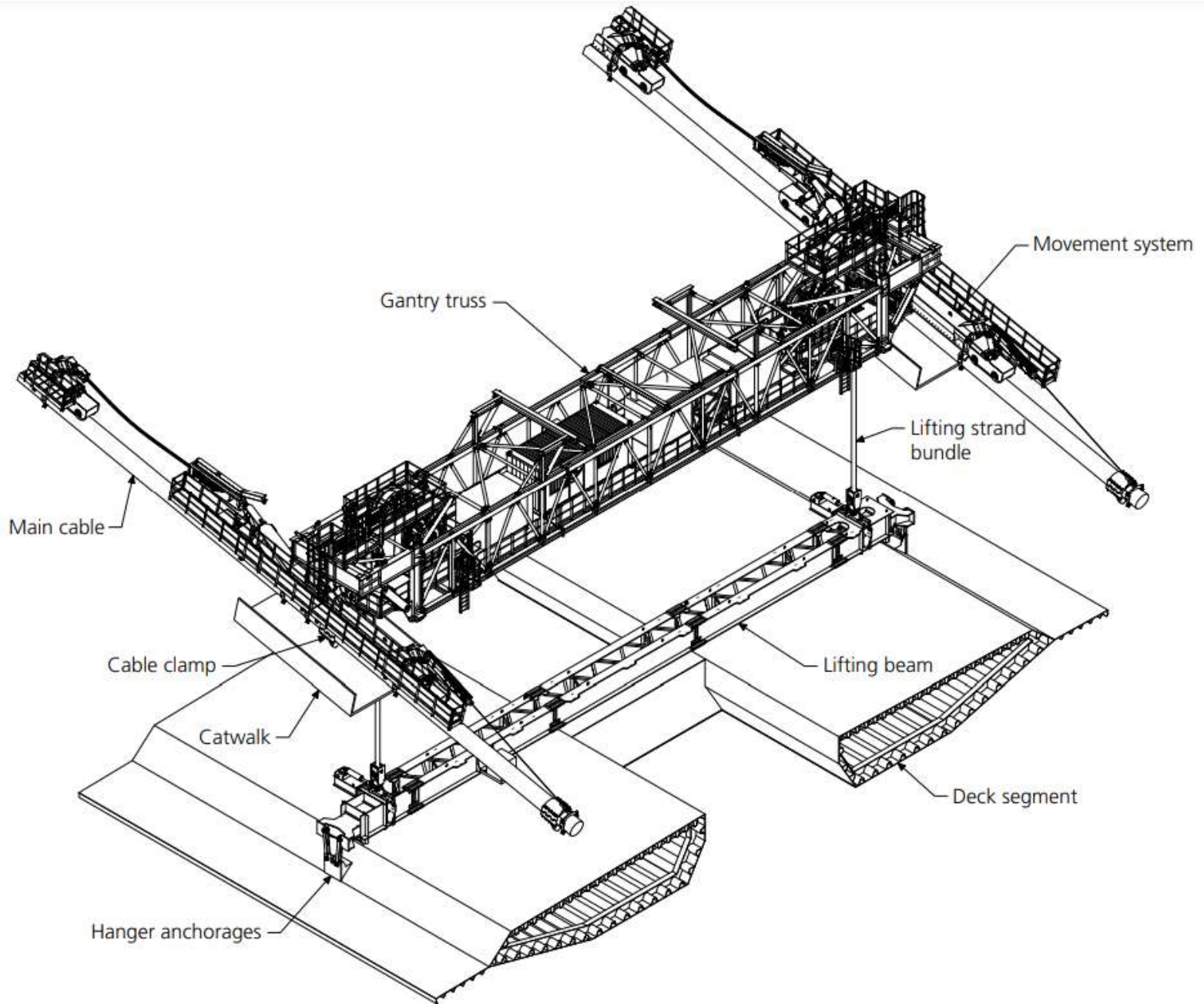


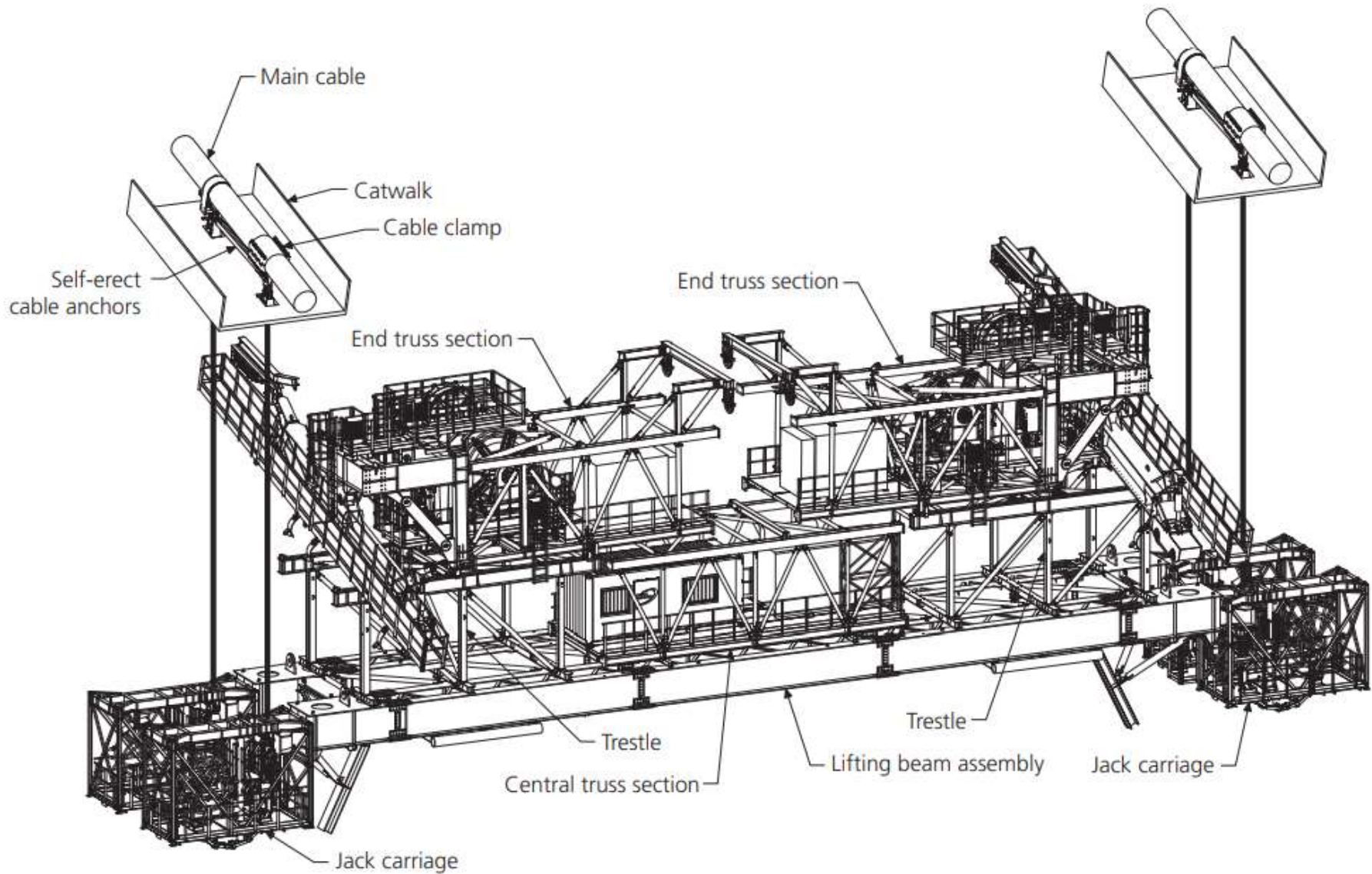


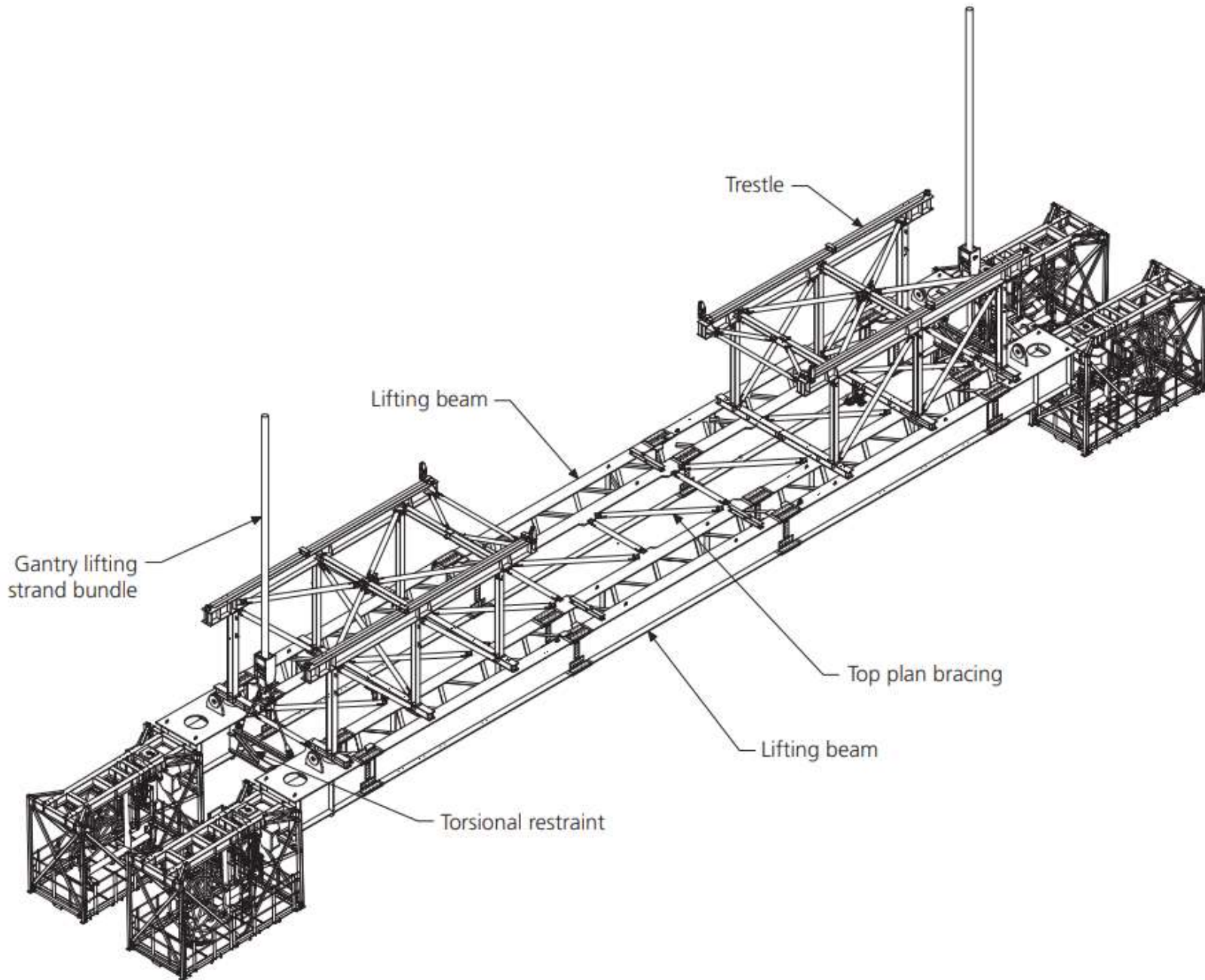
리프팅 디바이스 (Lifting Device)

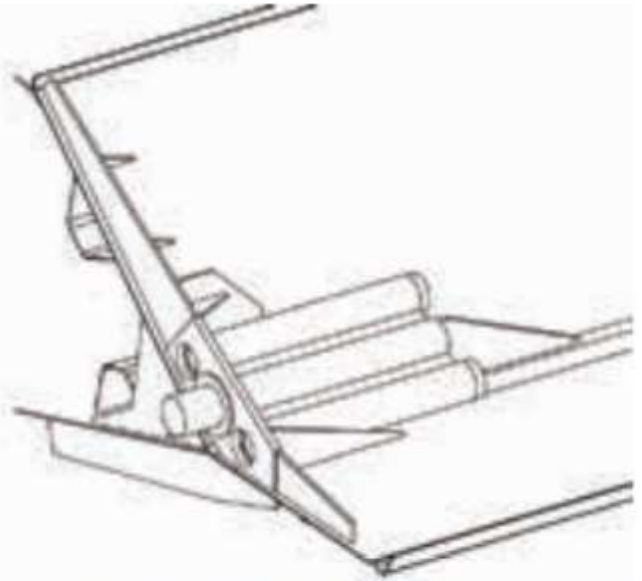
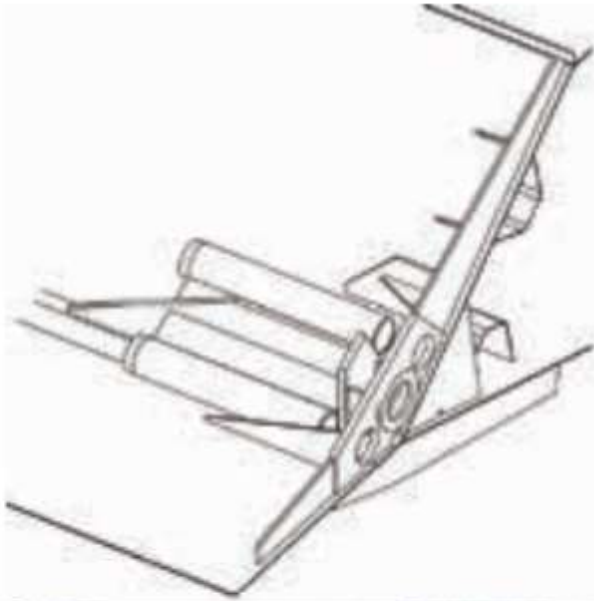














WUFENGSHAN RAIL CUM ROAD BRIDGE YANGTZE

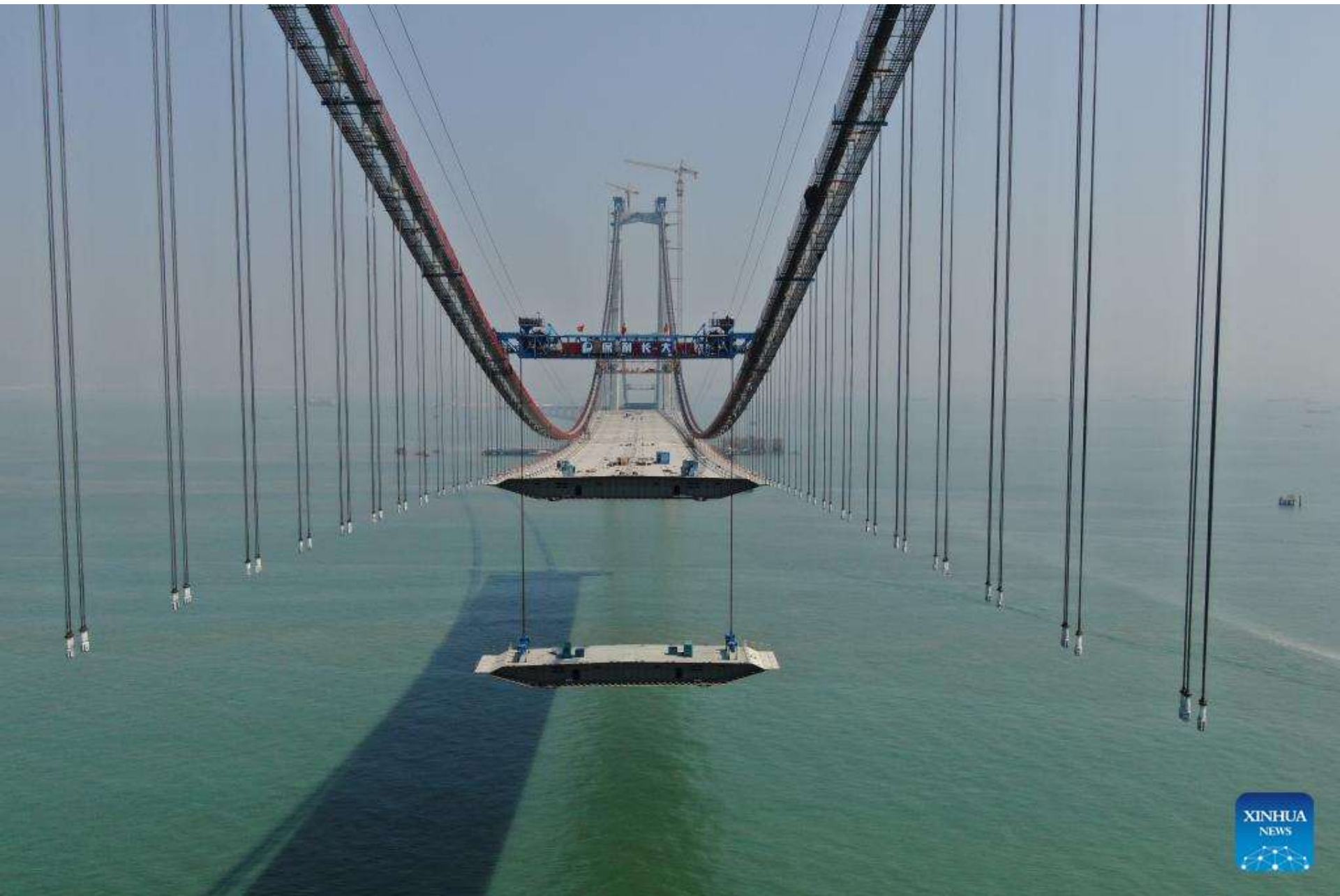












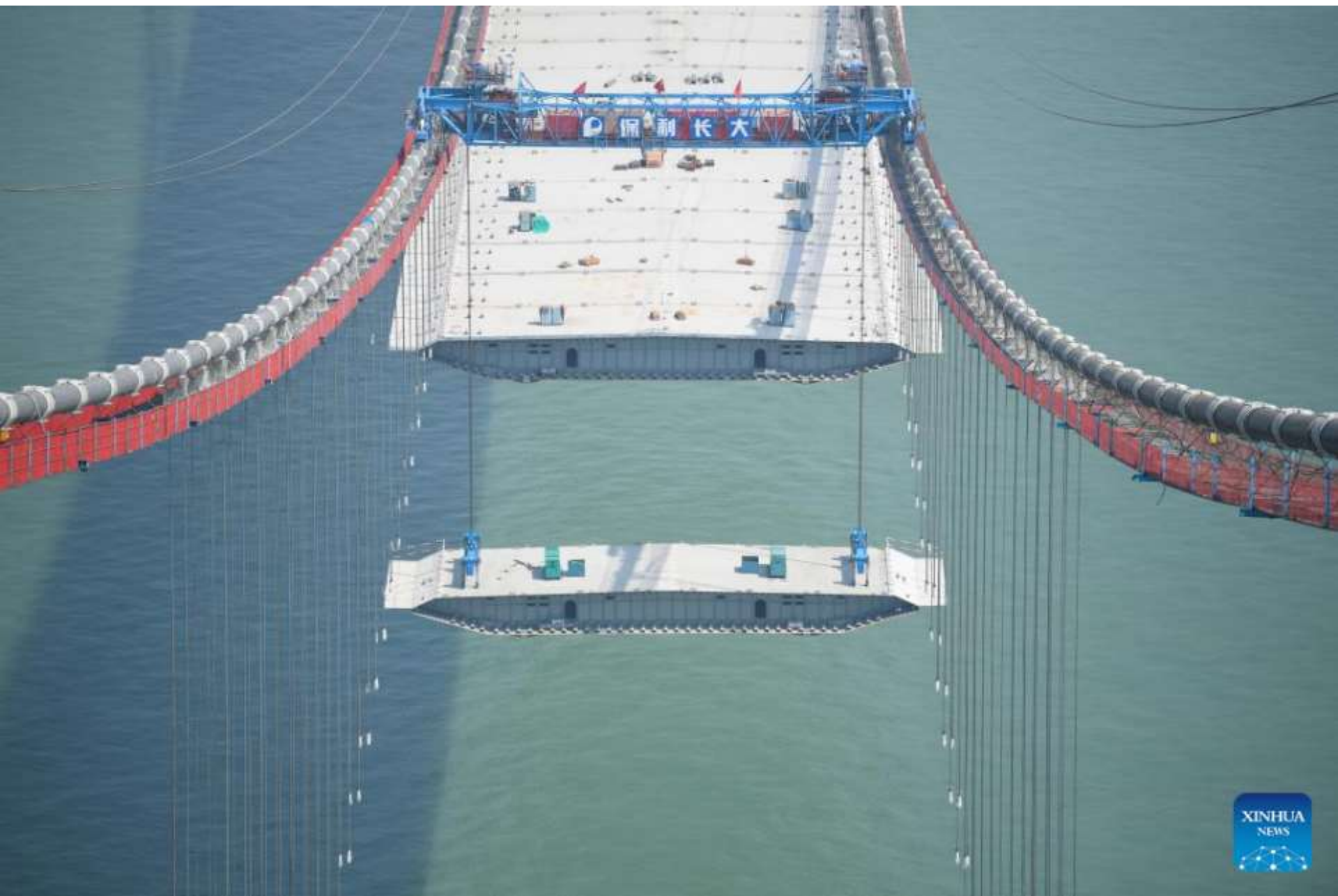


LINGDINGYAN BRIDGE













GALLERIA DEL VENTO MODELLI SENSORI



9. STABILITA' FENOMENI VENTOSI

- **FLUTTER MOTI ROTAZIONALI E VERTICALI**
- **VORTEX INDUCED VIBRATION SERVICEABILITY**
- **BUFFETING TURBOLENZA DECK FISSO**
- **GALLOPING AMPIE OSCILLAZIONI HANGERS**

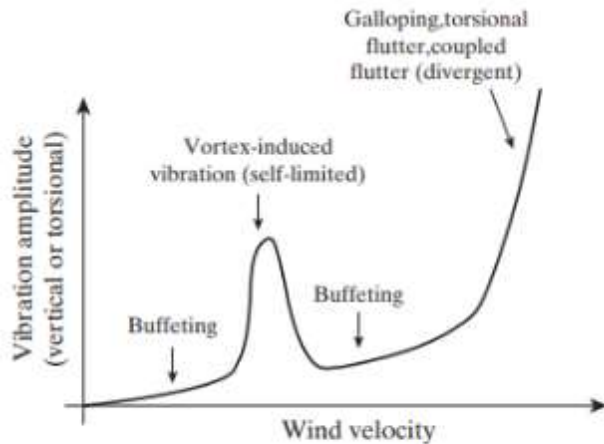


Fig. 3: Schematic figure showing wind-induced vibration phenomenon and its effect on bridge

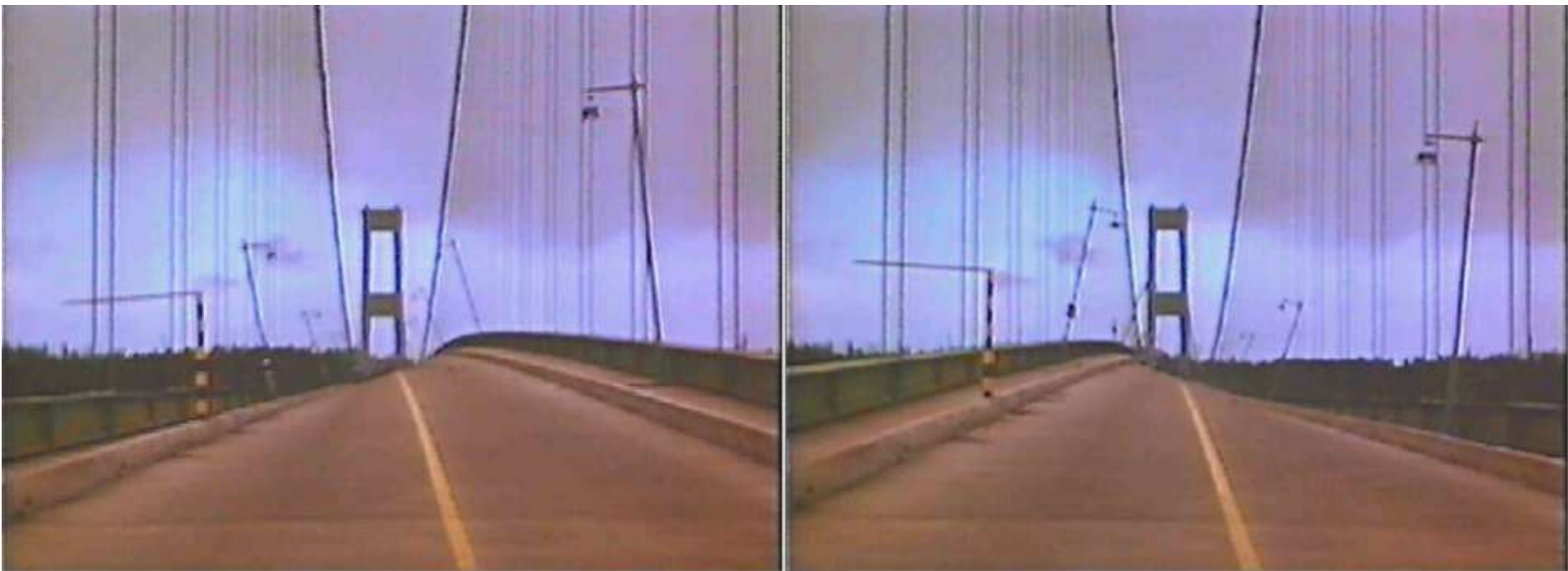


F. BRANCALEONI, G. DIANA ...



TAKOMA NARROWS 1940





TAKOMA BRIDGE

VORTEX INDUCED VIBRATION FROM 1 JULY 1940

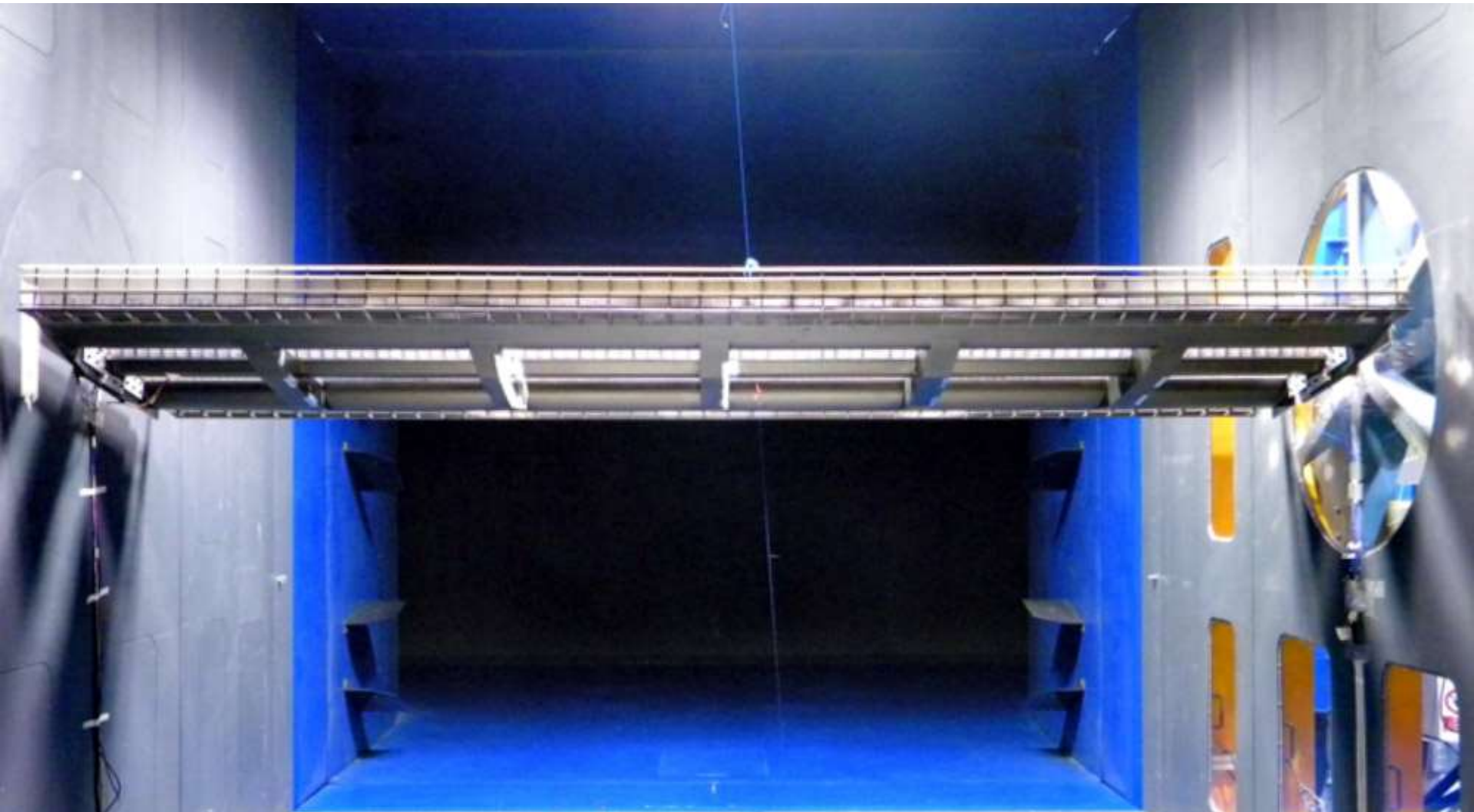
FLUTTER AND COLLAPSE

7 NOVEMBER 1940

DISTACCO VORTICI MONOBOX



GALLERIA DEL VENTO SECTIONAL MODEL



AEROELASTIC MODEL GALLERIA DEL VENTO



Figure 4: 1:190 scale full aeroelastic model of the 1915 Çanakkale Bridge at the RCWE boundary layer wind tunnel.

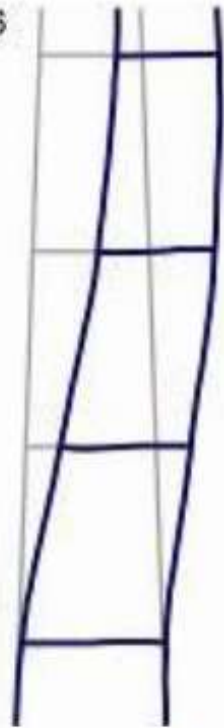
10. SISMA CONFRONTO PERIODI DECK - TORRI

T DECK > 20 s

MODE 50, F 0.3126

T TORRI

T= 3.2 s



MODE 68, F 0.4045

T= 2.47S

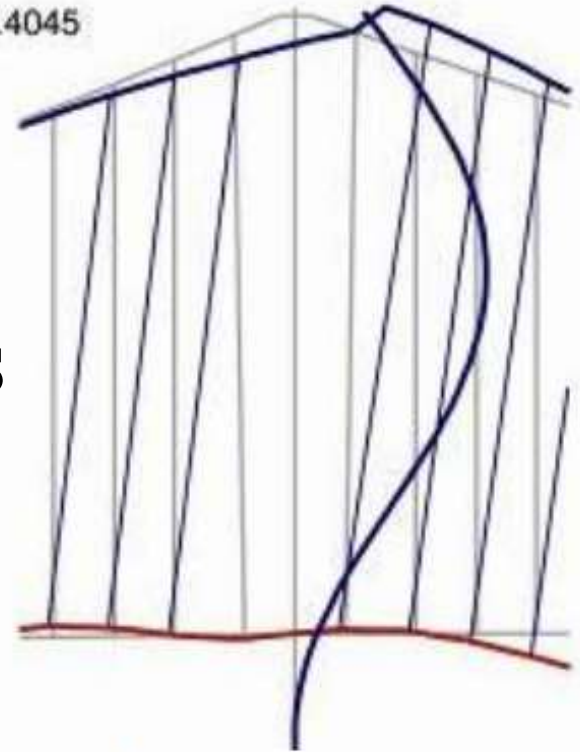
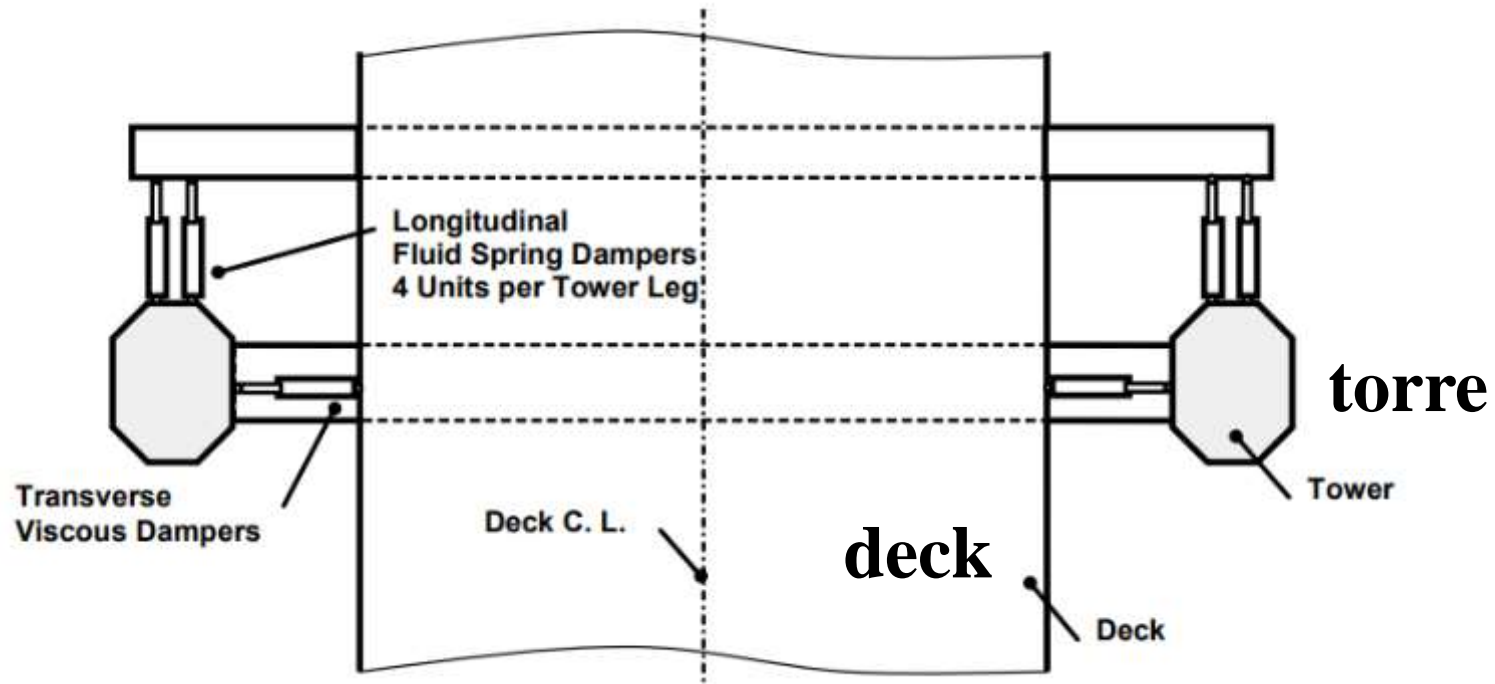


Figure 9. Transversal (T=3.2s) and longitudinal (T=2.47s) modes of the towers, Messina Bridge.
F. BRANCALEONI, 2016

11. ARTICOLAZIONI E GIUNTI

VISCOUS DAMPERS FIPMEC CONCEPT



GIUNTI CANAKKALE' L 2.8m



MAURER SWIVEL JOINTS



DISEGNO ARTICOLAZIONE DECK TORRE

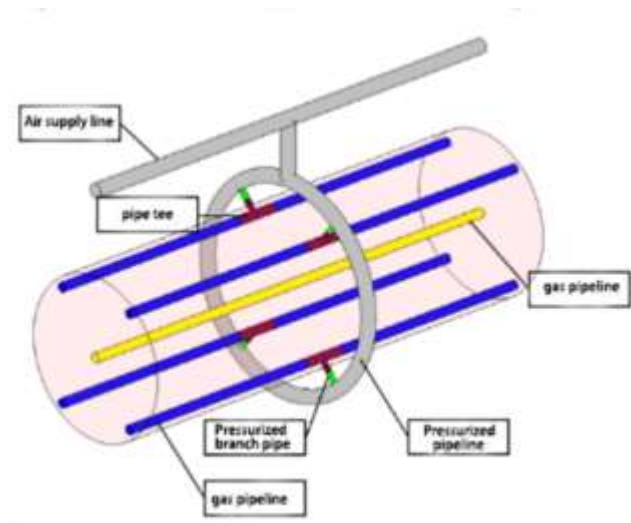
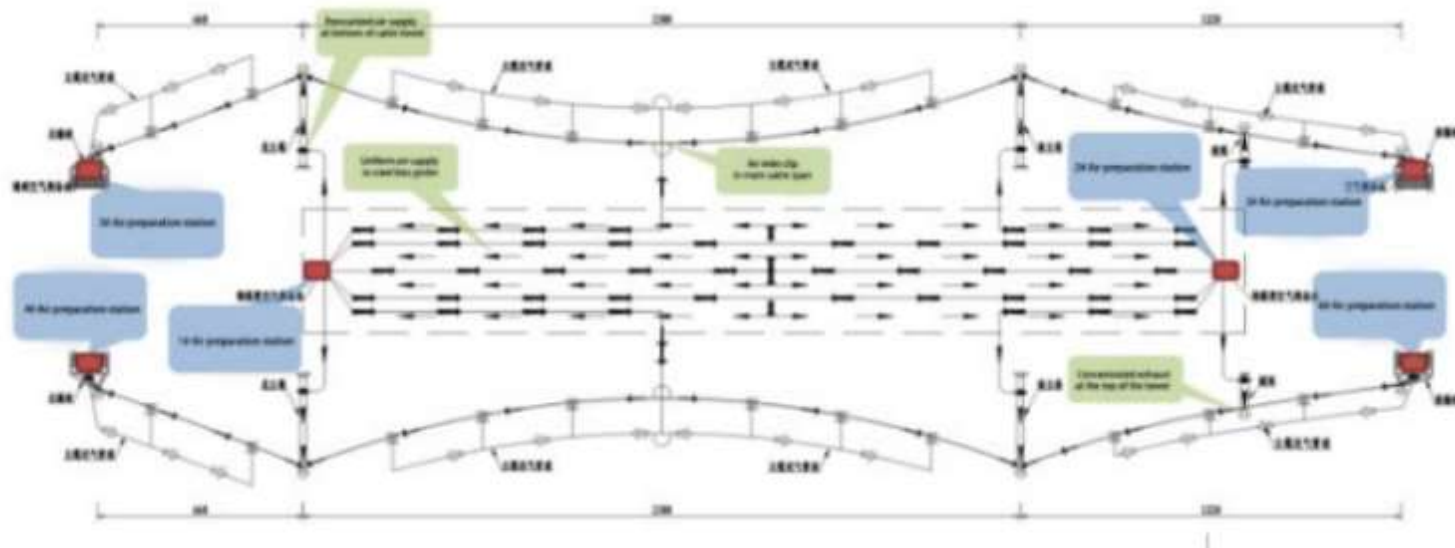


GIUNTO MAURER s 2.8m



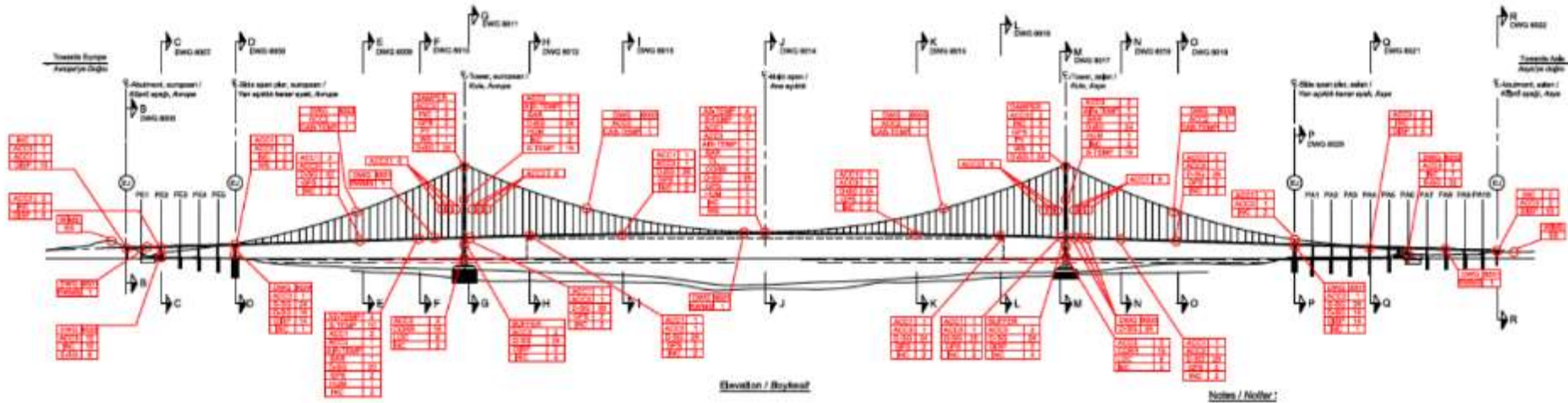
12. MANUTENZIONE BRIM

CORROSIONE DEUMIDIFICAZIONE CAVO



SHM SENSORI 1915CANAKKALE BRIDGE

Monitoring Layout 1915 Canakkale Bridge (main span 2023m)



> 1000 Sensors

Record Span
New Type of Design
High Visibility

Large System justified

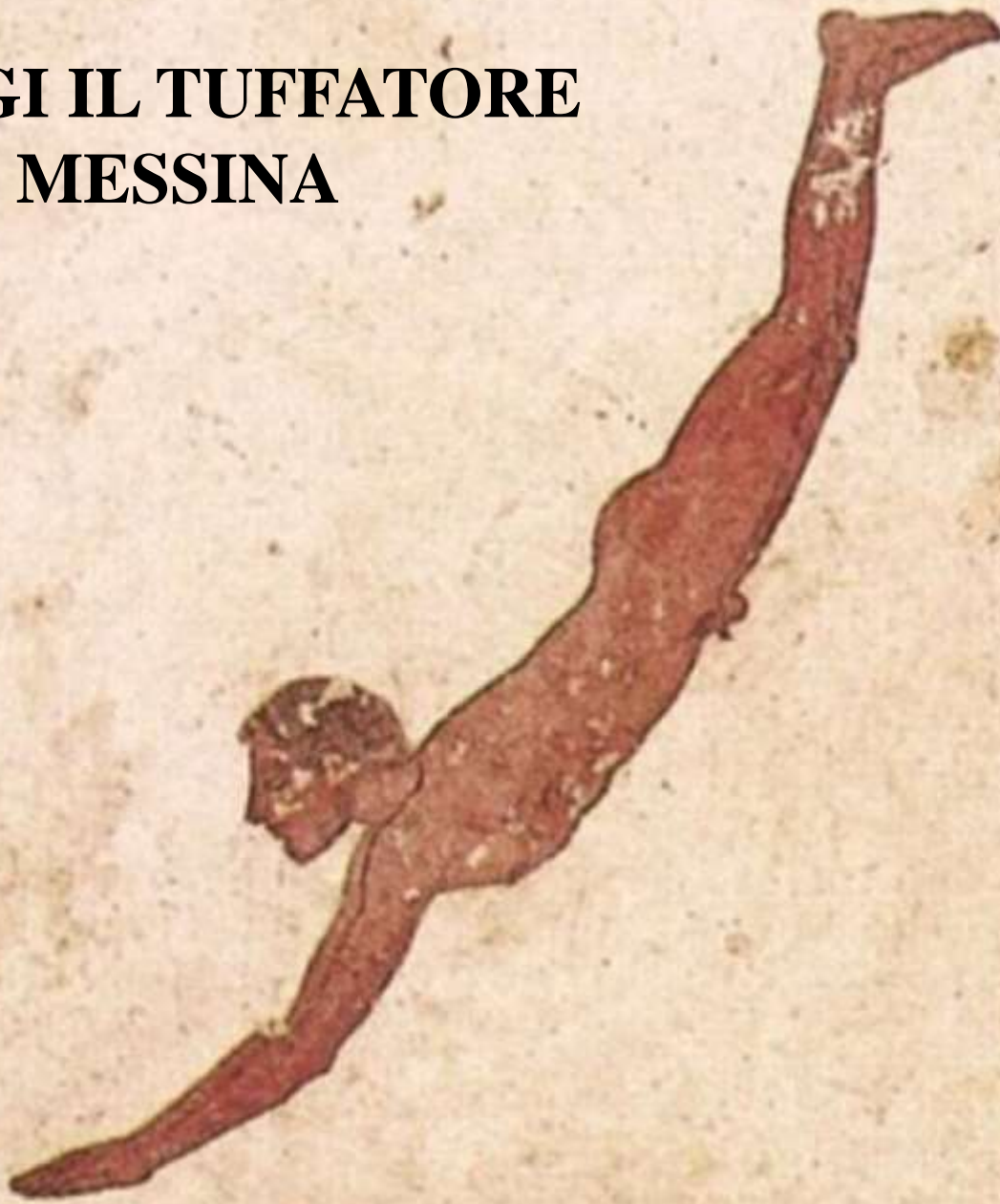
OUR TEAMS

Since designing our first bridge in 1888, CDW has actively recruited, trained and coached the best engineers. Now, our O&M teams are among the best in the world, adopting the latest techniques as well as cutting-edge technologies and materials. We push boundaries to innovate and maximize value, but at the same time, our engineers are focused on finding reliable solutions.

Every bridge job is unique, so we select a specific team to deliver a solution tailored to you.



**EGI IL TUFFATORE
DI MESSINA**



PAESTUM, 480ac