



With a total length of 2088m and a main span of 1377m the Tsing Ma bridge is the world's longest suspension bridge carrying both road and rail traffic and is the primary structure of the Lantau Link. Like the adjacent Kap Shui Mun bridge, it carries dual three lane carriageways on its upper surface, and two airport railway lines and two emergency traffic lanes for use during typhoons on the lower deck. The bridge was opened in 1997.

The deck comprises four longitudinal steel trusses with vierendeel crossframes at 4.5m spacings carrying steel orthotropic road decks. The section is clad in stainless steel with continuous longitudinal vents in the top and bottom surfaces along the centre-line to enhance its aerodynamic performance. The concrete towers include one founded on a new island constructed around a large precast concrete caisson structure. The 1.1m diameter main cables were constructed by aerial spinning and are anchored to large concrete gravity anchorage structures.

We have been involved with the bridge from an early stage, having performed the independent check of the abandoned original 1981 designs for the Lantau crossing. Since then, our role included:

- Derivation of traffic loading criteria which now apply to all long span highway bridges in Hong Kong.
- Study of the local wind climate leading to the determination of design wind speeds and associated partial load factors for typhoon winds.
- Derivation of design criteria for thermal effects based on local climatic data.
- Investigation of the aerodynamic performance and specification of the aerodynamic stability criteria.
- Full Independent check of the detailed design and alternative erection proposals put forward by the contractor.
- Shipping collision risk analysis and detailed check of impact forces.
- Specialist advice on construction issues including aerial spinning of the main suspension cables and fabrication of large steel elements.
- Design review of the rail track fatigue behaviour for the Mass Transit Railway Corporation.
- Development and implementation of a sophisticated full scale Wind and Structural Health Monitoring System.
- Advice on bridge maintenance regimes and procedures.

**Client:**  
Highways Department Hong Kong

**Location:**  
Lantau Link, Hong Kong

**Service Dates:**  
1981, 1990, 1992-1997

**Services:**  
Independent design check  
Construction engineering  
Development of WASHMS  
Specialist advice

