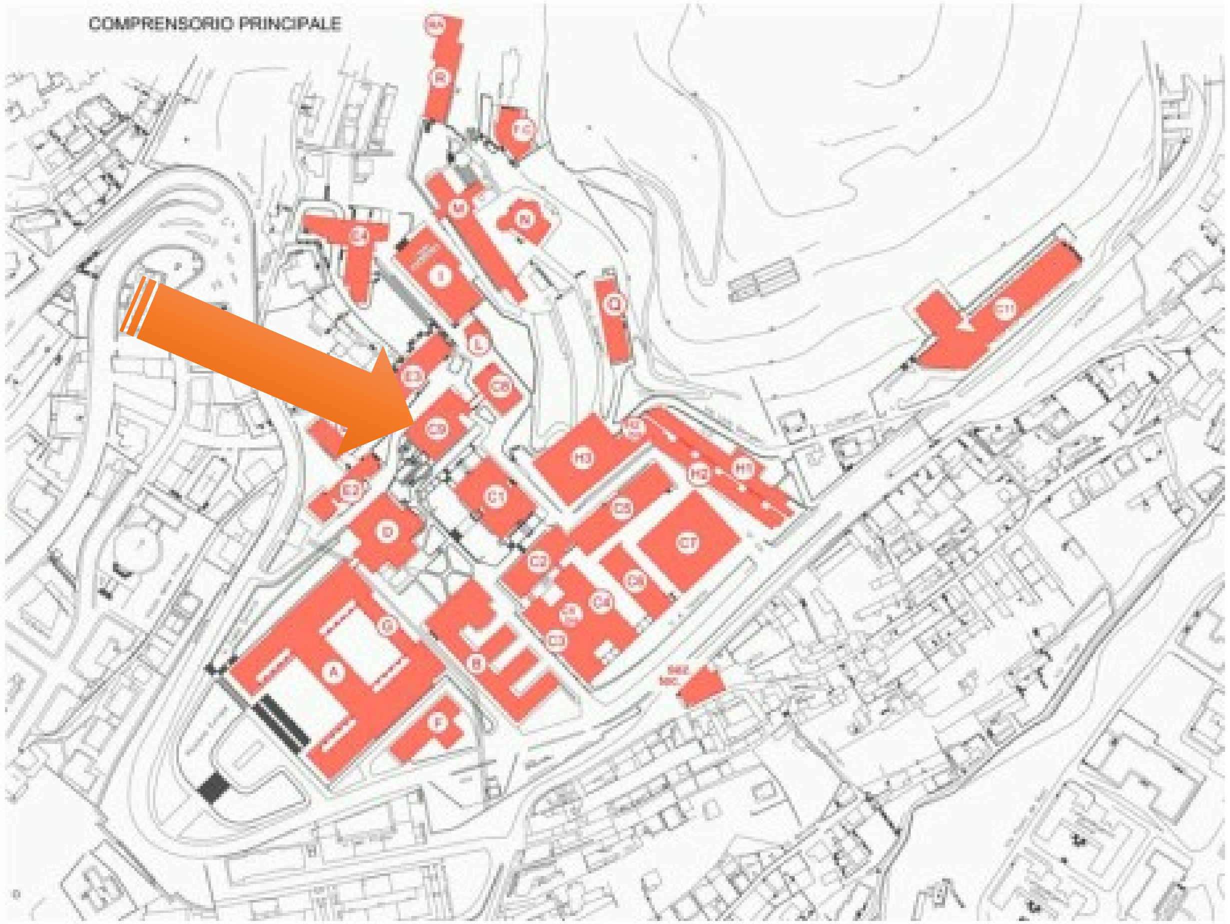
484MI – COSTRUZIONI IN ACCIAIO E VETRO

Informazioni generali

CONTATTI

Edificio C9 - Piazzale Europa 1 (5° piano)

email: **chiara.bedon@dia.units.it**



Ricevimenti:

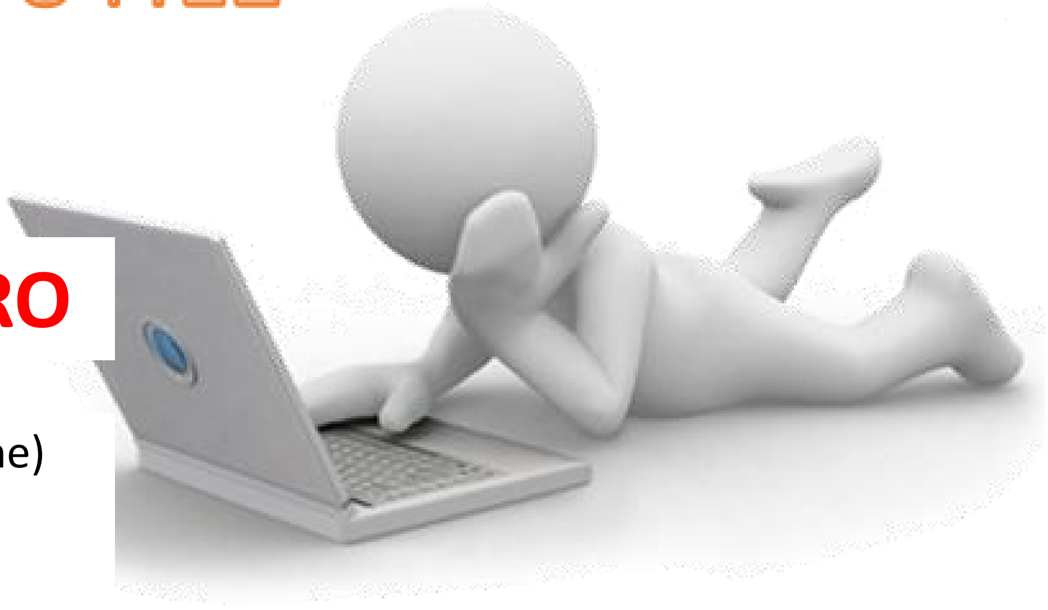
✓ disponibili SEMPRE (durante tutto l'anno), ma solo su appuntamento (da concordare via mail),

✓ **Privilegiare modalità online (Teams)**

✓ altre informazioni o chiarimenti via mail, sempre disponibili

PROGRAMMA & MATERIALE UTILE

Moodle (in continuo aggiornamento)



484MI - COSTRUZIONI IN ACCIAIO E VETRO

- ✓ Informazioni generali (calendario, modalità d'esame)
- ✓ Slides delle lezioni (in anticipo)
- ✓ Altro materiale utile (es. video, ecc.)
- ✓ Dettagli progetto d'anno

PASSWORD
AcciaioVetro_2025

✓ **NEWS** = avvisi vari **(in alternativa, chat Teams)**

MS Teams

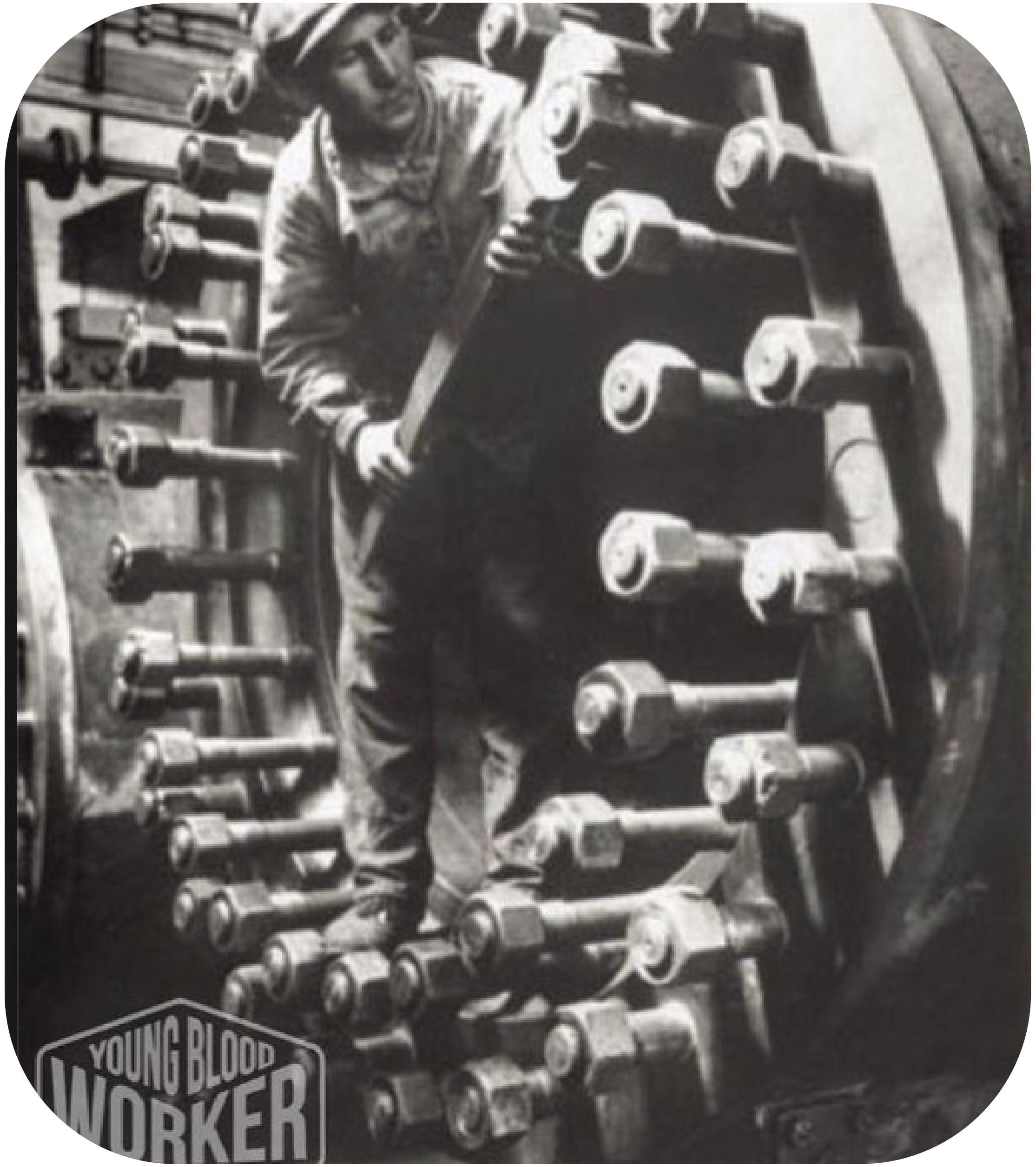
- ✓ Comunicazioni (chat)
- ✓ Richiesta ricevimenti / chiarimenti
- ✓ Revisione progetto
- ✓ Lezioni

ORARIO LEZIONI

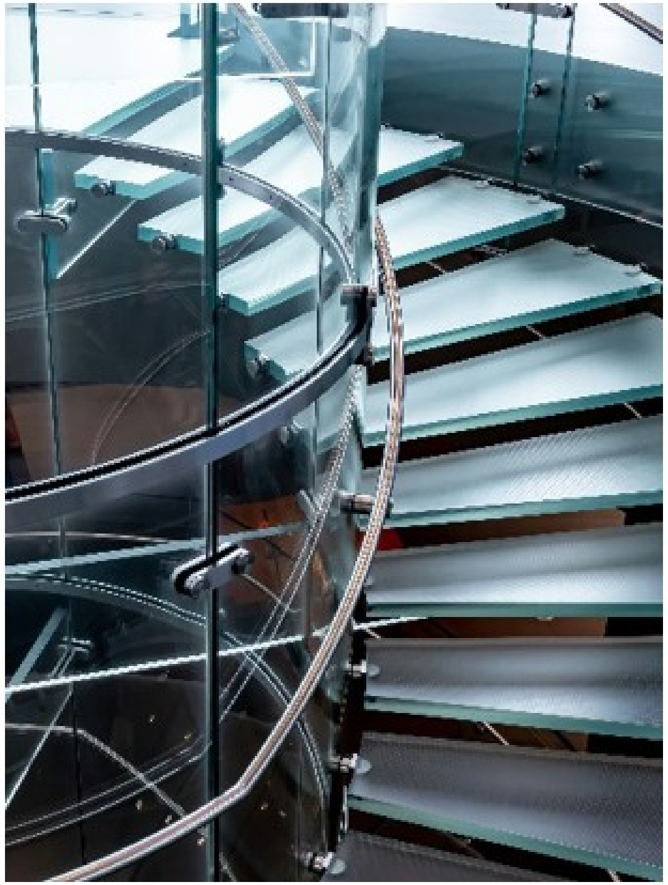
Martedì (3h)
15.00 – 18.00

Mercoledì (2h)
8.00 – 10.00

- Introduzione / metodo d'esame / calendario / argomenti / progetto
- Analisi dei telai
- Vetro strutturale
- Giunti / tipologie / metodo per componenti (Appendice J)
- Tipologie costruttive e dettagli
- Edifici monopiano in acciaio
- Stabilità dell’equilibrio
- Torsione non uniforme (Vlasov)
- Stabilità laterale di travi inflesse
- Lastre sottili
- Strutture composte in acciaio-calcestruzzo
- Progetto d’anno



ARGOMENTI DELLE LEZIONI



MUR
Ministero dell'Università e della Ricerca

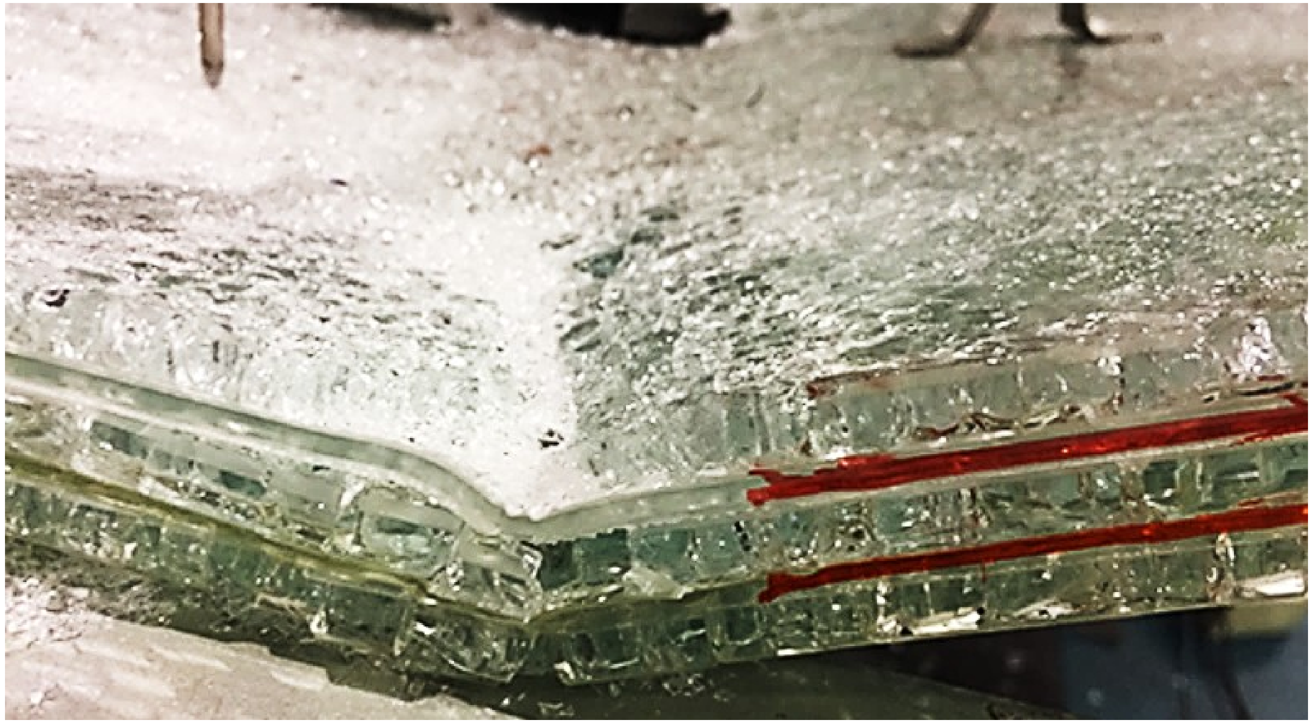
UNIVERSITÀ DEGLI STUDI DI TRIESTE
Dipartimento di Ingegneria e Architettura

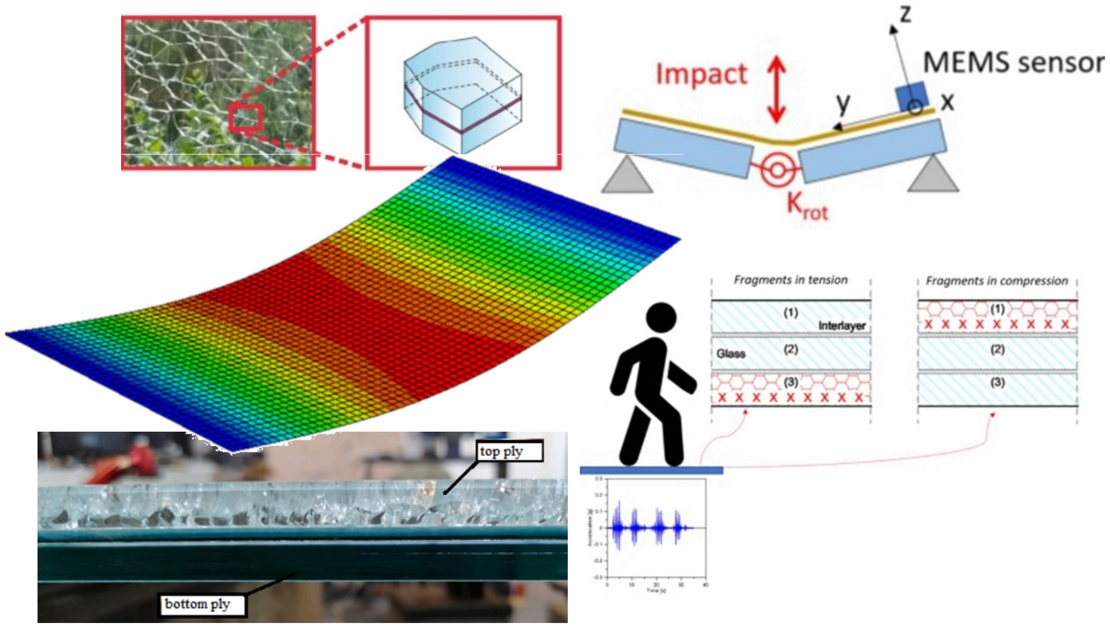
PI Prof. Chiara Bedon

FIS 1

HOPgLAz

Holistic post-breakage characterization for optimized safe design of glass under multi-hazard

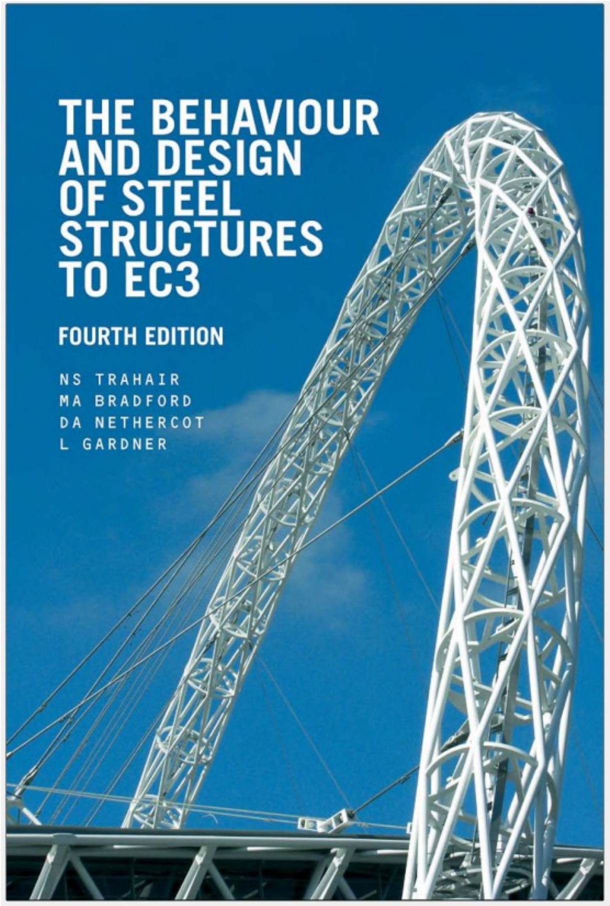


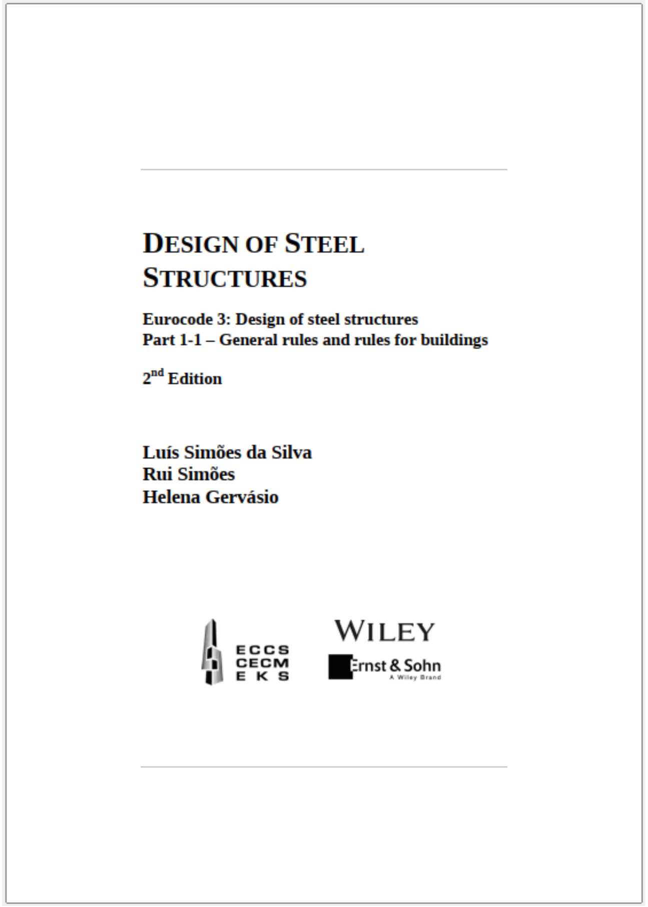


BIBLIOGRAFIA

- ✓ **Appunti del corso**

BIBLIOGRAFIA





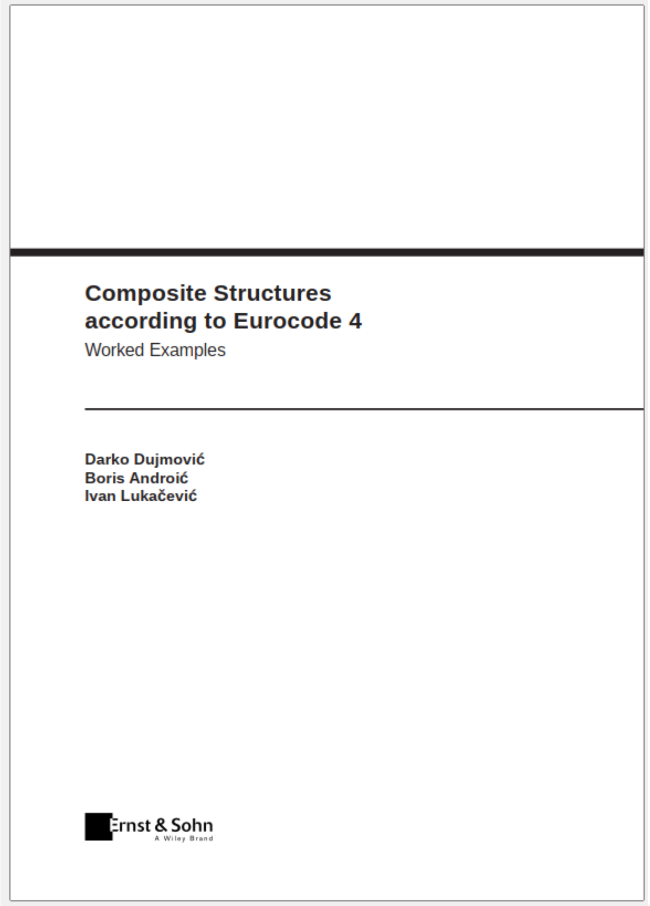
DESIGN OF STEEL STRUCTURES

Eurocode 3: Design of steel structures
Part 1-1 – General rules and rules for buildings

2nd Edition

Luís Simões da Silva
Rui Simões
Helena Gervásio

ECCS CECM EKS
WILEY
Ernst & Sohn
A Wiley Brand



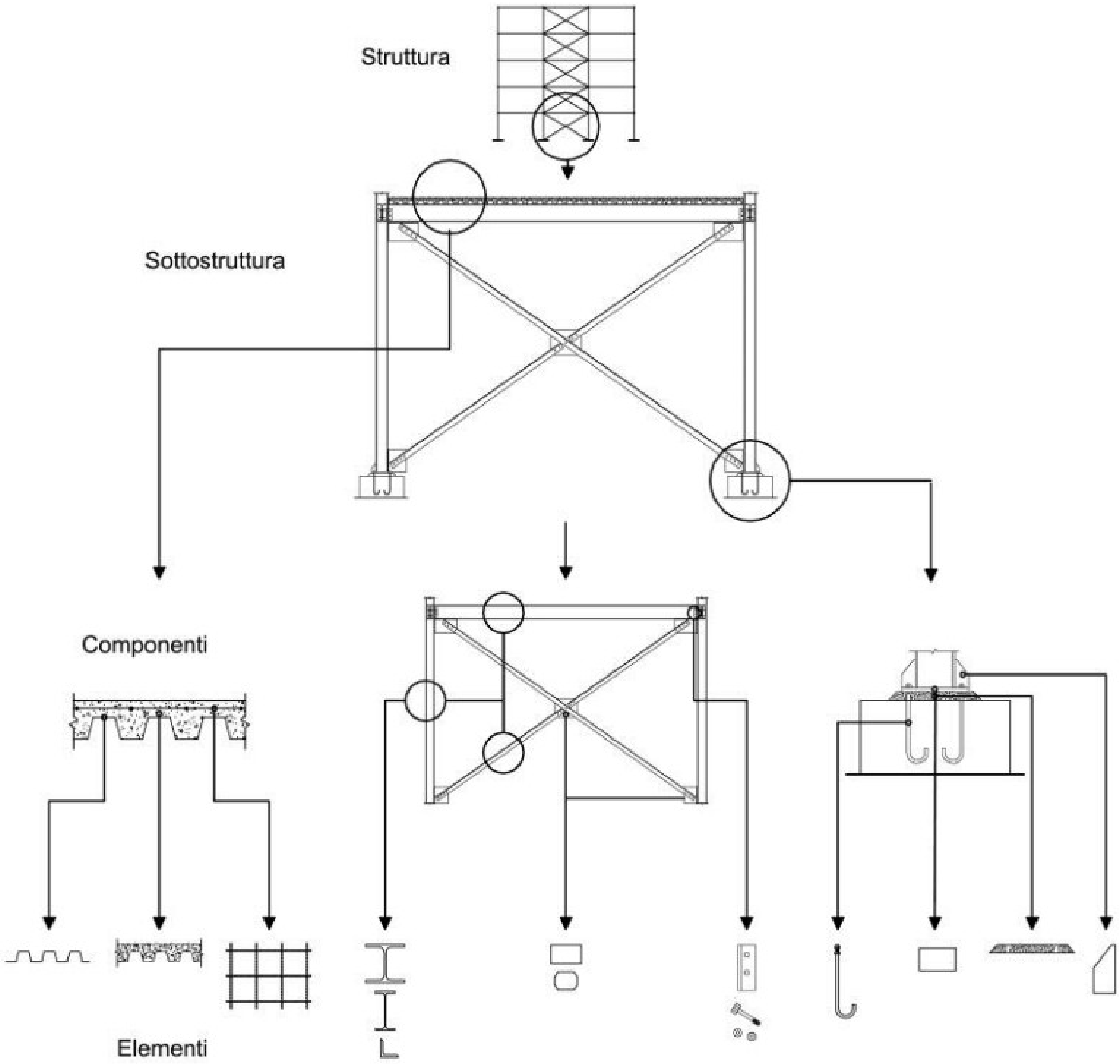
Composite Structures according to Eurocode 4
Worked Examples

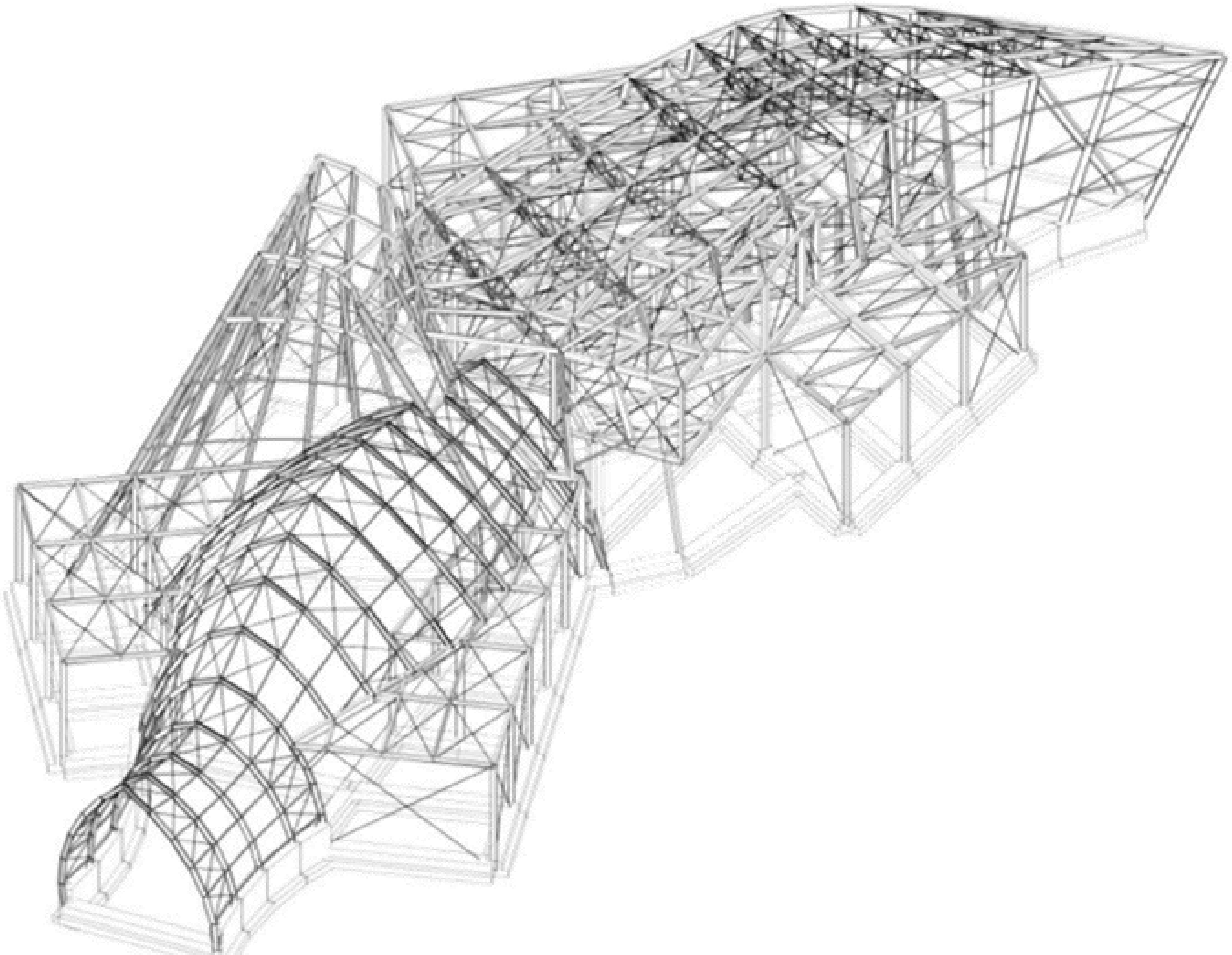
Darko Dujmović
Boris Androić
Ivan Lukačević

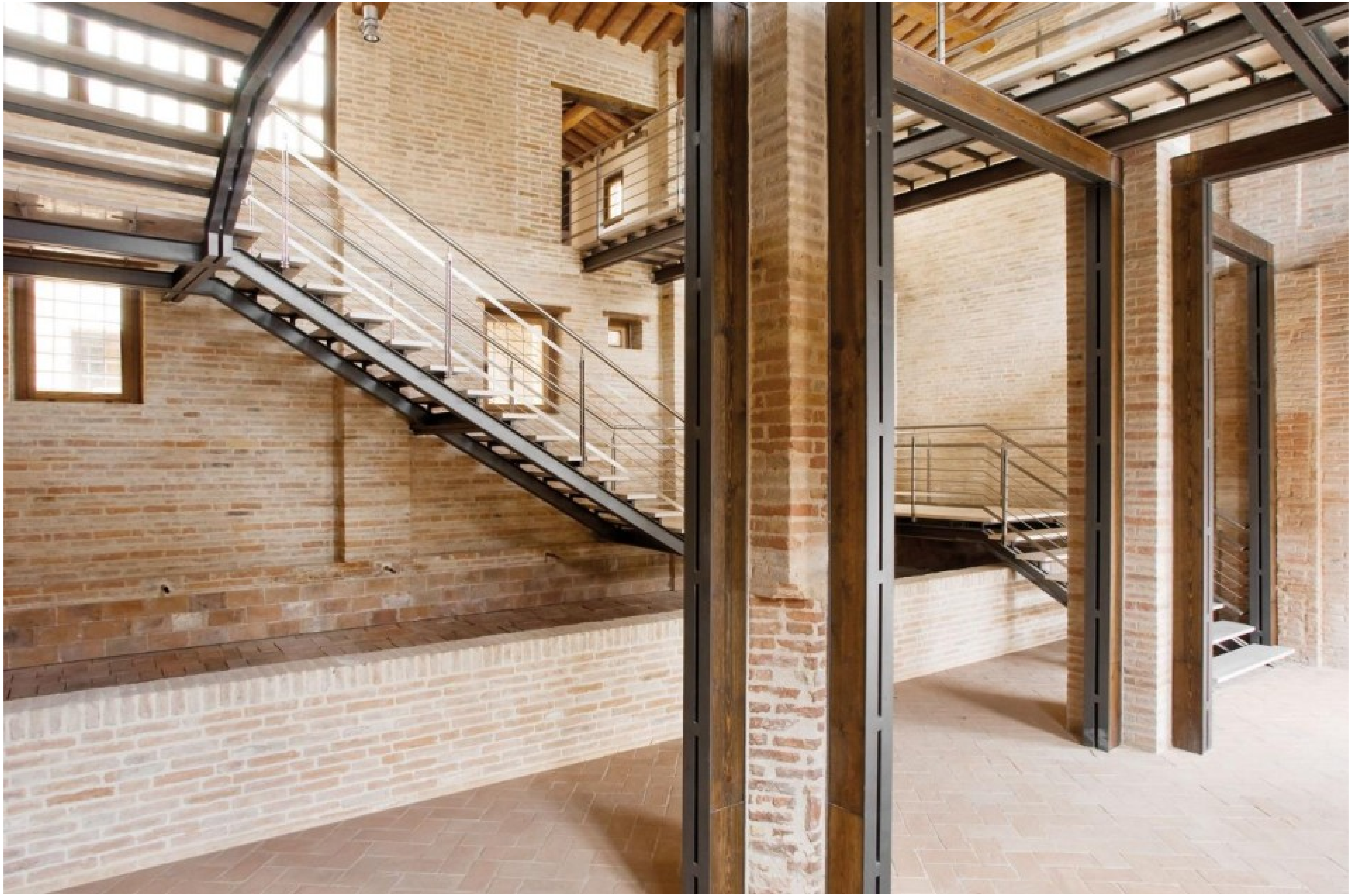
Ernst & Sohn
A Wiley Brand

ESAME

- ✓ **Progetto / esercitazione**
- ✓ **Prova orale (min 7 date d’appello all’anno)**

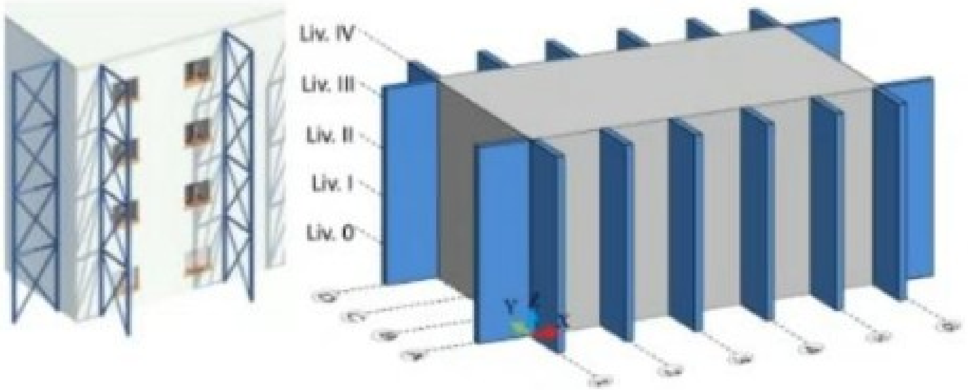

Struttura
Sottostruttura
Componenti
Elementi



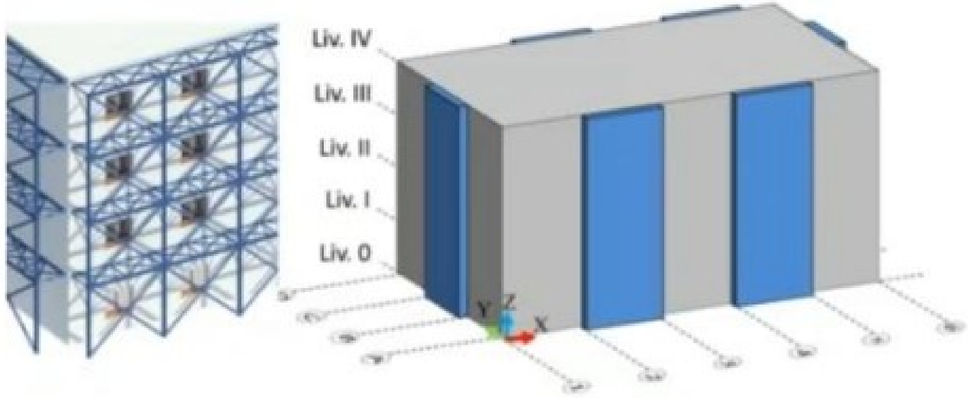


Esoscheletri 2D

Pareti di taglio ⊥

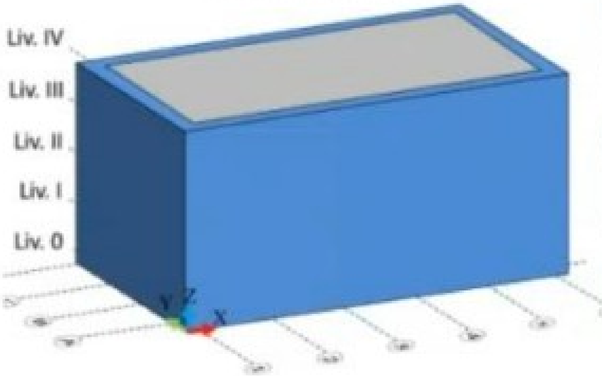


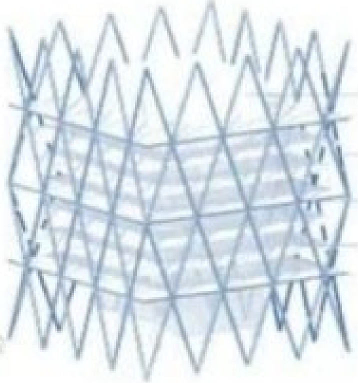
Pareti di taglio //



Esoscheletri 3D

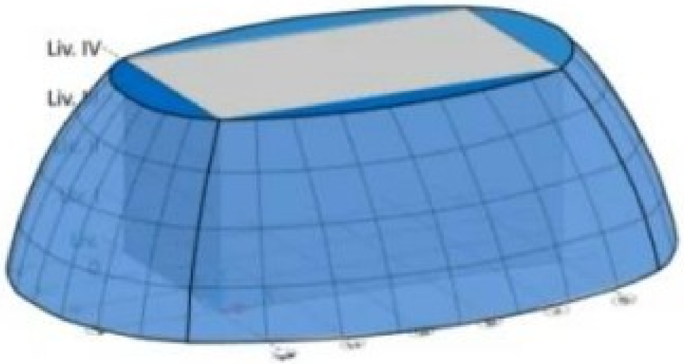
Scatolari





Diagrid

Gusci



Integrale se inviluppa integralmente la struttura, compresa la copertura

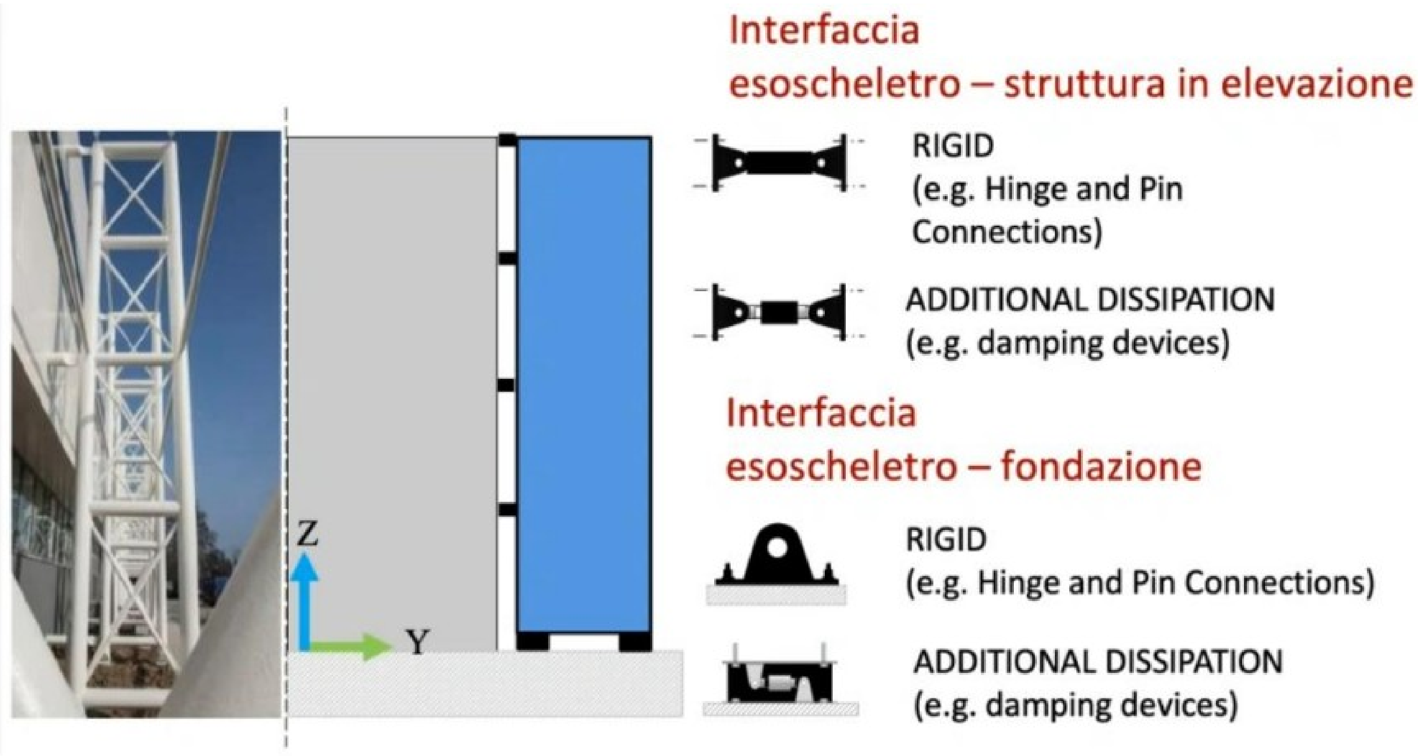


Fig. 24 – Interfaccia esoscheletro con struttura in elevazione e fondazione

Fig. 25 – Esempio di impiego di esoscheletri nell'adeguamento sismico di un edificio esistente

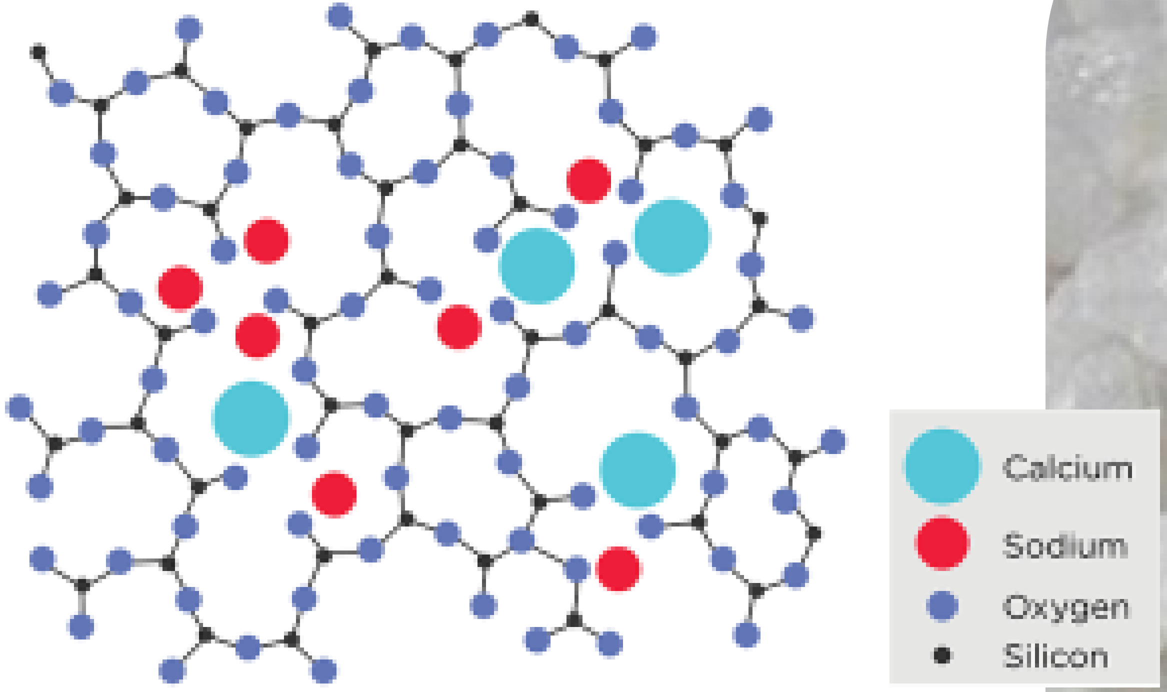


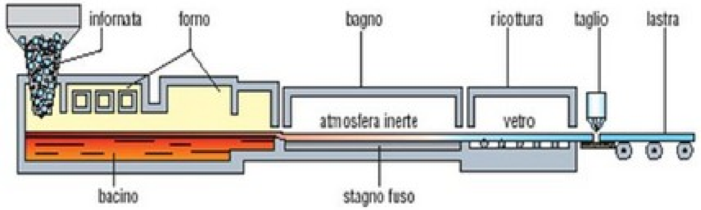


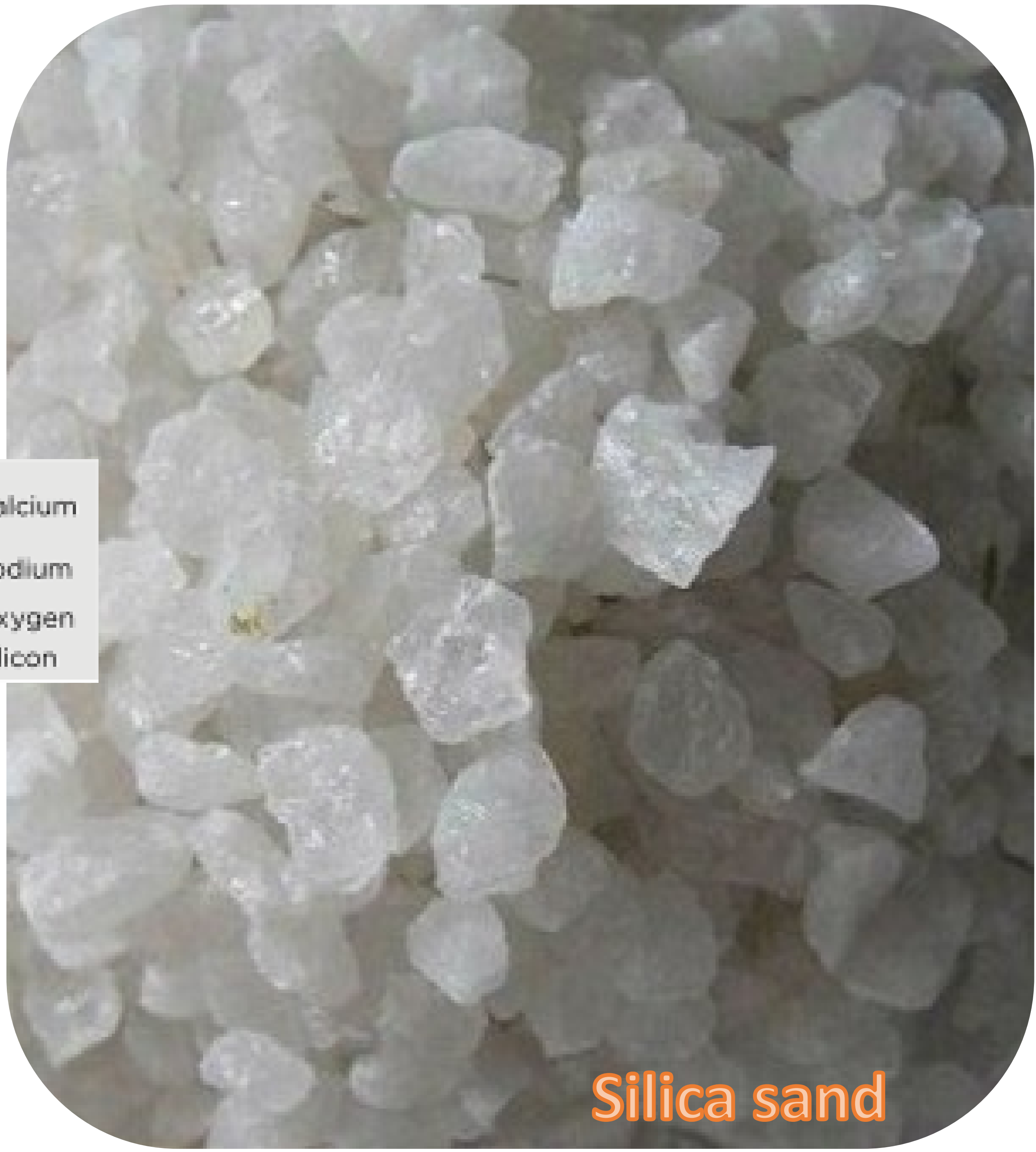
2000 BC
Egypt

4000 BC
Mesopotamia

1688 Saint Gobain
Production of flat glass

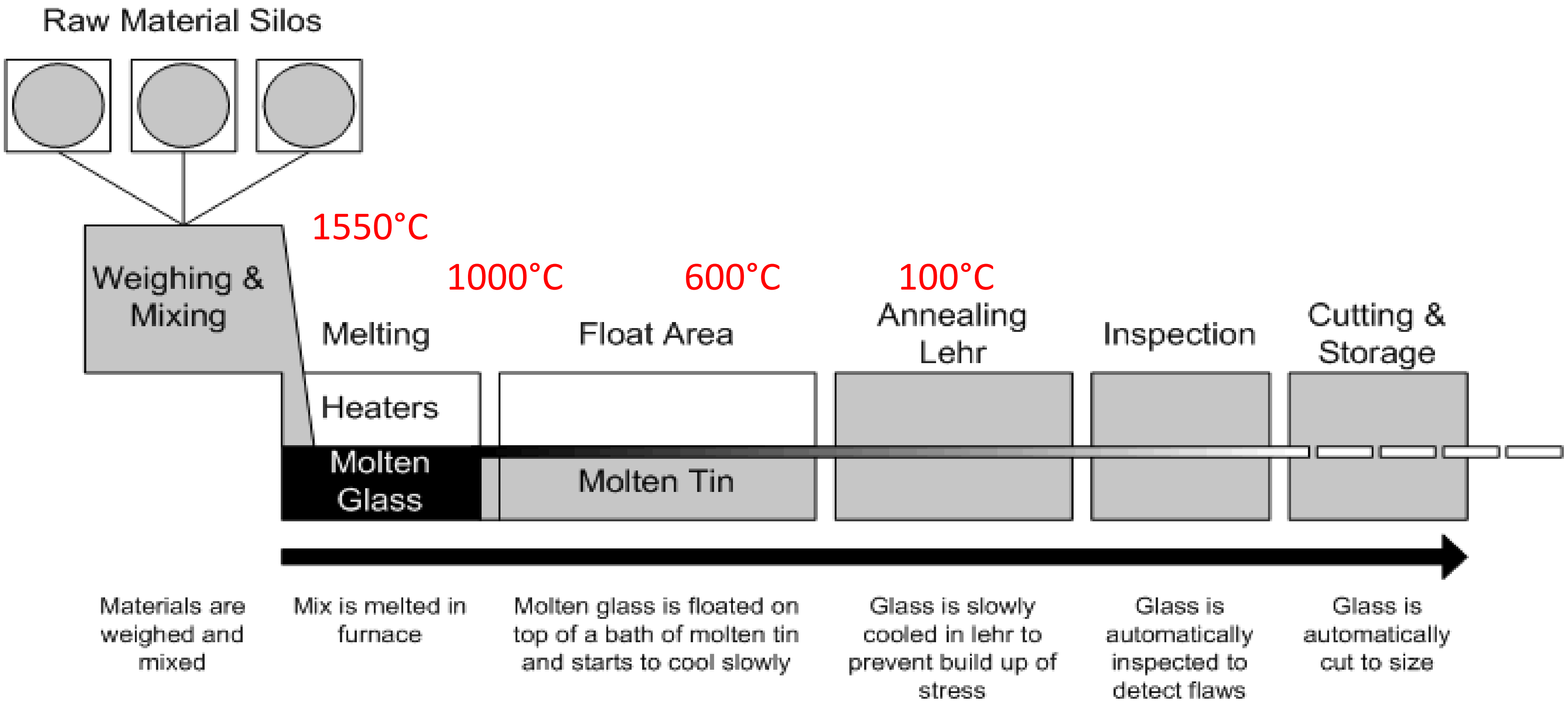

Calcium
Sodium
Oxygen
Silicon


infornata
forno
bagno
ricottura
taglio
lastra
atmosfera inerte
vetro
bacino
stagno fuso

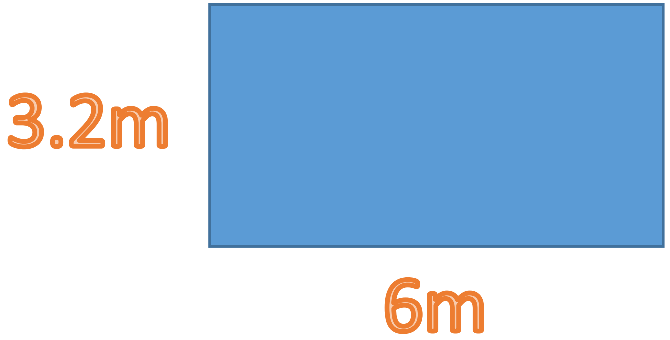

Silica sand

Modern Float Glass production

(Pilkington Brothers 1959)




22mm
19mm
15mm
12mm
10mm
8mm
6mm
5mm
4mm
3mm
2mm
1.5mm
1mm
0.55mm
0.2mm
0.1mm
0.05mm
0.025mm
STRUCTURES


3.2m
6m

2010

Dusseldorf

EXTRA SIZE

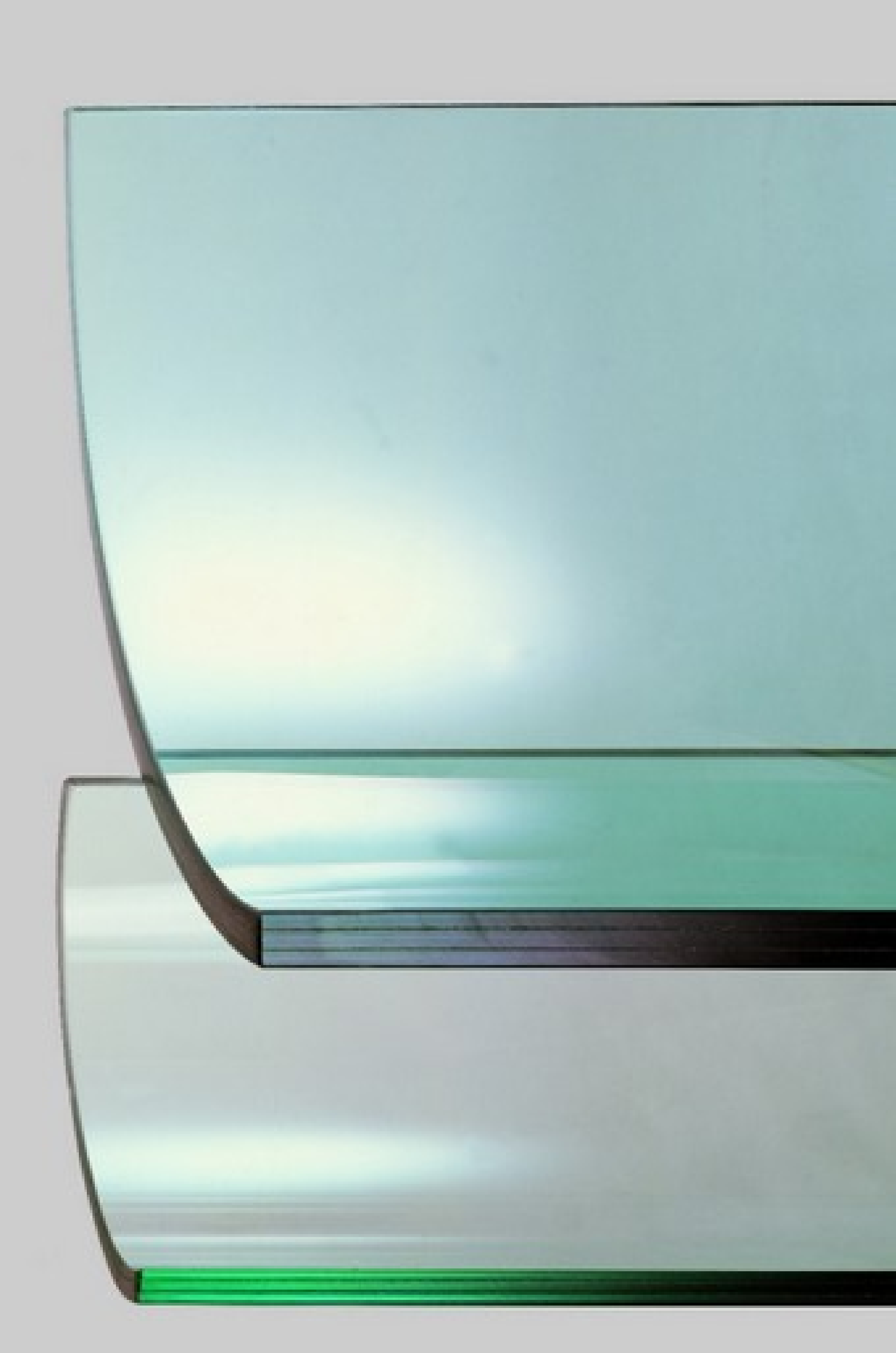
18 x 3.3m

3x10mm (4,5 tons)

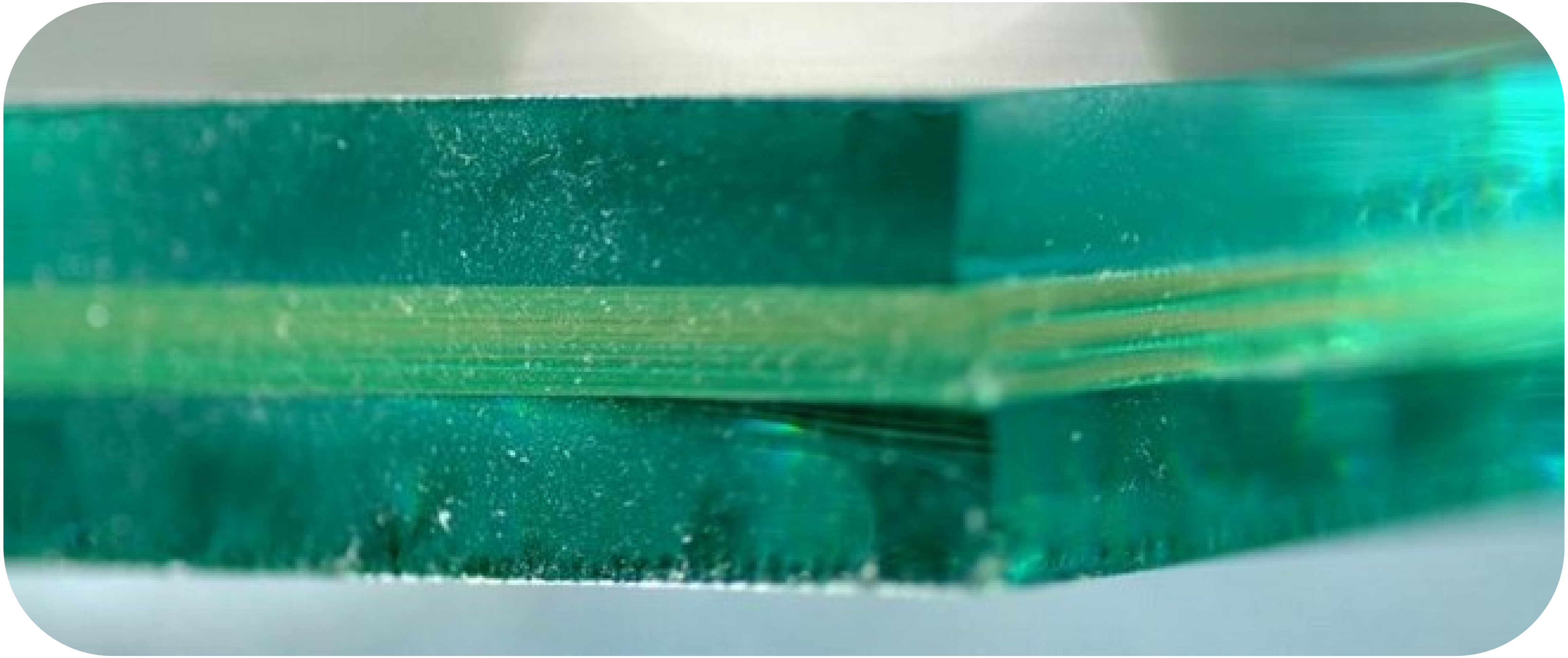
EXTRA SIZE
(China)
25m long

Curved glass

Curved glass



Laminated glass



1. **PVB - Amorphous thermoplastic family (1930's – Monsanto/DuPont)**
   - ❑ Tough, resilient, durable with high penetration resistance, sound, solar
   - ❑ Mechanical behavior is temperature / load duration dependent.
   - ❑ The cheapest interlayer
2. **TPU - Thermoplastic family (1937-Bayer)**
   - ❑ One of the most polyvalent plastic material & most expensive one
   - ❑ Performances between rubbers and plastics materials
   - ❑ Excellent mechanical and viscoelastic properties at extreme temperature
3. **EVA - Thermoplastic family (1950-ICI)**
   - ❑ Properties are less Time / temperature dependent than PVB's due to the fully cross linked (3D)structure
   - ❑ Performances and properties between LDPE, plasticized PVC and flexible rubbers
4. **Ionoplast: Elasto-plastic family (1960)**
   - ❑ Semi-crystalline thermoplastic
   - ❑ Superior mechanical and viscoelastic properties
5. **CIP - Thermo-set plastic family (1980's)**
   - ❑ Multi-components (polyester + acrylic resin +styrene) for acoustic performances
   - ❑ Mono-component (acrylic resin) for safety performances

Interlayers for laminated glass

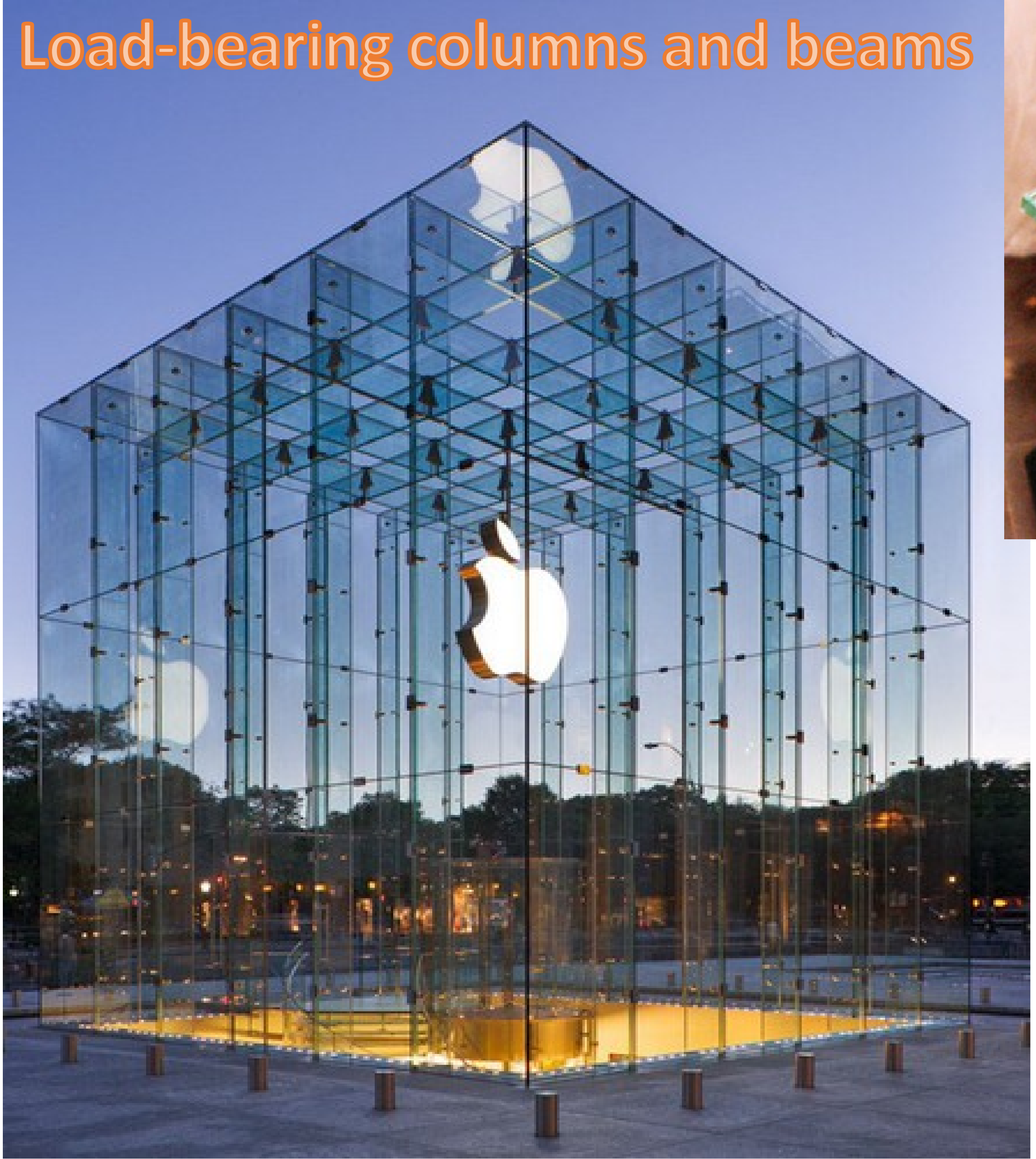
Production steps for edge finiture, holes, cuts, etc.

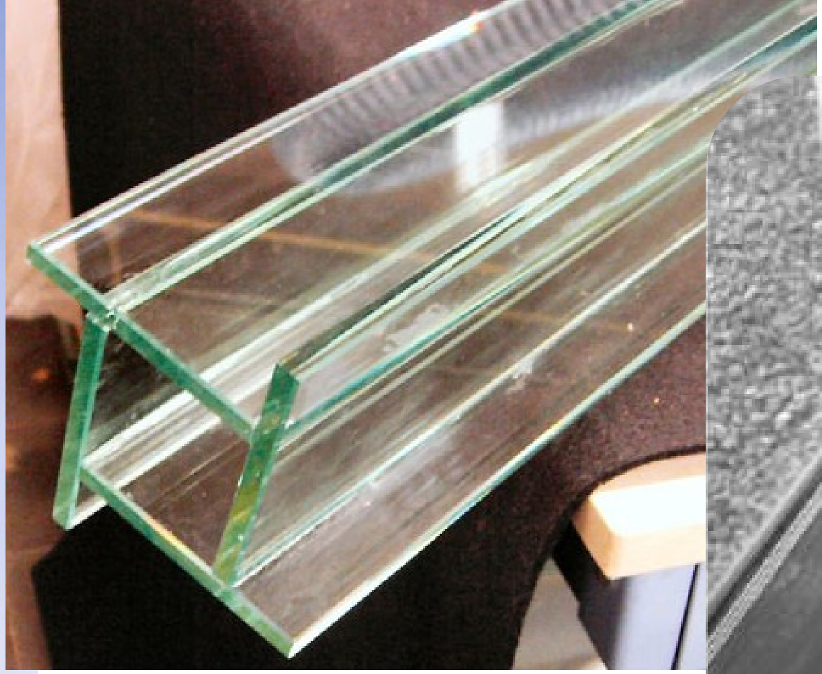

Facades

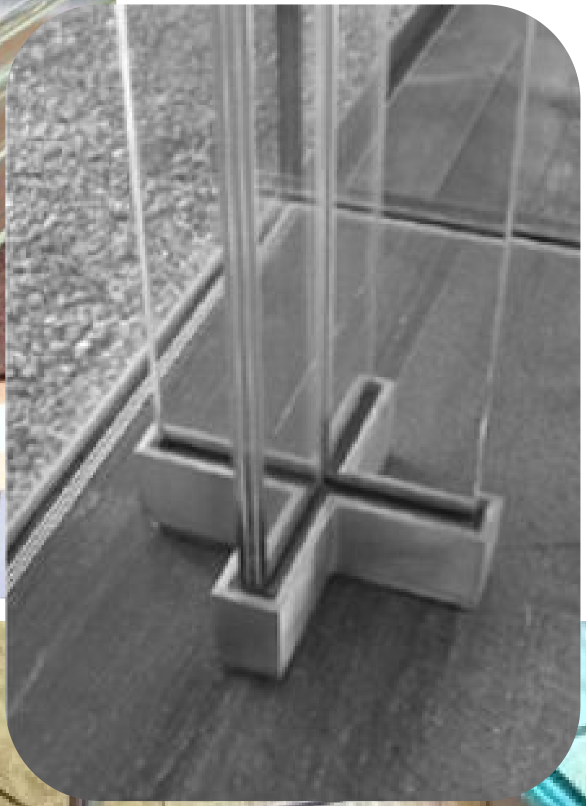
Facades


Privacy
Acoustic Comfort
Thermal Comfort
Energy
Solar radiation

Load-bearing columns and beams







Stairs


Stairs


Chicago (USA)
Willis Tower – TILT
2009 (1000ft)

Glass bridge Lisbon (Portugal)
2011 (20m)

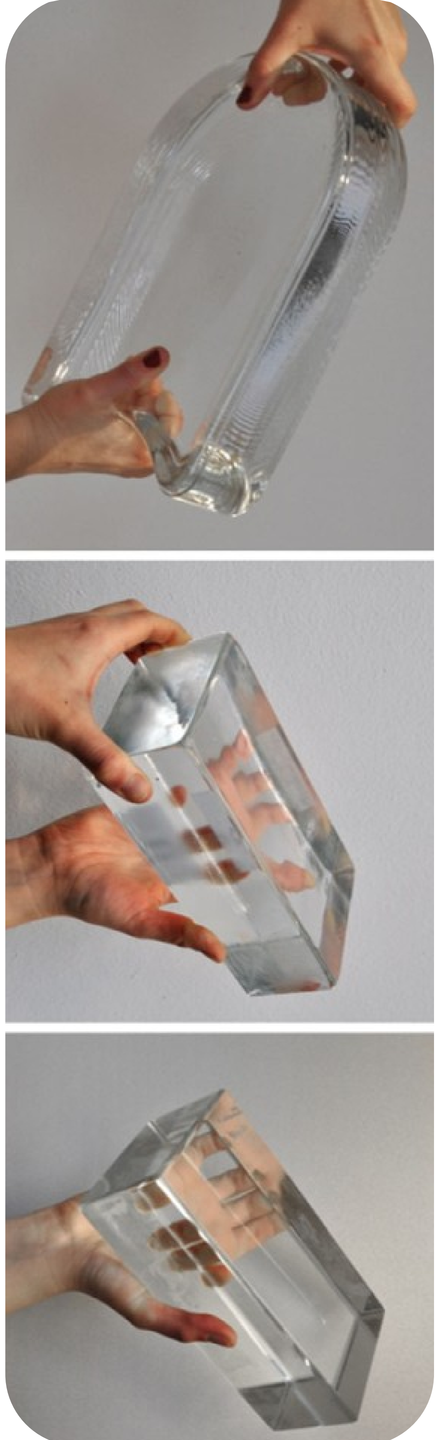
Glacier Skywalk (Canada)
2014 (35m, H=280m)

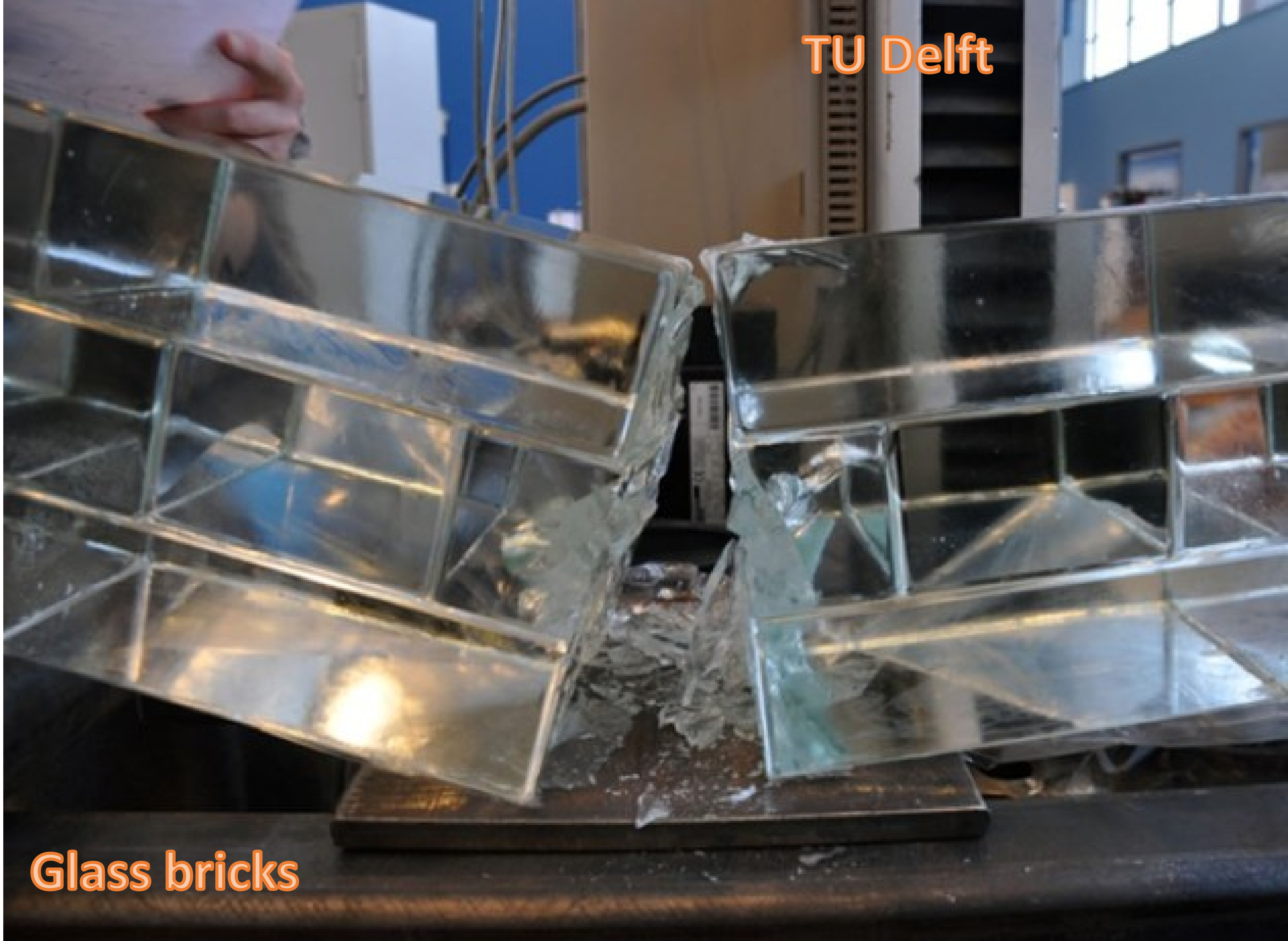
Grand Canyon Skywalk (Arizona)
2008 (H= 240m)

Shiniuzhai Glass Bridge (China)
2015 (L=300m, H= 180m)

Shiniuzhai Glass Bridge (China) 2015 (L=300m, H= 180m)


© Quirky China News / Rex Features

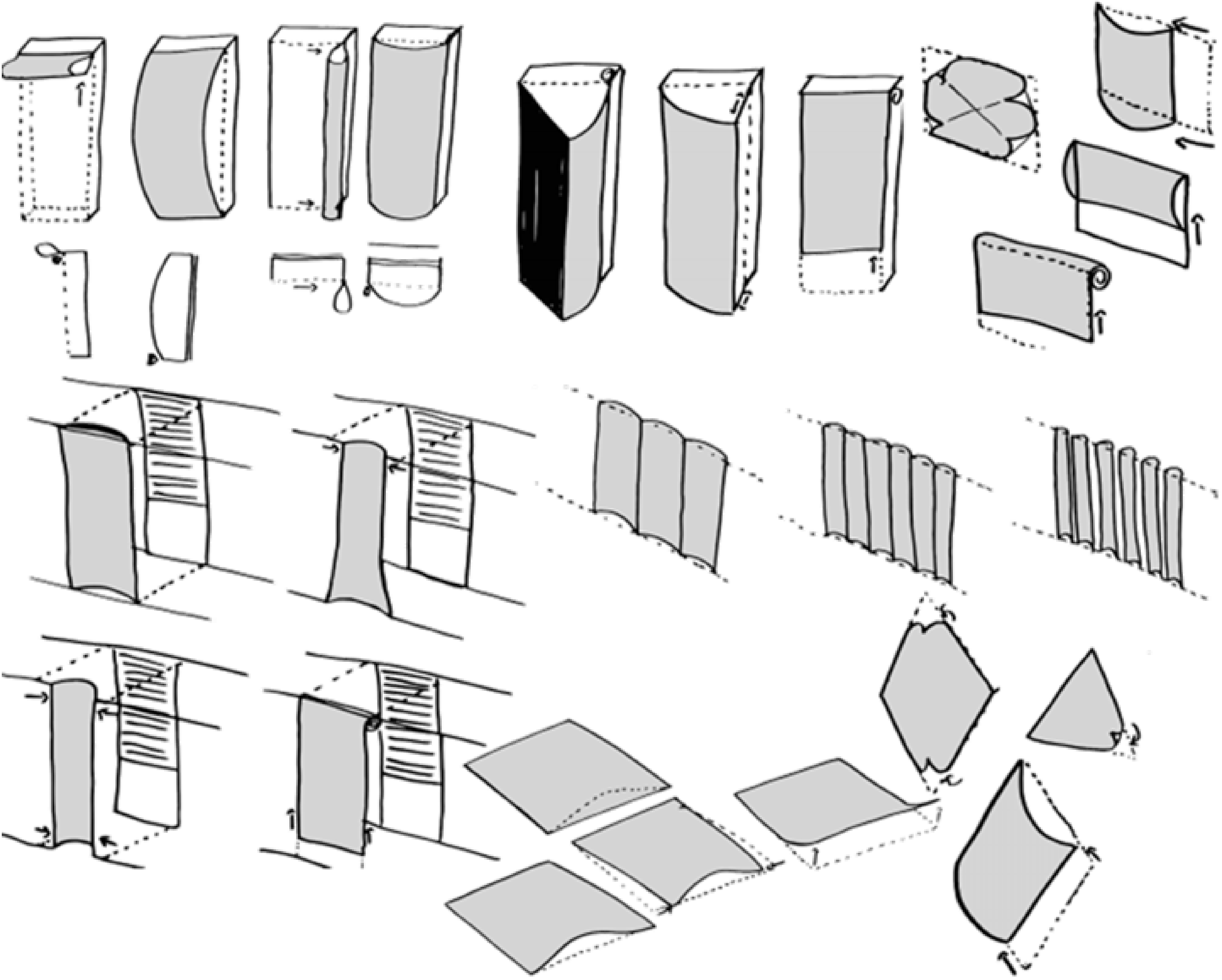


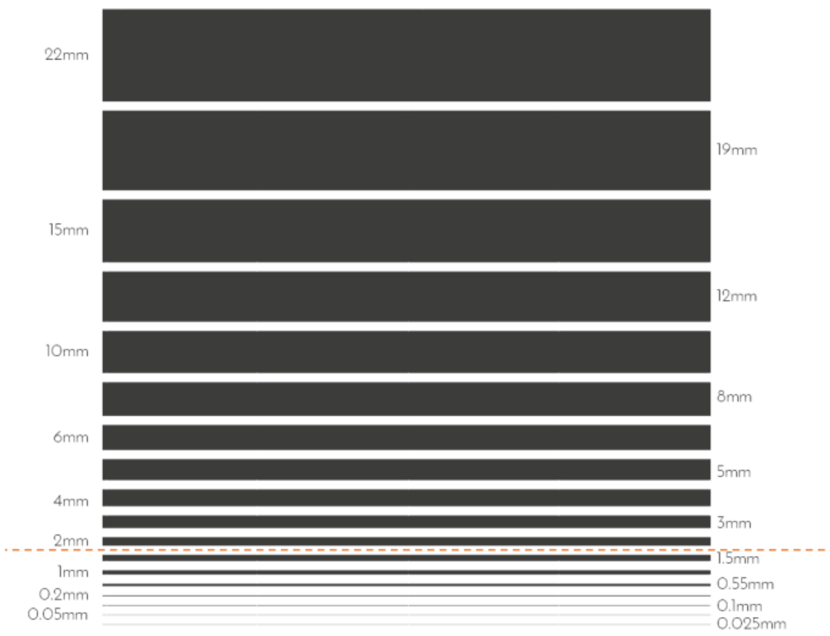

TU Delft
Glass bricks

Glass bricks

Chanel
Crystal Palace
Amsterdam

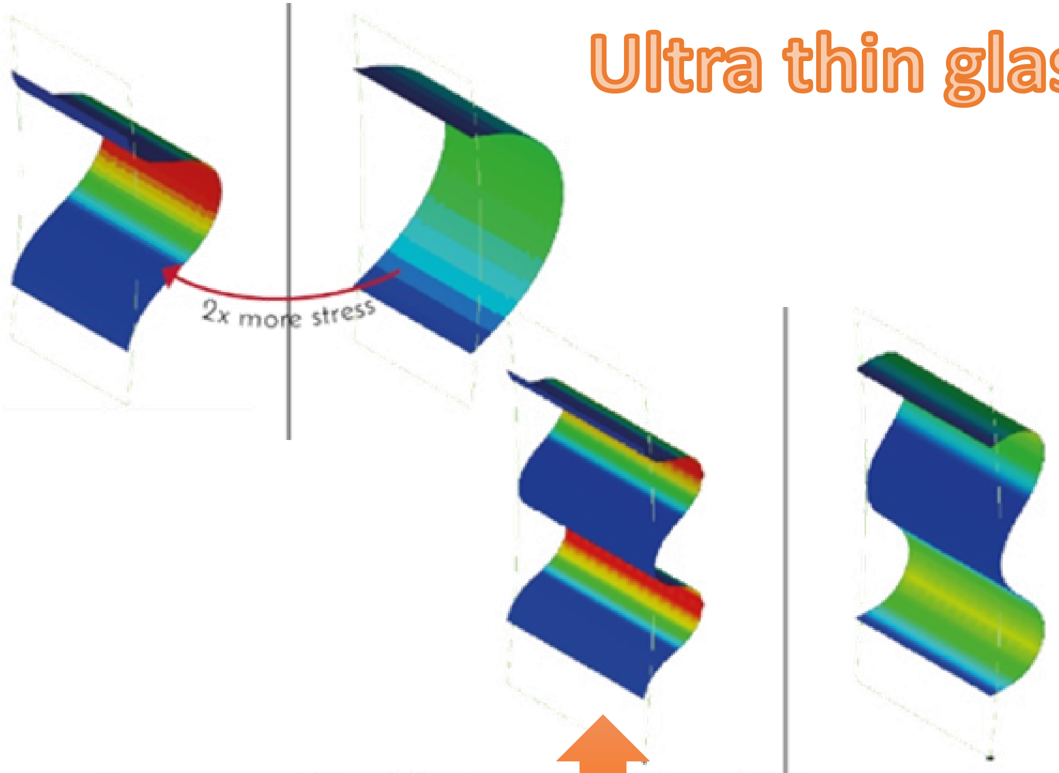
Ultra thin glass

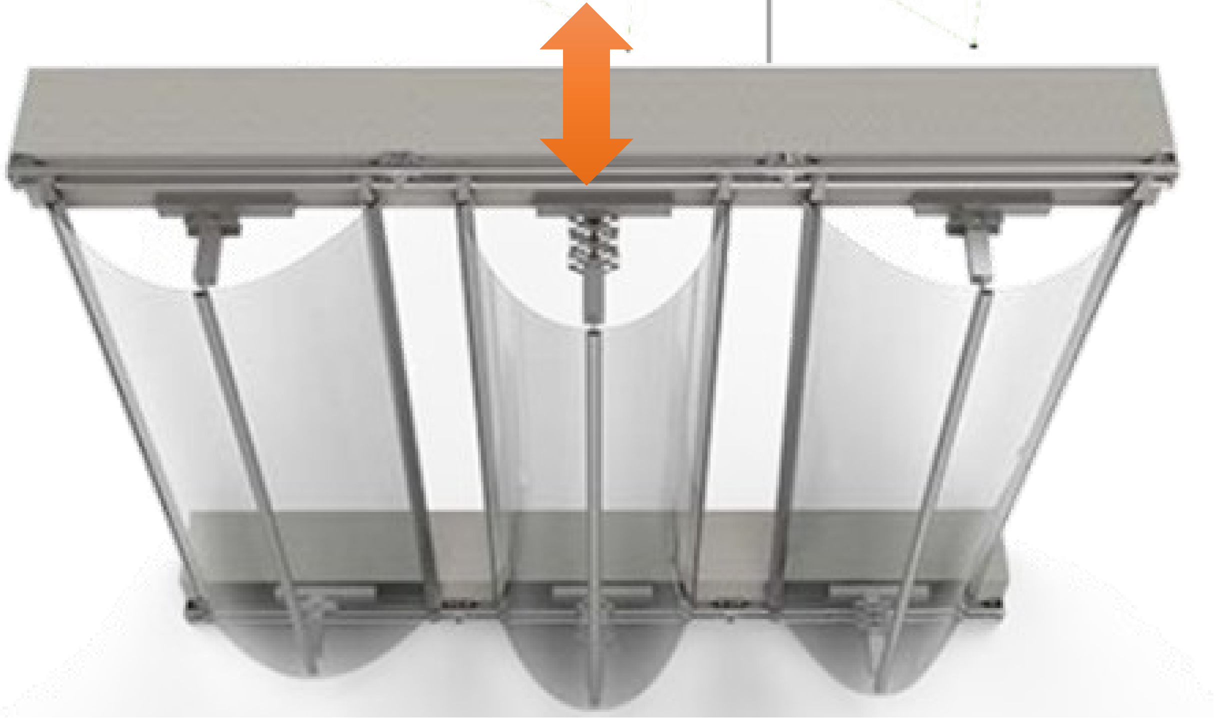


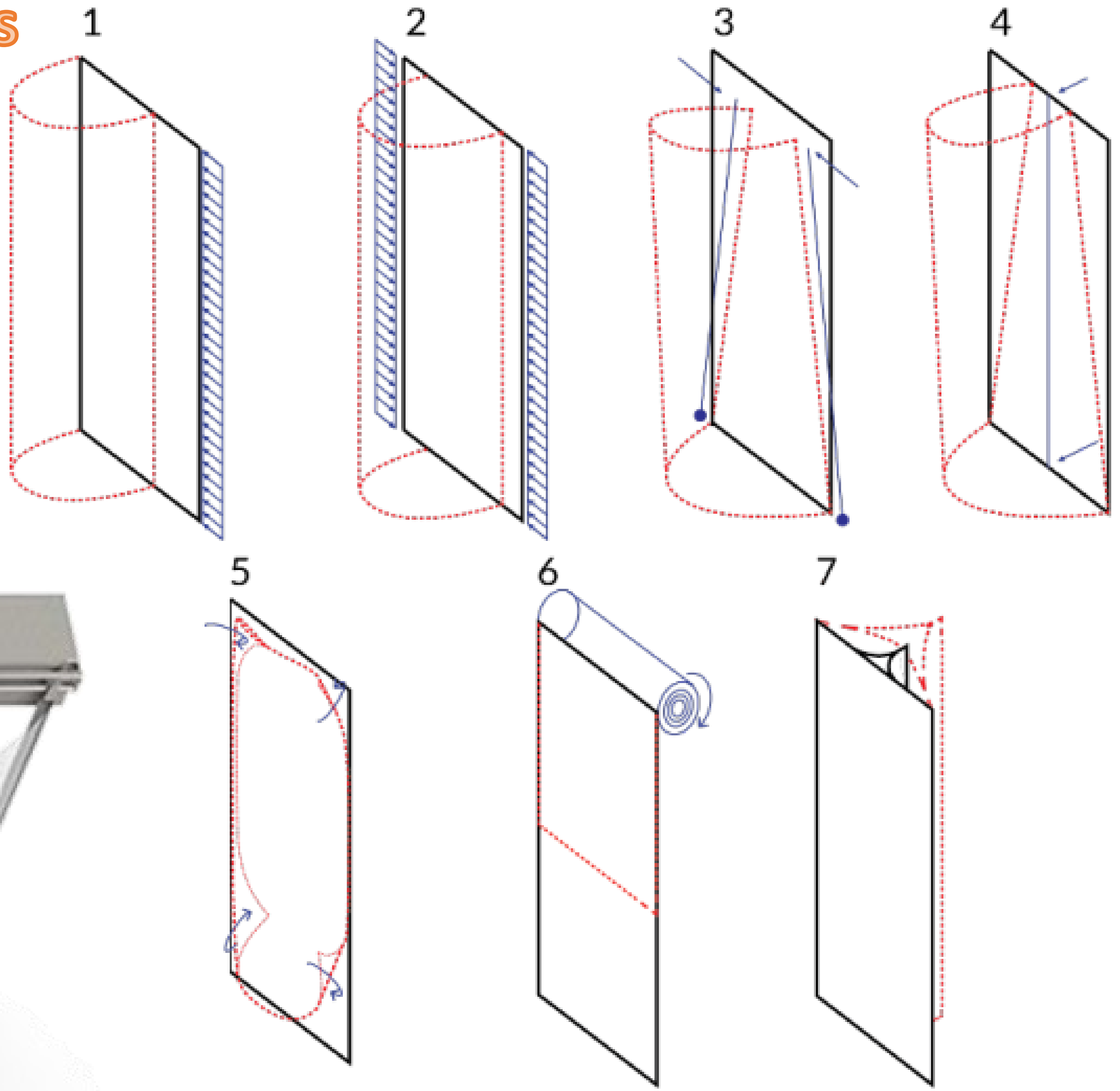


Adaptive facades

Ultra thin glass

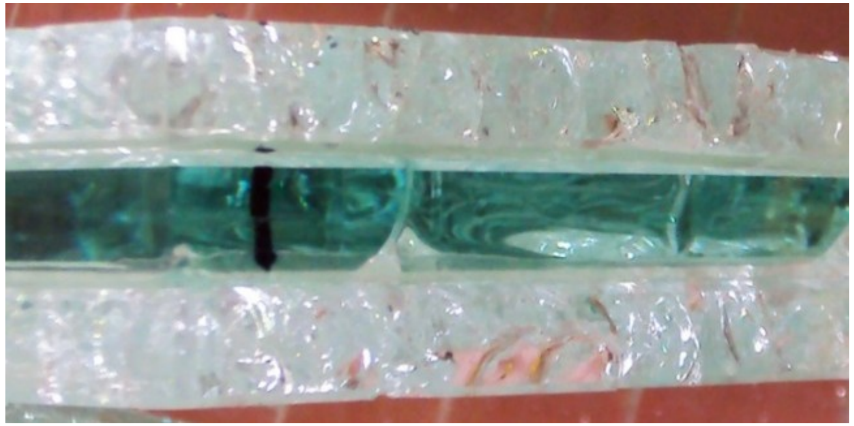






Glass

Glass


Extreme design loads

Natural hazards that glass structures should be able to withstand


Extreme design loads
Explosions and impact
(human-induced or accidental)
lass shards
re the first cause of injuries

Extreme design loads

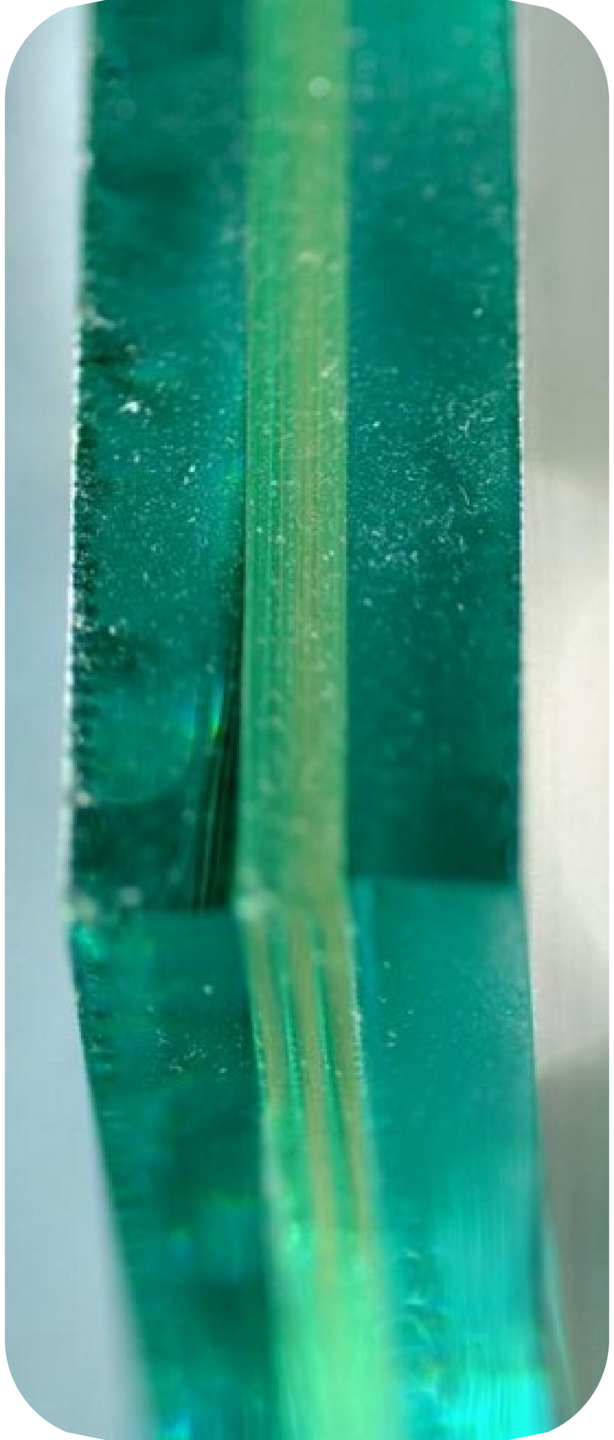
Brussels Zaventem

Extreme design loads

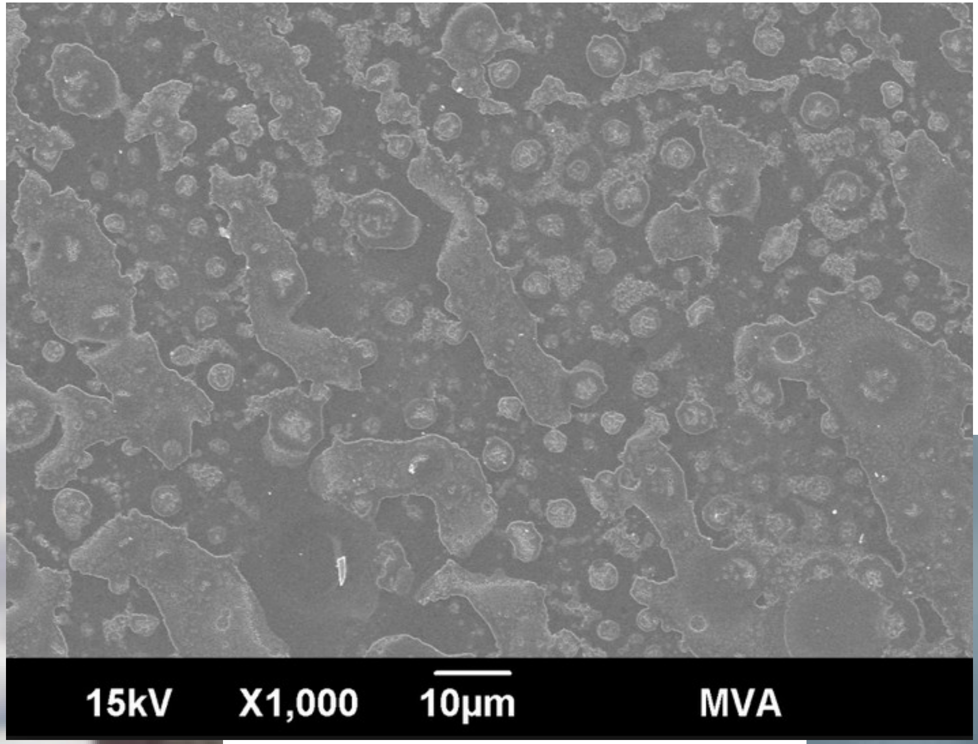
Impact

Post-cracked behaviour

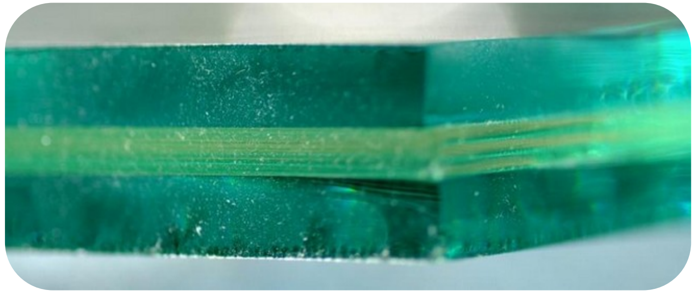
- Residual stiffness?
- Tearing of interlayers?

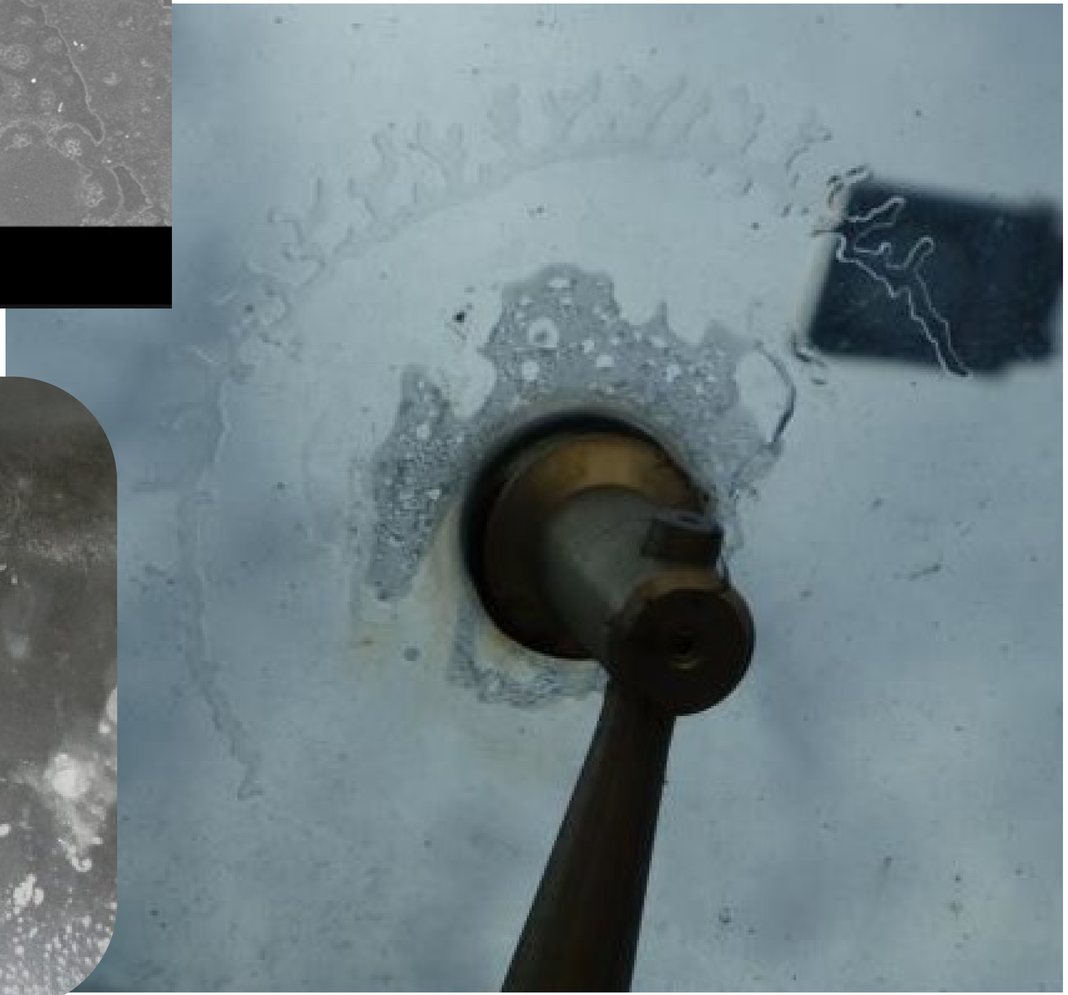


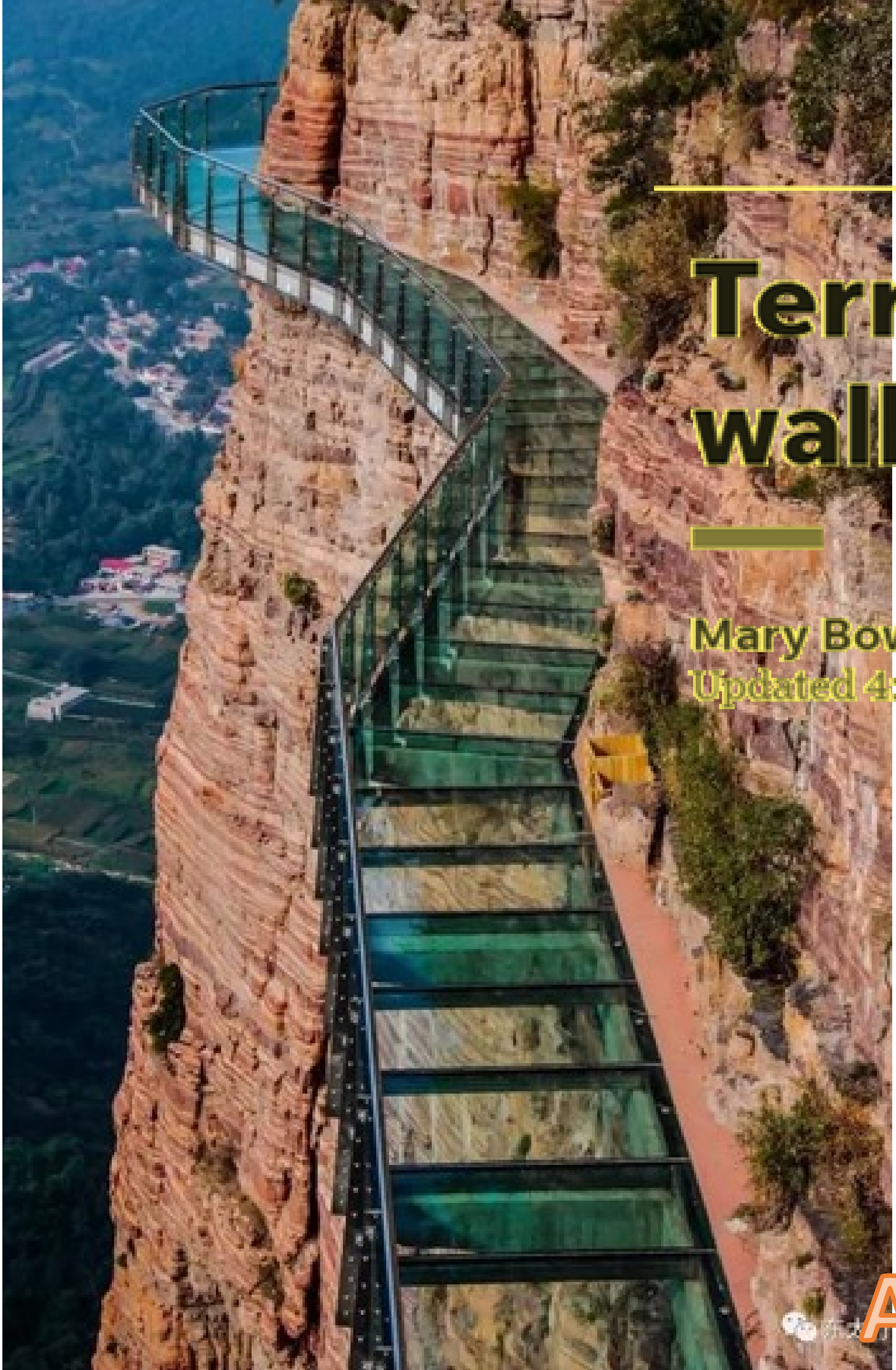
Degradation



Delamination







USA TODAY

Terror at 3,500 feet as glass walkway in China cracks

Mary Bowerman | USA TODAY Network
Updated 4:24 PM EDT Oct 7, 2015

Accidental failure

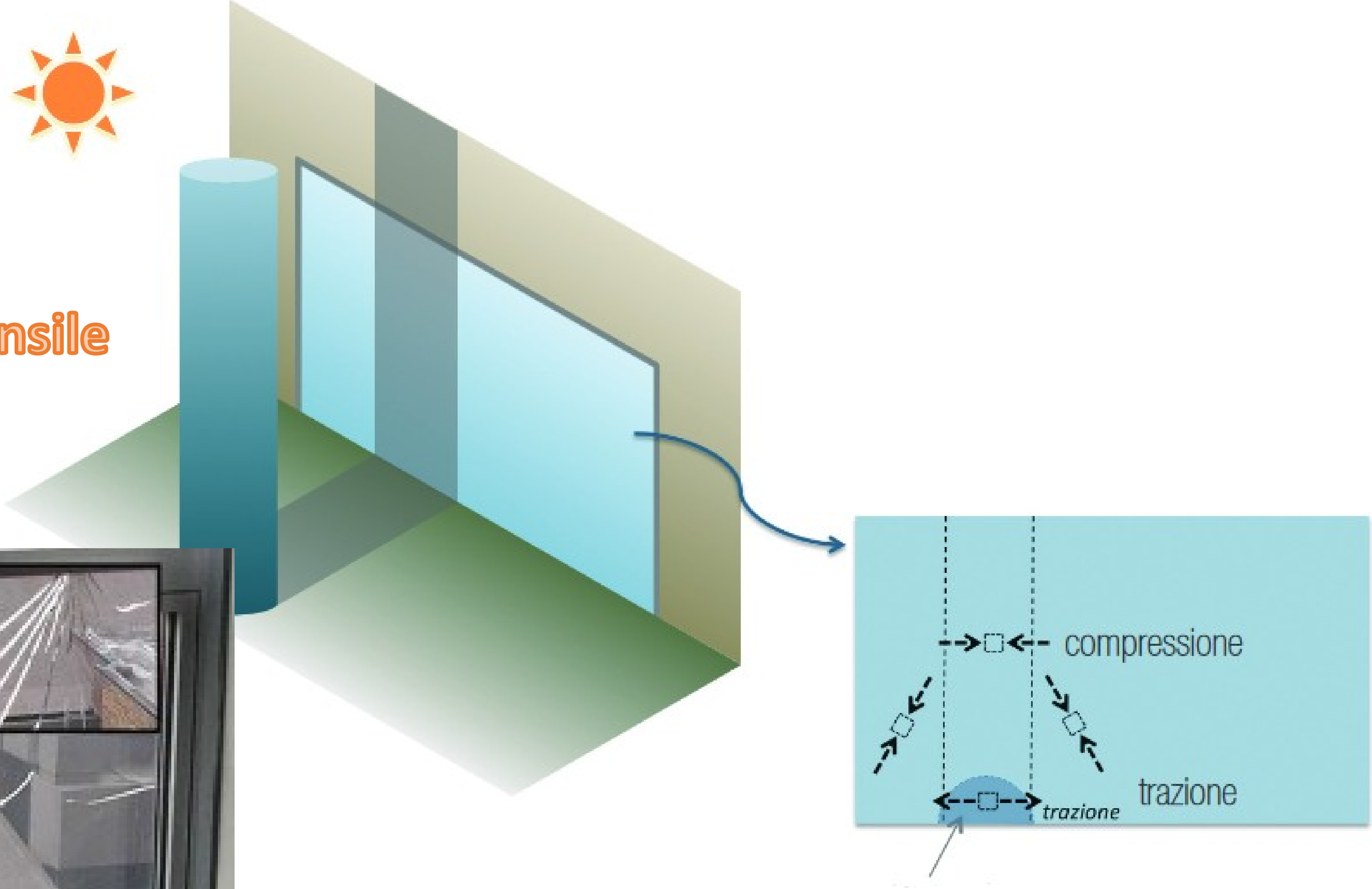
Accidental failure

Nichel sulfide inclusions in tempered glass

Accidental failure

Thermal shock

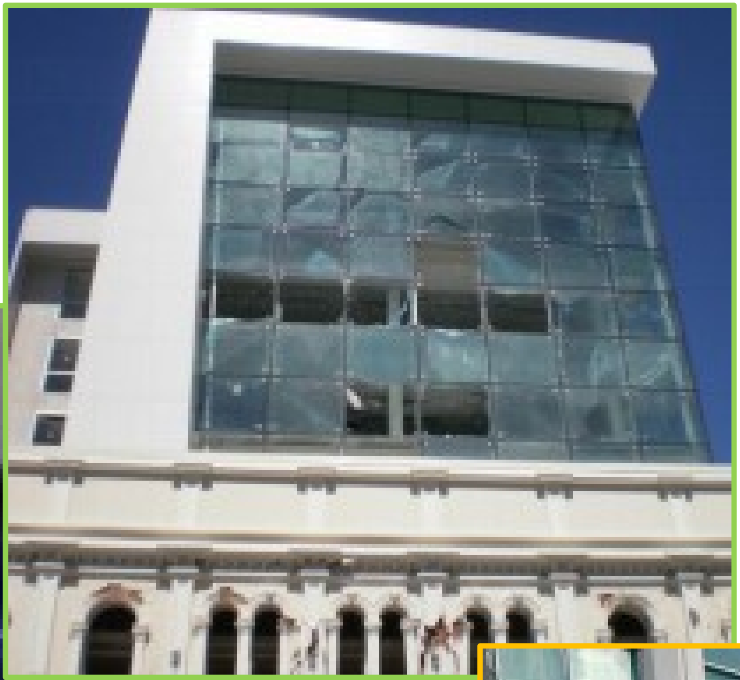
Depends on the limited tensile resistance and thermal conductivity of glass



Thermal gradients involve a differential expansion, thus stress peaks

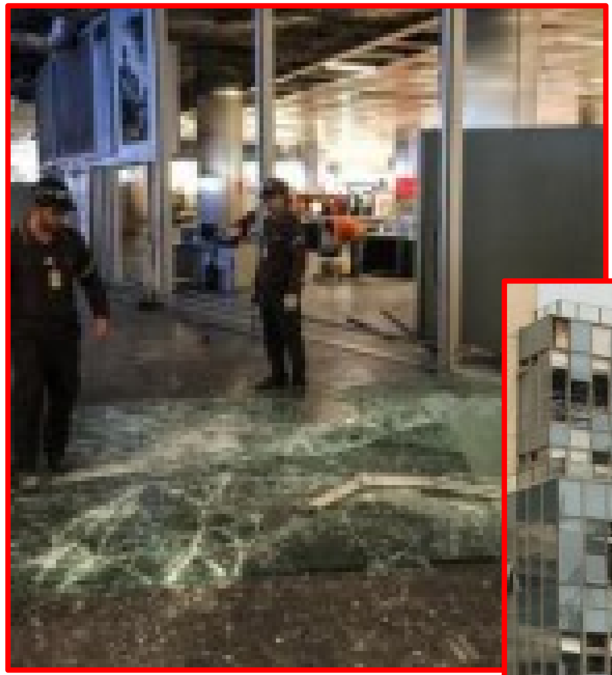
FACADES= physical barrier

EARTHQUAKES



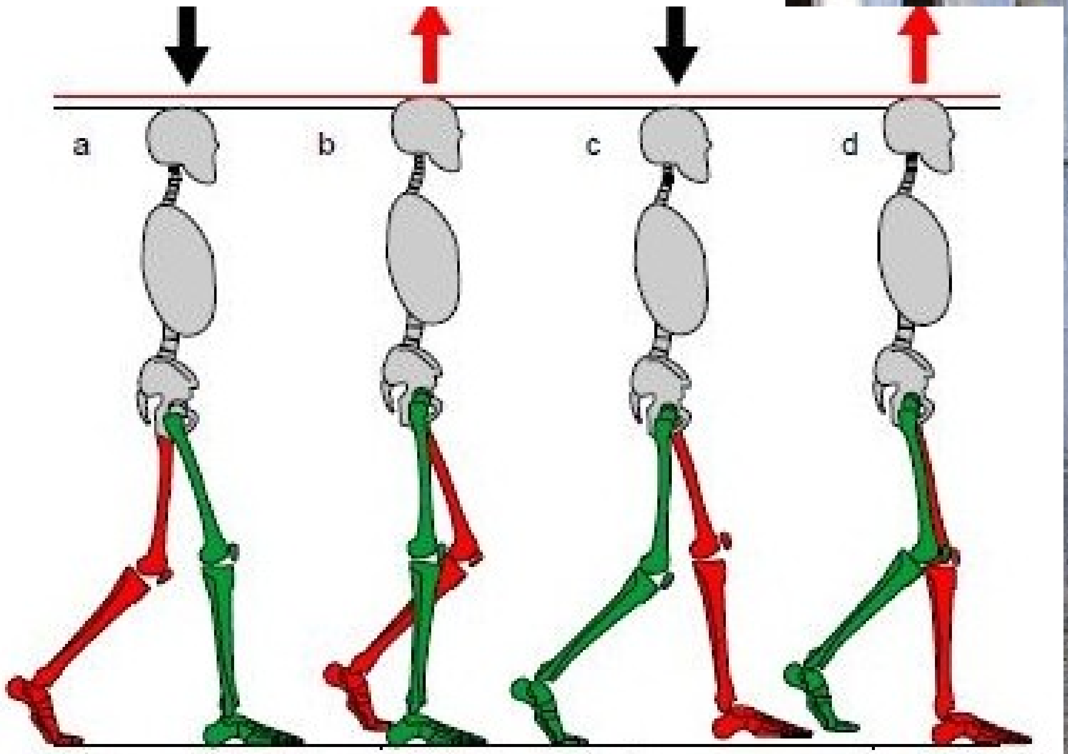
HURRICANES &CLIMATE EVENTS

EXPLOSIONS (ACCIDENTAL / HUMAN-INDUCED)



Diagnostic of existing structures

Vibrations



Aquileia (UD, Italy)

UniTS-DIA


Vibration serviceability vs. degradation of in-service glass structures
Human-Structure Interaction phenomena (mass, stiffness, damping)