Walking on Air

The Grand Canyon Skywalk

spectacular structure in steel and glass

Suspended 1.2 kilometres high at Eagle Point in the Grand Canyon, an amazing new walkway is taking shape. The Skywalk extends 21 metres from the cliff edge over the Colorado River affording an uninterrupted panorama of this beautiful area. The horseshoe-shaped platform and visitors' centre is being built as part of a $30 million plus tourism joint venture between the Hualapai Tribe, owners of the land and the Las Vegas-based entrepreneur David Jin who envisioned it in the first place.

This innovative structure afforded the design team many challenges, including the fact that on a typical day, this unique environment can generate vertical winds of more than 120 kilometres per hour. "Everything is difficult about this job", says Kenneth "Bill" Karren, Structural Engineer from Lochsa Engineering. "There's nowhere in the Building Code to tell you how to put a wind load on a building sitting right on the edge of a 4,000 foot cliff!" (http://www.grandcanyonskywalk.com/home.html). The cantilever structure was chosen to minimise environmental impact by avoiding the need for cable support from above or brace support from below.

The structure was designed to withstand an 8.0 magnitude earthquake 80 kilometres away and winds in excess of 160 kilometres per hour.

Welding

Mark Steel won the job of fabricating the Skywalk's frame and anchor system. The steel sections used to construct the anchors were 1370 millimetres by 760 millimetres by 50 millimetres and 2.4 metres long. These were joined to form the 14 metre anchors. The main horseshoe itself was formed from two twin box girders with sections 1370 millimetres by 760 millimetres by 50 millimetres and 1.8 metres long. They were shipped in 12 metre sections and assembled on site.

Glass

Set atop massive steel box girders, the walkway itself is constructed from layers of heat-strengthened glass with sides 3.8 centimetre thick and 150 centimetres high and a glass floor, three metres wide and 7.8 centimetres thick, comprising 41 pieces of curved glass in five layers.

Structural damping

The Skywalk is equipped with three oscillating steel plates or Tuned Mass Dampers (TMD's) of 1455 kilograms each inside the hollow bridge beams, acting as shock absorbers to neutralise vibrations from foot traffic and wind gusts.

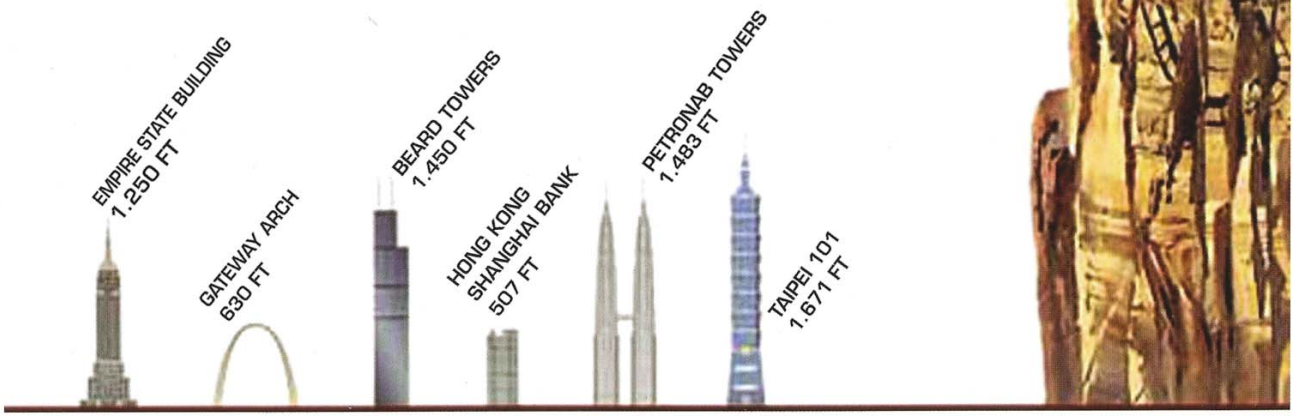
Construction

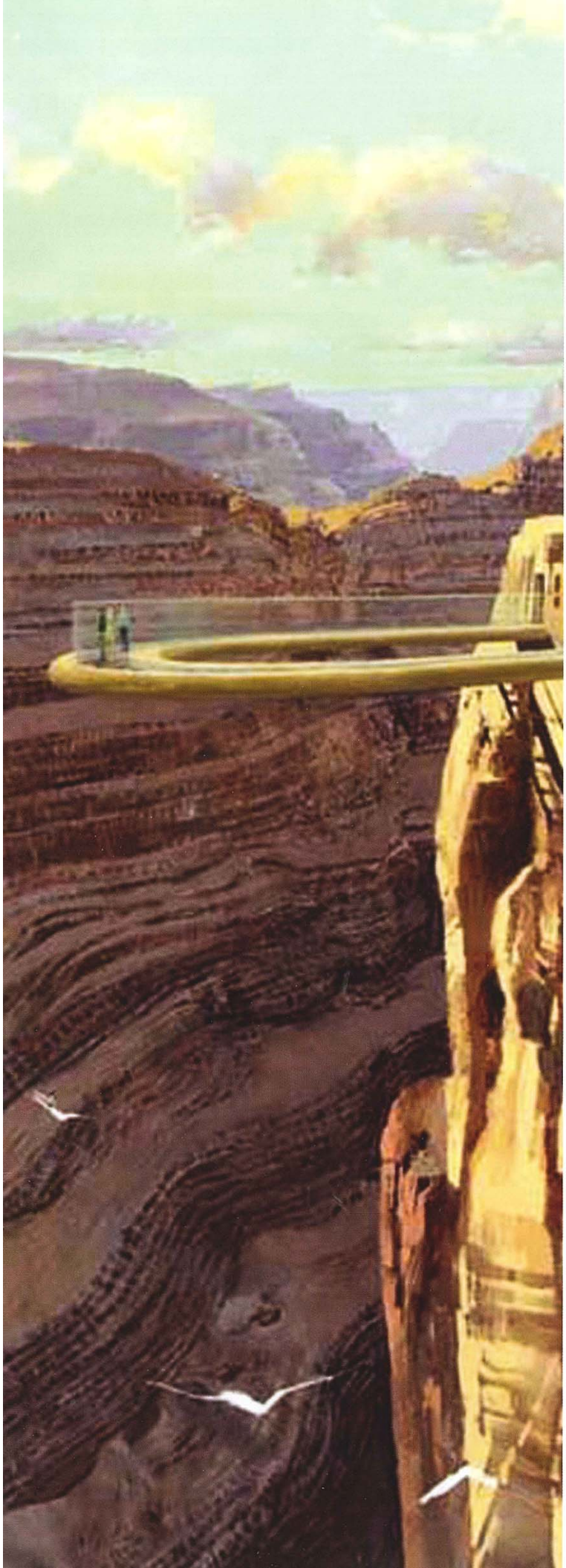
On site a 24 hour crew undertook the process of welding the huge steel sections together. The new structure was cantilevered to the cliff using the 14 metre anchors weighted in cement.

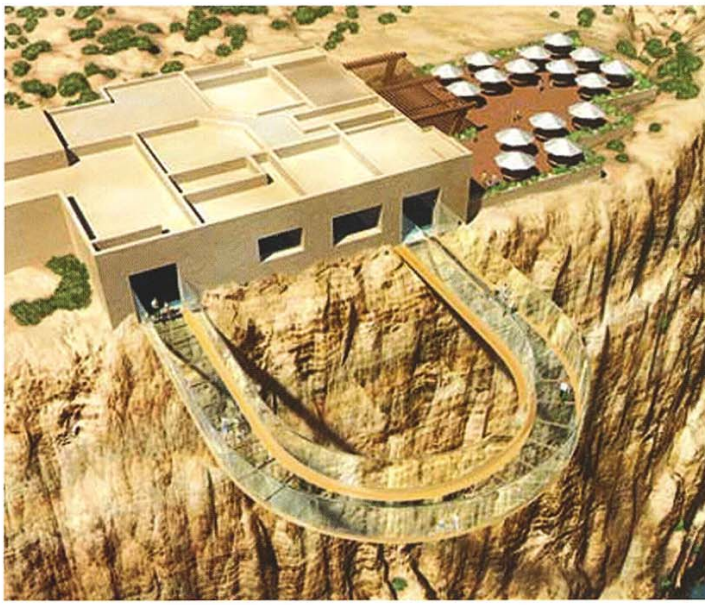
A wooden crib device was constructed in order to roll out each piece of steel to form the bridge's cantilever "U" shape. After the steel was fitted, a process called "Jack-and-Roll" was used to extend the steel structure 21 metres out over the 1220 metre cliff, removing the wooden crib as they progressed over the edge. A massive 450 tonnes of steel was used in the project. The Skywalk is due to open to the public in January 2007.

Project Team:

Client: Hualapai Tribe of Arizona/David Jin, Las Vegas
Architect: MRJ Architects, Las Vegas
Structural Engineer: Lochsa Engineering, Las Vegas
Building Contractor: APCO Construction, Las Vegas
Steelwork Fabricator/Contractor: Mark Steel, Utah
Glass Fabricator: St Gobain, Germany
Wind and Vibration Engineers: Rowan Williams Davies & Irwin, Canada
Structural Damping Design: Motioneering, Canada
TMD Fabricator: Process Custom Fabrication, Canada







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