



**ERSKINE
BRIDGE**
1971-2021

2. ERSKINE BRIDGE AND APPROACHES

Celebrating Fifty Years



2nd July 2021

Celebrating 50 years of the Erskine Bridge

The Erskine Bridge is a major crossing of the Clyde Estuary to the west of Glasgow. Designed by Freeman Fox and Partners, the cable-stayed steel box girder bridge opened to traffic on 2nd July 1971.

Discussions on the need for a bridge began in the 1930s, though it was the early 1960s before significant progress was made. As proposals for the network of motorways and dual carriageways in Central and West Scotland matured, it became clear that a bridge at this location would be an important piece of the jigsaw.

The ambitious and technically challenging project created the first fixed link between Dunbartonshire and Renfrewshire. Its completion led to significant reductions in journey times, particularly during the busy tourist season when traffic reaches its peak. Today, the bridge carries over 35,000 vehicles every day.

A notably slender design adds to the unique and recognisable appearance of what was not just the first large-scale cable stayed bridge in Scotland but, for a time, the bridge with the longest cable-stayed span in the world. The project cost £10.5 million, the equivalent of almost £150 million today.

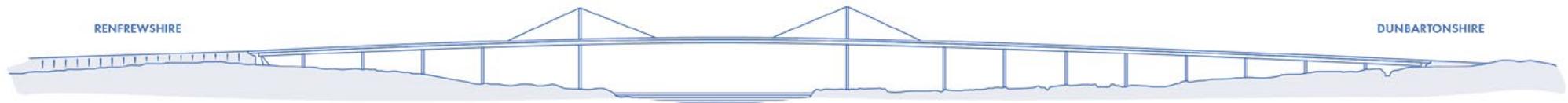
A ferry service operated between Erskine and Old Kilpatrick for almost two hundred years before the bridge was completed. In its last years of operation the services carried vehicles and pedestrians across the river on a chain ferry painted in the familiar blue seen on other Clyde services at Govan and Renfrew.

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Planning and Design

Traffic growth in the 1930s placed the ferry service between Erskine and Old Kilpatrick under increasing strain. In 1934, with public dissatisfaction growing, the need for a bridge was accepted.

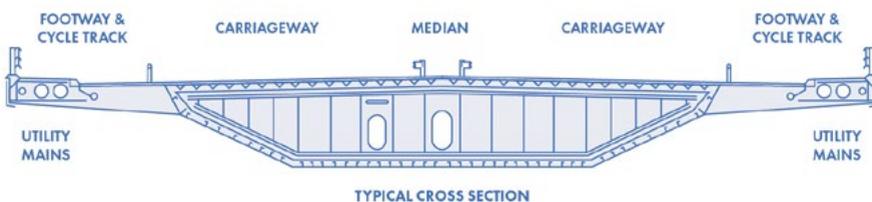


The Counties of Dunbartonshire and Renfrewshire began planning to replace the ferry, which had been running for two hundred years, but this was interrupted by the Second World War and it was 1955 before further progress was made. The Scottish Office, which took on responsibility for trunk roads in Scotland in April 1956, agreed to the formation of a Joint Committee. Its first meeting was held in March 1963 and a technical panel was set up to proceed with detailed design, traffic studies and site investigations.

In December 1963, Freeman Fox and Partners were appointed as Consulting Engineers. Their commission included the preparation of a design for the bridge and its main approach roads. In September 1965, as the scale of the project became clear, the Scottish Office assumed responsibility for the funding of the project.

Maintaining shipping in the River Clyde dictated that a high level bridge would be the only acceptable solution and various proposals including a tied arch, a steel truss and box girder were considered. The selected design was a multi span mono cable-stayed steel box girder bridge with a main span of 300m and side spans of 110m.

The section below shows how the slender look of the bridge was achieved. The deck is comprised of 80 sections welded together to provide a continuous steel box girder. Cantilever beams support the footways and cycle tracks at each side.



With a total length of 1.3km, the Erskine Bridge would be carried on fourteen slender reinforced concrete supports, the tallest of which is over 50m high. These were designed specifically for the bridge by Dr W.A. Fairhurst.

The approaches to the Bridge would connect to the A82 at Dalnottar Junction (shown here) and to the new M8 Bishopton Bypass at Craighton Junction.

In Renfrewshire a short section of motorway, the M898, would link the M8 to a point just south of the toll plaza. The M898 was briefly the shortest motorway in the UK; it remains the highest numbered.

The bridge deck, over 30m wide in the main span and on a gentle curving alignment, is carried on a steel trapezoidal box girder supported by a single 715m cable over two 40m tall towers. The box girder is comprised of 80 steel sections welded together. The bridge has two traffic lanes as well as pedestrian footways and cycleways in each direction.

A network of approach roads was to provide free-flowing links to local roads and the new motorway and trunk road network planned for Strathclyde Region. The bridge would also carry services including new water and gas mains to supply the Renfrewshire area.



Construction

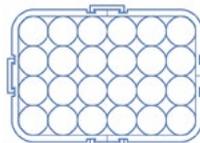
Freeman Fox and Partners revealed their design for the Erskine Bridge in 1966. The necessary parliamentary approvals were granted quickly and construction on the project, valued at over £10 million, began in April 1967.



For the main span, each girder extended by 150m before being jacked and welded together. The bridge towers were completed in advance to allow the connection of cables for additional support. When complete, mastic asphalt surfacing was applied directly onto the bridge deck.

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Each cable is over 210m long and comprises 24 strands, each 75mm in diameter. The 24 strands are clamped together to form a rectangular cable six strands wide by four strands deep. Prior to erection each strand was pre-tensioned and marked to the required length under a dead load of 170 tonnes.



CABLE CROSS SECTION SHOWING BAND

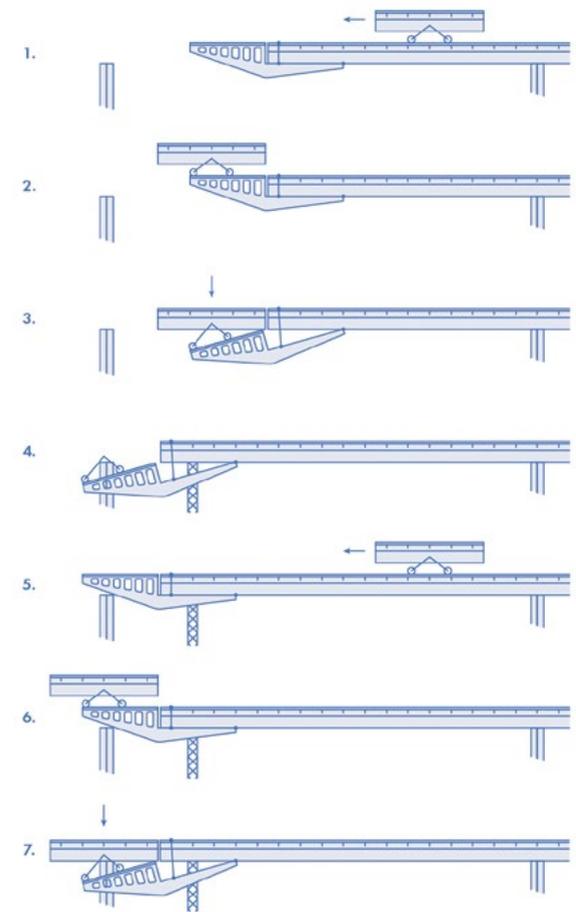
The project was split into four distinct contracts: foundations and piers, designed separately by W.A. Fairhurst and Partners; the bridge steel superstructure; the northern approach roads (A82 interchange); the southern approach roads (first stage of the M8 Bishopton Bypass and M898) including the toll plaza and administration building.

The main construction contract comprising the bridge superstructure was awarded to Fairfield Mabey Ltd. Construction of the foundations and piers was undertaken by Christiani-Shand Ltd. The contract for the north approach roads and link with the A82 at Dalnottar was awarded to Peter Lind & Co., whilst the south approach roads were awarded to Whatlings Ltd.



Construction proceeded from both banks of the river. Sections weighing up to 170 tonnes were launched by cantilevering them from previously built steelwork in a carefully controlled sequence using specially designed, temporary launching girders.

In this process each new box section was lifted on to the completed deck (1) and rolled out on to the launching girder (2). The launching girder lowered it in to place (3) allowing it to be welded to the finished steelwork, forming a single continuous box girder (4). The launching girder was then repositioned (5) ready to receive the next new section (6).



BOX GIRDER LAUNCHING SEQUENCE

By 1969 the fourteen soaring reinforced concrete piers were completed. Throughout 1970 the steel box girders were lifted in place, gradually crossing the river.

The approach roads including the M8 and M898 motorways as well as the administration building were largely operational by early 1971. This was followed by the completion of the toll plaza, high mast lighting, CCTV and remote controlled warning signal.





Opening



The Erskine Bridge was completed on schedule and opened by HRH Princess Anne on Friday 2nd July 1971. The ceremony was attended by several hundred people with commemorative plaques unveiled on the west footpath. During its first weekend of operation thousands of vehicles made journeys across the new bridge. They were joined by intrigued locals enticed by the stunning views available from the bridge's footways.

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Suspension v. Cable-Stayed

Suspension bridges and cable-stayed bridges look similar but are very different. The cables supporting the deck of a suspension bridge, such as the Forth Road Bridge, drape over towers and are anchored in large concrete structures at each end.

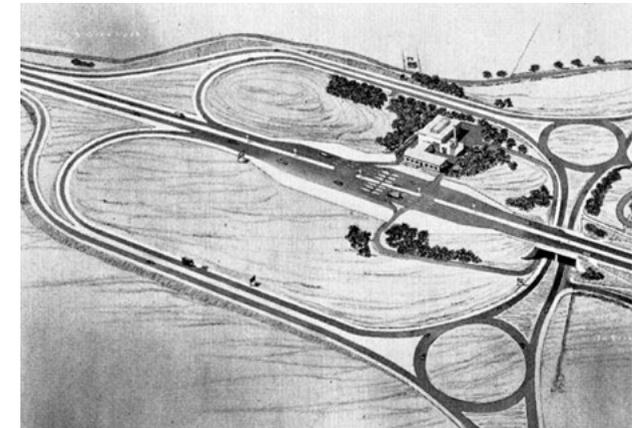


TYPES OF CABLE STAYED BRIDGE

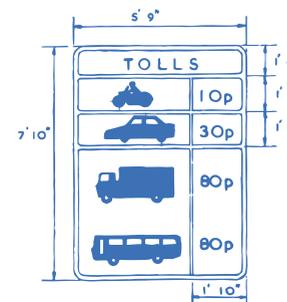
In cable-stayed bridges such as Erskine, the cables connect directly to towers, which become the primary load bearing element. Cable-stayed bridges require much less steel and often make use of precast sections which accelerates the rate of construction. This makes them significantly less expensive than suspension bridges to build.

Tolls

Until March 2006, users of the Erskine Bridge were required to pay a toll charge. Tolls were introduced on many new major bridges at this time as a way of recovering the enormous costs of their construction.



The initial proposals were for charges that varied by vehicle type, as shown on this proposed design for one of the original toll signs.



Sign Nos 47A(1), 98 & 160A
White on Blue

At Erskine, a toll plaza was constructed at the southern end of the bridge, opposite the administration building. Four toll booths were in place on each carriageway.

Day to day running of the bridge was to be entirely self-sufficient. To enable this, the administration building would be one of the most advanced in the UK with staff facilities, CCTV control, toll computer systems, maintenance workshops, a fire engine, road sweeper, snow plough and patrol vehicles. The designers even included a narrow tunnel that would allow personnel to cross the dual carriageway safely.

Though a variable toll had been planned, when the bridge opened in 1971 the charge was a flat rate of 15p for all vehicles. This increased to 60p in 1992 and remained at this level till 2006, with exemptions for motorcycles. The removal of tolls encouraged more people to use the bridge. The first year after abolition saw a 25% increase in traffic though this was offset by lower flows through the Clyde Tunnel, the nearest crossing upstream.

The Bridge Today

The Erskine Bridge is now managed by Transport Scotland on behalf of the Scottish Ministers. It is estimated that more than 400 million vehicles have used the bridge since it was completed.



On the 4th August 1996, the Erskine Bridge was seriously damaged when a 6,500 tonne oil rig being towed downstream struck its underside. Damage measuring 10 metres long and 30 centimetres wide was left in the steel box girder forcing the bridge to close to traffic and pedestrians.

Repairs costing over £3.5 million were required and the bridge was not fully reopened until December 1996. What was then the Scottish Office was later reimbursed for the cost of the damage.

Historic Environment Scotland listed the bridge as a Category A structure in November 2018, recognising its unique architectural and technical features.

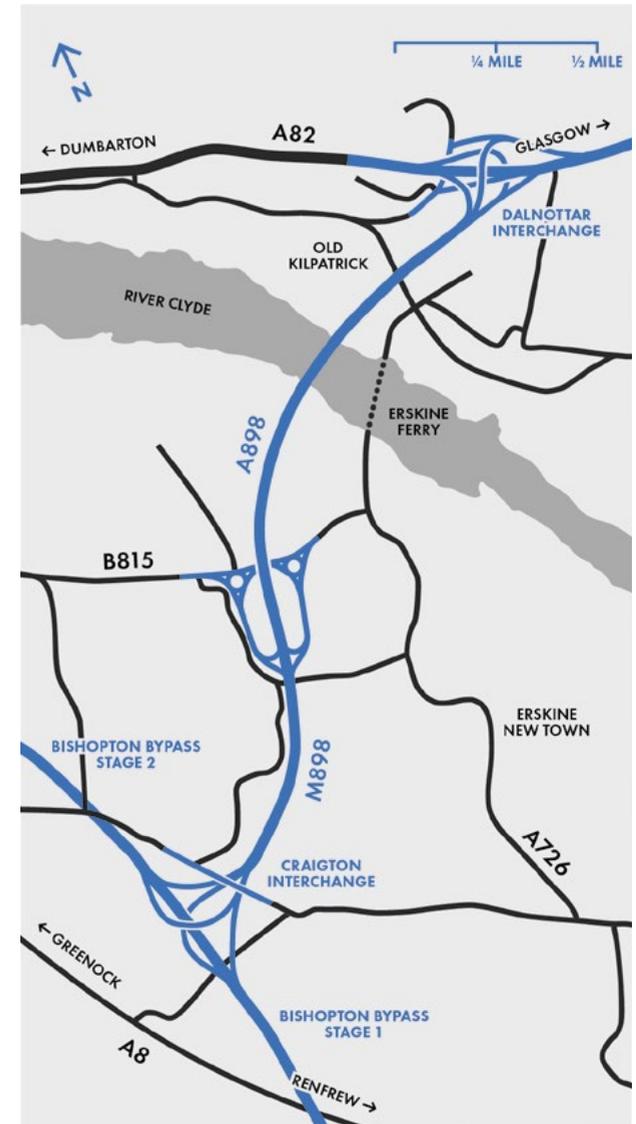
The bridge is a key link in the Scottish trunk road system and a series of multi-million pound projects are planned to ensure it remains operational for decades to come.

The bridge deck was refurbished in the 1990s and new inspection gantries and access points were installed between 2009 and 2011. Since 2010, works have been undertaken to replace the parapet and barrier systems as well as upgrade the lighting and electrical systems.

A programme of steelwork painting is currently underway. This will be completed in 2025 along with works to resurface the bridge deck. To date, more than £50 million has been spent.

Project Map

Over five miles of new roads were constructed as part of the Erskine project. This map, dated just before construction began, shows how they connected to the wider road network of the day.



■ New Roads
■ Existing Roads

Produced in collaboration with Transport Scotland



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Design by Toplicht Studio

The extraordinary effort to plan, design and build the biggest urban motorway scheme in the UK saw some of the most ambitious engineering projects in Strathclyde since the construction of the railways.

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