Metals, Iron, Steel

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BEG
Building Engineering Group

Overview of Presentation

- History
- Iron and Steel history

Definitions

- Iron
  - The element
- Pig Iron
  - Straight
- Cast Iron
  - Contains near maximum Carbon, 4-4.5%
- Wrought Iron
  - Iron low carbon content, glassy inclusions
- Steel
  - Iron with < 1% C

Early Ironmaking

- Earliest Iron 2000 BC India
- 5th Century BC – Greeks melt iron
  - 470 BC Agrigentum, Sicily 5”x12”x15 ft!
- 532 AD St Sophia Constantinople
  - Iron tension rods for dome
- St Peters / St Pauls Cathedral
  - Iron tension chains for domes
- Around 1500 – regained melting ability

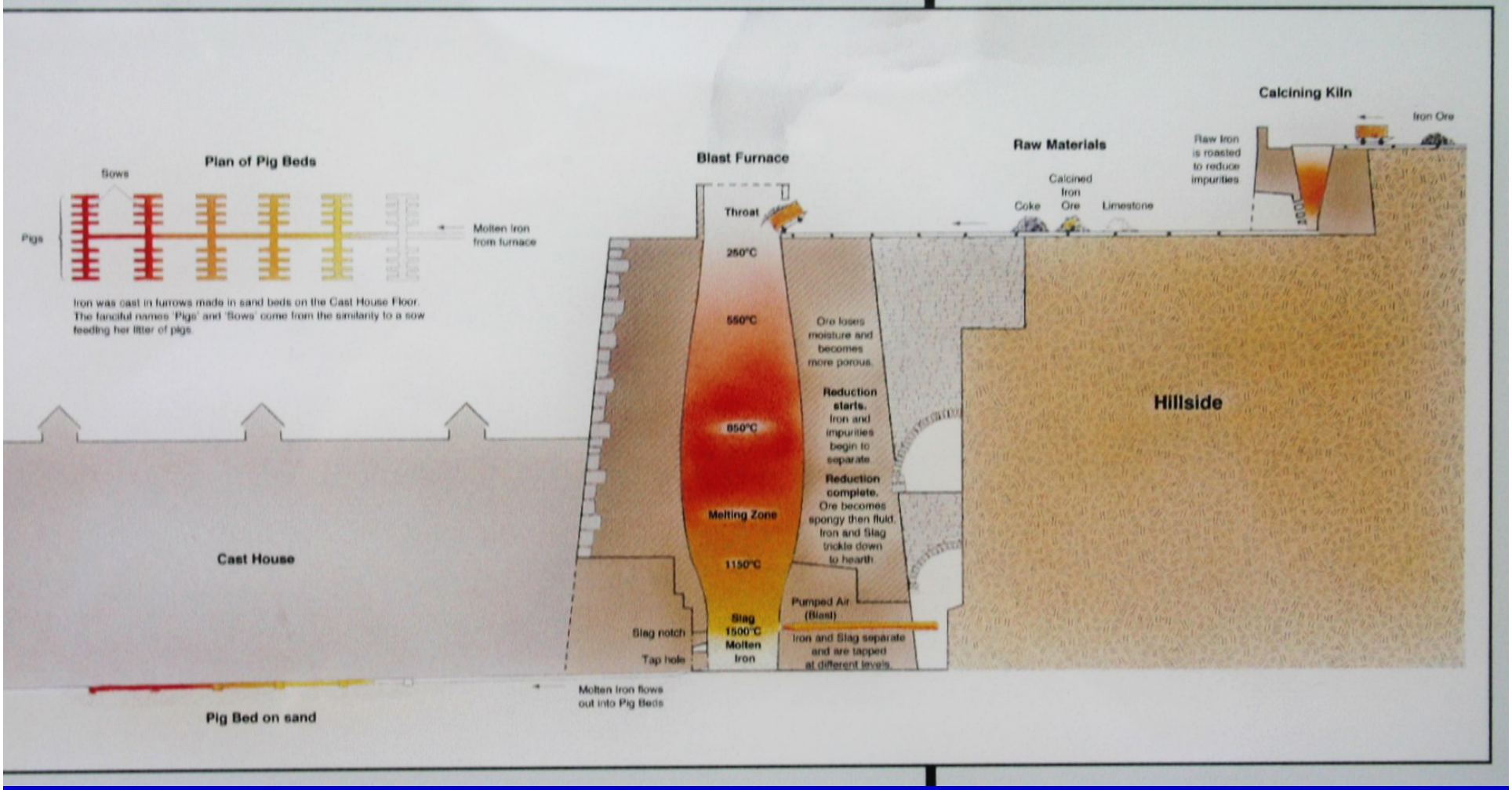
Early Ironmaking

- **Blacksmith and wrought iron**

Early Ironmaking

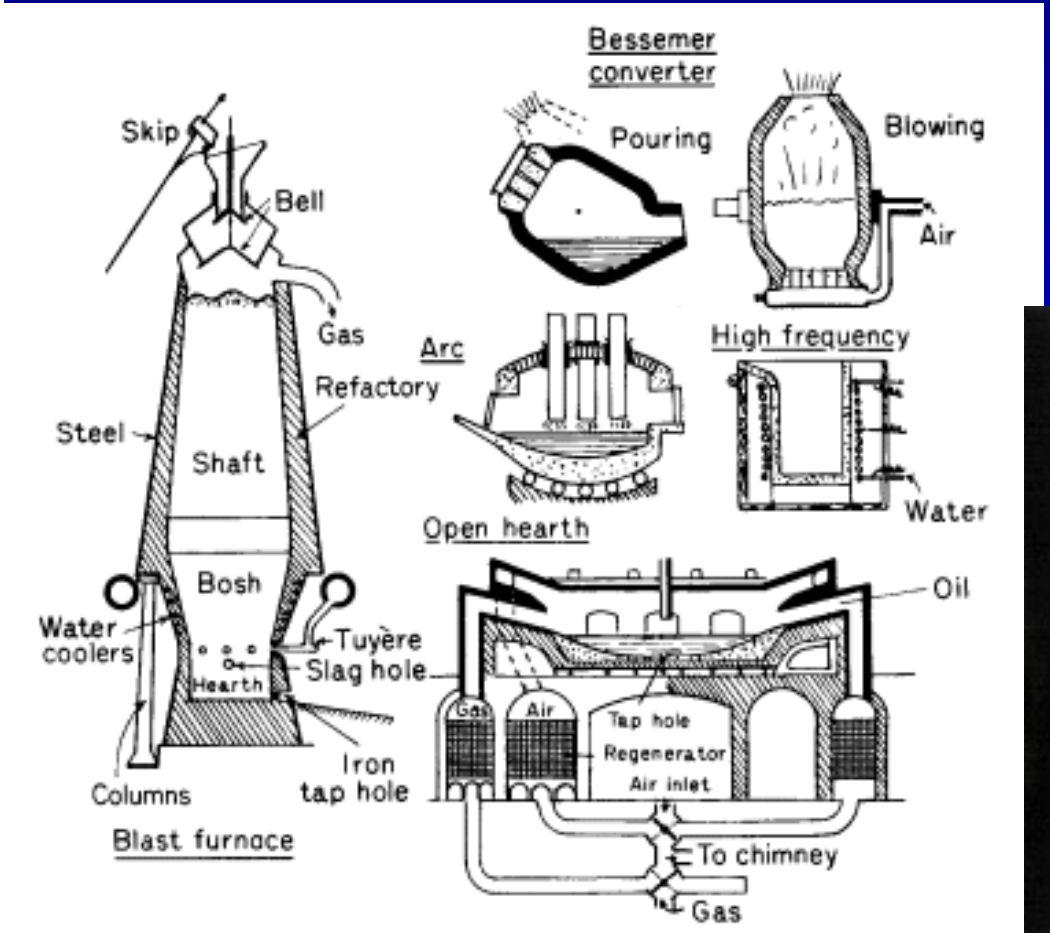
- Fuel used was wood (900-1000 C)
  - Good for bronze, bad for iron
- Charcoal with bellows got to over 1100
  - Blast furnace used 1500 acres timber/yr
- Coal + bellows over 1400
  - But impurities in coal
- 1709 – bake coal, make coke
  - Removed sulphur which damaged coal
- Waterwheel and them steam engines blow air

Blaeavon



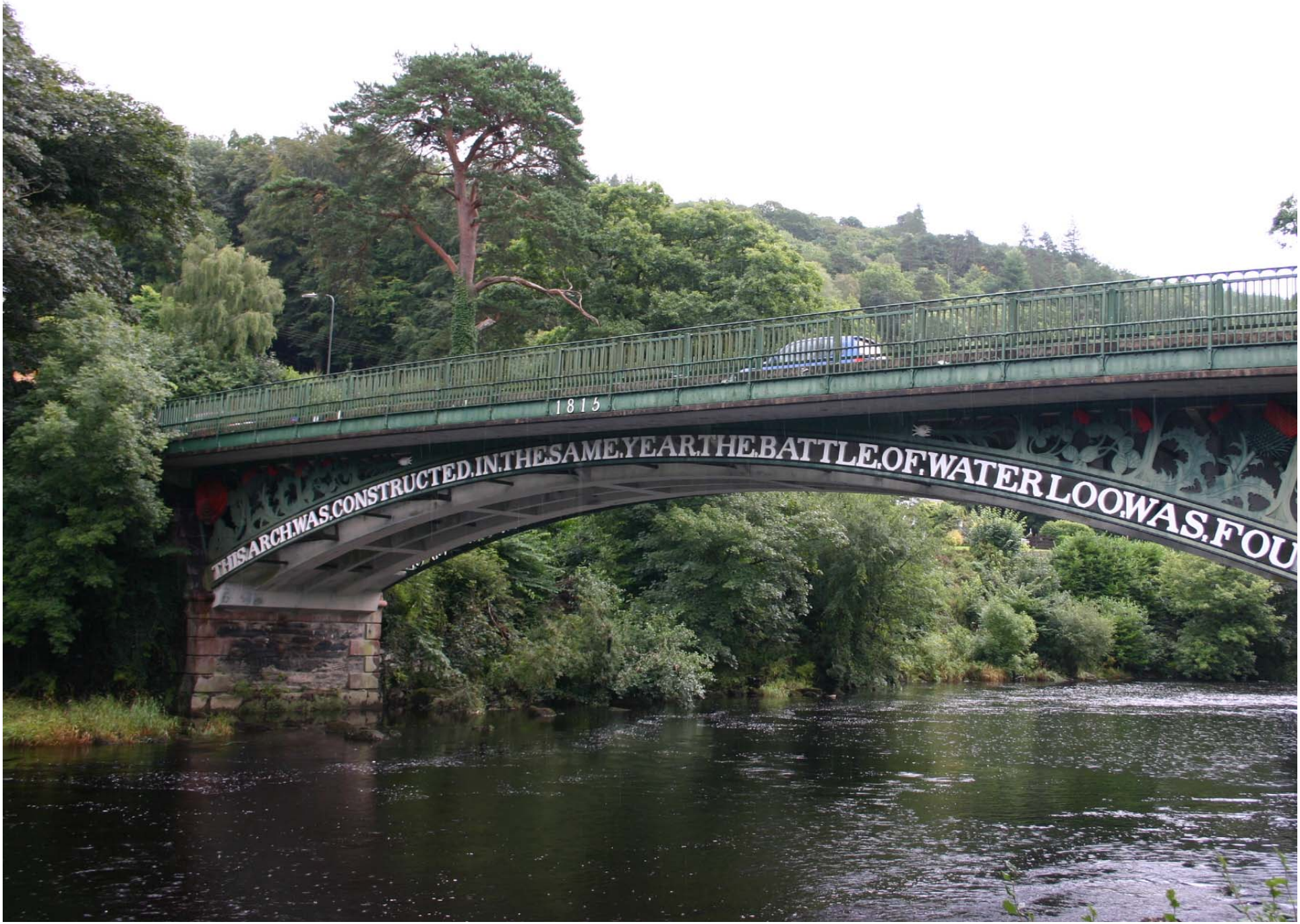
Bessemer Process

- Converted pig iron to steel




BISTRO

Coalbrook Bridge 1779


1815
THIS ARCH WAS CONSTRUCTED IN THE SAME YEAR THE BATTLE OF WATERLOO WAS FOU


WATERLOO WAS FOUGHT


THE BATTLE OF WATERLOO WAS
W.HAZLEDINE.FOUNDER
W.STUTTLE. FOREMAN


INTERNATIONAL HISTORIC CIVIL ENGINEERING LANDMARK
CONWY TUBULAR BRIDGE
ERECTED 1846-48. ORIGINAL CLEAR SPAN 400FT.
STRENGTHENED BY INTERMEDIATE PIERS 1899
ENGINEERS: R. STEPHENSON (1803 1859), W. FAIRBAIRN (1789 1874),
E. HODGKINSON (1789-1861). ARCHITECT: F. THOMPSON (1808-1895)
CONTRACTOR: WILLIAM EVANS
BUILT FOR THE CHESTER-HOLYHEAD RAILWAY, WHICH PROVIDED RAIL ACCESS TO THE SEA CROSSING TO IRELAND, THIS BRIDGE WAS A FORERUNNER TO BRITANNIA BRIDGE OVER THE MENAI STRAIT. CONWY TUBULAR BRIDGE WAS THE FIRST RAILWAY BRIDGE IN WHICH TRAINS RAN THROUGH THE MAIN GIRDERS. IT REPRESENTS A PIONEERING USE OF WROUGHT IRON FOR BRIDGES AND A MAJOR ADVANCE IN THE DEVELOPMENT OF BOX-SECTION GIRDER ELEMENTS.
PRESENTED
BY THE
INSTITUTION OF CIVIL ENGINEERS
AND THE
AMERICAN SOCIETY OF CIVIL ENGINEERS
26 JUNE 2003
AMERICAN SOCIETY OF CIVIL ENGINEERS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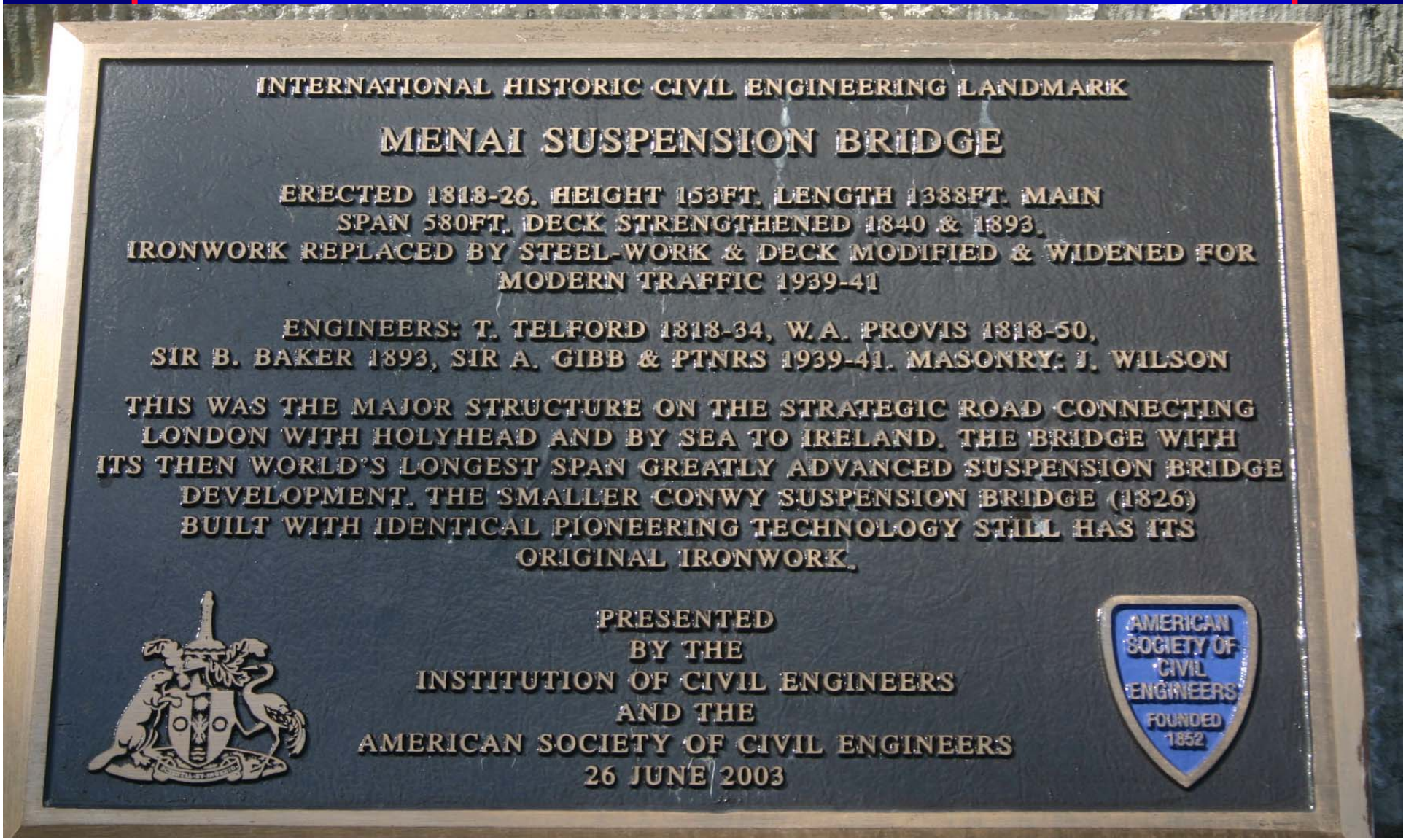
INTERNATIONAL HISTORIC CIVIL ENGINEERING LANDMARK
MENAI SUSPENSION BRIDGE
ERECTED 1818-26. HEIGHT 153FT. LENGTH 1388FT. MAIN SPAN 580FT. DECK STRENGTHENED 1840 & 1893. IRONWORK REPLACED BY STEEL-WORK & DECK MODIFIED & WIDENED FOR MODERN TRAFFIC 1939-41
ENGINEERS: T. TELFORD 1818-34, W.A. PROVIS 1818-50, SIR B. BAKER 1893, SIR A. GIBB & PTNRS 1939-41. MASONRY: I. WILSON
THIS WAS THE MAJOR STRUCTURE ON THE STRATEGIC ROAD CONNECTING LONDON WITH HOLYHEAD AND BY SEA TO IRELAND. THE BRIDGE WITH ITS THEN WORLD'S LONGEST SPAN GREATLY ADVANCED SUSPENSION BRIDGE DEVELOPMENT. THE SMALLER CONWY SUSPENSION BRIDGE (1826) BUILT WITH IDENTICAL PIONEERING TECHNOLOGY STILL HAS ITS ORIGINAL IRONWORK.
PRESENTED BY THE INSTITUTION OF CIVIL ENGINEERS AND THE AMERICAN SOCIETY OF CIVIL ENGINEERS 26 JUNE 2003
AMERICAN SOCIETY OF CIVIL ENGINEERS
FOUNDED 1852

Modern steel frame


Welded hot rolled
Screw fastened
Cold rolled
Screw fastened
Cold rolled


GP
Georgia-Pacific
Georgia-Pacific
GP