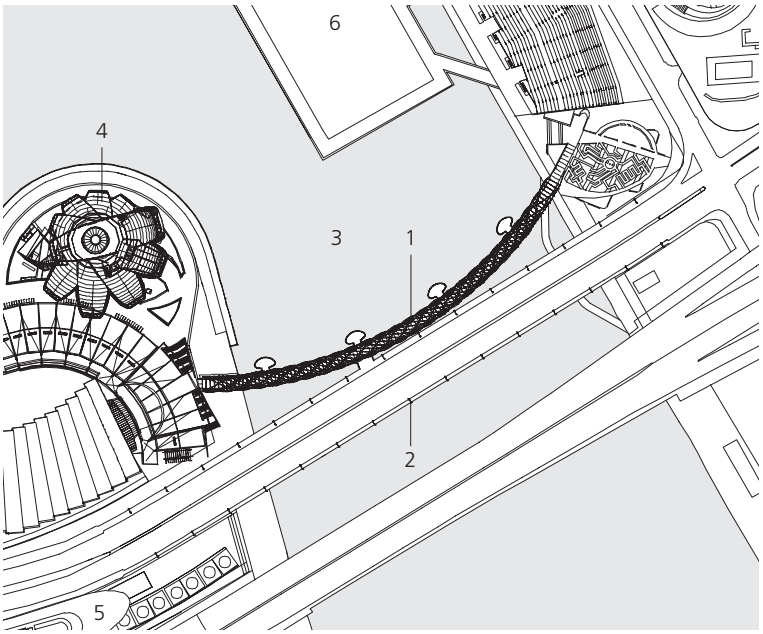
euro inox
The European Stainless Steel Development Association

Footbridge in Singapore



Site plan, scale 1:5000
1 Helix Bridge
2 Bayfront Bridge
3 Marina Bay
4 Art & Science Museum
5 Marina Sands Hotel
6 Floating stadium

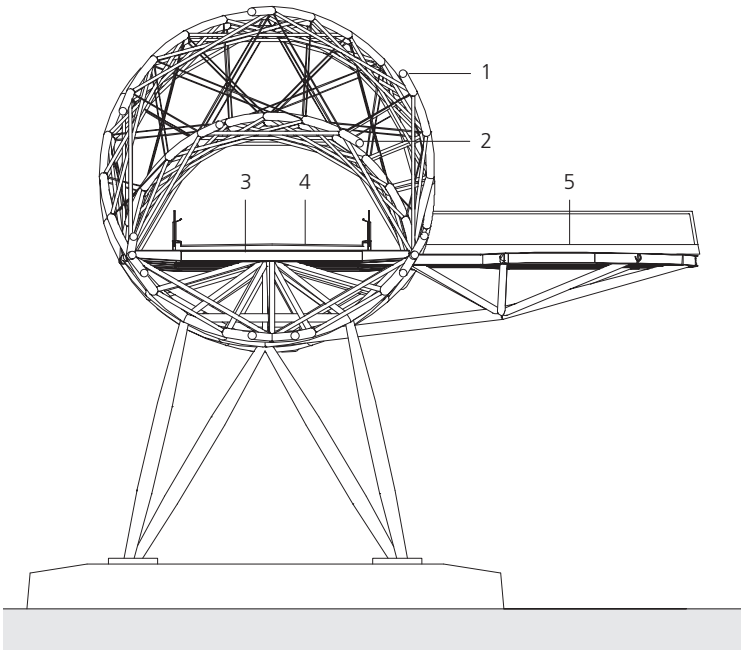
Canopies made of stainless steel mesh and glass built into the structural frame provide shade and protect against rain.

Singapore has the world's first footbridge built in the shape of a double helix – a light and airy construction of high-strength duplex stainless steel. Curvilinear in plan, the bridge is part of a 3.5 km long pedestrian promenade running along the bay from the Marina Center to the new Bayfront Area in Marina South. At the apex of the curve, the "Helix" connects with the six-lane motorway bridge.

The structural frame for the bridge consists of two spirals twisting in opposite directions, the minor one inserted into the major one. Together they form a tube-like cross section that accommodates both the walkway and the canopy. Totalling 280 m in length the bridge is divided into five sections, with spans of 65 m in each of the middle sections and 43 m at the ends. Cantilevered viewing platforms, one at each of the four intermediate supporting points, afford an impressive view out over Marina Bay.

The outer spiral consists of six, the inner of five stainless steel tubes with a diameter of 273 mm. A frame of compression bars at 2.70 m intervals links the outer and the inner spiral tubes, forming a ring around them. Additional tension bars between the outer and the inner spiral tubes counteract the tendency of the opposing spirals to unwind. The tension bars link the spirals together, while also keeping them apart, thus giving the complex structure stability and load-bearing capacity.

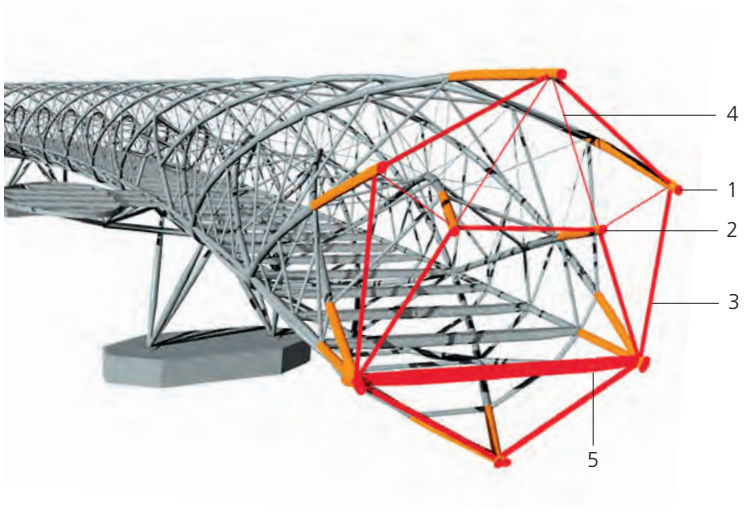
Compression and tension bars connect the tubular steel of the spirals.



Cross section, scale 1:250

1 Outer spiral,
Ø 273 mm stainless steel tube,
varying wall thicknesses, EN 1.4462
2 Inner spiral,
Ø 273 mm stainless steel tube,
varying wall thicknesses, EN 1.4462
3 Transverse girder,
stainless steel I-section,
EN 1.4462
4 Bridge deck,
precast concrete components
5 Viewing platform

Energy-efficient LEDs in the spiral tubes emphasise the helical structure and create added drama at night.



Schematic diagram of the structural design
1 Outer spiral
2 Inner spiral
3 Compression bar
4 Tension bar
5 Transverse girder of bridge deck

Six angled composite columns, tapering at both ends, transfer the load from each bridge section down into the concrete caps piled into the sea bed.

At the level of the bridge deck the tubular steel of the spirals converges with the circular hollow sections running horizontally along both sides, the latter supporting the frame below the 6 m wide walkway. As with all other connections between the tubular steel in the spirals, these junctions are welded, while the compression and tension bars are bolted.
All the steel components of the bridge are of duplex stainless steel, grade EN 1.4462. The austenitic-ferritic material has good long-term corrosion resistance in the aggressive, humid conditions of a tropical maritime climate, and it is cost-effective as regards maintenance. Its high strength and good fatigue strength meant that smaller cross sections could be used for the load-bearing components, a factor that, in combination with computer-aided calculations, greatly facilitated the slim design of this new architectural and engineering attraction in Marina Bay.

Euro Inox
Diamant Building, Bd. A. Reyers 80,
1030 Brussels, Belgium
Tel. +32 2 706 82 67
Fax +32 2 706 82 69
E-mail info@euro-inox.org
Internet www.euro-inox.org

Client: Urban Redevelopment Authority of Singapore
Structural engineers: Arup Singapore Pte Ltd, Singapore
Architects: Cox Rayner Architects, Brisbane; Architects 61, Singapore
Text and layout: Martina Helzel, circa drei, Munich
Photos: Christopher Frederick Jones (cover, p. 1, p. 2 bottom); Paul McMullin (p. 2 top, p. 3 bottom); Arup (p. 3 top)