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- Inspire the next generation of civil engineers through our education programme
- Provide professional expertise to government and independent professional advice to all political parties
- Promote the contribution of civil engineering to society including Awards for excellence in civil engineering in partnership with the Saltire Society and site visits as part of Doors Open Days

M.S. Hadenay

Kelvin BRIDGES

HERITAGE TRAIL

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INTRODUCTION

From its source on the moors near the village of Banton, the River Kelvin flows for almost 22 miles (35 km), initially south, then west, and finally south-west to its confluence with the River Clyde at Yorkhill Basin in the City of Glasgow.

The river is crossed by numerous bridges of various forms of construction, some small, but others of notable grandeur reflecting the rapid industrial and commercial development of the late 19th and early 20th centuries which made Glasgow one of the most important cities in the British Empire.

In more recent years, the de-industrialisation of Glasgow, together with the gradual improvement in

the water quality has made a walk beside the River Kelvin in the heart of the city a wonderful experience, with much to observe from the industrial heritage to the rich natural habitat. Once more, the river is home to iconic species including otters, kingfishers and the Atlantic salmon.

This publication seeks to enhance the experience of the visitor by describing some of the bridges crossing the river; a map is included in the centre pages and some definitions are provided inside the back cover to aid the reader.

We hope you enjoy reading it.

Institution of Civil Engineers
Glasgow & West of Scotland

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• Bridges of the Kelvin

David William Boyce

Glasgow City Libraries, 1996

• RCAHMS

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ditto

USEFUL LINKS

• Botanic Gardens

www.glasgow.gov.uk/parks

• Kelvin Walkway

www.scotcities.com/westend/kelvinwalkway.htm

• RCAHMS

www.canmore.rcahms.gov.uk

JP McCafferty 2015

1/2. GARRIOCH QUADRANT VIADUCTS – 1896

The viaducts, built circa 1896, formed a junction west of the former Maryhill Central railway station. The **western viaduct (1)** carried the Lanarkshire and Dunbartonshire Railway towards Kelvinside and comprises multiple, masonry arch, approach spans leading to three, highly skewed, plate girder spans over the river



1

supported on masonry piers. The **eastern viaduct (2)** carried the Glasgow Central Railway over the Kelvin towards Kirklee and comprises three large semi-circular arches, in rusticated masonry, with a smaller arch on each bank for a footpath. Both viaducts are now disused.



2

3. GARRIOCH DRIVE FOOTBRIDGE – 1974

The **Garrioch Drive footbridge**, constructed in 1974, carries the Kelvin Walkway over the river and provides an important link to the Arboretum on the right bank. It is 2.7m wide with a single skew span of approximately 23.7m. It comprises a concrete beam deck, which is believed to be post-tensioned,



4. KIRKLEE BRIDGE – 1901



This very imposing bridge carries Kirklee Road high over

the River Kelvin gorge into Clouston Street, and is probably the best example of a stone bridge in Glasgow. It was built between 1899 and 1901 for the Glasgow Corporation Highways Department by William Wilson.

The bridge has three spans of 5.5m, 24.4m and 5.5m, comprising good quality red sandstone masonry arches with internal brick walls and transverse jack-arches topped with polished pink granite balustrades. The main span over the river is a semi-elliptical arch, flanked by pairs of polished pink granite Ionic



columns. The narrow side spans are high semi-circular arches with carved keystones, which provide a slightly intimidating pedestrian route through the structure on both banks.



The bridge adheres precisely to the architecture of Robert Mylne's Blackfriars Bridge in London (1760-9,

demolished 1864) and the Piranesi engraving from which Mylne drew his inspiration. The entablature over the columns lines up with a fine cornice over the main arch. Projecting mouldings outline the border of each spandrel and the circumference of a circular relief of the Arms of Glasgow carved in-situ on the coursed sandstone. The bridge's foundation stone is on the left bank. Below one of the decorative granite pillars is a large block of sandstone which carries a memorial stone and inscription.



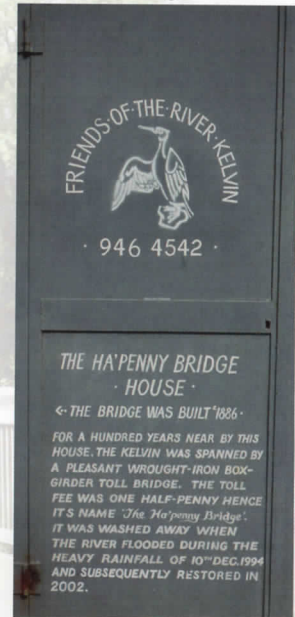
5. HALFPENNY BRIDGE – 2002



Also known as *Kirklee Footbridge*.

The first recorded bridge at this site, which replaced the ford, was known as the Three Trees Well Footbridge. It was named after a local beauty spot situated on the right bank of the river. It collapsed in the 1880s and was replaced by Ford Road Bridge, a light, half-through, wrought iron, Warren truss, built around 1886. A most unpopular toll of one halfpenny was set by the owner of Kelvinside House to deter the residents of Maryhill from using the bridge, hence the name. Over time the bridge fell into disrepair and disuse, and was finally washed away in December 1994.

In order to maintain the Glasgow to Milngavie cycle route and the Kelvin Walkway, Glasgow City Council decided to replace the bridge. The new bridge, which was completed in 2002, carries the Kelvin Walkway over the river and links the footpath to Garriochmill Road and Kirklee Road on the left bank with Addison Road and Ford Road on the right bank. The bridge is 4m wide, has a single clear span of 27m and has the form of a timber, half-through modified Warren truss supported on masonry abutments.



6. BOTANIC GARDENS FOOTBRIDGE – 1908



This elegant “B” listed structure provides access over the Kelvin between the Walkway on the left bank and the Botanic Gardens. Its attractive “humpback” profile is necessitated by the difference in level between the opposite banks. It was built in 1908 by Messrs Orr, Watt and Co. Ltd. of Motherwell.

deck comprises twin steel fabricated girders, connected transversely by steel rolled beams encased in a concrete slab. The slab is surfaced with tar macadam. The deck is supported on concrete abutments and cast iron intermediate column supports, linked transversely by elegantly curved cast iron cross bracing. The columns are connected by sole plates to concrete foundations, which also act as “cutwaters”. Decorative cast iron parapets complete the structure.

The bridge is 4m wide and has three simply supported spans of 13.6m, 15.2m and 13.6m. The



* Designed by the eponymous WL Scott when he was chief designer for Considered Construction Co. JPMcCafferty 2015

7. QUEEN MARGARET DRIVE BRIDGE – 1929



The first **Queen Margaret Bridge**, located on Hamilton Drive, was opened in 1870 and known locally as “**Walker’s Bridge**” after the local cab proprietor. It was partially demolished in 1971, but remains of the substantial piers and abutments can still be seen downstream, just below the weir. The current Queen Margaret Bridge was designed as part of a major road improvement scheme that separated the then BBC buildings from the Botanic Gardens. Built in 1929 by William Taylor and Son at a cost of around £108,000, it carries Queen Margaret Drive high over the Kelvin and its steep banks at a skew angle of 25 degrees.

The main span comprises a 300mm thick, reinforced concrete, rib-stiffened arch ring with a skew span of 41.8m founded on substantial mass concrete footings. The arch supports a regular arrangement of square reinforced concrete columns, which in turn support the reinforced concrete, rib-stiffened road slab. The approach spans comprise a stiffened reinforced concrete road slab supported on a grillage of reinforced concrete columns and beams. Both spans incorporate an arched pedestrian access through the bridge, the access on the left bank accommodating the Walkway.

The whole frame is clad with very smooth and finely jointed red Corncockle sandstone, mimicking voussoir arches and keystones, which gives the illusion that the bridge is a solid masonry arch structure, like Kirklee Bridge. The parapets, which include short lengths of open balustrade, are of polished red Peterhead granite. The overall impression is one of grandeur.



8. NORTH WOODSIDE FLINT MILL

The Flint Mill is an interesting structure, described in detail on the adjacent

information board. Look for the stone carvings in the wall opposite the mill.



9. NORTH WOODSIDE FOOTBRIDGE (FLINT MILL BRIDGE) – 1978

This simple bridge crosses the river at a skew angle of approximately 45 degrees just downstream of the former flint mill. It provides continuity of the Walkway on the right bank of the river, linking it to Kelvingrove Park.

The bridge was constructed by Whatlings Ltd. in 1978 as part of the Kelvin Walkway scheme. It is 3m wide and has a single clear span of 28.5m. It comprises twin rolled steel beams acting compositely with a reinforced concrete deck slab supported on stone-faced abutments.



10. BELMONT STREET BRIDGE – 1870



Constructed in 1870, **Belmont Street Bridge** was commissioned by the City of Glasgow Bank to give access to their development land in the North Woodside area. The Bank's specification was for a "handsome stone bridge", which has certainly been achieved with this imposing

river level is heightened considerably by the commanding presence of the adjacent Kelvin Stevenson Memorial Church.



example of Victorian bridge building.

The elliptical arch barrel, spandrel walls and parapets are all of sandstone masonry construction, supported on tall, rusticated sandstone abutments.



The masonry arch structure,

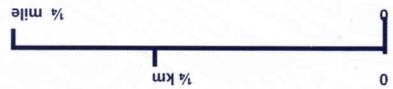
which has a clear square span of 24m, carries Belmont Street high over the river and the Walkway down to Great Western Road. The overall effect from





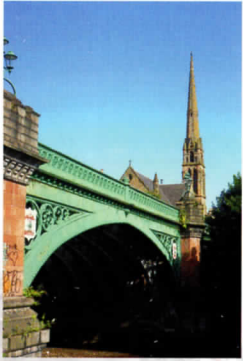
KELVIN BRIDGES MAP KEY

- 1/2 Garrioch Quadrant Viaducts
- 3 Garrioch Drive Footbridge
- 4 Kirklee Bridge
- 5 Halfpenny Bridge
- 6 Botanic Gardens Footbridge
- 7 Queen Margaret Drive Bridge
- 8 North Woodside Flint Mill
- 9 North Woodside Footbridge
- 10 Belmont Street Bridge
- 11 Great Western Bridge
- 12 Kelvinbridge Footbridge
- 13 Eldon Street Bridge
- 14 Prince of Wales Bridge
- 15 New Park Footbridge
- 16 Kelvin Way Bridge
- 17 Dumbarton Road Bridge
- 18 Partick Bridge
- 19 Sewer Bridge



11. GREAT WESTERN BRIDGE – 1891

Also known as the Kelvin Bridge, **Great Western Bridge** carries the A82 Great Western Road over the River Kelvin on the site of a ford that had existed for centuries.



The current structure is the third to be built on this site. Both previous structures were demolished during

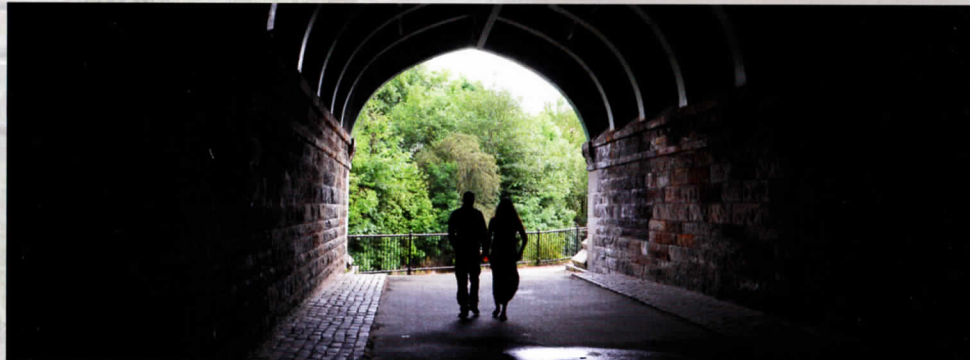
construction of the current bridge, which was formally opened in 1891. The engineers were Bell and Miller, the contractors Morrison and Mason, and the girders were fabricated by Sir William Arrol and Co..

The bridge has four arch spans of 13.7m, 31.1m, 31.1m and 9.2m. The two main central spans have a rise of 5.56m. The form of the bridge; arch rib or ring supporting the deck on

open spandrels, is similar to that of Queen Margaret Drive Bridge, but in cast iron and steel rather than reinforced concrete. All four spans comprise nine, longitudinal girders braced together transversely by five rows of cast iron frames. The arch rib for the seven internal beams is fabricated in five 910mm deep sections joined together by bolts. The decorative



arch rib for the outer girders is formed in a single casting, 814mm deep. The spandrels are a series of bolted cast iron frames; the outer spandrels being decorative.



11. GREAT WESTERN BRIDGE – 1891 CONT...



The arch girders support fabricated steel, transverse cross girders, which act as "springings" to support brick jack arches spanning longitudinally between them. Concrete

infill provides a plane surface for the road construction.

The side arch girders each comprise three cast sections bolted together, and provide access for the Walkway on the right bank and a pedestrian access through the bridge on the left bank. The abutments and piers are constructed from sandstone masonry, with pilasters faced in polished

granite. All supports are founded on bedrock, apart from the abutment on the right bank, which due to the presence of coal workings is supported on 7m long cast iron piles.



The spandrels have fascias depicting the coats of arms of Glasgow, Lanarkshire and Hillhead. At street level, an engraving on the central upstream pilaster records the opening of the bridge and a plaque installed in 2013 by the Institution of Civil Engineers is dedicated to the memory of Sir William Arrol.

12. KELVINBRIDGE FOOTBRIDGE

This rather unobtrusive, low level footbridge carries the Walkway over the River Kelvin at a skew angle of approximately 20 degrees, just downstream of the Great Western Bridge. It has two spans of approximately 10m each and comprises five fabricated steel plate girders, restrained transversely by lattice truss bracing, supporting a steel trough deck. It is supported on masonry abutments and five intermediate circular masonry piers.



13. ELDON STREET BRIDGE – 1895

The first bridge in this area was named **King's Bridge** and was erected in 1822. It was replaced in 1895 by **Eldon Street Bridge**; a Grade B listed structure, which carries Eldon Street/Gibson Street over the River Kelvin. Designed by Forman and McColl, its form and style are very similar to that of Great Western Bridge, albeit less imposing.



Street/Gibson Street over the River Kelvin. Designed by Forman and McColl, its form and style are very similar to that of Great Western Bridge, albeit less imposing.

It was constructed jointly by the Caledonian Railway and Glasgow Corporation and has a single clear span of 21.3m, comprising a concrete deck slab supported on seven open spandrel arch girders, which in turn are supported on cast iron bearings located on the masonry abutments.

The internal arch girders are of riveted steel construction, whilst the external arches are of cast iron in a single piece, the open spandrels formed by Gothic tracery and decorated with the Arms of Glasgow. The parapet is also of cast iron, with panels of tracery.



On the left bank, an adjoining span of mixed construction carries Eldon Street over the Walkway and the entrance to the disused St Vincent Crescent Railway Tunnel, which runs under Kelvingrove Park.



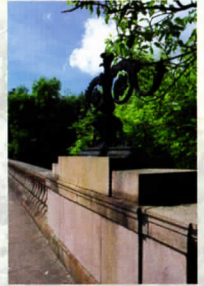
14. PRINCE OF WALES BRIDGE – 1895



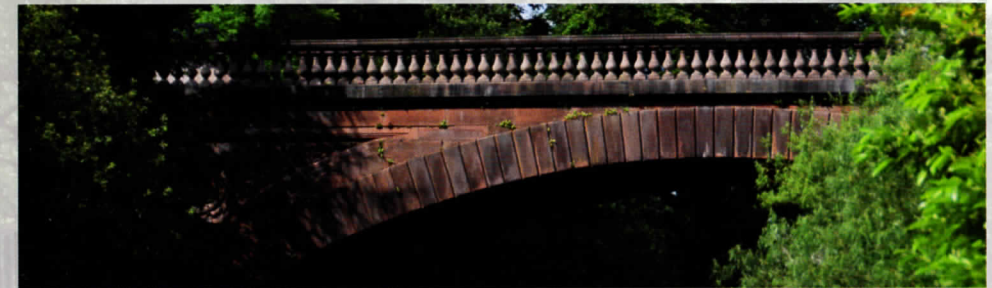
The current bridge was built in 1895 to replace a wooden structure, which had

stood for 25 years. Designed by the City Engineer, Mr. A. B. MacDonald, the bridge comprises a single elliptical red sandstone brick and blockwork arch with a span of approximately 39m and an overall width of 12.4m. It is

beautifully detailed with carved stone balustrades, low relief carvings of the Arms of Glasgow in the spandrels and elegant wrought-iron light fittings.



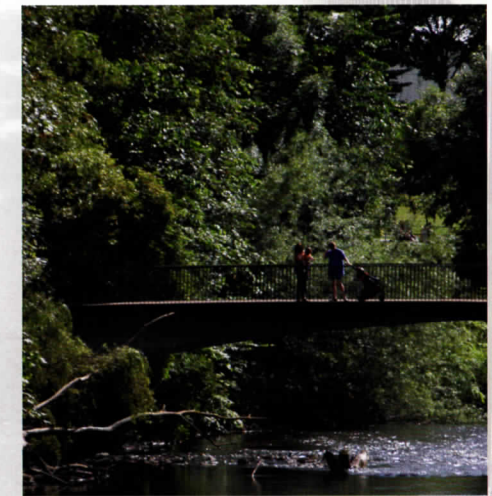
The bridge is a central feature of Kelvingrove Park, providing a popular link between Glasgow University and the West End with central Glasgow.



15. NEW PARK FOOTBRIDGE – 1964

This regularly used bridge carries a footpath over the river within Kelvingrove Park. It was designed by Ronald Walker and Co. and built in 1964 to replace Old Park Footbridge, a four-span wooden structure.

The form of the bridge is a reinforced concrete, three-pinned arch, inspired by the work of the renowned Swiss civil engineer Robert Maillart. This elegant structure is 3.6m wide and has a low-profile arch span of 25m with open spandrels.



16. KELVIN WAY BRIDGE – 1914

In 1911 it was decided to create a grand boulevard through Kelvingrove Park, which included the demolition of the **South Gate Bridge**, opened in 1881, and construction of the **Kelvin Way Bridge** over the river.

The Grade B listed structure comprises a single masonry arch span of 24.4m in red sandstone. The abutments are also in masonry and are founded on mass concrete on bedrock. The solid parapets are in sandstone and support four impressive bronze sculptured groups, which were added in the 1920s.

The sculptures represent Peace and War, Philosophy and Inspiration, Navigation and Shipbuilding and Commerce and Industry.



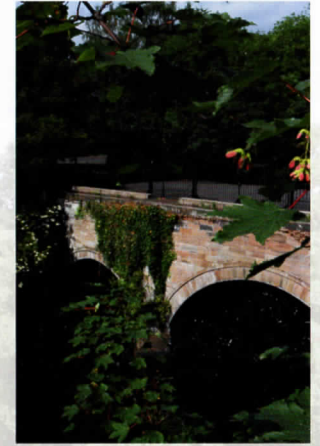
17. DUMBARTON ROAD BRIDGE – CIRCA 1800

Dumbarton Road Bridge was constructed around 1800 and carries Dumbarton Road over the River Kelvin, linking Partick to Glasgow. It is a four span masonry arch structure in cream sandstone with spans of 10.2m, 13.1m, 10.2m and 8.5m and an overall length of 58m. The easternmost arch spans the lade to the former Regent Mills. Cast iron girders have been added to strengthen the arch. The small blocked arch between span 3 and 4 is about 1.2m wide and is also of masonry construction.

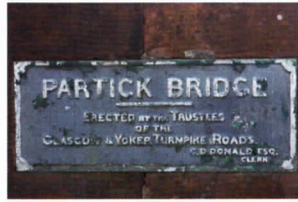
It was also known as the “**Snow Bridge**” since the central portion of its railings could be opened to

allow carts to deposit snow into the Kelvin after heavy falls.

As road traffic increased the bridge was widened and repeatedly repaired until it was eventually declared unsuitable for traffic. It now serves as a footbridge for public access to the Kelvingrove Art Galleries.



18. PARTICK BRIDGE – 1878



An Act of Parliament was obtained in 1875 for the construction

of a new bridge to replace Dumbarton Road Bridge and carry the realigned Dumbarton Road over the Kelvin. The bridge was 19.4m wide to accommodate a double tram line. It was constructed between 1877 and 1878 and comprises a single span cast-iron arch with a skew of 40 degrees, a span of 30.5m and a rise of 5.5m at the crown. The arch is formed by a series of seven cast iron internal girders and two edge girders, braced together transversely. Each girder comprises five segments, joined together with bolted joints through planed faces. The spandrels are composed of a series of bolted cast iron frames bolted to the top flange

of the arch girder. The deck comprises a series of brick jack-arches spanning longitudinally onto wrought iron transverse beams which are bolted to the top flange of the spandrel frames.

The abutments and wing walls are of “rock-faced” sandstone ashlar masonry, the pilasters being of smooth finished sandstone, all of which is covered in cement mortar rendering, some of which has since spalled off or been removed.



The bridge is similar to the Eldon Street Bridge, being another fine example of Victorian engineering. Careful attention to detail is evident, the outer girders being filled with Gothic tracery and display the Arms of Glasgow and of Partick.



19. SEWER BRIDGE – 1904



Immediately adjacent to and downstream of Partick Bridge is the Sewer Bridge. Opened in 1904 by Glasgow Corporation it forms part of the Partick Sewage

Pumping Station on Dumbarton Road and carries the main sewer across the

Kelvin. It also carried a steam main to the Kelvin Hall and was originally covered by a pitched roof, both since removed. The bridge comprises two steel half-through lattice truss girders supported on masonry abutments, curiously featuring large circular sandstone pilasters, topped with sheet-metal caps.

The lade supplying the Regent Mills passes under the east side of the bridge.

DEFINITIONS

The purpose of a **bridge** is to span a physical obstacle in order to provide passage over that obstacle. It must be designed to support its own weight and any imposed load and thereby transmit those loads safely to a suitable bearing stratum, without inducing significant settlement.

The **right bank** of a river is the bank that is on the right side, relative to an observer facing downstream.

A **half-through** bridge is one where the lower longitudinal structural members (chords) support the deck and hence the traffic, whilst the upper chords are not connected together transversely, thus allowing passage of traffic over the bridge.

A **springing** is the bottom stone of an arch from which it “springs”

A **vousoir** is a wedge shaped element of masonry used to build an arch.

A **spandrel** is the roughly triangular area between the outer curve of an arch and the horizontal line at road level

A **jack-arch** is a small arch of brick or concrete, normally spanning transversely between the bottom flanges of adjacent members such as “I” beams.

A **skew bridge** crosses an obstacle at an angle such that it does not span the shortest distance.

A **wing wall** is a soil retaining structure, which projects from the bridge abutment.

A **pilaster** is an architectural element used to give the appearance of a supporting column, having a purely ornamental function.