

The Severn Bridge - What makes it so special?

Severn - the world's first sleek aerodynamic road deck



Golden Gate, San Francisco (1937) Severn Bridge, Chepstow (1966)
Deep Deck - Depth/Span 1 :168 Thin Deck - D/Span ratio 1: 324

The **aerodynamic bridge deck**, by **Roberts and Brown (1966)** is like an aircraft wing - much thinner, lighter, and less costly than traditional USA decks. First used at Chepstow, then for the Humber Bridge (world's longest span for 18 years), and the Bosphorus, it is now the world standard for long span bridges.

Severn Bridge set the trend for current suspension bridges.

Of the world's **33** long span bridges with over 1,000m span, since Severn Bridge, **30** (90%) have thin aerodynamic decks.

USA led the world in long span bridges for 100 years. Then UK engineers built the Severn Bridge and led the world's long span bridge development from 1966-90. Japan led in the 90s, China from 2000. All now use the system piloted at Chepstow.

Only a few bridges world-wide have radically changed the form of suspension bridges during the past 200 years. The Severn Bridge is one of those few bridges. It is of world significance.

Chepstow's Severn Bridge - a part of Chepstow's skyline



From St Kingsmark



From Larkfield



From Bulwark



From Thornwell



From St Mary's Ward



...and the world famous aerodynamic bridge deck was assembled in Chepstow and floated to site.

Bridges and Local Sights

Chepstow



Chepstow Bridge
1816, World's largest iron arch road bridge built before 1840.



Rail Bridge 1852
Pillars of Brunel's ground breaking bridge remain.



Severn Bridge 1966
One of the World's most elegant suspension bridges



Castle 1067



Town Gate 1524



Port Wall 1274



Museum



High Street



Racecourse

Wye Valley



Monmouth



Tintern Abbey



Bigsweir Bridge

Monmouthshire



2nd Severn Bridge



Portskewett



'Roman' Caerwent

Gloucestershire



Beachley



Forest of Dean



Lydney

Chepstow is the meeting place of 3 major pathways:
Wales Coastal Path; Offa's Dyke Path; Gloucestershire Way.

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Data from: Severn Bridge Official Opening Brochure, GCC 1966;
M. Myerscough (Cass Hayward) Structural Engineer, July 2013;
World's Longest Suspension Bridges List, Wikipedia (Aug 2016).

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Severn Bridge

and the Wye Bridge

Information Leaflet

50 years old

8th September 2016

linking

England and Wales
Gloucestershire and Monmouthshire
Aust and Chepstow

The world's first major suspension
bridge with a sleek
aerodynamic road deck
- a revolution in
world bridge engineering

Severn and Wye Bridges
Half Century Half Marathon 2016

HISTORY OF SUSPENSION BRIDGES



1801: James Finley built the first **modern (rigid deck) iron chain suspension bridge**, Jacob's Creek, PA, USA -**21m**. Few built after 1810 - none survive. Largest span was **74m** at Newburyport, Mass. USA 1810 (rebuilt 1910).

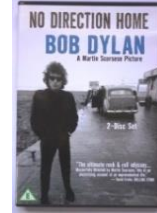
1810s: UK engineers led the way in the 1810s with long suspension bridges. **Telford** considered suspension bridges in 1814 to cross the Mersey, and the use of wire.

AUST-BEACHLEY FERRY AND HIGH TIDES



Severn Bridge spans the **world's 2nd highest tides**, rising 14.8m (48 ft) in 5 hours. Difficult for ferries. In 1886 the **railway went under** the Severn - world's longest under sea rail tunnel for 80 years, but traffic needed a **road bridge**.

DVD cover of Martin Scorsese's film 'No Direction Home: Bob Dylan' (Paramount 2005) is Barry Feinstein's iconic picture of Dylan at Aust Ferry, 1966, 4 months before the Bridge opened.



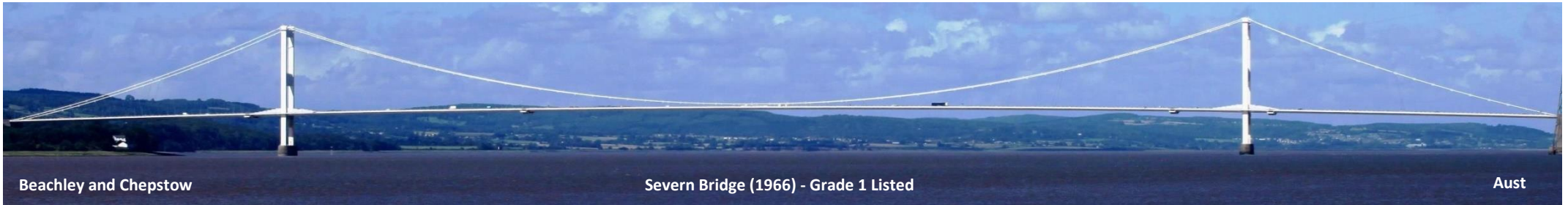
KEY STATISTICS

Aust to Chepstow crossing is 2,907 m, (9,538ft). 1.8 miles.

- Aust Viaduct** 156.7m (514ft) - a twin box girder span.
- Severn (Suspension) Bridge** 1,597.2m (5,240ft) (approx. 1 mile) comprising: 2 side spans, each 304.8m (1,000 ft); and a centre span of **987.6m** (3,240ft), 37m (120ft) above water.
- Beachley Viaduct** 745m (2,444 ft.) - on 10 steel trestles.
- Wye (Cable Stay) Bridge** 408m (1,340ft) - 2 side spans of 86.9m (285ft) each; and a centre span of **234.7m** (770 ft).

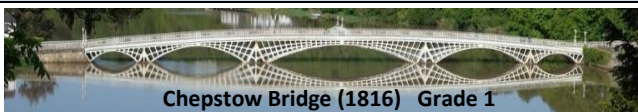
Overall width - 31.85m (104.5ft). Deck Depth: 3.05m (10ft). 2 x 7.32m (24ft) carriage-ways and a 4.5m (14.75ft) cantilever cycleway/footpath of 3.66m (12ft). M48 has 2 lanes each way.

Deck has 88 box girder sections (127 tons each): fabricated at Glasgow, Darlington, Middlesbrough; assembled at **Chepstow**. 18.3m (60ft) long, 31.9m (104.5ft) wide, 3.05m (10ft) deep. Deck/Span ratio **1:324** (Av. for Top 10-1966 1:150; 2016 1:408)



1819-20: Sir Samuel Brown's Union Bridge nr Berwick, UK **137m**. Europe's 1st (now world's oldest) suspension br.
1819-26: Telford built **Menai Bridge, 177m** in N. Wales.
1824: Telford suggests suspension bridge - Beachley/Aust.
1829: Brunel designs **Clifton Bridge - 194m** (built 1864).
1820s - 40s: French engineers - Seguin, Vicat, Chaley, led next phase with wire suspension bridges to **273m** span.
1850-1966: For 100 years, **USA** dominated suspension bridges: **Ellet; Roebling; Ammann**. From **300m** to **1,298m**.
1966 - 1990: UK led with long thin spans - up to **1,410m**
1990s: Japan led **1,991m** (record span); **China** from 2000. Now, they all use thin decks - piloted at **Chepstow - 1966**.

Before 'suspension' - 'iron arches' were state of the art



Chepstow Bridge (1816) Grade 1

Chepstow has the world's largest iron arch road bridge of the period immediately before suspension bridges: a unique piece of world heritage (see separate leaflet).

Severn King and Queen ferries were scrapped. *Severn Princess* is being preserved at Chepstow. Seen here next to the cast iron piers of Brunel's pioneering Chepstow Rail Bridge (1852).



Severn Bridge bringing the new M4 (now M48) into Wales

Pressure for a bridge grew in the C20th with the growth of car traffic. **Chepstow Urban District Council** pressed for the bridge. **Monmouthshire** and **Gloucestershire County Councils** took it forward, then **Ministry of Transport** 1946.

'It will be the largest suspension bridge in Europe with a centre span of 3,300ft, the third largest in the world. Only two bridges, both in the United States, have longer spans than that proposed for the Severn Bridge - Golden Gate 4,200ft at San Francisco, and George Washington 3,500ft over Hudson River, New York City'. Mr Barnes - Transport Minister - 1 August 1947

Statement correct in 1947 but work was postponed to 1961-66. Span reduced by 18m. World's 7th longest, 1966.

The Queen opened new Severn bridge on 8th Sept 1966.

Steel Towers 121.9m (400ft) on 13.7m (45ft) concrete piers. Height - **135.6m (445ft)** above water. 1,300 tons each.
Main cables: 51cm (20 ins) diameter with 8322 wires, of 5mm (1/5"). Steel clamps at 18.3m (60ft) intervals - to which are attached the **diagonal suspender ropes 5cm (2")** in diameter. Tension in each main cable 11,400 tons. Main cables/ropes - 2,600 tons each. **Deck/cables/towers c. 18,500 tons. Cost £8m**

By 2020 Severn will have 40th longest span. Longest are 1,991m in Japan, 1,650m in China, and 1,624m in Denmark. Humber, UK is now 9th longest span but the overall Severn-Wye crossing is the same as the Humber Bridge - so in world terms it is still 'large'.

Consulting Engineers: Mott, Hay, Anderson & Freeman Fox.
Superstructure: Freeman Fox Partners - under the direction of Sir Gilbert Roberts & Dr. William Brown OBE
Aerodynamic testing: Dr. R. A. Frazer and C. Scruton.
Resident Engineers: B.G. Smith; M.F. Parsons; A. Hardie.
Consulting architect: Sir Percy Thomas
Contractors: Associated Bridge Builders (Agent: K.E. Hyatt) a consortium of Sir Wm Arrol (Glasgow), Cleveland Bridge (Darlington) & Dorman Long (Middlesbrough).
Substructure: John Howard & Co. (Agent B.J. Soanes)
Wye Bridge/Viaduct: Cleveland Bridge (Agent D B Fawcett).
Deck assembly: Fairfield-Mabey, Chepstow.