# Thomas Telford – Colossus of Roads

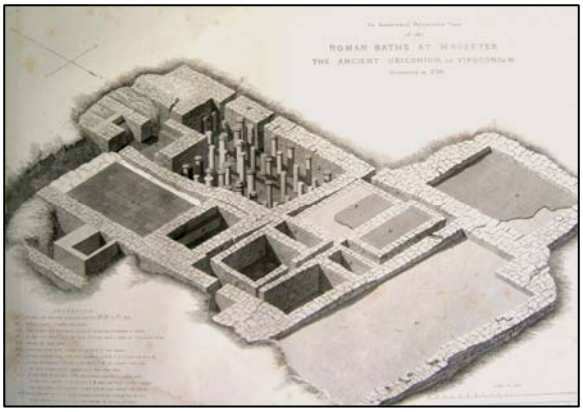
**Distant and aloof**

His friends found him charming, considerate, well read and enjoyable company. His colleagues admired him, but thought him distant and aloof. The son of a Scottish shepherd, Thomas Telford rose to become the most important road and bridge builder of the Industrial Revolution. He developed a reliable system of estimates, contracts, specifications and tenders, a standard that in many respects is still followed to this day. His reputation is based on his enormous output – 1,500 miles of roads, over 1,000 bridges, 400 miles of canals and numerous harbours – and his ability to deliver projects on budget and on time through a team of well trained assistants.

Telford (1757-1834), detail of the engraving by Raddon after the portrait by Lane, 1831

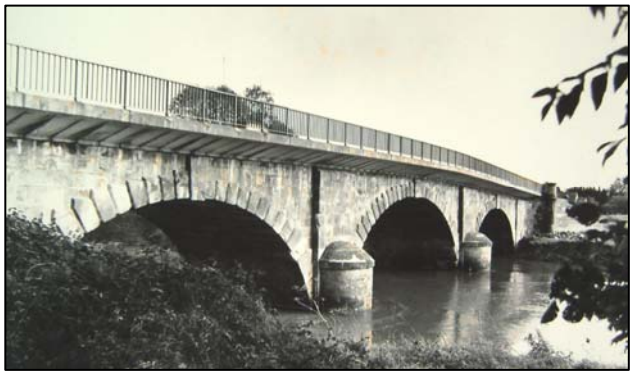
**Telford in Shropshire**

He had trained as a stone mason, and after working in Edinburgh he had left Scotland in 1780 to work in Portsmouth and then London, before coming to Shropshire as an architect. Arriving in 1786 he restored Shrewsbury Castle as a residence for his patron, Lord Pulteney, excavated the Roman remains at Wroxeter, and built Montford Bridge and Shrewsbury Jail. He began to build up the team of assistants and contractors which was to serve him so well in later years.

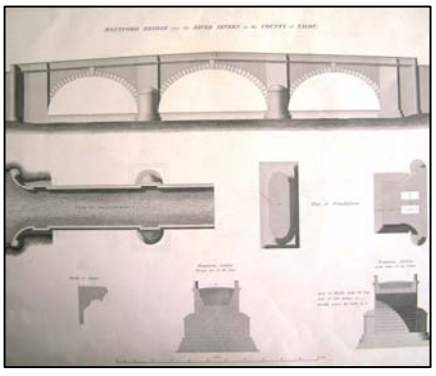


Wroxeter excavation, 1788

Shrewsbury Jail, 1787-93



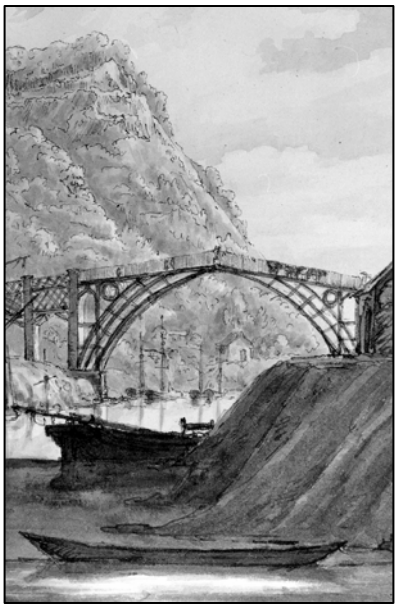
Montford Bridge today



Montford Bridge, 1792, built for £5,800

**Nothing to do with the Iron Bridge**

He became 'Surveyor of Public Works for the County of Salop' in 1787, but had nothing to do with the Iron Bridge, which had been built in cast iron by Abraham Darby when Telford was only 22, seven years before he came to Shropshire. While he praised the use of the new building material, he criticised the design for mimicking a masonry style bridge "the form of which in iron is not graceful".



Darby's Iron Bridge by Holdsworth

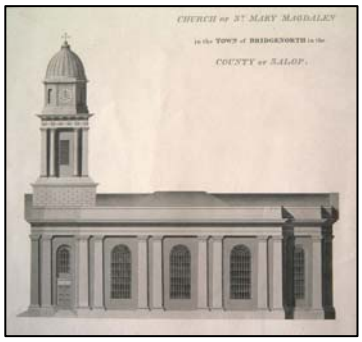
In February 1795 a major flood destroyed or damaged every bridge in Shropshire, except for the Iron Bridge. Telford replaced 41 of them, mostly in stone, but five of the bridges and one aqueduct were in the new material of cast iron.

Flood in Ironbridge, 2000

Replacing the medieval stone bridge in cast iron, Buildwas Bridge was almost 40 metres span (130ft), 10 metres wider than the Iron Bridge, and yet it used less than half the amount of iron. Cast by the Coalbrookdale Company, it cost £5,435 and opened in 1796, remaining in use for 109 years. The same year he replaced the damaged Longdon-on-Tern aqueduct on the Shrewsbury Canal in iron, cast at the Ketley works by William Reynolds. In 1796 Telford also built three churches in Shropshire – at Bridgnorth, Malinslee and Madeley, but his work was clearly shifting away from architecture towards civil engineering.

Telford's Buildwas Bridge, 1796

Longdon-on-Tern Aqueduct, 1796



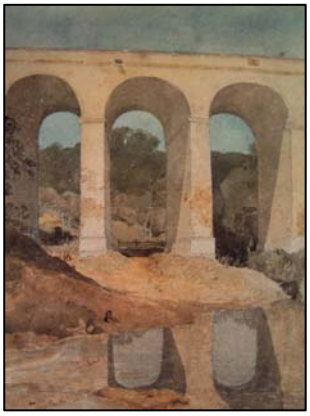
St Mary's, Bridgnorth, 1796

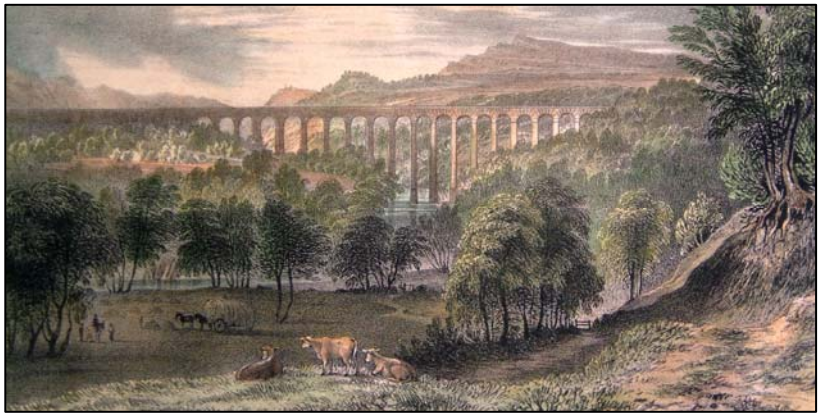
Old St Michael's, Madeley

New St Michael's, Madeley, 1796

**The great aqueducts**

William Jessop was the Principal Engineer of the Ellesmere Canal, with Telford appointed under him two years later in 1793 as 'General Agent, Surveyor, Architect and Overlooker'. In his Autobiography Telford hardly mentions Jessop at all as if it was all his own work, though in reality he was just one member of a team of gifted engineers on the project. The main route was Ellesmere to Chester, but the branch to Llangollen included a major embankment, aqueduct and tunnel at Chirk, and then the dramatic Pontcysyllte Aqueduct over the River Dee. Telford was already thinking about using cast iron for aqueducts in 1794, but the formal proposal to use it on the Ellesmere Canal came from Jessop a year later, and the experience Telford had gained at Longdon-on-Tern in 1796 proved really valuable.

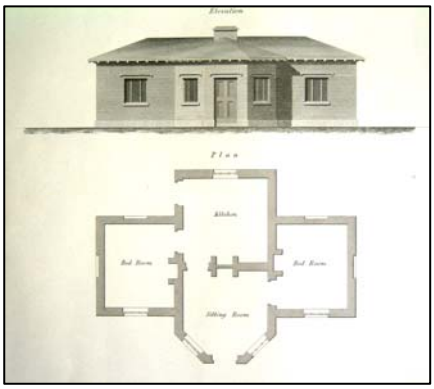




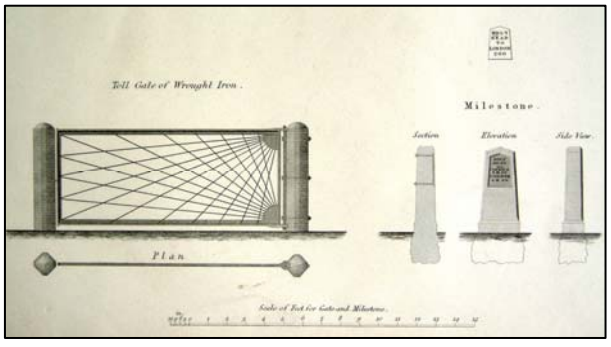
Left: Chirk Aqueduct, 1801 by Cotman (V&A Museum), Right: Pontcysyllte Aqueduct, 1805 by Pickering

Chirk Aqueduct is built in stone with 10 arches of 12 metre span (40ft), but with a stone facing covering a cast iron trough that contains the water. Begun in 1796 it was completed in 1801 for £20,898, with iron cast by the Shrewsbury ironmaster William Hazledine at his foundry at nearby Plas Kynaston. The more dramatic Pontcysyllte Aqueduct was also cast there by him, but the confidence in iron had grown and this time the cast iron trough was left uncovered. At 307 metres long (1,007ft) and 39 metres (127ft) above the River Dee, it was opened in 1805 at a cost of £47,018, over £17,000 of which was for the ironwork. Telford clearly identified the project as being his rather than Jessop's because it is included in the background of his portrait. Both aqueducts are still in use and are bidding to become designated as World Heritage Site in 2008.

**The Holyhead Road – the first motorway**



Regarded as "a model of the most perfect road making that has ever been attempted in any Country", this was a government-financed scheme to improve the links between London and Dublin. Telford was in charge of the whole project, the most ambitious stretch being the 106 miles from Shrewsbury to Holyhead.




Design for standard tollhouses (above), and (right) Telford's 'sunburst' tollgates and mileposts along the Holyhead Road, 1829

Massive civil engineering works were undertaken to keep gradients no greater than 1 in 20 so that horses could pull a carriage at a trot, improving safety and comfort and dramatically cutting journey times. Crossing the Welsh mountains made this a major challenge, but today's motorways follow the same approach. Work began in earnest in 1819 and was largely completed ten years later. With solid foundations and substantial retaining walls, the road was expensive but built to last. The proof of its value lies in the fact that much of the route is still in use today. Instead of separate Turnpike Trusts each looking after a local section as was common elsewhere, the entire road was managed and maintained centrally. Along the route were standard tollhouses built to a detailed specification and costing around £245 each. Telford's legacy is here again, as we have seen tollbooths becoming a common feature on the world's motorways. Tollgates and mileposts were also specified as standard.

Betws-y-Coed Bridge of 1816, by Gentleman

Menai Bridge of 1826, by Dibdin

A stunning iron bridge crosses the River Conway at Betws-y-Coed cast by Hazledine, but this is eclipsed by Telford's greatest legacy – the Menai Bridge that crosses the Menai Straits and links Anglesey to the mainland. It was the longest suspension bridge of its day at 176 metres span (579ft). Using a 15 metre (50ft) model of the central span, over 200 experiments were made to test the design and strength of the chain links that were to carry the road deck. Begun in 1818 and opened in January 1826, the bridge was high enough to pass a man-of-war in full sail, a limitation that had been imposed by the Admiralty. Once again, the ironwork was made by Hazledine. At the same time improvements were also made to the Chester to Bangor coast road, which included a suspension bridge at Conway. Of similar construction, it spans 100 meters (327ft) and opened six months after the Menai Bridge in July 1826.

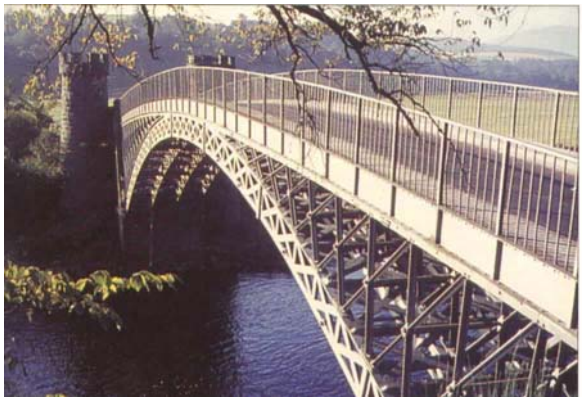
Menai Bridge, c1880

Conway Bridge of 1826, by Pickering

**Meanwhile …**
Unlike many engineers of his day and those that came later, Telford gained a reputation for delivering road and bridge building schemes on time and on budget. In Scotland alone between 1801 and 1822 he was responsible for over 1,000 miles of roads, 1,117 bridges, numerous harbours and ferry landing piers. The work also included the Caledonian Canal through the Great Glen to link the North Sea with the Atlantic, which opened in 1822. These government subsidised job-creation schemes aimed at providing better transport links and employment opportunities at a time of severe unemployment and emigration following the Napoleonic Wars.

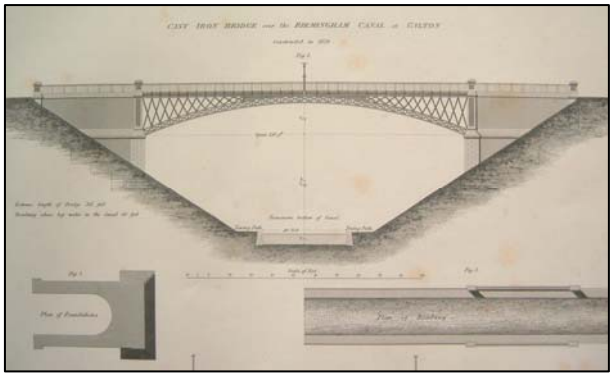
Telford taught a team of assistants to work to the same exacting standards he had pioneered and so brought respectability to what was then a new profession – civil engineering. In order to manage his enormous workload he developed a reliable system of estimates, contracts, specifications and tenders that led local communities, landowners, politicians and central government to believe in him. This professional approach became the standard that in many respects is still followed to this day.


Dunkeld Bridge, 1806 `


Craigellachie Bridge, 1812

Crossing the River Tay at Dunkeld, Telford's road linked Edinburgh and Perth to Inverness. The government subsidised it with £5,000 and the Duke of Athol added £7,000 himself towards the total cost of £30,000. Further north in the malt whiskey region of Strath Spey is the beautiful 46 metre span (150ft) Craigellachie Bridge. Having abandoned the solution used at Buildwas 16 years earlier, here Telford perfected a system for cast iron bridges that he was to use in England at Mythe near Tewkesbury in 1826, Holt Fleet a year later and at Galton Bridge in Smethwick in 1829, also of 150ft span. He had proposed the same system to span the Thames at London Bridge in 1801 in a single arch of 183 metres (600ft), and though it attracted Royal approval it was never built.


Mythe Bridge, Tewkesbury, 1826


Galton Bridge, Smethwick, 1829.

**And there's more …**
In 1808 he surveyed a route for the Göta Canal in Sweden and instructed resident engineers to carry out the work via a voluminous series of correspondence, the work finally being completed in 1832. His works in Scotland were not confined to the Highlands. Between 1815 and 1825 the government also financed the improvement of the Glasgow to Carlisle road and certain key roads in Lanarkshire, all under Telford's supervision. From 1817-29 he was the government's advisor to the Exchequer Bill Loan Commission, which gave loans to civil engineering projects all over the country. His advice was sought on bridges, canals, harbours, and even the Liverpool & Manchester Railway.

His extensive river and canal improvement schemes in England included the Birmingham Canal and the Birmingham & Liverpool Junction Canal, the 2,675 metre-long Harecastle Tunnel on the Trent & Mersey Canal (1827), as well as St Katherine's Dock in London which opened in 1828. He was made a Fellow of the Royal Societies of Edinburgh and of London, and a Knight of the Royal Order of Vasa for his work in Sweden. In 1820 he became the first President of the recently-formed Institution of Civil Engineers.

Telford's legacy is the fast roads, shorter canals and long-span bridges that provided the communications network of the Industrial Revolution, many of which are still in use today – and the New Town that is named after him. But most of all it was his reliable system of estimates, contracts, specifications and tenders that became the blueprint for the civil engineer and brought respectability to what was then a new profession.

The Telford Medal, awarded to Associates of the Institution of Civil Engineers

**Sources**
The Ironbridge Gorge Museum Library and Archives house a considerable collection of material on the life and works of Thomas Telford, from paintings, prints, drawings and photographs, to draft manuscripts (including his Autobiography) microfilm copies of Telford correspondence, reports, and photographs of all known Telford sites. They can be studied on application to the Librarian & Information Officer at the Museum. Email for an appointment library@ironbridge.org.uk.

**Exhibition**
In the 250th anniversary of his birth a special exhibition traces his key works in Shropshire, Wales and the Midlands using the above resources. The exhibition – Colossus of Roads – is open weekdays until 7th December 2007 at the Coalbrookdale Gallery, next door to Enginuity, in the Ironbridge Gorge in Shropshire. Admission and Parking is free.

Text and exhibition by David de Haan, Ironbridge Gorge Museum Trust 2007