The background is a vibrant yellow. It is decorated with several abstract geometric shapes in shades of blue, teal, and white. These include circles, semi-circles, and rounded rectangular shapes, some of which are layered or overlapping. The shapes are scattered across the page, creating a modern and dynamic visual effect.

**Appendix A3.1**  
Scherzer Bridges Options Report

# Relocation of Scherzer Bridges, Dublin City: Industrial Heritage and Options Appraisal



**Fred Hamond, John Kelly  
&  
Fergal McNamara**



*for*

**Roughan & O'Donovan and National Transport Authority**

**February 2021**



## Contents

	Preface	
	Summary	
1.	Introduction	1
	1.1 Bridge locations	1
	1.2 Bridge proposals	1
	1.3 Moveable bridges	2
	1.4 Scherzer bridges	2
2.	Options appraisal methodology	6
	2.1 Planning context	6
	2.2 Conservation rationale	7
3.	History of the Royal Canal bridges	8
	3.1 Swivel Bridge	8
	3.2 Rolling drawbridge	8
	3.3 Enlargement of sea lock	9
	3.4 Scherzer bridges	11
	3.5 Recent developments	15
4.	Royal Canal bridge descriptions	17
5.	Royal Canal options appraisal	21
	5.1 Options appraisal 1	21
	5.2 Options appraisal 2	26
	5.3 Appraisal conclusions	28
6.	History of the George's Dock bridges	29
	6.1 Swivel Bridge	29
	6.2 Rolling drawbridge	29
	6.3 New swivel bridge	31
	6.4 Scherzer bridges	33
	6.5 Recent developments	34
7.	George's Dock bridge descriptions	37
8.	George's Dock options appraisal	41
	8.1 Relocation restrictions	41
	8.2 Options appraisal	41
	8.3 Appraisal conclusions	43
9.	Bridge conservation	45
	9.1 Conservation principles	45
	9.2 Options' implementation	45
	Appendices:	47
1.	Scherzer bridges in Ireland	48
2.	Royal Canal Scherzer bridges	51
	2.1 Original drawings	51
	2.2 Historical photographs	57



## Preface

The purpose of this report is to inform the design development of Core Bus Corridor (CBC) No.16 of 'BusConnects Dublin' that will connect Ringsend to the City Centre, by testing the feasibility of the retention and conservation of two pairs of historic Scherzer bridges located on the North Quays. The challenge addressed by this report is how best to conserve the historic character of the bridges whilst also enabling BusConnects Dublin's objectives to be delivered.

The objective of the BusConnects programme of the National Transport Authority (NTA) is to improve bus services in Irish cities, focussing on the enhancement of bus routes in urban areas and the creation of priority bus corridors. As noted in the Preferred Route Option Report the aim of BusConnects is: *to transform Dublin's bus system, with the Core Bus Corridor project aiming to provide 230km of dedicated bus lanes and 200km of cycle lanes on sixteen of the busiest bus corridors in and out of the city centre. This project is fundamental to addressing the congestion issues in the Dublin region with the population due to grow by 25% by 2040, bringing it to almost 1.55 million.*

In order to increase the capacity and quality of bus services between the City Centre and Ringsend along the Quays and the expanding North Lotts district adjacent to Dublin Port, the need has been identified for a four-lane road, including two for buses, along the north side of the Liffey. Lying directly on the proposed route are two pairs of Scherzer lifting bridges, all of which are included as Protected Structures in Dublin City Council's Development Plan 2016-22. This statutory protection is in recognition of their architectural and engineering significance.

During the route selection stage, the Scherzer bridges were identified as pinch points along the CBC route. It was determined through the analysis various different criteria (e.g. economic, social, environmental, and cultural) that their relocation would be required to fulfil the objectives of BusConnects Dublin. The assessment concluded that: *... the relocation of the historic Scherzer Bridges to an appropriate new location and the provision of new bridges in between are preferable. This will allow the hazard traffic poses to the bridges and vice versa to be better addressed.*

For the purposes of assessing the feasibility of conserving the Scherzer bridges on the north Quays as part of this process, it is assumed that the case for two dedicated bus lanes in addition to the existing two-lane carriageway has been made elsewhere to meet the requirements of BusConnects Dublin along CBC route 16.

It should be noted that, because of the of the Covid-19 pandemic, historical research and site surveys were restricted due of lockdown and travel restrictions imposed since March 2020 and which are still in force at the time of writing.

The assistance of Lar Joye, Heritage Director of the Dublin Port Company, in researching the history of the Scherzer bridges is gratefully acknowledged.

Fred Hamond *Industrial Archaeologist*

John Kelly *Brady Shipman Martin*

Fergal McNamara *7L Architects*

24 February 2021



## Summary

This report explores the feasibility of relocating two pairs of Scherzer bridges on the North Quays to deliver BusConnects Dublin's objective of creating a dedicated bus route (CR 16) to and from Dublin City Centre. The study entailed the recording and assessment of the bridges in their current state, and researching their historical development.

Scherzer bridges were an innovation type of lifting Bridge patented by William Scherzer in 1893. They were first introduced to Ireland in 1905-06. Under the direction of Sir John Purser Griffith, two were erected in 1910-12 by the Dublin Port & Docks Board (DP&DB) over the entrance to the Royal Canal on North Wall Quay. A second pair was also installed by the DP&DB in 1932-34 over the entrance to George's Dock on Custom House Quay, this time under the direction of Joseph Mallagh.

An initial inspection of the bridges over the Royal Canal shows them to survive in a reasonably complete state. Although still capable of operation to facilitate boat access to the sea lock at this end of the canal, their spans have been temporarily clamped shut and they are now rarely, if ever, opened. The Scherzers at George's Dock have been permanently shut since 2001 and George's Dock is now dry. Although also in good condition, this pair is less complete and no longer capable of operation.

The four bridges are of national importance in terms of their architecture, technology and engineering interest and are Protected Structures in the Dublin City Development Plan 2016-22. Only eight were ever built in Ireland. The two on the Royal Canal are now the earliest complete examples to survive, whilst the ones at George's Dock were the last to be built in the country.

Given the bridges' heritage significance, the strategy adopted here is to retain them as close as possible to each other in their present localities, minimise any loss of physical fabric and, at the same time, minimise any negative impacts upon adjacent built heritage features and their settings. The bridges' public amenity value is also considered.

An initial analysis of various relocation options showed that it will be impossible to retain either or both bridges in situ if BusConnects Dublin's objective is to be delivered, namely the creation of two dedicated bus lanes in addition to the existing two-lane road. Repositioning them both is the only feasible way forward.

In the case of the Royal Canal bridges, the preferred option is to move them apart to accommodate a fixed new bridge and also raising the deck levels of all the bridges by c.100cm. The new road bridge would carry two lanes of general traffic and two for buses, whilst the Scherzers would be reserved for pedestrians and cyclists. This option minimises loss of physical fabric on the bridges and adjacent heritage features, makes the bridges' dynamic loading more sustainable, creates an opportunity to enhance the public's appreciation and understanding of them, and also future-proofs the Royal Canal and North Wall Quay in the face of rising sea levels brought about by climate change.

At George's Dock, the preferred option is also to move the two bridges apart to accommodate a new fixed four-lane road span and reserve the Scherzers for foot and cycle traffic. It is also recommended that both bridges be turned through 180 degrees so that the impact on the adjacent Stack B is reduced. This will also make the bridges more prominent and greatly enhance the public realm hereabouts.

The report concludes with recommendations for further research and field survey and highlights key stages in their repositioning and conservation should these recommendations be adopted.



# 1. Introduction

## 1.1 Bridge locations

Both pairs of bridges under review carry vehicular traffic and were designed to open to enable boats to pass underneath (fig 1.1). One pair is on North Wall Quay and spans the entrance to the Royal Canal and Spencer Dock. It dates from the 1910s and is still capable of operation. The other two are on Custom House Quay and span the former entrance to George's Dock. They date from the 1930s but are no longer openable for boat traffic as the Dock is long defunct.

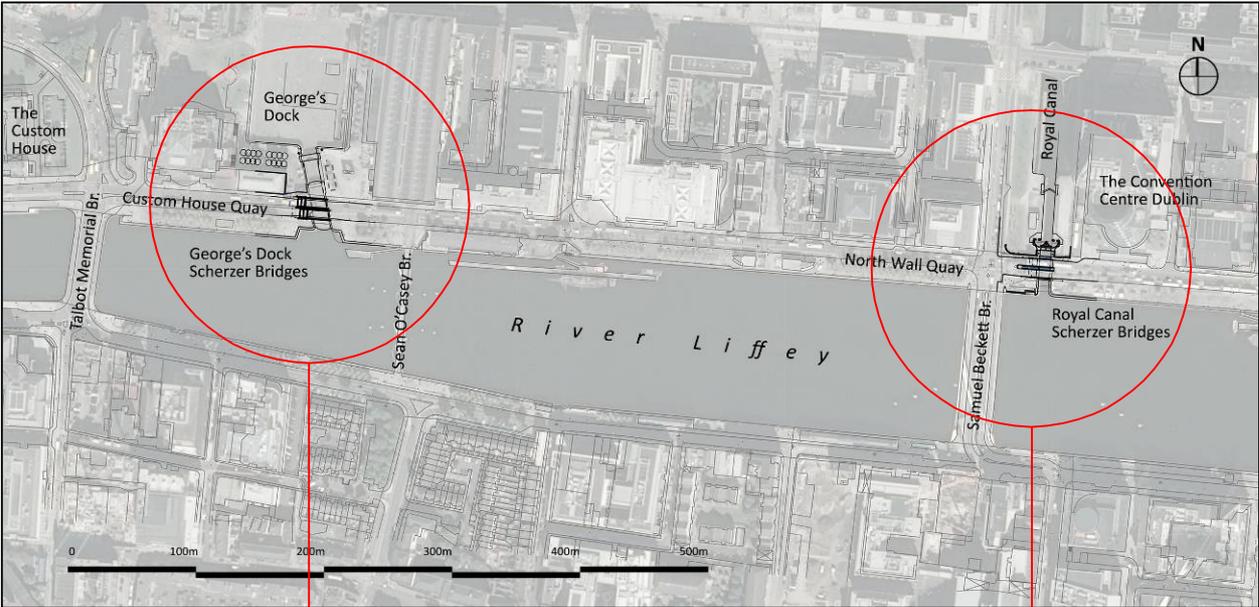


Fig 1.1 Locations of Scherzer bridges across entrance to George's Dock (left) and Royal Canal (right).

## 1.2 Bridge proposals

The BusConnects Dublin project has identified the need to provide a four-lane carriageway along the quays to facilitate dedicated bus and general traffic lanes in both directions, and also pedestrian and cycle facilities along the quayside. New fixed bridges will be required at Custom House Quay and North Wall Quay and it will be necessary to relocate the Scherzer bridges to make way for the new bridges.

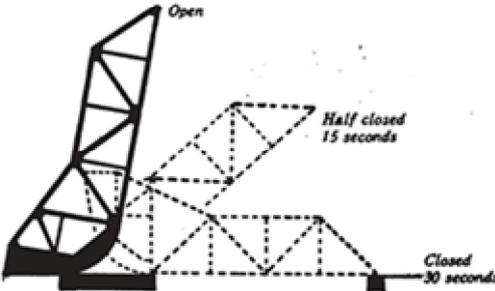
### 1.3 Moveable bridges

Where a road spans a navigable waterway and it is not feasible to create a sufficient air gap between them to enable boats to pass underneath, the only option is to install a moveable span. Such spans would normally be closed to facilitate the movement of road traffic but they could also be temporarily opened to let boats through underneath.

Because of the close juxtaposition of a busy road network with railways, canals and working port, Dublin's Docklands are unique in Ireland for the variety of moveable bridges which once operated in that locality: lifting and roller drawbridges, swivel bridges, vertical lifting bridges, and bascule bridges. Three such bridges are still in operation today over the Liffey: the Tom Clarke bridge between East Wall and Ringsend (a 1984 bascule bridge with below-ground counterweight), Sean O'Casey bridge (a pedestrian swivel bridge of 2005), and the Samuel Beckett Bridge (a cable-stayed swivel bridge of 2007).

**Scherzer ROLLING Lift Bridges cost less than other movable bridges because they are the *Extreme of Simplicity.***

*Deep waterways carry raw materials inland. Factories increase, population and land values go up. Railroads must distribute the finished materials away from the deep waterways. Everyone is benefited because business is stimulated.*



**Scherzer ROLLING Lift Bridges are used *all over the world* because they use the only principle for moving a bridge that anyone would consider for moving any kind of land traffic. They ROLL (or rock) a short distance on *part* of a wheel, just as all land traffic rolls all distances on *whole* wheels.**

But Scherzer ROLLING Lift Bridges have a great advantage over other ROLLING stock. They do not use friction-causing axles, trunnions and journals to support the bridge. Using only part of a wheel, they do away with this constant trouble and expense.

Scherzer ROLLING Lift Bridges ROLL upward and back away from the water, leaving the channel entirely clear in thirty seconds, also forming a signal and barrier against accidents. Or they roll forward and down, *closing* the channel in thirty seconds. Traffic has practically no interruption because Scherzer ROLLING Lift Bridges do not *start* to open until a vessel is almost upon them and they *close* before it is more than a few feet away.

Scherzer ROLLING Lift Bridges combine economy, simplicity, efficiency. They adapt to movable bridges the greatest mechanical principle—the ROLLING principle.

Scherzer Bridge foundations are simpler and cost less because Scherzer Bridges are simpler and weigh less than any other movable bridge.



Scherzer Rolling lift bridge—fully open. Leveburg & Smith Stone Ry., Genoa, Ohio.



**Scherzer ROLLING Lift Bridge Co.**  
Main office Monadnock Block Chicago, U.S.A.

### 1.4 Scherzer bridges

The four Scherzer bridges under review are patented variants of the bascule type of lifting bridge. A bascule bridge has a span which is hinged and counterweighted at one end so that its outer end can be raised with minimal effort. They are named after William Scherzer who patented their design in 1893 and set up the Scherzer Rolling Lift Bridge Co in Chicago to manufacture them and license their use by others (fig 1.2).<sup>1</sup>

Fig 1.2 Advertisement for Scherzer bridge, 1913 ([www.builtublin.com](http://www.builtublin.com)).

<sup>1</sup> For further details, see *Scherzer Rolling Lift Bridges: Their Inception, Development & Use*, published by the Scherzer Rolling Lift Bridge Co in 1916. It is available on-line at <<https://archive.org/details/ScherzerRollingLiftBridgesTheirInceptionDevelopmentAndUse/mode/2up>>.

As noted in the above advertisement, the key feature that differentiates a Scherzer from a bascule bridge is that the former's span simultaneously opens and moves backwards (fig 1.3). Unlike bascules, its span is not hinged to an abutment. Rather, it is connected along both sides to heavy metal quadrants, the back ends of which are connected to a massive counterweight. A horizontal drive shaft runs through the centre of gravity of the span-counterweight assembly. This point also coincides with the centre of rotation of the entire assembly. If this shaft is moved backwards, the entire assembly rocks back on its quadrants along track plates, causing the outer end of the span to rise. The only power required is that to move the assembly back and forth, rather than lift it as would be the case with a bascule.

The drive shaft is rotated by an electric motor through a series of gears. Affixed to each end of the shaft is a pinion gear which, as it rotates, engages with a cogged rack on a fixed horizontal frame. Turning the shaft causes the pinions to travel along the rack and drag the span-counterweight assembly with them. This forces the quadrants to rock backwards and the span to open. Turning the shaft in the reverse direction causes the assembly to roll forwards and the span to close.

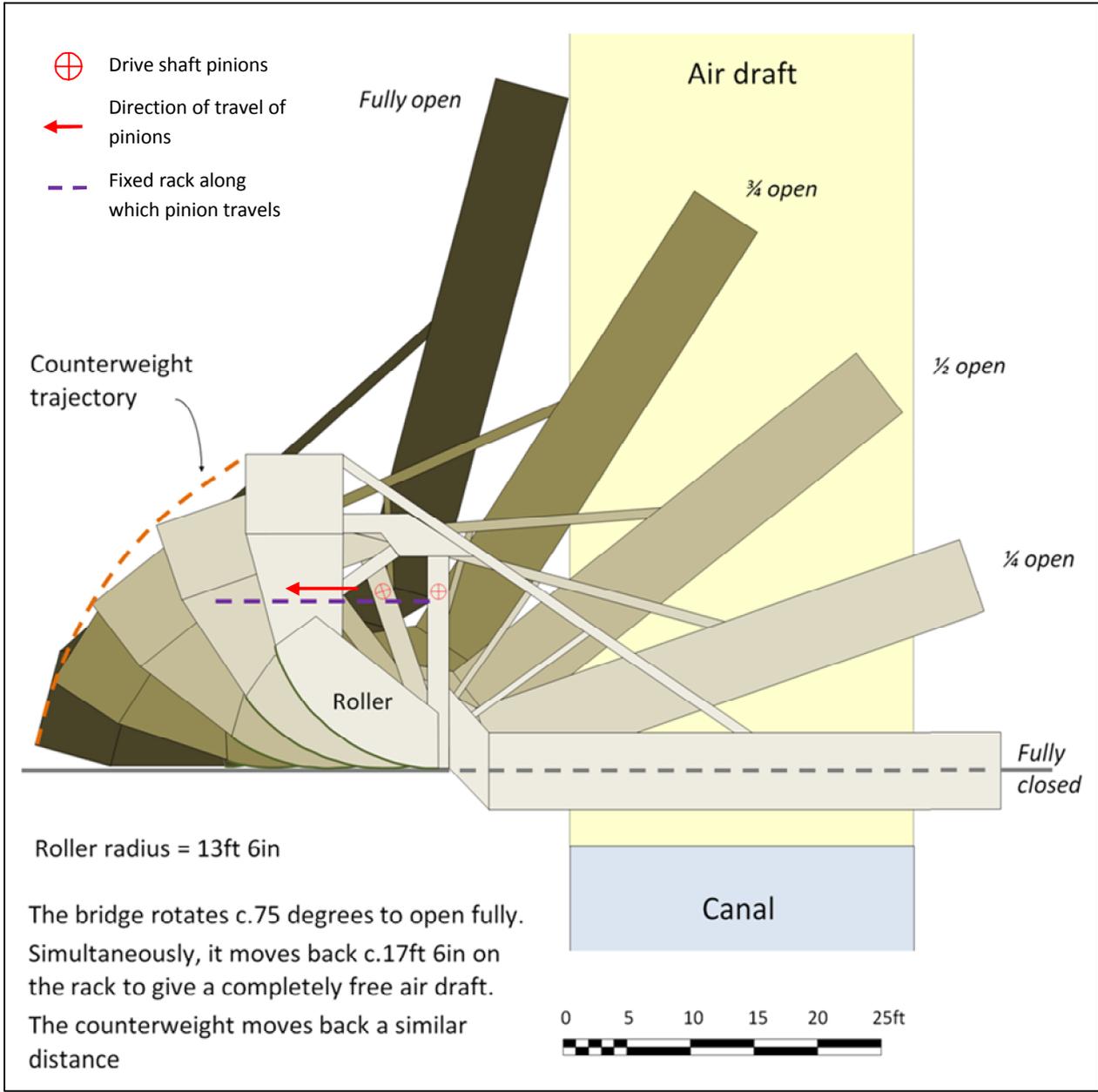
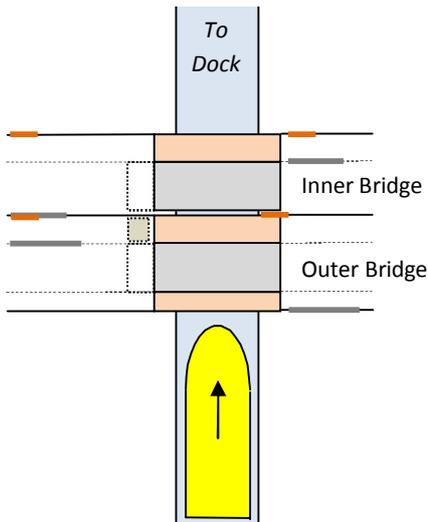


Fig 1.3 Operation of Scherzer bridge (based on Royal Canal, Dublin).

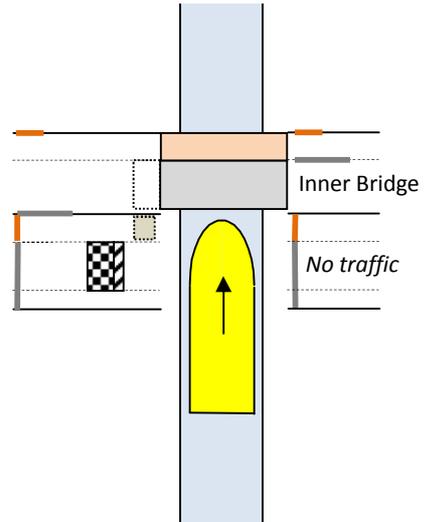
Apart from their simplicity of design and modest power requirements, another advantage of Scherzer bridges is that a completely clear air draft is created without having to open the spans fully to the 90 degree position. It therefore takes less time to operate than a standard bascule.

One Scherzer bridge would normally suffice at a particular location. The only drawback is that road traffic is at a complete standstill whilst the bridge is opening and closing. Using two bridges in tandem, all traffic is stopped only for the time it takes a boat to traverse the width of one of the bridges rather than both of them (fig 1.4). This saving in time might seem insignificant but given the high volume of road and canal traffic when the bridges were in use, the overall saving would have been considerable in the long term.

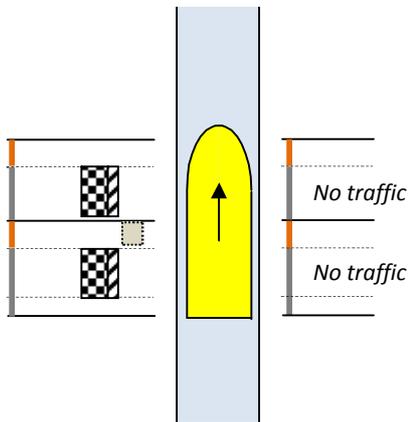
Only eight Scherzer bridges were ever constructed in Ireland, all in the first half of the 20th century (Appendix 1). The two over the Royal Canal are now the earliest surviving examples which are still in an operable state, whilst the two at George's Dock are the last in Ireland to have been built.



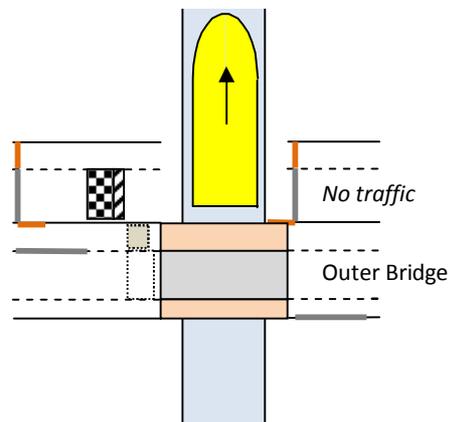
1. Road traffic passes over both bridges as boat approaches along canal from river.



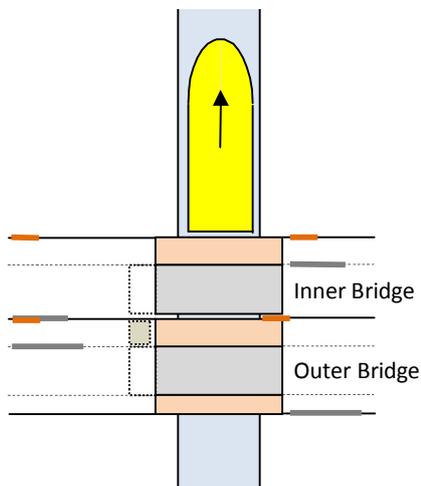
2. Outer Bridge is raised to let boat pass under. All road traffic is rerouted across Inner Bridge.



3. Inner Bridge now raised to let boat pass under. Outer Bridge remains raised so both bridges are now closed to all road traffic.



4. Outer Bridge is closed once boat passes under. All road traffic is rerouted across Outer Bridge.



5. Inner Bridge closed once boat passes under. Both road lanes now in use once again.

- |   |                 |   |   |
|---|-----------------|---|---|
|  | Footpath        |  | Counterweight is overhead when span is down |
|  | Road            |  | Counterweight blocks road when span is up   |
|  | Canal           |  | Overhead control tower                      |
|  | Vehicle gate    |   |   |
|  | Pedestrian gate |   |   |

Fig 1.4 Operation of Scherzer bridges for road and canal traffic.

## 2. Options appraisal methodology

The methodology used for assessing the various options for relocating the bridges is largely informed by the planning regulations and various international charters relating to the built heritage.

### 2.1 Planning context

The National Development Plan 2018-2027 sets out the significant level of investment which underpins the National Planning Framework and drives its implementation over the ten-year period. In Chapter 5 of the Plan, *National Strategic Outcomes* are set out including BusConnects Dublin as a *Strategic Investment Priority for Sustainable Mobility*. The North Quays are also included as a core radial bus corridor in the *Transport Strategy for the Greater Dublin Area 2016-2035* prepared by the National Transport Authority.

#### *Record of Protected Structures*

A 'Structure' is defined by the Local Government (Planning and Development) Act of 1999 as - *any building, structure, excavation, or other thing constructed or made on, in or under any land, or any part of a structure*. The Government publication *Architectural Heritage Protection Guidelines for Planning Authorities* (2004) expanded on the definition of 'structure' to include (a) the interior of the structure, (b) the land lying within the curtilage of the structure, (c) any other structures lying within that curtilage and their interiors, and (d) all fixtures and features which form part of the interior or exterior of the above structures.

A 'Protected Structure' is defined in the 1999 Act as any structure or specified part of a structure, which is included in the Record of Protected Structures (RPS) of the local authority Development Plan. The bridges at North Wall Quay (registration number 912) and Custom House Docks (reg.no. 896) are included in the RPS of the Dublin City Development Plan 2016-2022.

Industrial heritage is also the subject of Chapter 11.1.1.5 of the Dublin City Development Plan 2016-22 administered by Dublin City Council. One objective of the Plan (CHCO10) is to take cognisance of the City's industrial heritage in assessing planning applications. The Council will also implement and promote the *Dublin Principles* (see below) and proposes to review the Dublin City Industrial Heritage Record (DCIHR).

#### *Nizhny Tagil Charter*

Given the heritage significance of the Scherzer bridges, it is pertinent to briefly review those international charters and principles which are particularly relevant to industrial heritage. The Nizhny Tagil Charter for the Industrial Heritage was adopted jointly by ICOMOS (International Council of Monuments and Sites) and TICCIH (The International Committee for the Conservation of Industrial Heritage) in July 2003. ICOMOS is a professional association that advises UNESCO on the conservation of historic sites and which is, in turn, advised by TICCIH in relation to industrial heritage. The Nizhny Tagil Charter was the first internationally recognised reference text to guide the protection and conservation of industrial heritage. It sets out definitions of industrial heritage and its cultural significance - its values, the importance of research and recording, procedures for its protection, maintenance and conservation, education and training and, finally, presentation and interpretation.

## *Dublin Principles*

Following a TICCIH convention in 2011, *The Dublin Principles* were adopted by ICOMOS to assist in the documentation, protection, conservation and appreciation of industrial heritage as part of the heritage of human societies around the World. This document expands on the Nizhny Tagil Charter and notes a particular emphasis on industrial heritage dating from the Industrial Revolution in the Modern Era – including power generation, production, transport processes and technologies. It also includes reference to less tangible aspects of industrial heritage such as commercial and trade interactions, new social and cultural patterns and underlines the need to archive associated documentation. It emphasizes important values such as functionality, reversibility and recording.

Part I sets out the importance of research and documentation so that industrial technologies and processes can be properly understood and contextualised. Part II concerns the continued use and functional integrity of industrial heritage. Part III emphasizes the importance of adaptive re-use in the sustainable conservation of industrial heritage and its settings. Part IV is concerned with the importance of presenting and communicating the values of industrial heritage.

### **2.2 Conservation rationale**

It is the task of the conservation professional to translate the various charters and principles into a strategy for the conservation of a particular historic site, artefact or process. Every place and every task poses a challenge to reach the high standards demanded in these documents. Where change is proposed, the task is to manage the process to ensure the conservation of the cultural heritage, especially where intervention is required.

Of particular relevance to the Scherzer bridges is Part III of the *Dublin Principles* which notes that interventions should be reversible. In addition, *dismantling and relocating are only acceptable in extraordinary cases when the destruction of the site is required by objectively proved overwhelming economic or social needs.*

In assessing options for conserving the Scherzer bridges, it is assumed that the case has been proven elsewhere for providing two dedicated bus lanes and cycle lanes along the north Quays to replace the existing two lanes of traffic and footpaths. As noted above, the economic and social aspects of the route selection process are beyond the scope of this assessment, having been undertaken at the initial route selection stage of the BusConnects Dublin programme.

The objective of the options analysis for each pair of Scherzer bridges is to retain their industrial heritage significance as far as possible following the provision of additional traffic lanes. As part of the process, it became apparent that each pair of bridges needs to be relocated in order to accommodate the proposed new road scheme. However, following an initial appraisal, it was concluded that their relocation elsewhere so that they could be kept together was an unacceptable worst-case scenario with regard to their conservation. For these reasons, only the options which kept them as close as possible to one another in the vicinities their present locations were evaluated. The actual criteria used to assess the various options will be discussed in detail under each pair of bridges.

### 3. History of the Royal Canal bridges

In the two centuries since the first bridge was erected over the entrance to the Royal Canal, there have been no fewer than six bridges at this location.

#### 3.1 Swivel Bridge

The Royal Canal initially ran from Dublin - Broadstone to Mullingar and opened in 1806.<sup>2</sup> Around 1809, it was connected into the tidal River Liffey with the completion of the Royal Canal Docks and a 113ft long x 27ft wide sea lock. The approach to the lock from the Liffey was spanned by a double-leaf, single-lane swivel bridge (i.e. one that rotates about a vertical axis). This bridge is captioned as 'Draw Br' on 1838 OS map, although it was never a lifting bridge as this designation implies (fig 3.1).

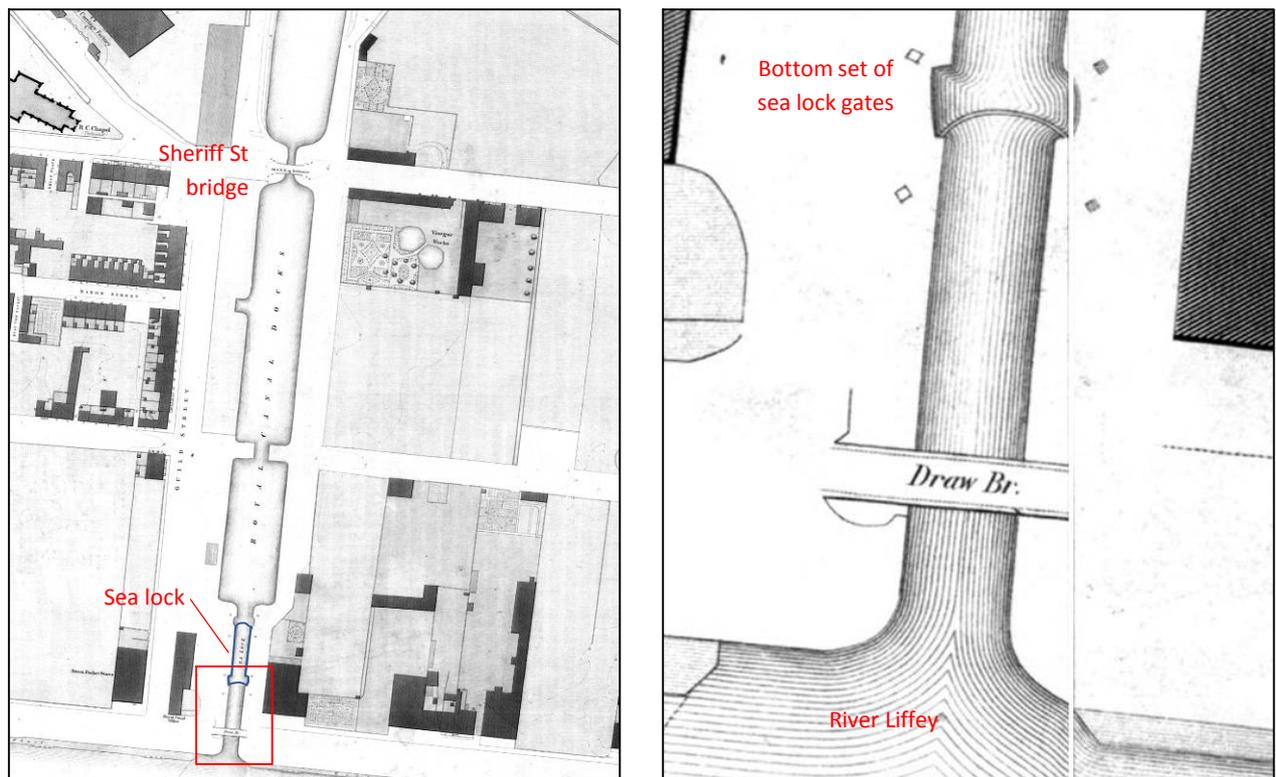


Fig 3.1 1838 map showing the Royal Canal Dock and moveable bridge at its entrance from the Liffey (OS 1:1056 map, Dublin City sheets 15 and 16).

#### 3.2 Rolling drawbridge

In 1845, the Royal Canal Company was purchased by the Midland & Great Western Railway Co (MGWR). In 1860, they replaced the bridge with a rolling drawbridge capable of carrying two lanes of vehicular traffic.<sup>3</sup> Patented and erected by Messrs Turner & Gibson of the Hammersmith Works, Ballsbridge, this new bridge comprised a girder span pivoted centrally on a *horizontal* axis (fig 3.2). By lowering one end, the balanced opposite end rose clear of the road. Using a rack and pinion system, the entire span was then wound back along the line of the road to clear the canal. To close the bridge, the process was reversed.

<sup>2</sup> For a history of the Royal Canal see Ruth Delaney & Ian Bath (2010), *Ireland's Royal Canal, 1789-2009* (Dublin: Lilliput Press).

<sup>3</sup> Griffith, Sir John Purser (1913), 'Twin Scherzer bridges at Dublin', in *The Engineer*, 19 Sept 1913, pp 304-305, 308. Turner & Gibson installed an identical bridge at the entrance to George's Dock in the same year.



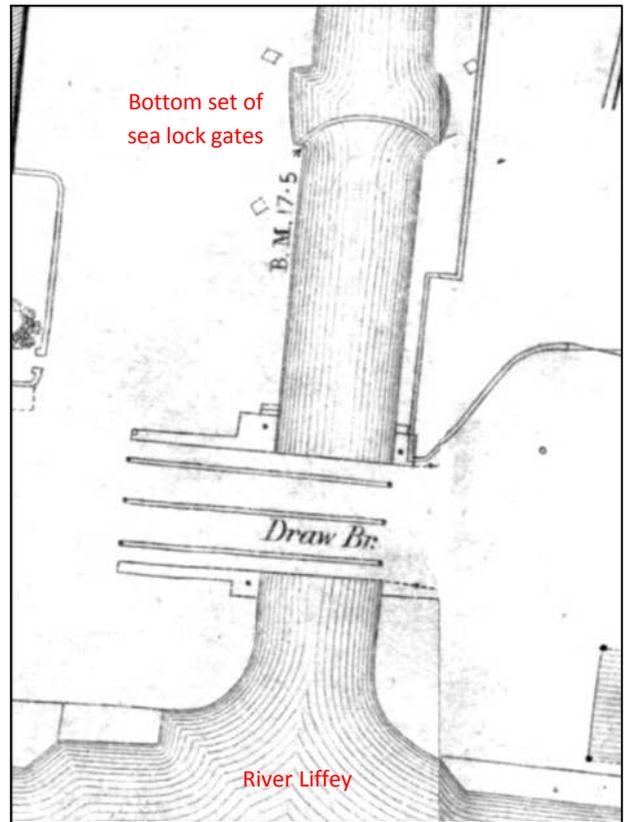
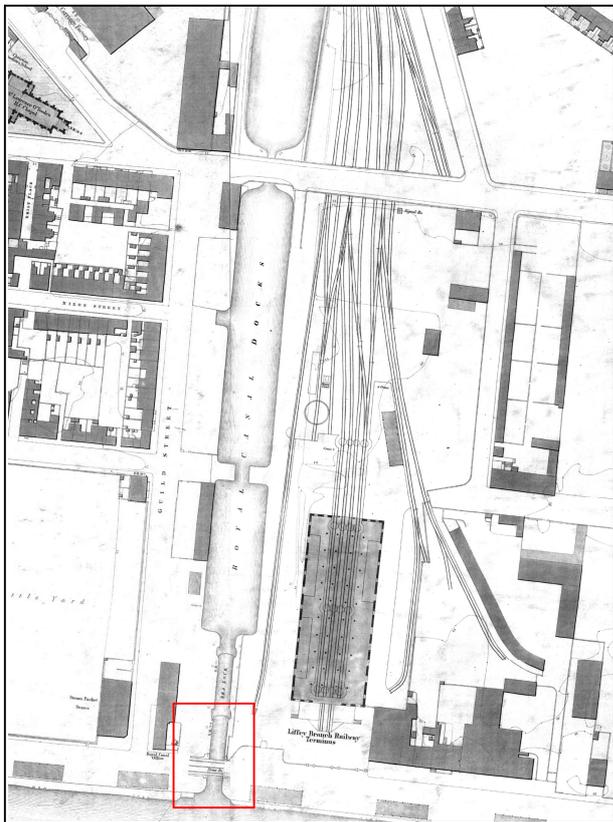


Fig 3.3 1864 map showing the Royal Canal Dock and new moveable bridge at its entrance from the Liffey. The bridge moved west when being opened (*OS 1:1056 map, Dublin City sheets 15 and 16*).

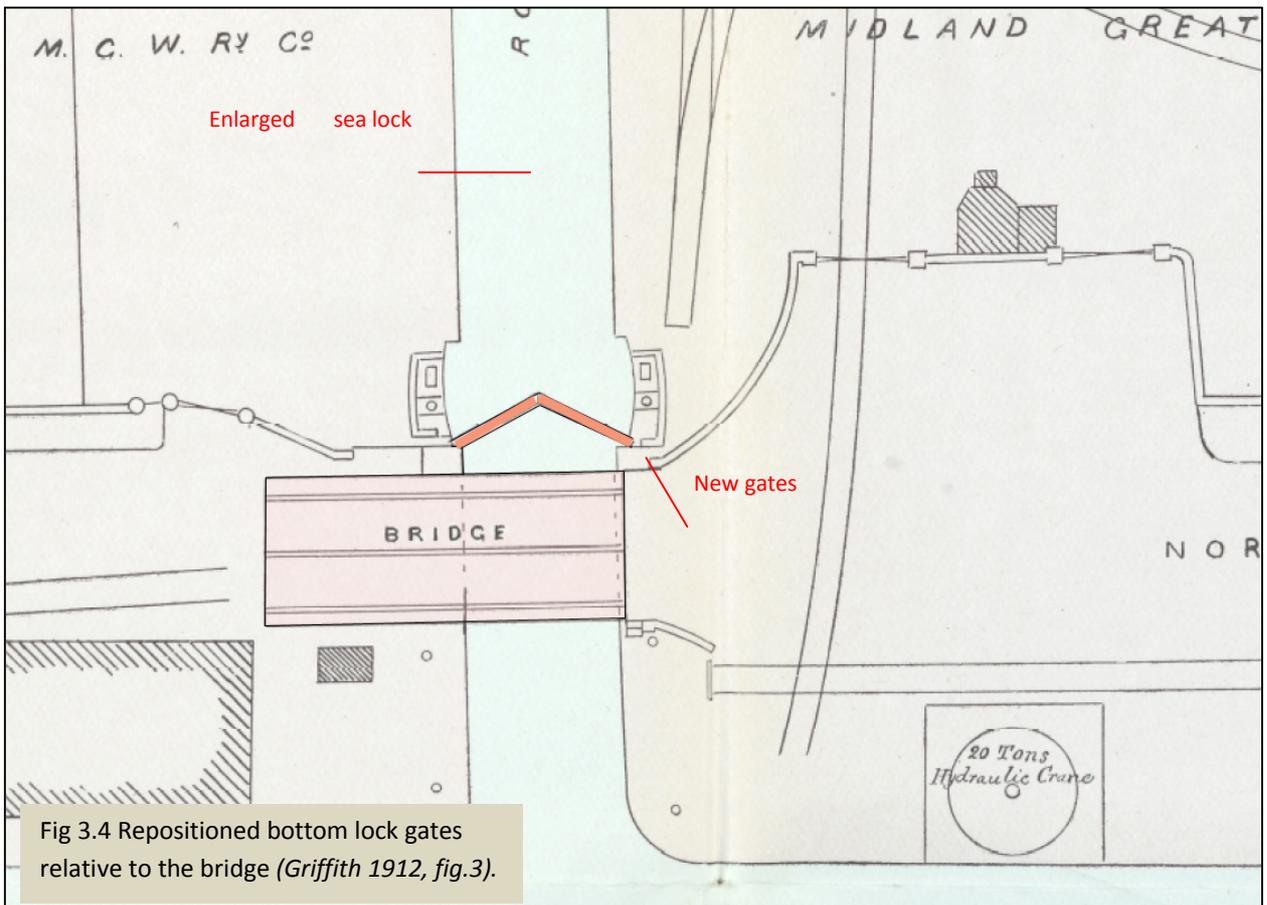


Fig 3.4 Repositioned bottom lock gates relative to the bridge (*Griffith 1912, fig.3*).

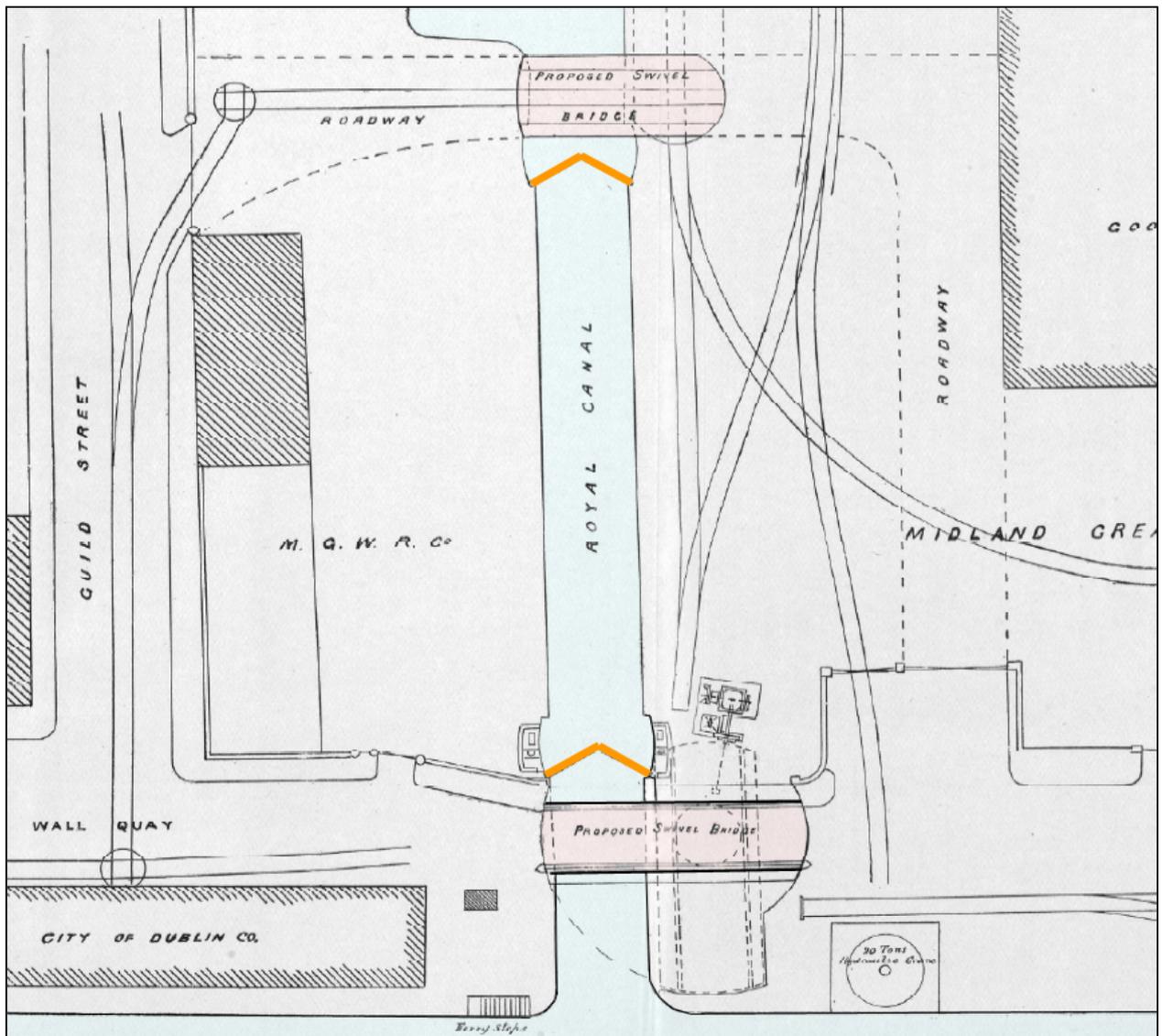


Fig 3.5 Stoney's swivel bridge proposals (Griffith 1912, fig.4).

Both the 1887 and 1907 OS maps shows little change to the 1864 edition except there is now a moveable pedestrian bridge at the north end of the sea lock rather than the vehicle bridge which Stoney had envisaged (fig 3.6).

### 3.4 Scherzer bridges

By the early 1900s, it was increasingly apparent that the rolling drawbridge was no longer fit for purpose. Apart from its physical deterioration, its narrowness now a bottleneck for road traffic and its slowness of operation added to the delays. The only solution was to replace it.

The new bridge had to be at least double the width of the existing one and there was just about enough room to accommodate it without encroaching unduly on MGWR land. Secondly, the new bridge had to be much quicker to operate to minimise traffic delays.

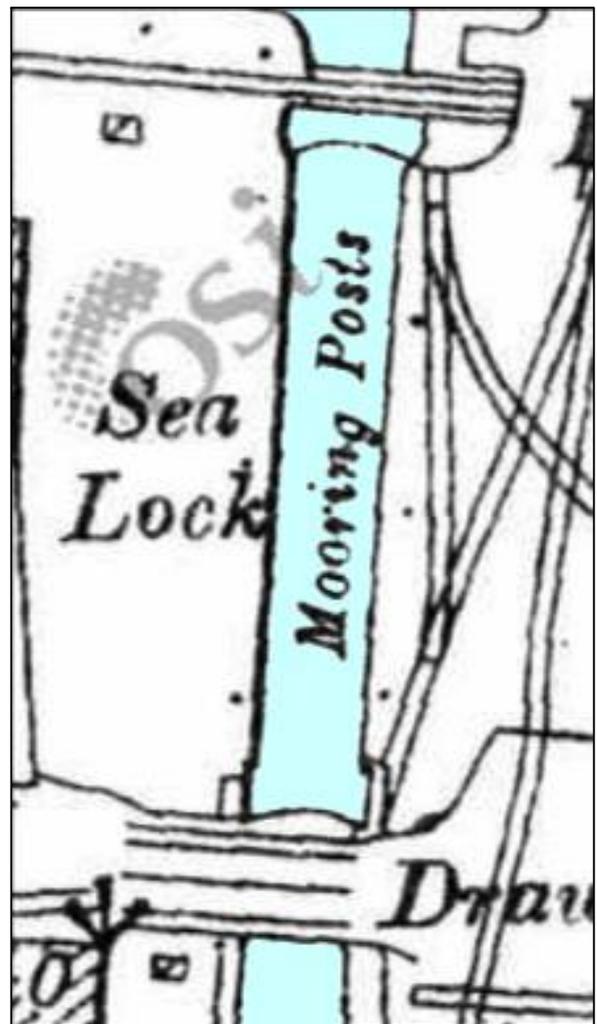
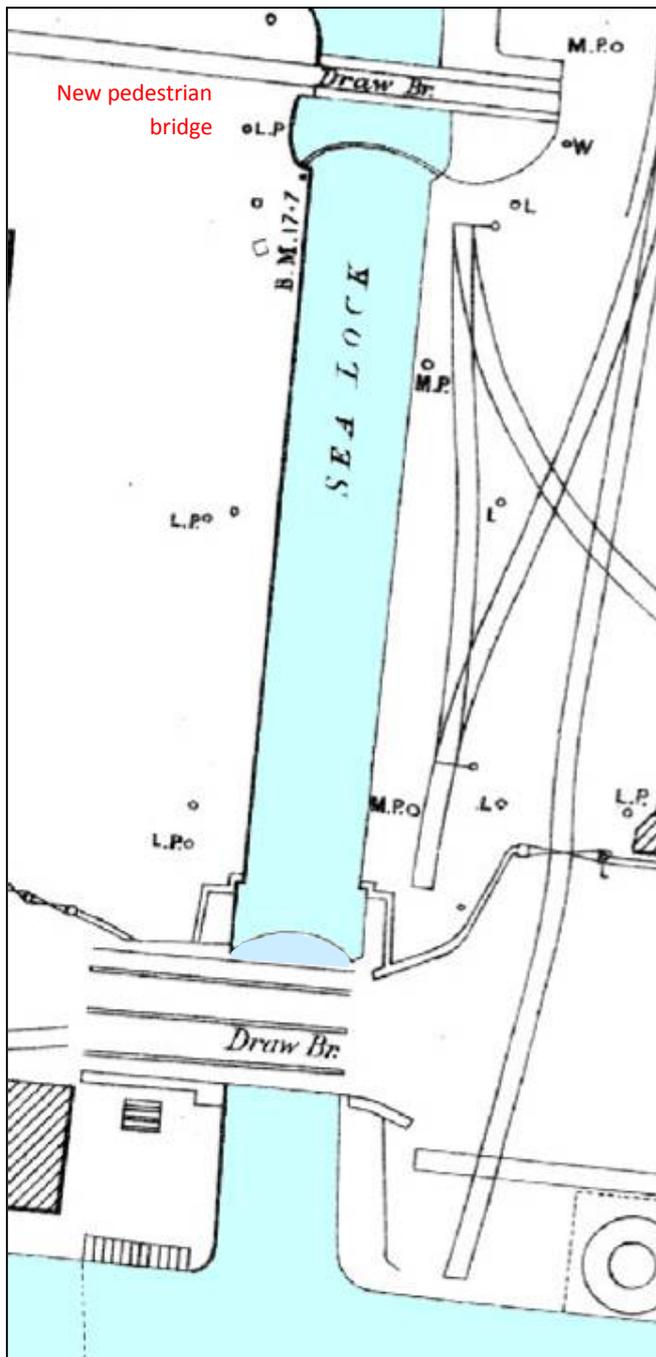


Fig 3.6 Left: 1887 map showing the Royal Canal Dock the same moveable bridge as before. The bottom lock gate is visible just beyond its north side (OS 1:1056 map, Dublin City sheets 49, 50). Above: 1907 map showing the same moveable bridges as before (OS 1:2500 map, Dublin sheets 18-08, 18-12).

John Purser Griffith, the DP&DB's Engineer, resolved these issues by commissioning the Scherzer Rolling Lifting Bridge Co to design two identical side-by-side bridges (fig 3.7). A selection of original design drawings dated 1909 and 1910 are reproduced in Appendix 2.1 and historical photographs are presented in Appendix 2.2. A working model of the bridges can also be found in the foyer of the Old Museum Building at Trinity College Dublin.

The scheme went out to tender in June 1910.<sup>5</sup> The contract for the bridges' steelwork was awarded to Messrs Spencer & Co, millwrights and iron founders of Melksham, Wiltshire, whilst the civil engineering works (foundations, road/ footpath surfacing, and boundary walls) were carried out by the DP&DB using direct labour.<sup>6</sup>

<sup>5</sup> *Dublin Daily Express*, 1 June 1910.

<sup>6</sup> Dublin Port Co archive: drawings 7830 and 7837.

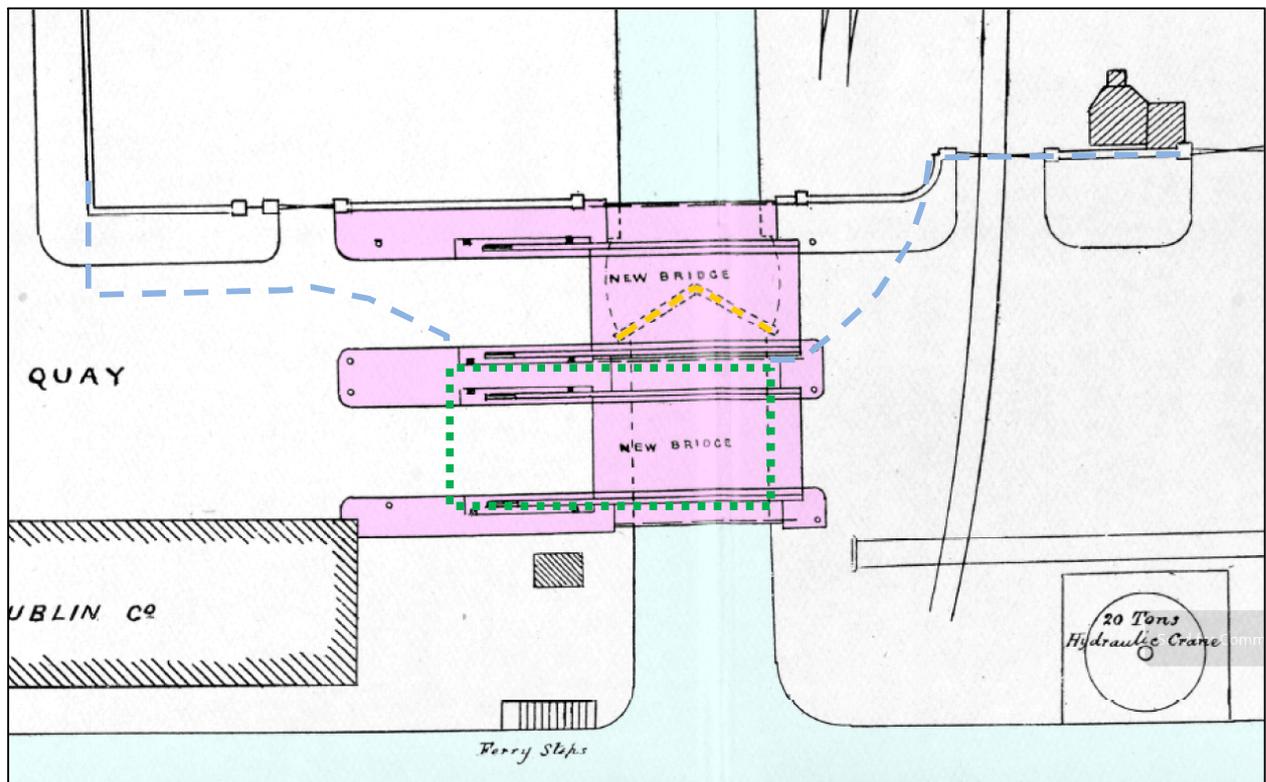


Fig 3.7 John Griffith's Scherzer bridges. The outline of the replaced rolling drawbridge is shown in green. The previous wall along the north side of the road (shown as a dashed blue line) was moved back to accommodate the new inner bridge, under which was the bottom pair of sea lock gates (Griffith 1912, fig.5).

Full details of the contract and what it entailed will be found in the following two publications (Griffith was knighted in 1911):

- Griffith, Sir John Purser (1912). 'The twin Scherzer bridges on the North Wall Quay, Dublin, across the entrance to the Royal Canal and Spencer Docks', in *Transactions Institution of Civil Engineers Ireland*, vol.38, pp 176-204. Selected drawings from this publication are reproduced in figure 3.8.
- Griffith, Sir John Purser (1913). 'Twin Scherzer bridges at Dublin', in *The Engineer*, 19 Sept 1913, pp 304-305, 308.

Under the terms of the contract, Messrs Spencer were obliged to pre-fabricate all the steelwork in their Melksham factory, then dismantle it and ship the components to Dublin for on-site re-assembly. Construction was programmed to maintain the flow of traffic along North Wall Quay for the duration of the contract. The first new bridge (Inner Bridge) was positioned immediately north of the existing drawbridge and, once completed in mid-1911, the traffic was rerouted over it. The drawbridge was then removed to make way for the second Scherzer (Outer Bridge). According to the contract, the latter should have been finished in December 1911, but work seemingly ran over into 1912.<sup>7</sup>

The total cost of the new bridges was £13,294 (€1.7m in today's money), of which over half (£7,374) went on the steelwork and £520 in fees to the Scherzer Bridge Co for the use of their patented design.

<sup>7</sup> A plaque on the side of the Inner Bridge's counterweight has a 1911 date. However, the outer one does not seem to have been completed until 1912: Griffith noted in his 1913 article (p.304) that the bridges were opened the *previous year*. Unfortunately, the Outer Bridge is now missing the date plaque shown on old photographs.

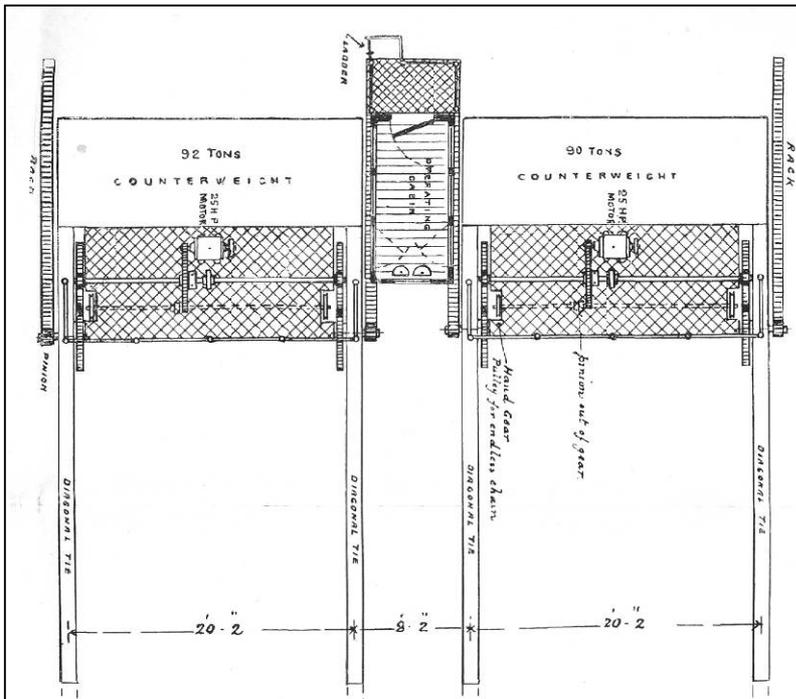
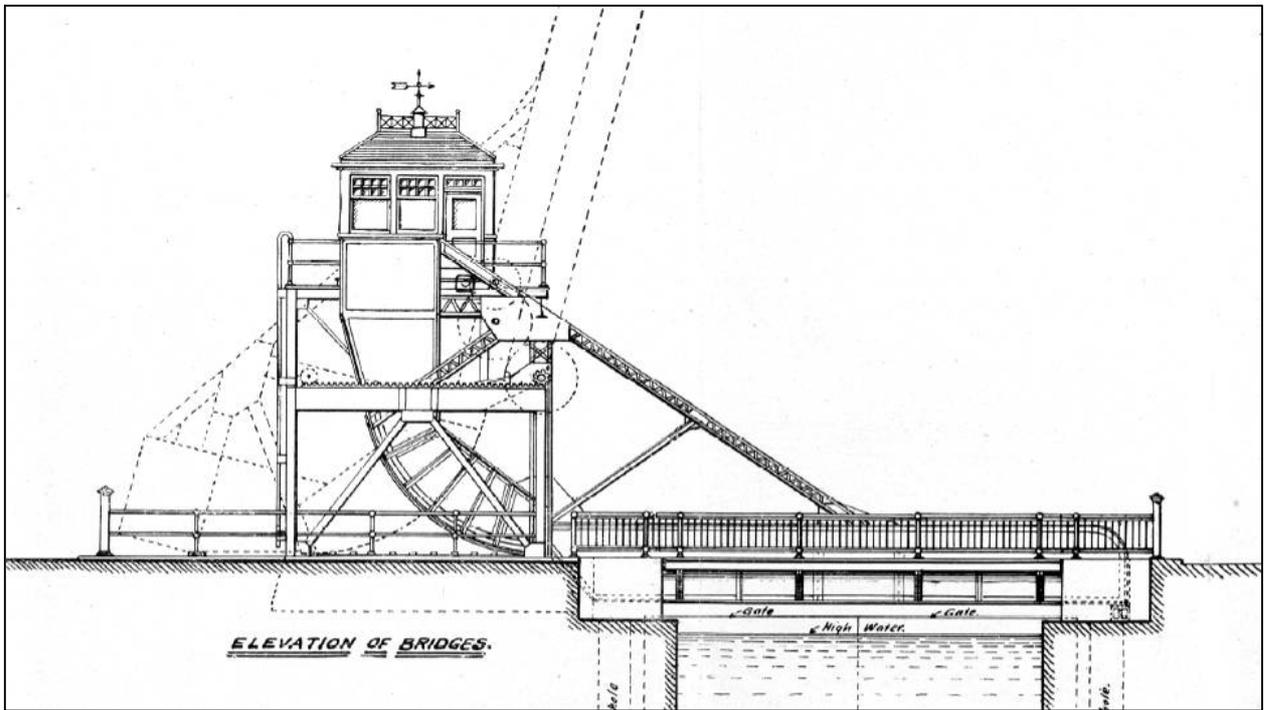
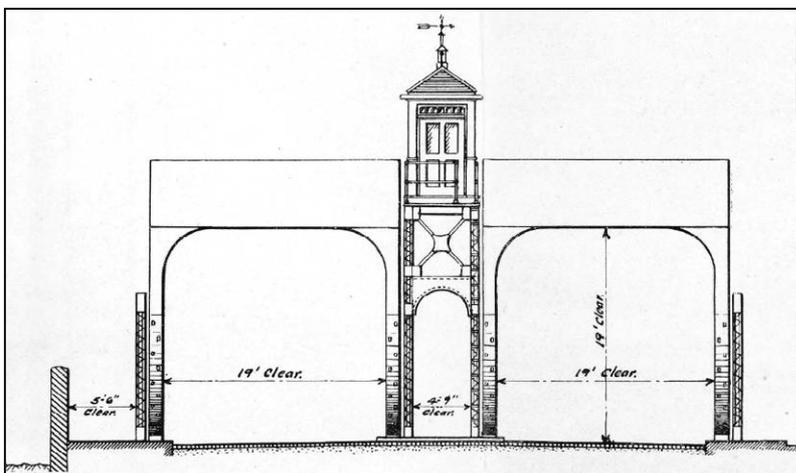


Fig 3.8 Scale drawings of the Scherzer bridges (Griffith 1912, figs 6-8).



Above: Side elevation from south. The width of the canal is 8.28m (27ft 2in) and the span's total length is 13.26m (43ft 6in).

Middle: Plan. The centre-centre width of each span is 6.15m (20ft 2in).

Bottom: End elevation from west. The clear width and headroom on both bridges is 5.79m (19ft 0in).

The main reason for choosing two single-lane bridges rather than a double-width one was, as explained above, to allow traffic to continue to flow along the Quay during construction. In section 1.4, it was noted there would also have been a slight reduction the time road traffic was delayed whilst boats passed through.

Griffith claimed that each bridge could be fully opened in 40 seconds and closed in 30. The average time for the pair of bridges to let a vessel to pass through was reduced from 22 minutes to an average of 4½ minutes. There was also an override mechanism which enabled the bridges to be operated by hand in the event of a power cut. Even then, the delay to traffic was still less that with the previous drawbridge.

The one unresolved issue was that the new Inner Bridge now spanned the bottom gates of the sea lock and their balance beams (i.e. long arms projecting from their landward ends) could no longer be accessed by the lock-keeper when the span was shut. Ideally, the gates should have been opened before the bridge was lifted to allow boats to pass to and from the lock without any additional delay.

To solve this problem, each gate was therefore connected via an elaborate series of shafts and gears along the tops of the canal's side walls to a hand-winch positioned just north of the Inner Bridge (fig 3.9). The modifications to the gates operating mechanism were carried out by Messrs Ross & Walpole

whose premises were also on North Wall Quay.

By 1950, a second control cabin had been added to the west of the original one (see appendix 2.2). Whether it was supplementary or a replacement has yet to be determined.



Fig 3.9 One of the two winches used to open and close the repositioned timber lock gates underneath the Inner Bridge.

### 3.5 Recent developments

In 1961, under the provisions of the 1958 Transport Act, the Royal Canal is officially abandoned except for the reach between the Liffey and Spencer Dock. The two Scherzer bridges therefore continued to be maintained in an operational state.

In 2003-04, the bridges were restored to full working order by the Dublin Docklands Development Authority under the direction of John Cradock Ltd (Kilcullen). The replacement of any corroded steel-work was subcontracted to Messrs Steele & Co Ltd of New Ross.

In 2008, the bottom lock gates were replaced by a pair of curved hydraulic gates which also doubled as flood barriers (fig 3.10). As such, they were higher than the original gates so could not be accommodated underneath the Inner Bridge. They were therefore repositioned on the dock side of the bridge. This reduced the lock's length by 56ft, from 174ft to 118ft. The present lock is therefore around its original 113ft length.



Fig 3.10 Installation of new sea lock gates, 2008 (Delaney & Bath 2010, p.306).

In 2010, the entire length of the Royal Canal was reopened between Dublin and the Shannon at Richmond Harbour, Clondra. A major obstacle to boat traffic at its Dublin end is the Newcomen lifting bridge which carries the railway line over the canal at the north end of Spencer Dock and which is only occasionally open. Another obstacle is the Scherzer bridges, the ends of which are now firmly clamped to their eastern abutments. The maximum size of vessel is therefore restricted to those which can clear the spans' undersides at low tide.

In December 2019, two new fixed, single-span bridges were placed side-by-side across the canal on the river side of the Outer Bridge - one (nearest the river) for pedestrians and the other for cyclists (fig 3.11). All the service ducts and cables are also rerouted under these two new bridges.

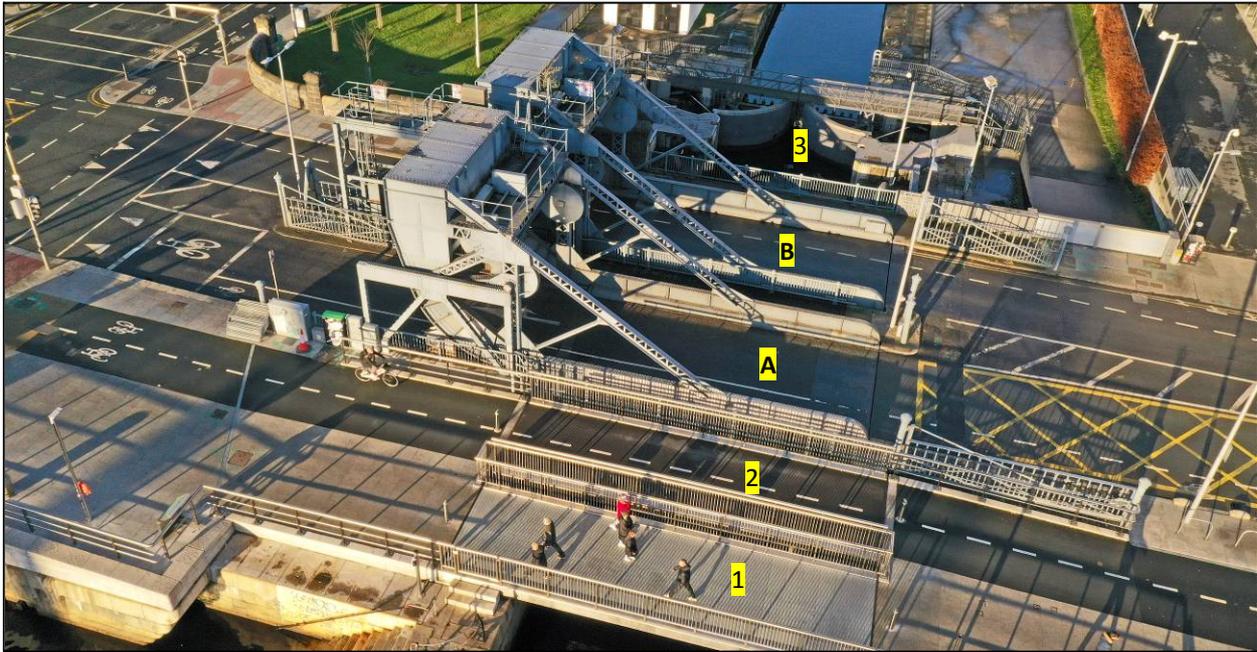
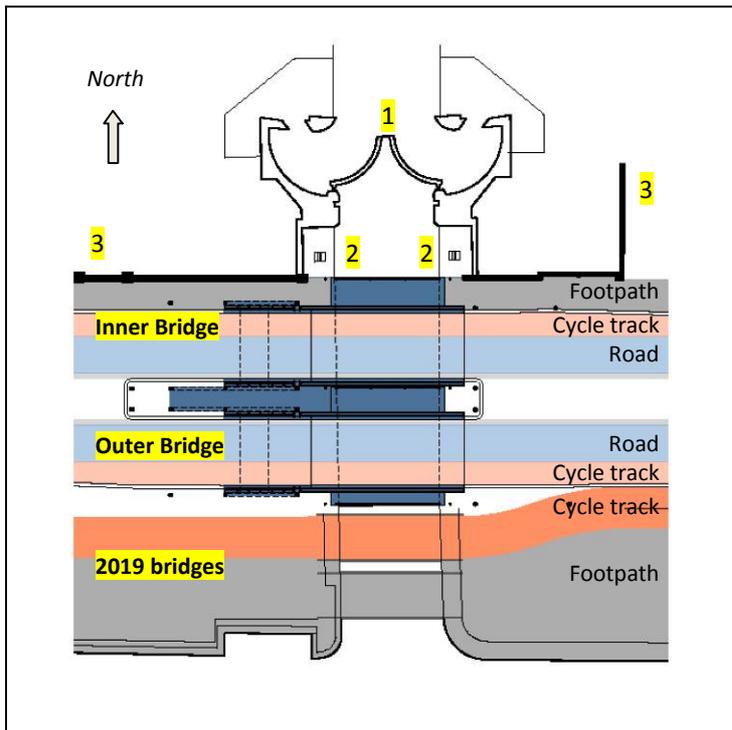


Fig 3.11 Aerial view of modern bridges over the Royal Canal from south, 2021. Key: A - Outer Scherzer; B - Inner Scherzer; 1 - 2019 foot bridge; 2 - 2019 cycle bridge; 3 - Bottom lock gates/ flood barrier.

#### 4. Royal Canal bridge descriptions

Although erected 110 years ago, both Scherzer bridges continue to serve their original function of carrying road traffic over the Royal Canal. They were supplemented in 2019 by a pair of fixed non-vehicular spans at their river end (fig 4.1). Attached to the north side of the Inner Bridge is a cantilevered pedestrian footpath which lifts with the main span. There is a similar footway along each side of the Outer Bridge, the north one of which gave access to the control cabin; both lift with the main span. When one or both spans were in the raised position, all traffic was stopped by means of gates at both ends which were manually swung into place by the bridge operator. Each bridge worked independently of the other and both are, in theory, still operable to allow canal traffic to pass. However, their lifting ends are now clamped shut to make the spans more rigid. This effectively limits the size of



boats using the canal to those whose air draft is less than the gap between the undersides of the bridges and tide level.

As noted in the preface to this report, a detailed survey was limited by the Covid-19 restrictions. On the basis of limited field inspection, laser scanning and original drawings, however, it has been possible to prepare preliminary measured survey drawings (fig 4.2).

Fig 4.1 Plan of existing bridges over entrance to Royal Canal. Key: 1 - Sea lock bottom gates (modern); 2 - Winches to open previous gates; 3 - Masonry wall along north side of Inner Bridge.

Cursory inspection suggests that both bridges are largely intact (fig 4.3). The two original motors mounted on platforms in front of their respective counterweights have been replaced with more modern ones. The original gearing to the pinions along the tops of the side racks has been retained, including the manual back-up system (but without its operating chains).

The original control cabin is long removed, although its platform survives between the two bridges. There were originally also two plaques on the west face of each counterweight, of which only the pair on the Inner Bridge survive. The left one reads "Scherzer Rolling Lift Bridge/ Patented by/ William Scherzer C.E./ [???]/ The Scherzer Rolling Lift Bridge Co Ltd/ Chicago [??]. The right-hand one reads "This bridge was built by/ the Dublin Port & Docks Board/ 1911./ Spencer & Co Ltd Melksham, Wilts/ Contractors for the steelwork & [?]/ Sir John Purser Griffith [???" All the gates for stopping the traffic are intact except for the pedestrian one at the NE end of the Outer Bridge.

Underneath the Inner Bridge, the defunct lock gate recesses are evident along with the gates' operating mechanisms (fig 4.4). The removal of several courses of stonework for the previous drawbridge is also evident. Just beyond the dock end of this bridge are the two winches which were once used to open and close the gates.

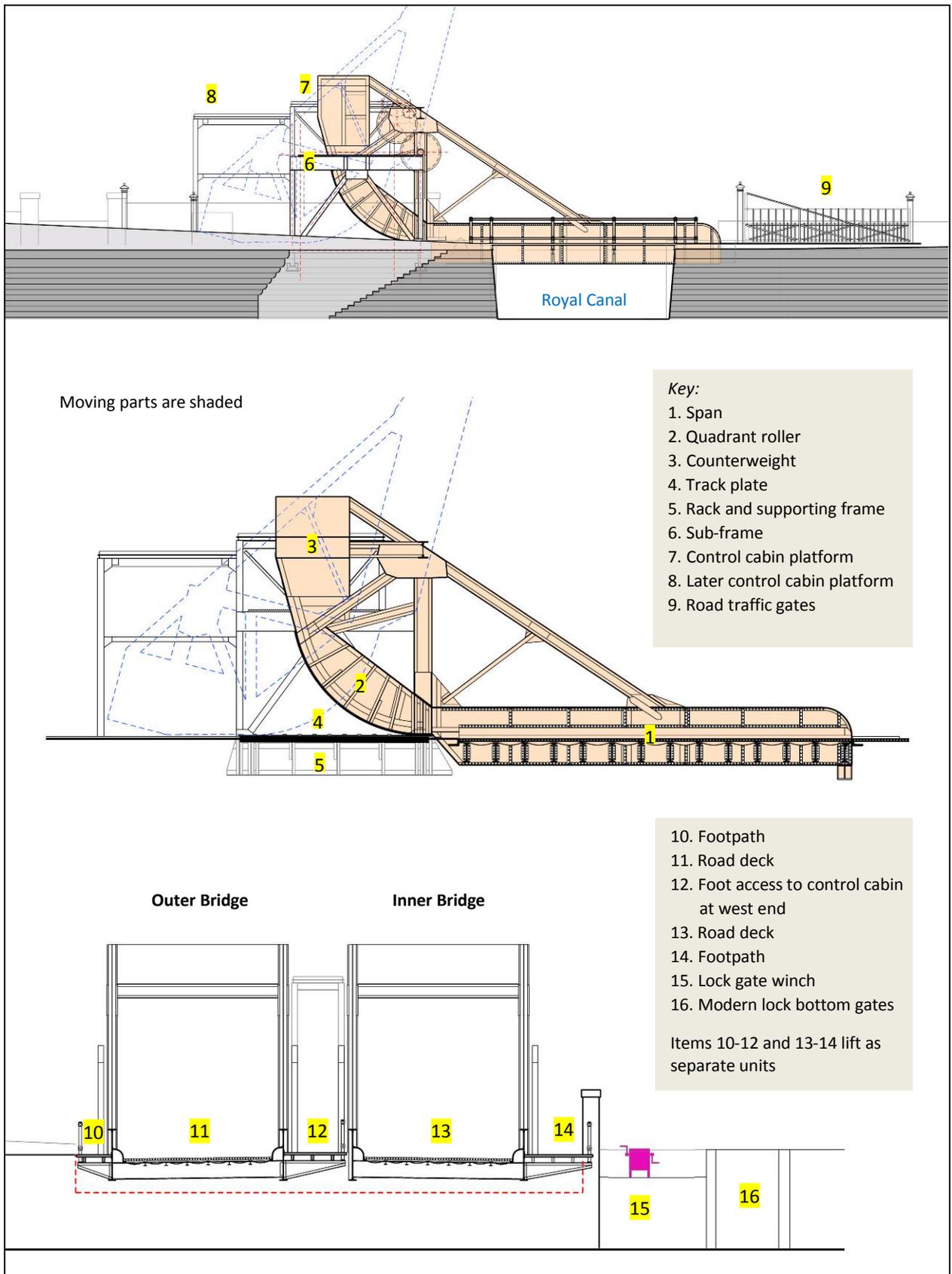


Fig 4.2 *Top*: Elevation of Outer Bridge, from south. *Middle*: Longitudinal section. *Bottom*: Cross-section, from east.

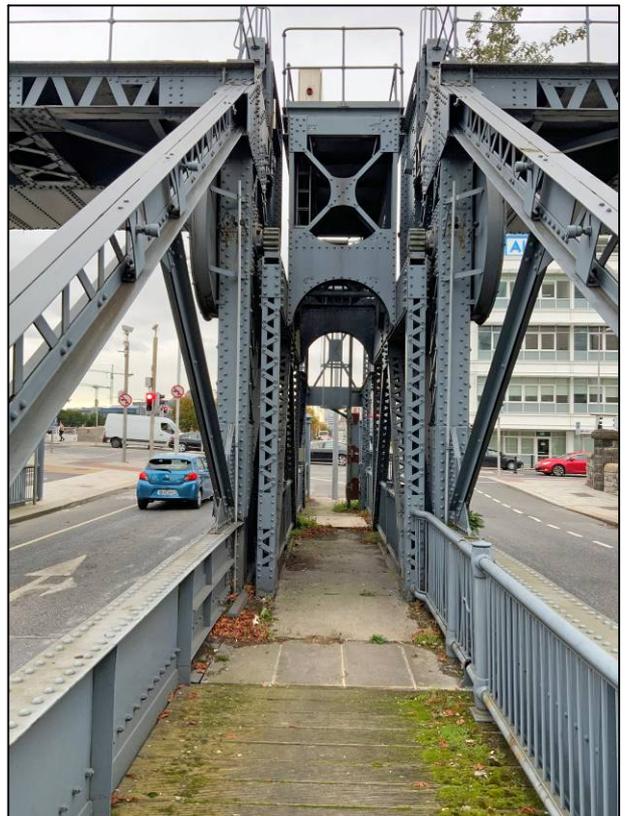
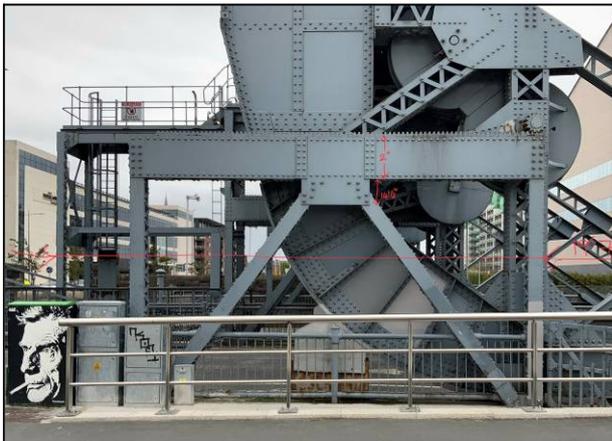
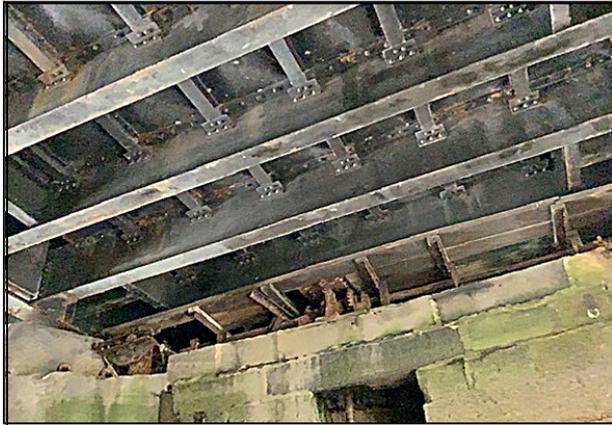


Fig 4.3 Contemporary photographs of Scherzer bridges over Royal Canal. *Top left* - From east; *Top right* - From west; *Middle left* - Quadrant roller; *Middle right* - From north; note lock gate winches in front. *Bottom left* - Track along which bridge travels. *Bottom right* - Control cabin platform from east.



Inner Bridge showing the lock gate operating linkage along the top of its gate emplacement. The gates were operated using winches just beyond the bridge.



View E showing foot deck along N side of Outer Bridge (*right*). The Inner Bridge's span (*left*) is secured shut by means of the yellow clamp at bottom left.



Outer Bridge showing concrete pillow block along top of masonry side wall of canal. This replaced several removed courses of stonework.



Looking W showing one of the 2019 spans carried over the top of the canal's side wall. By contrast, the end of the Outer Bridge (*at right*) is let into its top.

Fig 4.4 Undersides of Scherzers spans and canal walls.

Close inspection indicates some minor damage caused by traffic impacts and there are also small patches of rust here and there (fig 4.5). However, there is nothing untoward which cannot be rectified through regular inspection and maintenance.

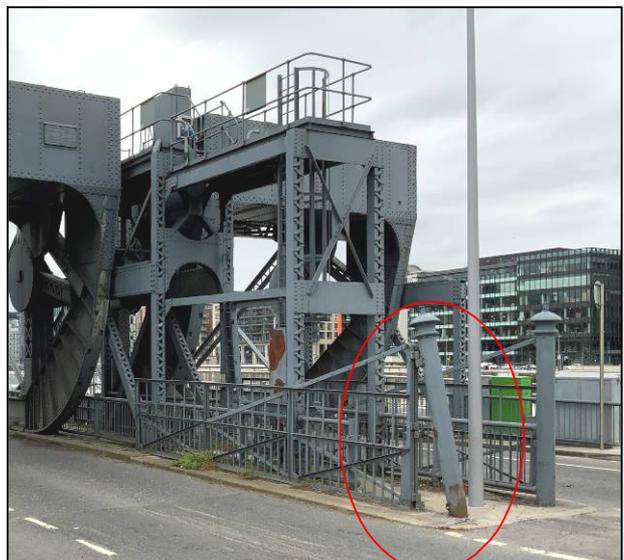


Fig 4.5 Traffic impact damage. *Left*: Bent flange on main girder at east end of Outer Bridge. *Right*: Damaged traffic control gatepost at west end of Inner Bridge.

## 5. Royal Canal options appraisal

The criteria chosen to evaluate the options for relocating the bridges are informed by the BusConnects Dublin objectives, planning regulations relevant to Protected Structures, and international charters relating to the conservation of industrial heritage. Various criteria were considered at the initial route selection stage but only those pertaining to the Architectural Heritage aspects of the project are dealt with in this report.

### 5.1 Options appraisal 1

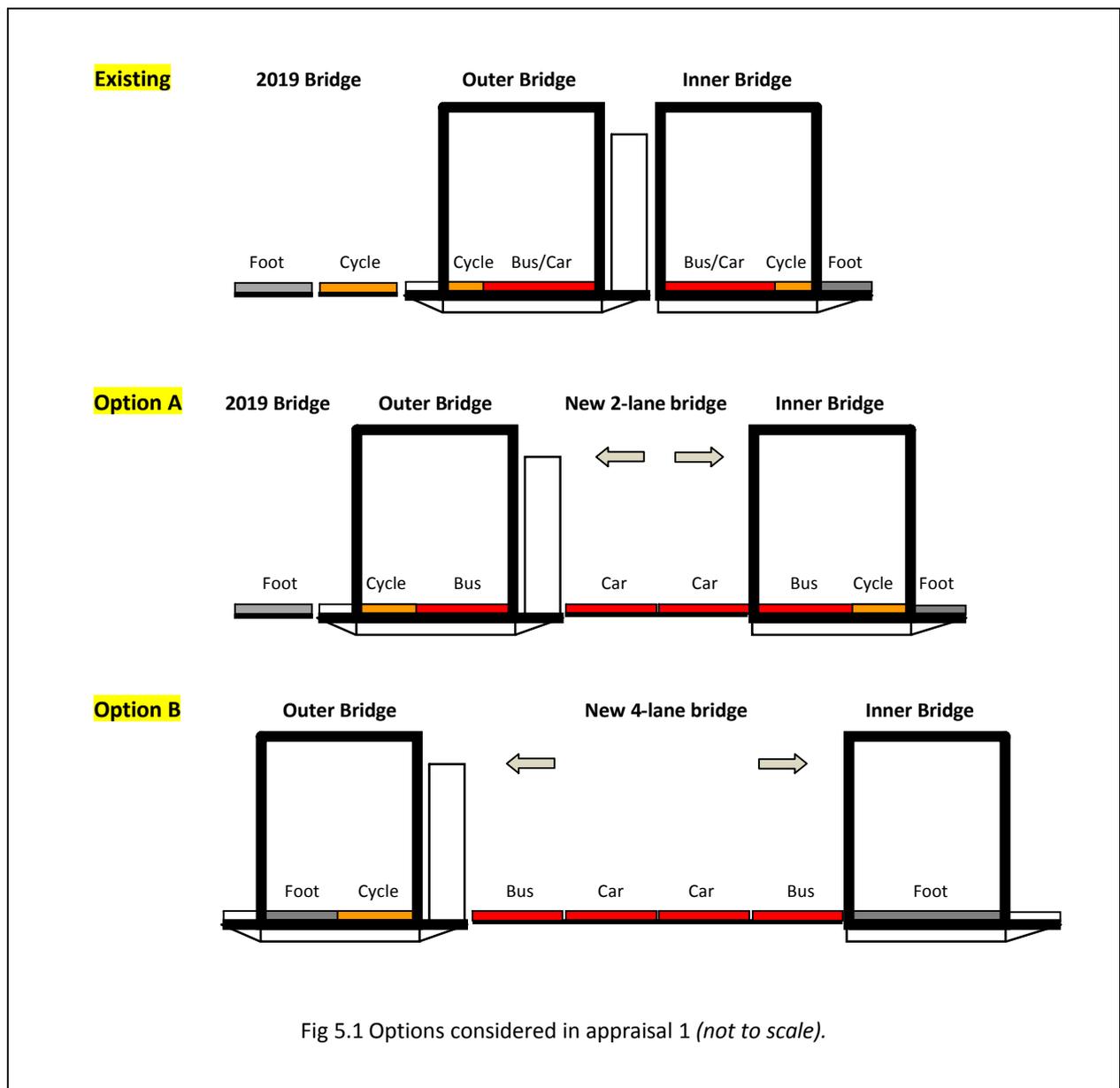
Given the fact that these are now the earliest complete Scherzer bridges surviving in Ireland and also Protected Structures, scrapping them is not an option, nor is relocating them elsewhere as they would be removed from their original contexts. Rather, the strategy adopted here is to keep them as close as possible to each other and to their original (existing) positions. A number of different relocation scenarios were explored, all of which entailed moving them both horizontally and vertically.

#### *Options*

An initial analysis was carried out to determine the feasibility of separating the bridges to enable the proposed new bridge to pass between them along the existing road line. As noted in section 1.4, the bridges operated in tandem but had separate motors which were independently controlled from a cabin mounted on an overhead platform between them. It is proposed to split the bridges and move this platform with the outer one.

The degree to which the bridges can be physically separated is constrained at north by the bottom set of sea lock gates (which also double as a flood barrier) and on the south side by the River Liffey (no extension beyond the line of the quay wall is envisaged). With these constraints in mind, two options were considered in the initial appraisal (fig 5.1).

- A The bridges would be moved apart to enable a two-lane road bridge to pass between them. The latter would be dedicated to general traffic, whilst the relocated Scherzer bridges would carry bus, cycle and pedestrian traffic. It would also be necessary to remove the innermost of the two 2019 bridges to make room for the relocated Outer Bridge. Its outer span would, however, be retained for pedestrians.
  
- B The two Scherzers would be moved further apart than Option A to accommodate a four-lane bridge for general traffic and buses, with the relocated bridges being reserved for cyclists and pedestrians. It would be necessary to remove both 2019 spans, but their roles would still be performed by the relocated Outer Bridge.



### Evaluation criteria

Five criteria were used to assess the potential consequences upon the bridges and their environs of implementing each of the above relocation options:

#### 1. Physical integrity of bridges

Both options will require the dismantling of the Scherzers. As noted in section 1.4, the moving assembly rolls along two track plates which are interconnected by a substantial steel sub-frame supported on multiple timber piles. The question arises as to how much of the existing bridge, both above- and below-ground is actually moved. There are two possible actions:

- The sub-frame will be excavated and moved together with the track plates and above-ground components of the bridge to their new locations where they will be re-erected. However, the condition of the buried steelwork is unknown without actually excavating it. For the purposes of this assessment, it will be assumed that should the buried remains be excavated, they will be found to be no longer fit for purpose.

- Only the track plates and above-ground components will be moved. It would, of course, be preferable to conserve the frame in situ as evidence of the Scherzers' original locations. However, the feasibility of doing so will require more careful consideration when designing the new bridge. For the purposes of ranking this particular criterion, this action will be assumed along with the likelihood of the sub-frame being lost.

## 2. Physical integrity of associated historic buildings/structures

As noted in section 3.4, the new 1870s' lock emplacement was spanned in the 1910s by the Inner Bridge. Although the timber gates are long gone, their emplacements survive along with the two operating winches at the dock end of the bridge.

The bottom flanges of the principal girders of the Inner Scherzer are c.83.5cm below its deck. To move the span sideways would therefore require the removal of several courses of stonework along the tops of the sidewalls to accommodate the span at the same level as it is today.

Another issue are the two winches for opening and closing the former lock gates. The tops of their metal casings are c.31.5cm above the Inner Scherzer's present deck level. They would therefore seriously impede the span being shifted sideways in the direction of the dock. Rather than removing them completely, it may be possible to sink them partially into the ground to clear the bottom flange of the principal girders. This mitigation would enable them to be retained as reminders of an episode in the canal's historical development. Its implementation will be assumed for the purposes of ranking this criterion for each option.

## 3. Landscape setting

Apart from the quay wall and actual canal, the bridges' immediate environs have been redeveloped and the canal banks have also been completely relandscaped in the relatively recent past. The only built heritage feature hereabouts is the North Quay Wall which is a Protected Structure (reg.no. 5835).

The 2019 bridges hide the entrance to the canal from view, and its visibility will be further restricted as the Inner Bridge is moved progressively northwards towards the modern lock gates.

## 4. Functionality

As noted in section 3.5, both bridges were restored to working order in 2003-04. The original motors were replaced and the electrics upgraded, but the original gear trains were retained. In theory the bridges are still operable but in practise they are not as both spans are clamped shut to prevent them moving slightly as traffic passes over. Depending on the state of the tide, small vessels can still access the lock chamber even when the spans are closed. As sea levels rise, however, this air gap will diminish and potentially create difficulties for more canal users unless the bridges are still capable of being opened. For the purposes of this analysis, it is assumed that the repositioned Scherzers will still be operable.

Another functional consideration is the loading on each bridge. Although designed for 1930s traffic, they are still capable of carrying today's traffic. However, any reduction in such traffic, particularly heavy goods lorries, would certainly be beneficial as there will be less dynamic loading and also less risk of physical damage from traffic collisions. Most benefit would come by restricting the bridges to pedestrians and cyclists and this would also effectively remove any risk of further damage such as that shown in figure 4.5.

## 5. Public amenity

The volume of traffic over the bridges does not make for a pleasant user experience, whether as a pedestrian or cyclist. As with the functionality criterion, both bridges would be better appreciated in greater safety if all vehicles were removed.

There are obviously many other relevant factors to be considered as well, e.g. third-party land acquisitions, construction costs, planning permissions, public safety etc. These relate to the construction phase of the project and are outside the scope of the present report which is limited to the operational phase of the 'Cultural and Industrial' aspects of the project's broader environmental multi-criteria analysis.

### *Ranking of options*

Each criterion was scored on a seven-point scale relative to the existing situation. Half points were also used where necessary to rank particular options more precisely. The relative ranking scale used here is as follows:

Large beneficial	+ 3
Moderate beneficial	+ 2
Slight beneficial	+ 1
Neutral	0
Slight adverse	- 1
Moderate adverse	- 2
Large adverse	- 3

The existing situation is taken as the baseline and accorded a neutral score of '0'. Positive scores indicate that an option is more beneficial than the existing situation for that particular criterion. Conversely, a negative score indicates a worse situation than at present. Each criterion was given equal weight in gauging the overall impact of each option upon the bridges' overall heritage significance (table 5.1).

Option	Existing situation		Option A		Option B	
Criteria		Rank		Rank		Rank
1. Physical integrity of bridges	<ul style="list-style-type: none"> <li>Entire bridge remains in situ.</li> </ul>	0	<ul style="list-style-type: none"> <li>Sub-frame will be lost.</li> </ul>	-2	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	-2
2. Physical integrity of associated features	<ul style="list-style-type: none"> <li>Canal walls remain intact.</li> <li>Lock gate winches are not impeded.</li> </ul>	0	<ul style="list-style-type: none"> <li>Some loss of stonework along canal walls.</li> <li>Lock gate winches require sinking.</li> </ul>	-2	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	-2
3. Landscape setting	<ul style="list-style-type: none"> <li>Both bridges make a positive contribution to the landscape.</li> </ul>	0	<ul style="list-style-type: none"> <li>As existing situation.</li> </ul>	0	<ul style="list-style-type: none"> <li>As existing situation.</li> </ul>	0
4. Functionality	<ul style="list-style-type: none"> <li>Highly unlikely that the bridges will ever open.</li> <li>High dynamic loads and risk of traffic damage.</li> </ul>	0	<ul style="list-style-type: none"> <li>Possibility of at least one bridge opening; but buses would require temporary rerouting.</li> <li>Less dynamic loads and reduced risk of traffic damage.</li> </ul>	+1	<ul style="list-style-type: none"> <li>Most likelihood of at least one bridge opening without impeding road traffic.</li> <li>Least dynamic loads and minimal risk of traffic damage.</li> </ul>	+2
5. Public amenity	<ul style="list-style-type: none"> <li>Poor user experience and little opportunity for public engagement.</li> </ul>	0	<ul style="list-style-type: none"> <li>Improved user experience and some opportunity for public engagement.</li> </ul>	+1	<ul style="list-style-type: none"> <li>Best user experience and best opportunity for public engagement.</li> </ul>	+2
<b>Overall score</b>	<b>0</b>		<b>-2</b>		<b>0</b>	

Table 5.1 Ranking of options by criteria for Royal Canal Scherzer bridges - stage 1.

Comparing the two options in the above table, it is evident that B would best retain the bridges' existing architectural, technical and engineering significance in the long-term: i.e. moving them apart to make way for a new four-lane bridge and restricting their use to pedestrians and cyclists (fig 5.2).

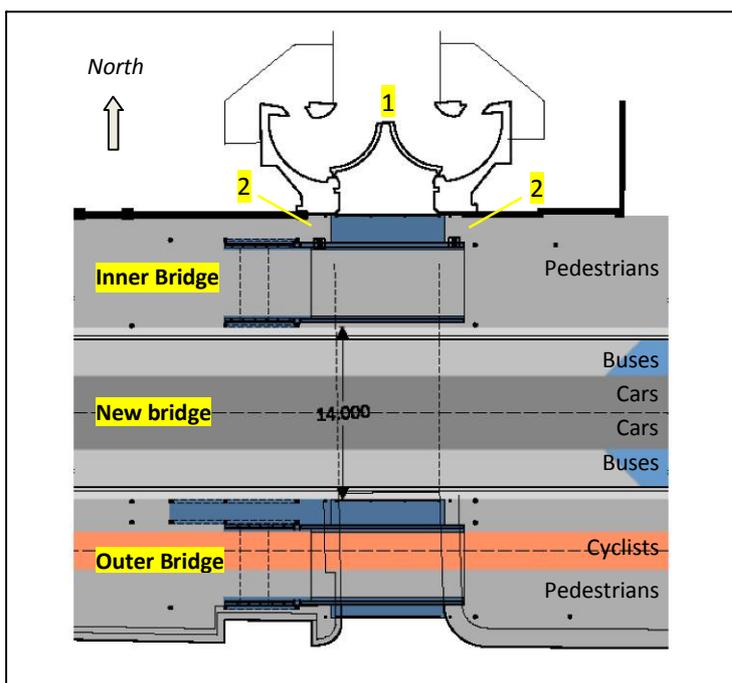


Fig 5.2 Plan of proposed reconfiguration of bridges over Royal Canal. Key: 1 - Sea lock bottom gates (modern); 2 - Winches to operate previous gates (underneath repositioned Inner Bridge).

Although there will be some loss of original fabric (i.e. the buried sub-frame) and of stonework along the tops of the canal walls, they will be outweighed by the bridges' enhanced long-term functionality, user experience and potential for public engagement and appreciation. The two 2019 bridges would have to be completely removed to make way for the Outer Bridge but their functions would continue to be served by their replacement. Finally, the option to retain the bridges in an operational state is retained.

## 5.2 Options appraisal 2

Having selected Option B, the next step is to determine whether they might also be repositioned vertically to mitigate some of the negative impacts highlighted above. Alternative height levels for the relocated bridges were informed by two considerations:

1. The extent to which the relocated Scherzer bridges and the new road bridge would impact upon the existing granite capping of the canal walls, the historic quay wall and the two lock gate winches.
2. The potential to increase the clearance under the bridges to facilitate traffic in and out of the Royal Canal and thus mitigate rising sea levels brought about by climate change.

Two variants of Option B were considered (fig 5.3):

- B1 The new 4-lane road bridge would be positioned so that the underside of its frame will clear the sidewalls. The Scherzers would then be raised to bring their decks level with that of the new road bridge. Roughan & O'Donovan have given 70cm as the depth of the new span below its deck level for the purposes of this analysis.

Raising the new road by 70cm compared with its existing level would enable the new bridge to clear the sidewalls. The bottom flanges of the Scherzers' principal girders are c.83.5cm below the tops of the walls, so raising them by 70cm would place them c.13.5cm below the tops of the walls (83.5cm - 70.0cm). Less stonework would thus require removal than under Option B to accommodate them when shifted sideways.

The tops of the winches are currently c.115cm above the bottom of the girders' bottom flanges. Raising the spans by 70cm would place their tops c.45cm above the flanges (115cm - 70cm). They would thus require sinking by the same amount to clear the raised Inner Scherzer.

Raising all the bridges by 70cm would increase the headroom for boat users by the same amount. However, it would also require the existing road approaches to be regraded at both ends to tie in with the new road bridge's deck.

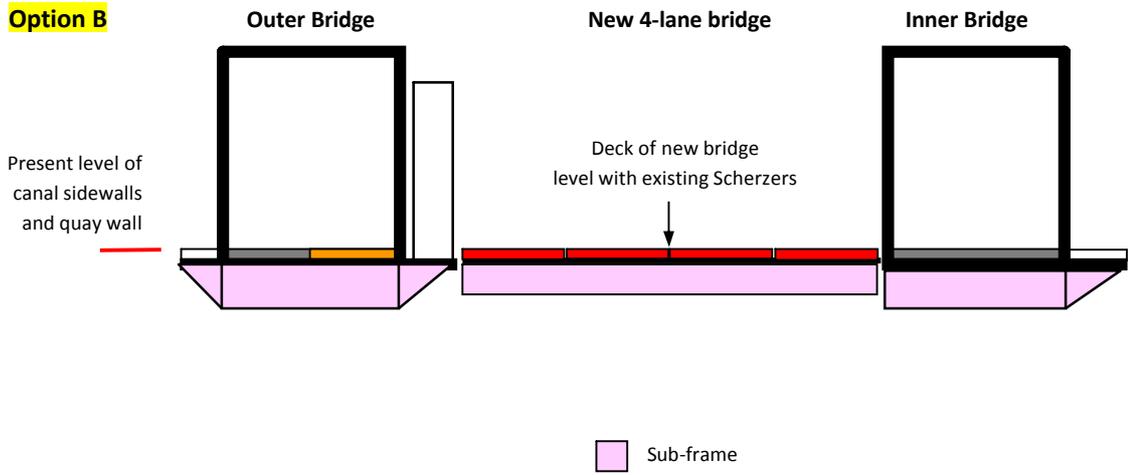
It would also be necessary to heighten the North Wall Quay to form a continuous surface with the decks of the raised Scherzers. Such additions should be reversible, of contemporary design, and stepped back from the existing granite copings along the river to distinguish new from old.

It should be noted that the historic ground finishes east of the Scherzers have already been disturbed by construction and their original stone setts have been removed. To the west, the installation of the Beckett Bridge at a level necessary for its operation has already impacted on ground levels adjacent to the Scherzers, and raising them will be beneficial to a degree.

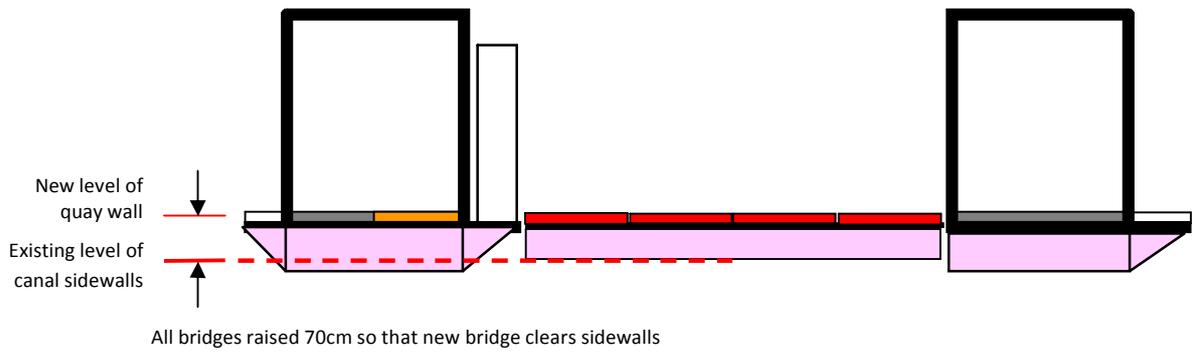
- B2 The Scherzers would be raised by at least 83.5cm so that their principal girders would clear the side walls. This would also give some flexibility for positioning the deck of the new bridge in that it could be raised to this level as well or kept at its Option B1 level, i.e. c.13.5cm below that of the Scherzers.

Under this option, the air draft under the bridges would be increased by c.83.5cm. Moreover, the winches would require sinking by only 31.5cm to clear the Inner Bridge (115cm - 83.5cm). The road approaches would require regrading as before, and the surface of the quay would require raising by an additional 13.5cm (83.5cm - 70.0cm) to bring it level with the Scherzers' decks.

**Option B**



**Option B1**



**Option B2**

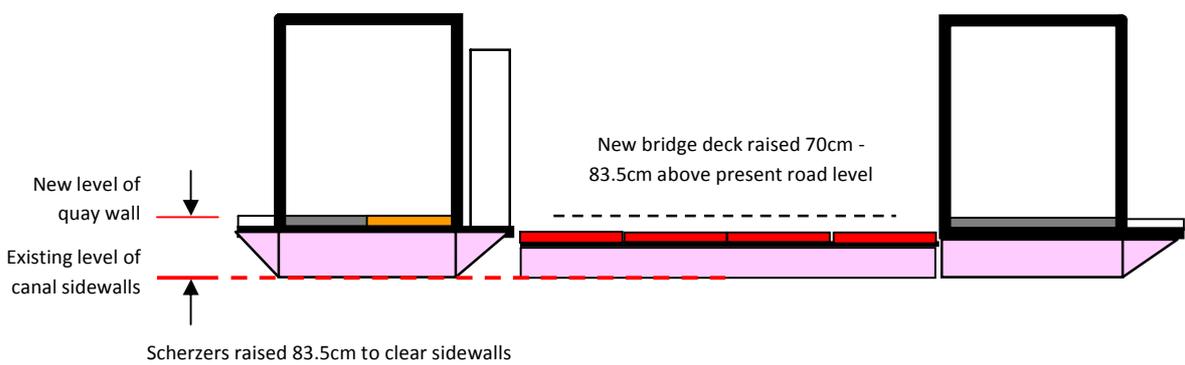


Fig 5.3 Option variants considered in appraisal 2 (not to scale).

As before, each criterion was ranked on the seven-point scale for all options (table 5.2).

Option	B	Option B1		Option B2	
Criteria	Rank		Rank		Rank
1. Physical integrity of bridges	-2	As Option B.	-2	As Option B.	-2
2. Physical integrity of associated features	-2	Less loss of canal wall stonework. Lock gate winches require sinking.	-1	No loss of canal wall stonework. Lock gate winches require less sinking.	-½
3. Landscape setting	0	Existing road and quay graded to new deck levels.	-½	As Option B1	-½
4. Functionality	+2	As Option B. Clearance for canal users increased by 70cm.	+2½	As Option B. Clearance for canal users increased by 83.5cm.	+3
5. Public amenity	+2	As Option B.	+2	As Option B.	+2
<b>Overall score</b>	<b>0</b>		<b>+1</b>		<b>+2</b>

Table 5.2 Ranking of options by criteria for Royal Canal Scherzer bridges - stage 2.

### 5.3 Appraisal conclusions

It is evident from tables 5.1 and 5.2 that the best option is B2, i.e. to raise both Scherzers by 83.5cm (at least), and the proposed new bridge by at least 70cm above the present road level. This option would (1) retain all the above-ground components of the Scherzers, (2) have minimal impact on adjoining historical features, (3) enable one or both bridges to operate for demonstration purposes, (4) future-proof access to the canal, and (5) enable the Scherzers to continue to serve a useful purpose for pedestrians and cyclists.

The absolute heights of the final deck levels and their tying-in with the existing road and footpaths on both approaches will be resolved at the detailed design stage of the project. Consideration will also be given to the feasibility of the new bridge spanning both the canal gap and the buried sub-frames of the Scherzers so that they can be left in situ rather than demolished when the new road bridge's abutments are constructed.

The surface treatments of the raised footpaths and cycle tracks along the historic quay will also be carefully considered to ensure that they are clearly read as contemporary additions which will provide a high-quality public realm and setting for the historic bridges. There will also be the opportunity to restore the stone cube surface to the bridges (as depicted on Griffith's drawing in Appendix 2.1/ 7683), thus distinguishing them as part of the historic setting.

## 6. History of the George's Dock bridges

The erection of the fixed-arch Carlisle Bridge in 1796 (where O'Connell Bridge now stands) effectively marked the upstream limit of Dublin Port. This eastwards shift of maritime activity is exemplified by the Custom House which opened in 1791 to replace one near Essex Bridge (now Grattan Bridge). The Custom House Dock was opened by the Board of Works beside the new building in 1796, followed by George's Dock in 1821 (named after George IV), and the Inner (Revenue) Dock in 1824.

### 6.1 Swivel Bridge

To facilitate movement along the Quay whilst at the same time giving vessels access to the three docks, moveable bridges were erected over their entrance channels. Although all are captioned 'Draw Br' on 1838 OS map, they were actually double-leaf swivel spans, slightly offset from each other to allow for the skewed angles of the channels relative to the quay walls (fig 6.1).

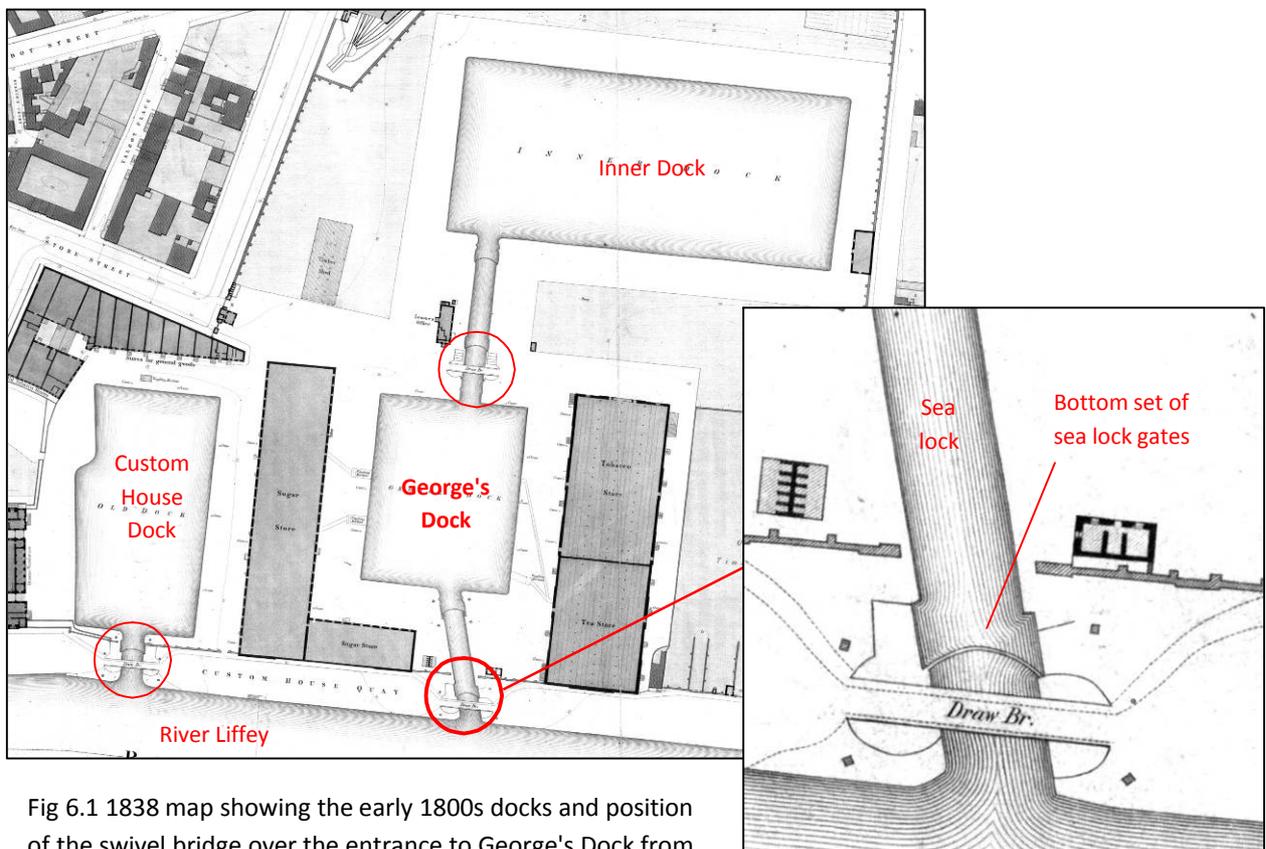


Fig 6.1 1838 map showing the early 1800s docks and position of the swivel bridge over the entrance to George's Dock from the Liffey. (OS 1:1056 map, Dublin City sheet 15)

### 6.2 Rolling drawbridge

In 1859-60, the swivel bridge at George's Dock was replaced with a rolling drawbridge of similar make, design and operation to the one installed at the same time over the Royal Canal (figs 6.2 and 6.3). It is captioned 'Draw Br' on the 1864 OS map which shows it positioned over the bottom set of lock gates (fig 6.4).



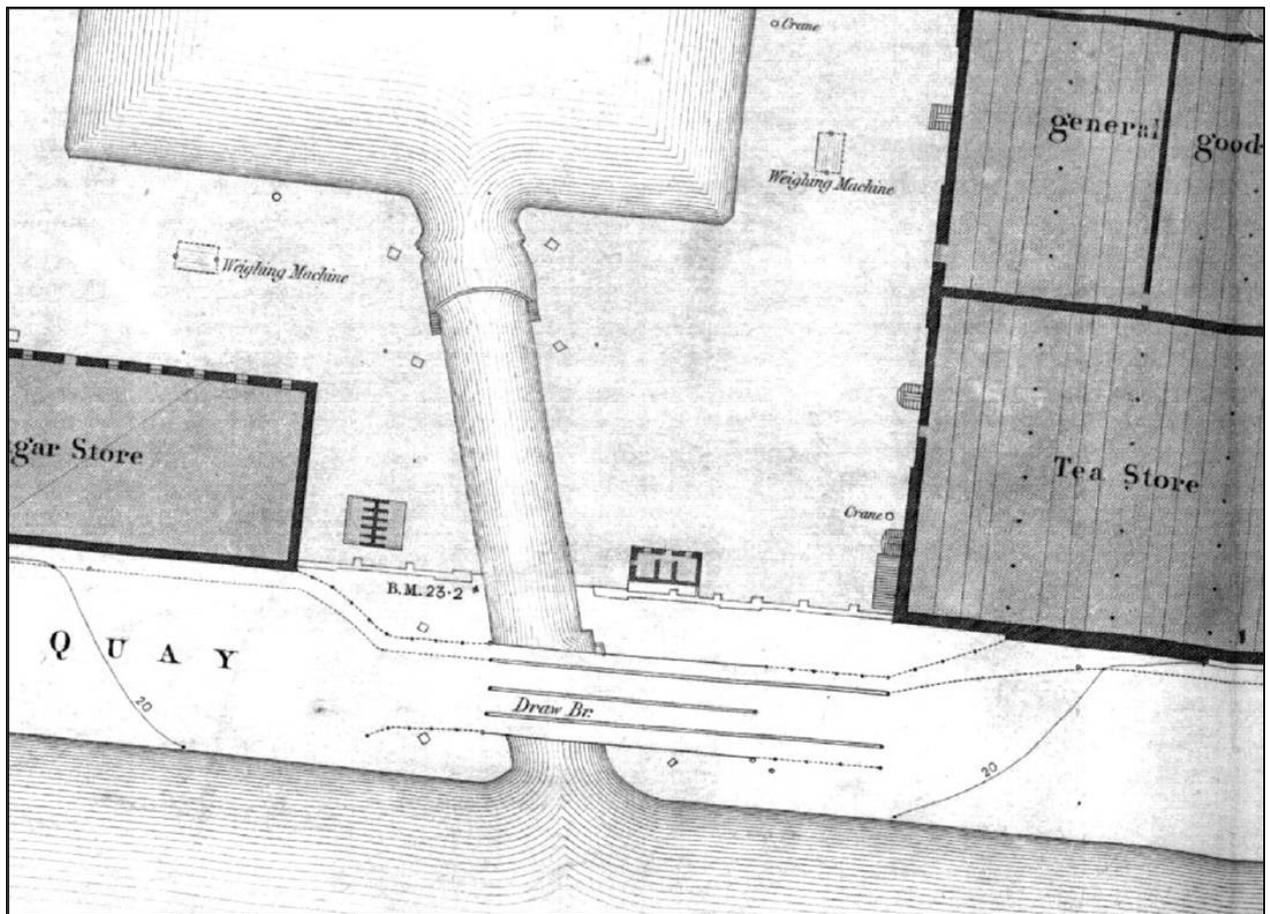


Fig 6.4 1864 map showing the new rolling drawbridge at the entrance to George's Dock. The entire bridge moved eastwards when being opened (*OS 1:1056 map, Dublin City sheet 15*).

### 6.3 New swivel bridge

In 1884, the drawbridge over the entrance to George's Dock was replaced with a new swivel bridge.<sup>8</sup> It was commissioned by the Dublin Port & Docks Board which had acquired the Custom House Dock, George's Dock and the Inner Dock from the Government when it succeeded the Ballast Board in 1867.<sup>9</sup>

The new bridge is captioned 'Swivel Br' on the 1889 and 1907 OS maps and was positioned slightly north of the previous bridge, thus exposing the tops of the lock gates (fig 6.5). Unlike the original swivel bridge, this one had two traffic lanes but only a single leaf which pivoted about a point on the east side of the channel.

<sup>8</sup> The *Dublin Daily Express* of 23 Feb 1884 noted that this swivel bridge was almost complete. However, Thom's 1887 *Dublin Directory* (p.1273), noted that it had been opened for traffic on 12 Feb 1884 and was designed by Bindon Stoney, the Dublin Port & Docks Board's Engineer.

<sup>9</sup> *Dublin Evening Mail*, 18 Jan 1866.

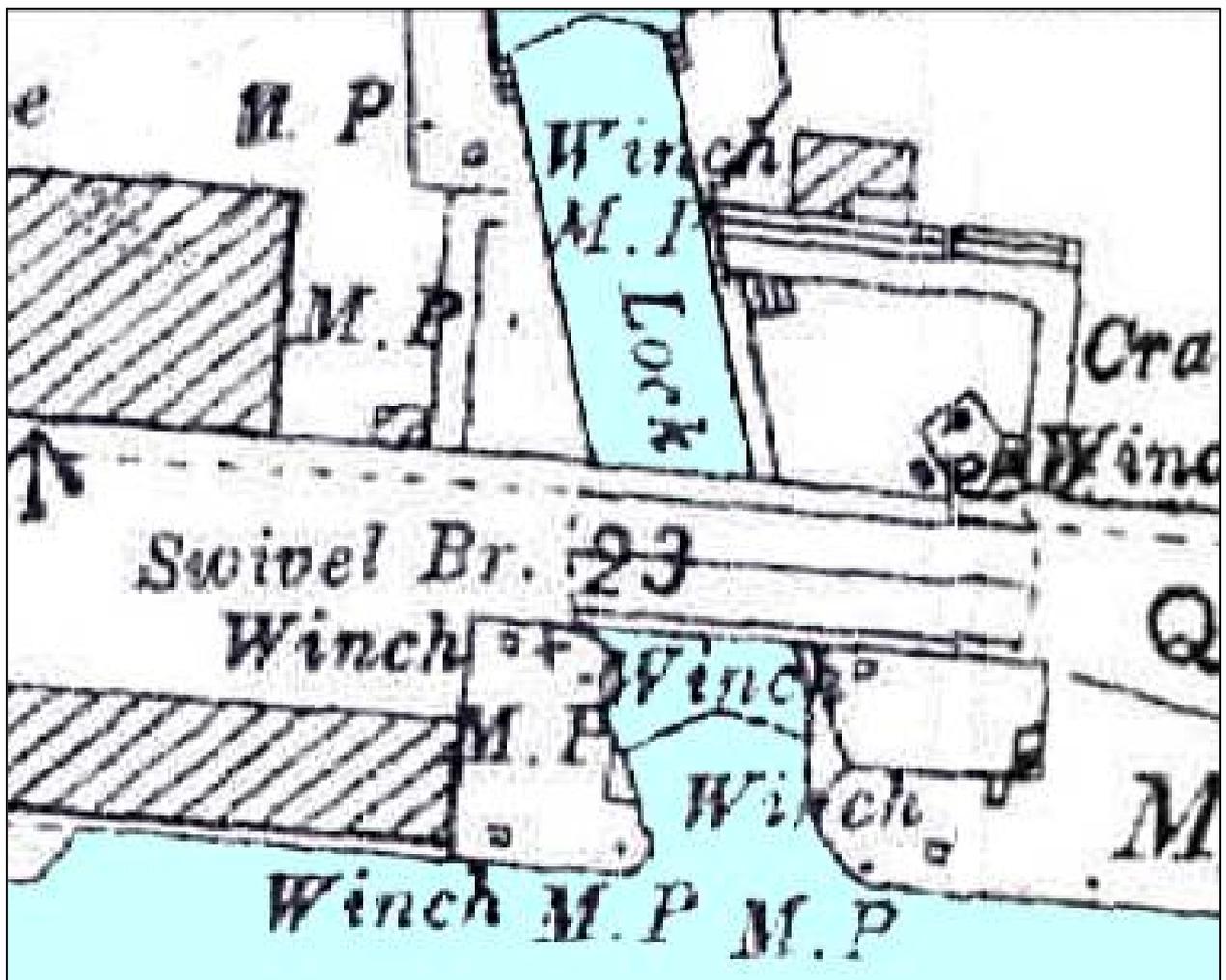
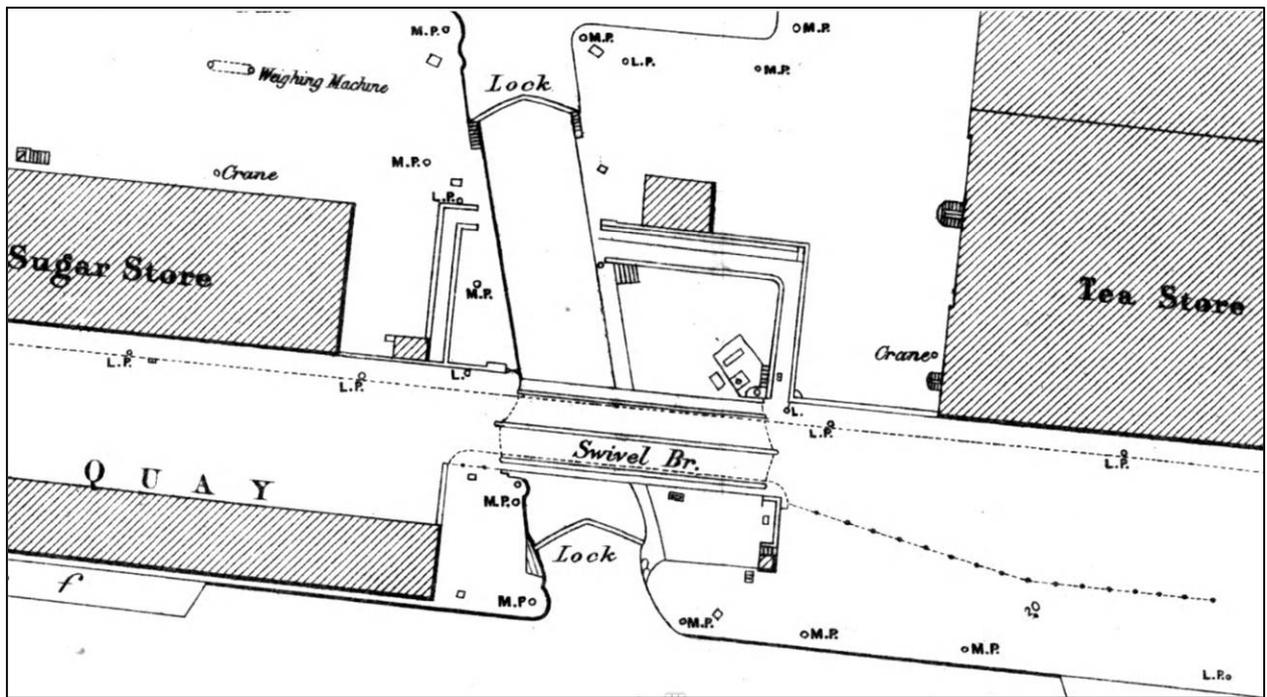


Fig 6.5 Top: 1889 map showing the replacement swivel bridge (OS 1:1056 map, Dublin City sheet 58);  
 Bottom: 1907 map depiction (OS 1:2500 map Dublin sheets 18-11 and 18-12).

## 6.4 Scherzer bridges

The hindrance to traffic caused by the rolling drawbridge over the Royal Canal also pertained to some extent at the entrance to George's Docks. It was not until the 1930s that the issue was resolved with the swivel bridge's replacement with two Scherzer Bridges. The contract for their construction and removal of the existing bridge was advertised in 1932 (fig 6.6).

What little historical information as is currently available indicates that the work was well underway in 1933. An aerial photograph of that year shows the Outer Bridge being fabricated on the same alignment as the earlier rolling drawbridge (fig 6.7). As with the Scherzers over the Royal Canal, the two lanes of traffic along Custom House Quay continued to use the existing swivel bridge. Once the Outer Bridge was finished, the swivel bridge was removed and the second Scherzer erected. It was probably completed in 1934. Given that the Outer Bridge was now over the bottom end of the sea lock, it is uncertain how its gates were opened and closed thereafter.

The Port & Docks Board's Engineer at that time was Joseph Mallagh. He was well aware of Scherzer bridges, having played a role in the construction of one over the River Barrow at Mount Garrett several years previously.<sup>10</sup> Seemingly Scherzer's patent had expired,<sup>10</sup> so the bridges' design may well have been Mallagh's own work rather than that of the Scherzer Rolling Lift Bridge Co. Unfortunately, no contract specifications and drawings have yet been found in the Dublin Port Company's Archive, nor is the name of the contractor known.

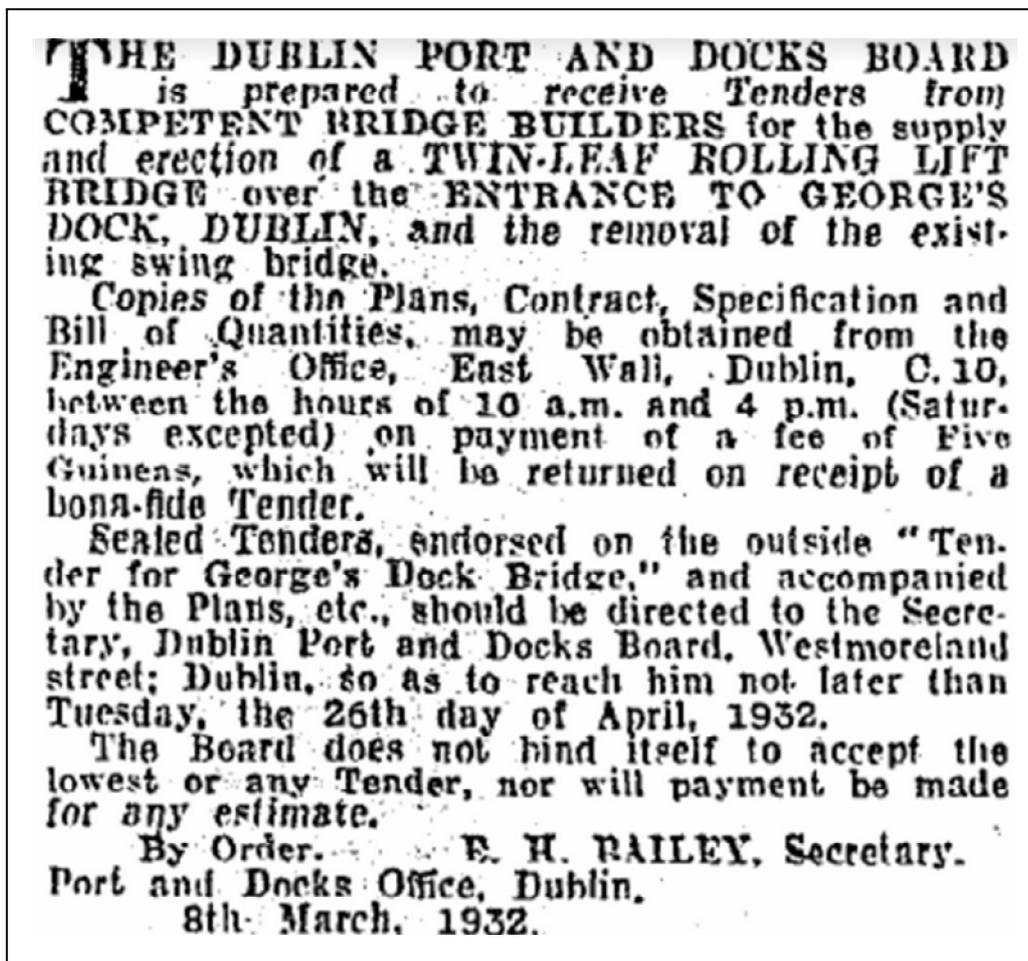


Fig 6.6 Contract for new bridges as advertised in *Irish Times*, 12 March 1932.

<sup>10</sup> Maconchy, J.K. (1932), 'Mount Garrett Bridge' in *Trans Institution of Civil Engineers Ireland*, vol. 58, p.158.



Fig 6.7 Aerial view from east showing Outer Scherzer under construction, 1933. (*Britain from Above, XPW043441*)

Mid-1900s aerial photographs show that the control cabin was mounted on an overhead platform at the SW end of the Outer Bridge and also that cantilevered footpaths were attached to the north side of the Inner Bridge and south side of the Outer Bridge (fig 6.8).

### 6.5 Recent developments

By the later 1900s, George's Dock and the Inner Dock had been abandoned and were derelict (the Custom House Dock had been infilled many years before). With the formation of the Custom House Docks Development Authority in 1987, the area began to be comprehensively redeveloped for commercial and residential use.

In 1998, the triumphal arch which formerly stood in Amiens Street was relocated here as a monumental feature. In 2001, the Scherzer bridges were designated by Dublin Corporation as 'public road bridges' under the Road Act 1994 Section 11(1). As a consequence, their spans were permanently fixed shut.<sup>11</sup>

In 2005, Stack A, a former tobacco and tea store along the east side of George's Dock designed by John Rennie in 1821, was converted into retail space. Now known as the CHQ Building, it also houses the Irish Emigration Museum. Stack B, a former sugar store at the SW end of the dock, has also been converted into office use.

<sup>11</sup> *Irish Independent*, 3 Aug 2001.

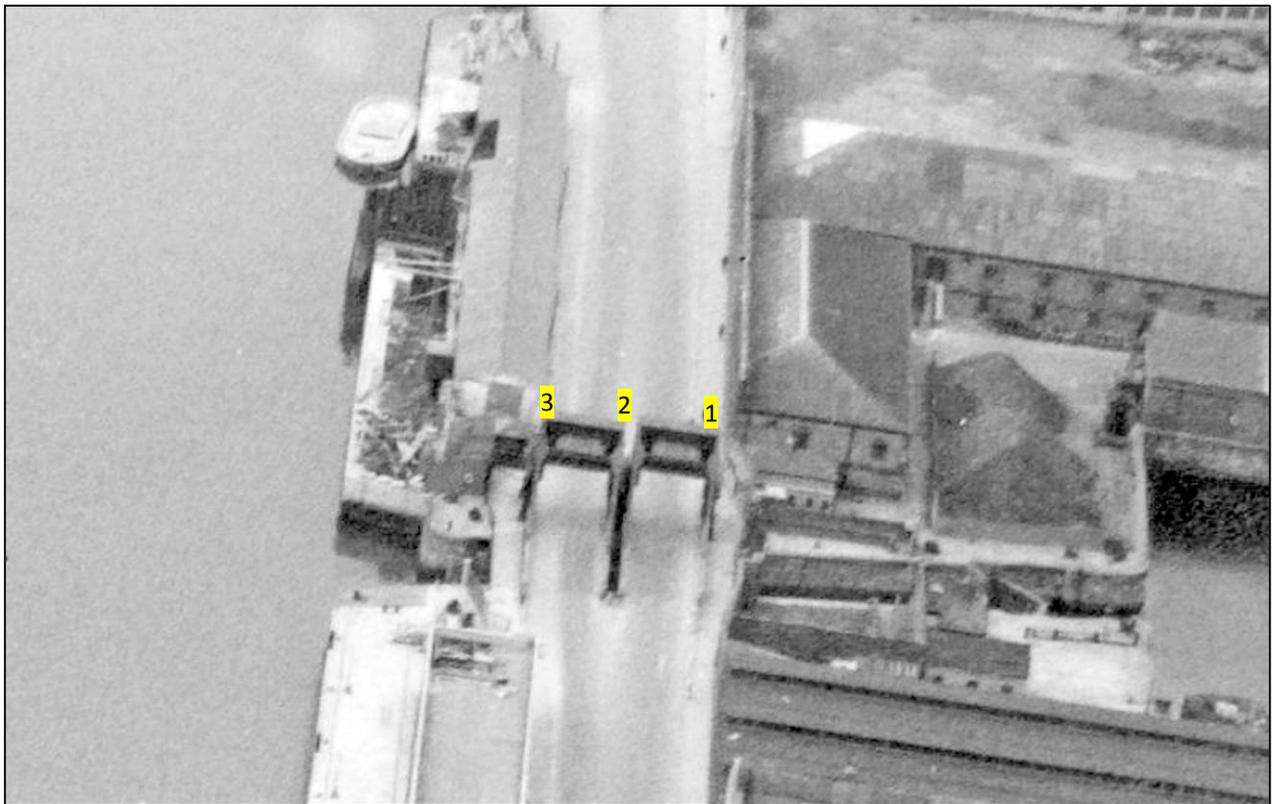


Fig 6.8 Aerial views of Scherzer bridges over entrance to George's Dock, from east. Top: 1949 view (*Britain from Above*, XAW027127). Bottom: 1955 view (*National Library Ireland, Morgan Aerial Photographic Collection*). Key: 1 - Inner Bridge, 2 - Outer Bridge, 3 - Overhead control cabin.

George's Dock was emptied of water and a concrete wall inserted across its entrance, just north of the bottom lock gates. A large platform was constructed on the bed of the dock by Dublin City Council for use as a temporary event space.

Three new fixed metal bridges were also erected over the entrance channel to the former dock: (1) a wide footbridge on the river side of the Outer Scherzer, (2) ditto on the dock side of the Inner Bridge and (3) a bridge over the gates at the north end of the lock chamber for vehicular access to a car park at the east end of Stack B (fig 6.9). It may have been around this time that the cantilevered footpaths were dismantled and the control cabin and its platform removed.

The most recent development has been the granting of planning permission for the conversion of George's Dock into a whitewater rafting centre.

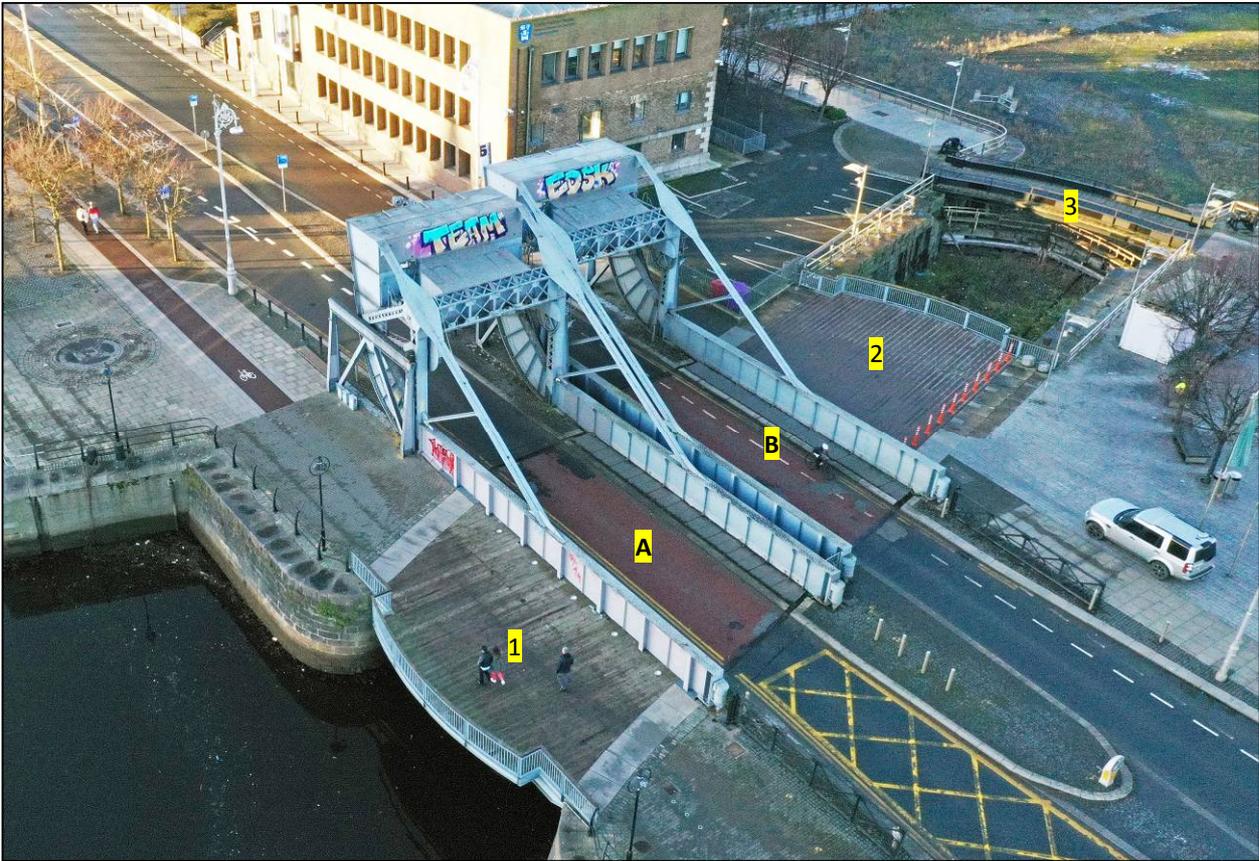


Fig 6.9 Aerial view of modern bridges over the entrance to George's Dock, from SE, 2021. Key: A - Outer Scherzer; B - Inner Scherzer; 1 - Modern foot bridge; 2 - Modern footbridge; 3- Vehicle access bridge.

### 7. George's Dock bridge descriptions

Although no longer operable, both Scherzer bridges continue to carry vehicles over the former entrance channel to George's Dock. However, their cantilevered footpaths have been superseded by modern footbridges at both ends (fig 7.1).

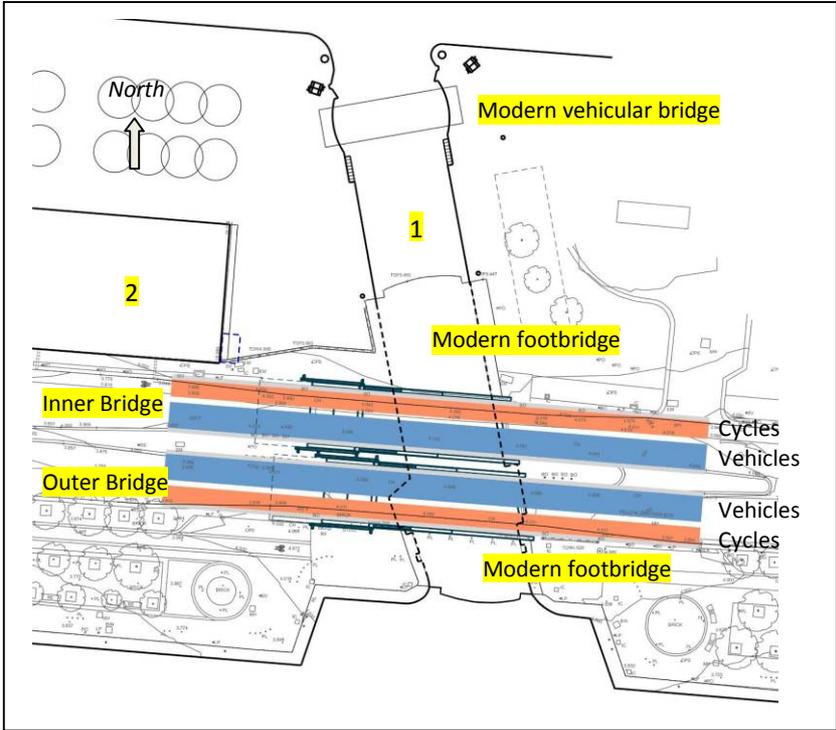


Fig 7.1 Plan of existing bridges over entrance to George's Dock.  
Key: 1 - Sea lock chamber; 2 - Stack B.

Because of Covid-19 restrictions, only a preliminary measured survey of the bridges was possible at this stage (fig 7.2). It is evident that the George's Dock Scherzers are more substantial structures than the pair over the Royal Canal (table 7.1).

	George's Dock	Royal Canal
Span length (m)	18.69	13.29
Span width (m)	7.18	6.15
Channel gap (m)	11.37	8.28

Table 7.1 Dimensions of George's Dock and Royal Canal Scherzers.

Without the original drawings and a detailed inspection, it is difficult to determine how many original components are now missing or have been replaced. The control cabin and cantilevered footpaths have been removed along with most of the traffic control gates and probably also the operating motors. Of special note is the survival of compressed air buffers at the opening ends of the spans (fig 7.3); these cushioned the impact on the sidewall when the span fell shut.

Underneath the Outer Bridge, the timber lock gates are still in place (fig 7.4). These match the ones at the north end of the lock chamber, underneath the modern bridge. Whilst the operating winches are still in place at the latter, the means of opening and closing the gates under the Outer Bridge has yet to be determined. The stonework along the tops of the walls has also been altered to accommodate the various replacement bridges.

There is evidence of traffic impact damage and also patches of rust here and there (fig 7.5). Overall, however, the bridges survive in good condition, albeit no longer fully complete.

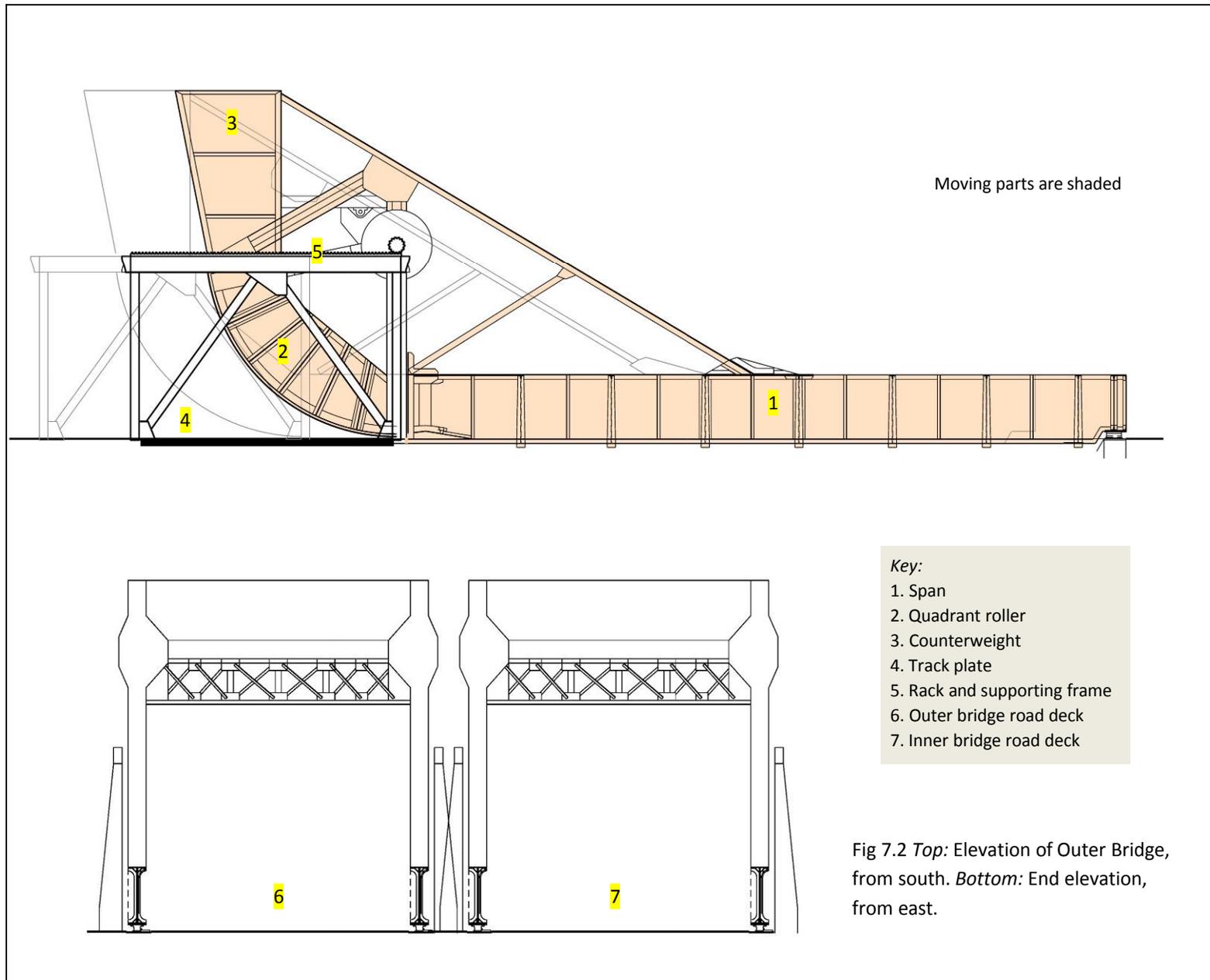




Fig 7.3 Contemporary photographs of Scherzer bridges at George's Dock. *Top left* - From SW; *Top right* - From NE; *Middle left* - Rack and pinion (at right end of rack); *Middle right* - Air buffers at lifting end of spans. *Bottom* - Quadrant rollers and toothed track plates along which they travel.



Looking S underneath the Scherzers towards the Liffey. At the far end, the lock gates are visible under the Inner Bridge.



Concrete wall across lock chamber, with drainage pipes along bottom.



Curved timber lock gate on west side of channel underneath Outer Bridge.



Lock gate on east side. Note the vertical slot at right for timber baulks to cut the channel off from the river.

Fig 7.4 Undersides of Scherzers spans and lock gates.



Fig 7.5 *Left*: Incomplete spur gear on Outer Bridge. Note also bent flange on cross member due to strike from a high load. *Above*: Minor rusting on flange plates.

## 8. George's Dock options appraisal

As with the evaluation of the various options for repositioning the Scherzer bridges over the Royal Canal, only those criteria relating to the architectural heritage aspects of the proposed road scheme are considered here.

### 8.1 Relocation restrictions

As with the bridges on the Royal Canal, it is proposed to separate the bridges to enable the new road bridge to pass between them on the same alignment. As before, the strategy is to keep the Scherzers as close as possible to their existing positions. Unlike the situation on the Royal Canal there are a number of Protected Structures and other built heritage features of interest in the vicinity of the Scherzers at George's Dock (fig 8.1). Stack B, to the west of the bridges, incorporates fabric from an early 19th century sugar store but is not included in the RPS or the National Inventory of Architectural Heritage. The sole archaeological monument is an 18th century glasshouse (DU018-020152) which lies just beyond the west end of Stack B, well away from the bridges.



Fig 8.1 Built heritage features in the vicinity of the Scherzer bridges.

From the above map, the only heritage features relevant to the Scherzers' relocation are the lock chamber on their north side and North Wall Quay. Stack B is obviously a physical barrier to the west and there is also a further potential constraint on the east side of the lock chamber where planning permission has been granted for a new building for the whitewater rafting facility.

### 8.2 Options appraisal

The option of moving the bridges only slightly apart was dismissed for the same reasons as Option A for the Royal Canal. Relocating the Inner Bridge to the north end of the lock chamber in place of the

modern vehicle access bridge was also considered but rejected as it would impinge too much on the existing lock gates and winches. Four options were eventually shortlisted for evaluation (fig 8.2):

- A The two Scherzers would be moved apart to accommodate a four-lane bridge for cars and buses. The relocated bridges would be reserved for cyclists and pedestrians. It would be necessary to dismantle the modern bridges on either side, but their roles would continue to be served by the Scherzers.
- B As Option A, but the Inner Bridge would be moved slightly further north to enable the continuation of the footpath along the south side of Stack B eastwards on the same alignment.
- C As Option A, but both bridges would be rotated through 180 degrees so that their overhead counterweights are now on the east side of the canal and not up against Stack B.
- D As Option B, but both bridges would be flipped so that their counterweights are on the east side.

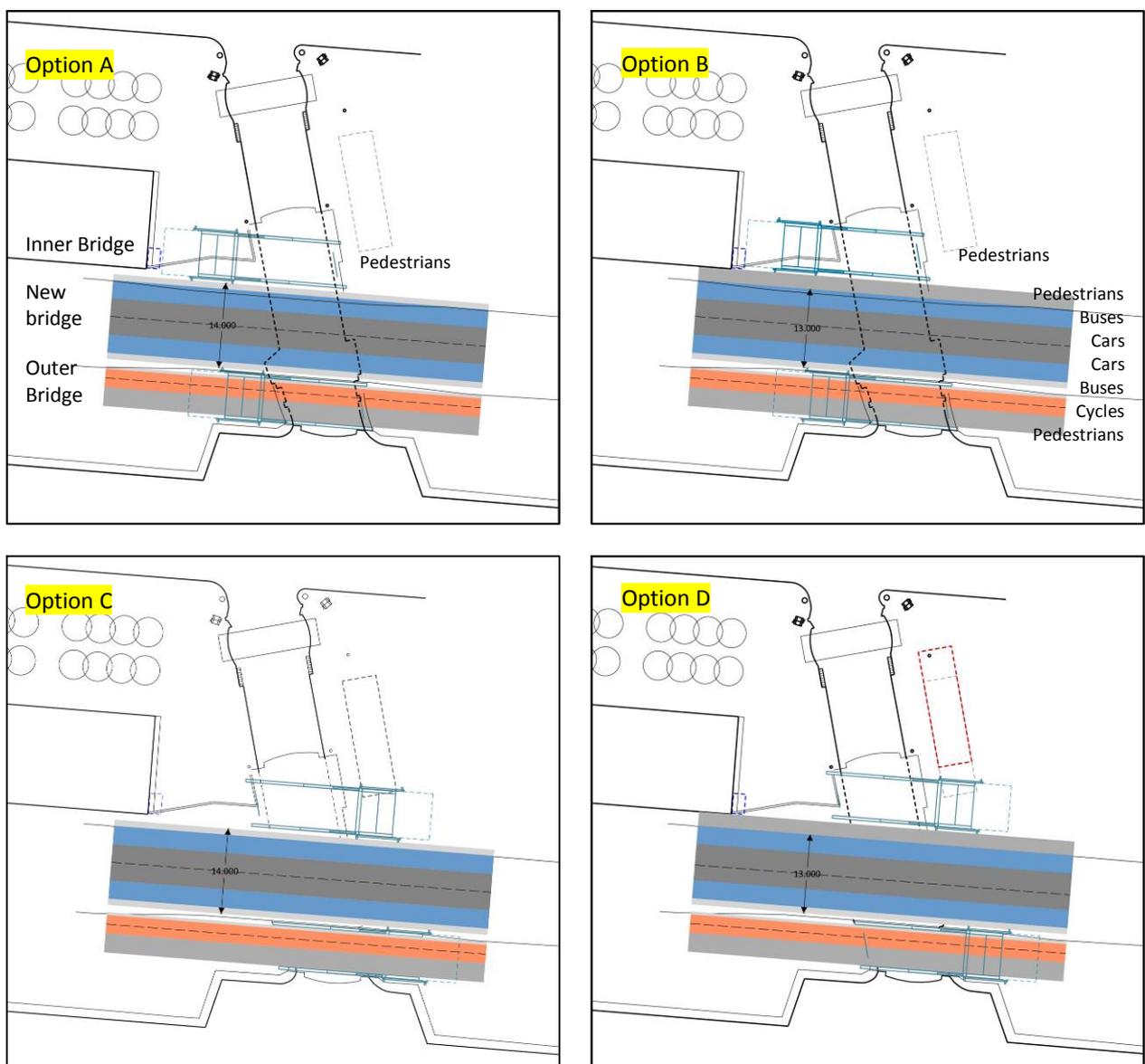


Fig 8.2 Options for repositioning Scherzer bridges.

### *Evaluation criteria*

The same five criteria used in relation to the Royal Canal bridges was also used to determine the likely consequences of relocating the George's Dock bridges: (1) physical integrity of bridges, (2) physical integrity of associated historic buildings/structures, (3) landscape setting, (4) functionality, and (5) public amenity. As before, other considerations such as third-party land acquisitions and wayleaves are beyond the scope of this report.

### *Ranking of options*

Each option is ranked for the above criteria using the same seven-point ranking system as before, and again with half-point scores where finer differentiation is required (table 7.1).

## **8.3 Appraisal conclusions**

The table clearly shows that Option D would best retain the Scherzer bridges' heritage value in the long-term, i.e. moving them apart to make way for a new four-lane road bridge, reversing their orientation, and restricting their use to pedestrians and cyclists. Moreover, the insertion of a footpath alongside the new bridge will also bring the relocated Inner Scherzer into a more satisfactory visual alignment with Stack B. Finally, this option will enable the Inner Bridge to be restored to an operational state for demonstration purposes without impeding on Stack B as it rolled backwards.

The footpath between the new road bridge and relocated Inner Scherzer is a matter for the more detailed design stage of the project, as is any consideration of raising the deck levels.

Option	Existing situation		Option A		Option B		Option C		Option D	
Criteria		Rank		Rank		Rank		Rank		Rank
1. Physical integrity of bridges	<ul style="list-style-type: none"> <li>Entire bridge remains in situ.</li> </ul>	0	<ul style="list-style-type: none"> <li>Sub-frame will be lost.</li> </ul>	-2	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	-2	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	-2	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	-2
2. Physical integrity of associated features	<ul style="list-style-type: none"> <li>Canal walls remain intact.</li> <li>Lock gates remain in situ</li> </ul>	0	<ul style="list-style-type: none"> <li>Some loss of stonework along canal walls.</li> </ul>	-1½	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	-1½	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	-1½	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	-1½
3. Landscape setting	<ul style="list-style-type: none"> <li>Both bridges make a positive contribution to the landscape.</li> </ul>	0	<ul style="list-style-type: none"> <li>Inner Bridge almost hidden from view on approach from west.</li> <li>Counterweight of Inner Bridge will be closer to Stack B.</li> </ul>	-2	<ul style="list-style-type: none"> <li>Inner Bridge is now hidden from view on approach from west but better aligned with south elevation of Stack B</li> <li>Counterweight of Inner Bridge will be even closer to Stack B, detracting from both.</li> </ul>	-2½	<ul style="list-style-type: none"> <li>The Inner Bridge will be more prominent as more distant from adjacent buildings.</li> <li>No visual impact on Stack B.</li> </ul>	+2	<ul style="list-style-type: none"> <li>As Option C.</li> <li>The footpath will give better separation between the Inner Bridge and new road bridge, and also better align the Inner Bridge with south elevation of Stack B.</li> </ul>	+2½
4. Functionality	<ul style="list-style-type: none"> <li>High dynamic loading and high potential for traffic impacts.</li> </ul>	0	<ul style="list-style-type: none"> <li>Reduced dynamic loading and minimal traffic damage as both bridges now for pedestrian/cycle use only.</li> </ul>	+3	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	+3	<ul style="list-style-type: none"> <li>As Option A.</li> <li>No encroachment on Stack B should the Inner Bridge be made operable.</li> </ul>	+3½	<ul style="list-style-type: none"> <li>As Option C.</li> </ul>	+3½
5. Public amenity	<ul style="list-style-type: none"> <li>Poor user experience and little opportunity for public engagement.</li> </ul>	0	<ul style="list-style-type: none"> <li>Good user experience and opportunity for public engagement.</li> </ul>	+2	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	+2	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	+2	<ul style="list-style-type: none"> <li>As Option A.</li> </ul>	+2
<b>Overall score</b>		<b>0</b>		<b>-½</b>		<b>-1</b>		<b>+4</b>		<b>+4½</b>

Table 7.1 Ranking of options by criteria for George's Dock Scherzer bridges.

## 9. Bridge conservation

### 9.1 Conservation principles

The strategy behind the options' appraisal for both pairs of bridges has been to retain them as close as possible to their existing positions. Moreover, their long-term survival is believed to be better secured if they are repurposed for non-vehicular traffic and thus kept in use rather than being preserved as defunct monuments which are less likely to be maintained than functional structures.

In implementing whichever options are chosen, the general approach to the bridges' conservation will be to do *as little as possible and as much as is necessary*. Surviving historical fabric should always be treated with care, the first priority being to maintain and repair rather than to remove and replace.

### 9.2 Options' implementation

The following list of tasks outlines what will be required to carry out any of the above relocation options. It does not purport to be exhaustive and the order of work will depend to a large extent on the sequencing of the new road bridge's construction programme.

#### *Recording*

- A complete photographic and measured survey should be made. The latter will entail an extension of the laser survey already carried out and will include the bridges' undersides and associated components (e.g. control cabin, railings, gates) and also adjoining features such as the masonry approach walls on the north side of the Inner Bridge and also canal features (walls, gate emplacements, and winches).
- A comprehensive survey should be made of the completeness and condition of the bridges' components. This will inform the bridges' disassembly, repair and rebuilding. It should also differentiate those components which are original fabric from items which have been replaced or were added at a later date.

#### *Decommissioning works*

- Temporary bridges will be provided as necessary to maintain the necessary connectivities during decommissioning and reconstruction.
- The bridges' above-ground components should be carefully dismantled only in so far as necessary to enable them to be repaired and moved to their new location with minimal intervention. This will include the moving components (spans, quadrant rollers, counterweights, motor and drive gears, all of which might possibly be lifted as a single unit), racks and frames, track plates (having separated them from the sub-frame), and overhead platform. The electrics will also require decommissioning in the case of the Royal Canal bridges. Where existing components are sound and their relocation feasible without further dismantling, their fixings, joints and seams should all be left intact.
- The feasibility of leaving intact the below-ground supporting frame for the bridges' track plates should be investigated further as this would mitigate to some extent the loss of original fabric. If they need to be removed, they should be carefully excavated and recorded by way of photographs and measured drawings.

- Associated elements such as railings, gateposts, kerbs, and the stone wall along the north side of the Inner Bridge over the Royal Canal, should be dismantled and stored for repair and reconstruction.
- All the modern bridges should be removed and placed in storage for possible re-use elsewhere at a later date.

#### *Enabling works*

- Foundations for the relocated Scherzers will include piles, pile caps and ground beams to support the original track plates and loadings thereon (assuming the original steel substructures are not reused).
- In the case of the Royal Canal, the lock gate winches will be sunk as required to accommodate the repositioned bridges.

#### *Recommissioning works*

- The restored bridges will be reassembled at their new locations, with the overhead platform being kept as part of the Outer Bridge over the Royal Canal. Consideration will also be given to replicating its control cabin. This could improve the interpretation of the bridges and be made accessible for guided visits. Carefully designed information panels would enhance the interpretation of the bridges and their fascinating design.
- For the Royal Canal bridges, it is also intended to reinstate the various operating mechanisms and electrical controls so that they remain in an operational state after being repositioned. These could be opened during events to demonstrate the impressive mechanism. At the time of writing, the only working Scherzer in Britain and Ireland is Inchinnan Bridge over the White Cart Water on the A8 near Renfrew, Scotland, <<https://www.youtube.com/watch?v=qCqBi243v1A>>.
- Associated works will include reinstatement of the ancillary railings, gateposts, stone wall etc once the bridges are repositioned.
- New high-quality paving will be laid to tie in the relocated bridge decks with the adjoining quays. The actual surface treatments of the new footpaths and cycleways will require further consideration to clearly differentiate them from the quays' existing historic fabric. One option would be to restore the stone cube surface on the bridge spans, if these have not survived below the bitumen road surface.

## **Appendices:**

1. Scherzer bridges in Ireland
- 2.1 Original drawings of Scherzer bridges over Royal Canal
- 2.1 Historical photographs of Scherzer bridges over Royal Canal

## Appendix 1: Scherzer bridges in Ireland

Eight Scherzer bridges were constructed at six different locations (fig A1.1). In chronological order they are as follows:

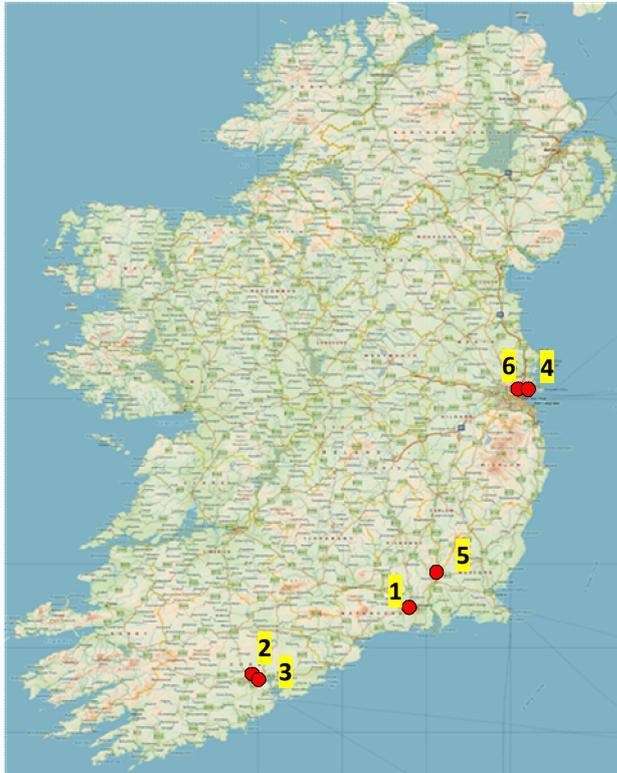


Fig A1.1 Locations of Scherzer bridges in Ireland (in chronological order).

Key:

1. Suir Railway Viaduct (1905-06).
2. Brian Boru Bridge, Cork (1911).
3. Clontarf Bridge, Cork (1911).
4. North Wall Quay, Dublin (x2; 1910-12).
5. Mount Garrett Bridge (1929-30).
6. Custom House Quay, Dublin (x2; 1932-34).

### 1. Suir Railway Viaduct Waterford

The first Scherzer bridge in Ireland was built in 1905-06 by the Fishguard and Rosslare Railways & Harbour Co to carry a single track line over the River Suir just upstream from Waterford City (fig A1.2). It comprised multiple fixed spans and a 50ft wide Scherzer opening span in the middle. The steelwork was supplied by Messrs Arrol, Glasgow. Although long defunct, much of the bridge still survives but its Scherzer section has been removed.

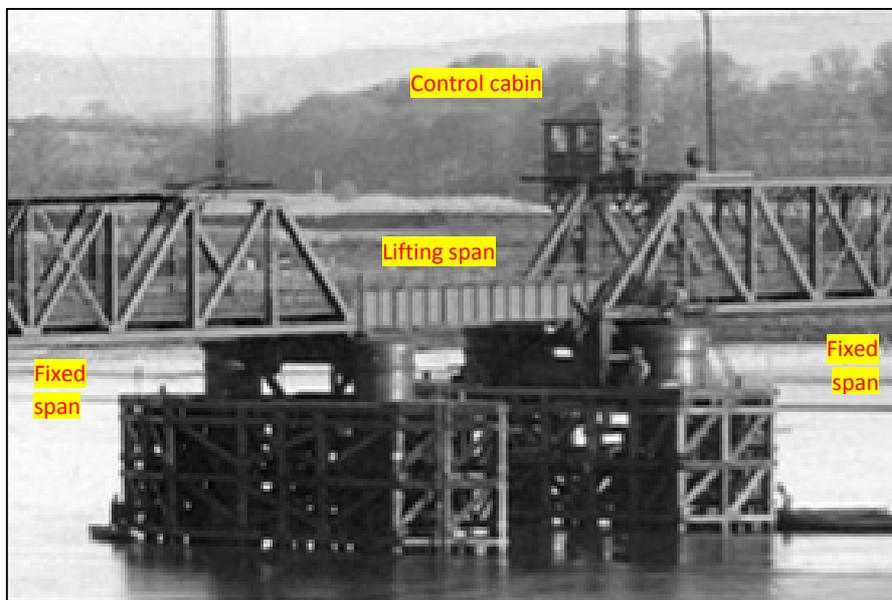


Fig A1.2 Suir Viaduct, Waterford, 1906. (Sir William Arrol Collection, Historic Scotland: Canmore SC 554594).

## 2. Brian Boru Bridge, Cork City

This bridge was completed in 1911 and opened in 1912 to carry the Cork City Railway over the North Channel of the River Lee (fig A1.3). It worked in tandem with the Clontarf Bridge, a short distance to its south. When the railway was closed in 1976, the bridge continued in use for road traffic. Around 1981, the counterweight, quadrant rollers and control cabin were removed, leaving only the actual span which now functions as a fixed road bridge.

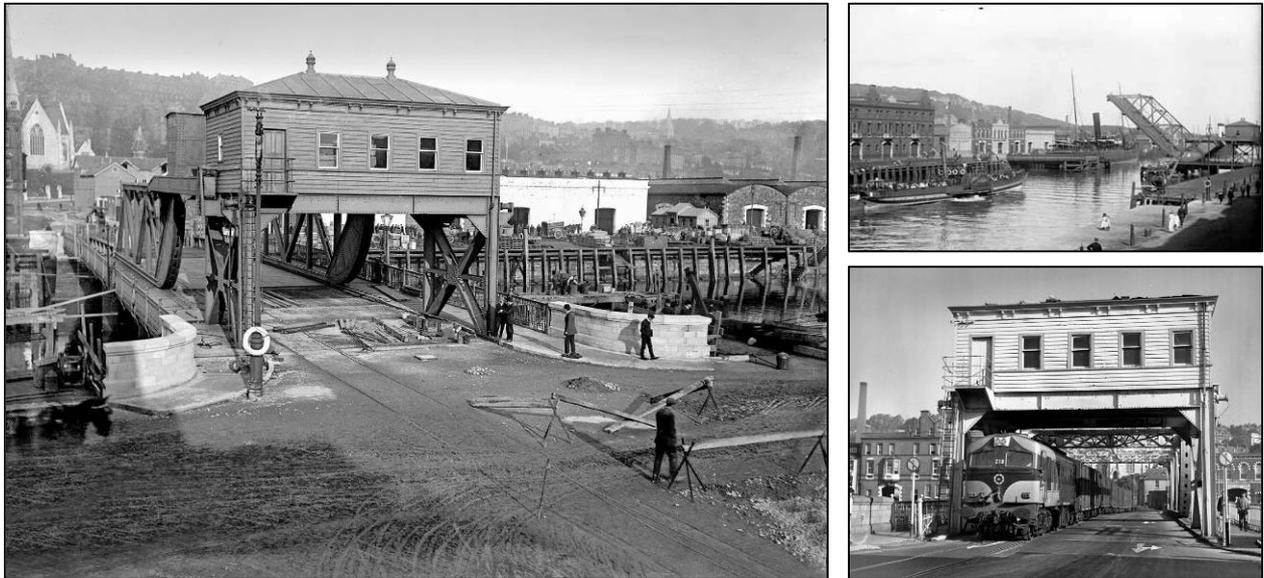


Fig A1.3 Clockwise from above: Brian Boru Bridge, Cork, 1911 (*insert credit*); Bridge in open position (*insert credit*); CIE loco crossing bridge, 1976 (*insert ref*).

## 3. Clontarf Bridge, Cork City

This bridge carried the railway over the South Channel of the River Lee but is otherwise the same in all respects to the Brian Boru Bridge (fig A1.4).



Fig A1.4 Clontarf Bridge, 1989. ([www.oldphotosofcork.wordpress.com](http://www.oldphotosofcork.wordpress.com))

## 4. North Wall Quay, Dublin

As noted in section 3.4, these two bridges were commissioned by the Dublin Port and Docks Board under the direction of its Engineer, Sir John Purser Griffith. The Inner Bridge dates to 1910-11 and the outer one to 1911-12. They are still used by road traffic and also, in theory, openable for canal traffic.

## 5. Mount Garrett Bridge

This bridge was completed 1929 and opened in 1930 to carry a public road over River Barrow on the Wexford-Kilkenny border, 3km north of New Ross (fig A1.5). It was designed by Joseph Mallagh, Engineer to Dublin Port & Docks Board, and heavily influenced by Griffith's 1910-12 Scherzer bridges in Dublin.

For a detailed technical description see Maconchy, J.K. (1932), 'Mount Garrett Bridge' in *Transactions Institution of Civil Engineers Ireland*, vol. 58, pp 147-198. This article is also on-line at <[https://www.tcd.ie/library/digitalcollections/home/#folder\\_id=1097&pidtopage=ICEI-058\\_181&entry\\_point=180](https://www.tcd.ie/library/digitalcollections/home/#folder_id=1097&pidtopage=ICEI-058_181&entry_point=180)>.



Fig A1.5 Above: Mount Garrett Bridge in 1930 (Maconchy, 1932. Left: As it is today (NIAH, 15702907).

## 6. Custom House Quay, Dublin

This pair of bridges has been discussed in section 6.4. They are of identical function to the ones on North Wall Quay but date from 1932-34. They are also the work of the Dublin Port and Docks Board, this time to the design of Joseph Mallagh, the Board's Engineer. They are the last Scherzers to be have been erected in Ireland. Although they still carry road traffic, they have lost their control cabin and the span permanently fixed in the closed position.

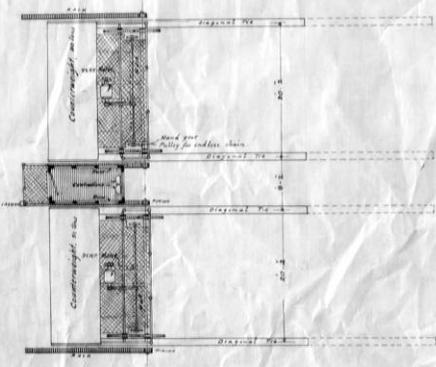
## Appendix 2.1: Original drawings of Scherzer bridges over Royal Canal

The Dublin Port Co's Archive contains the following drawings (asterisked ones are reproduced here).

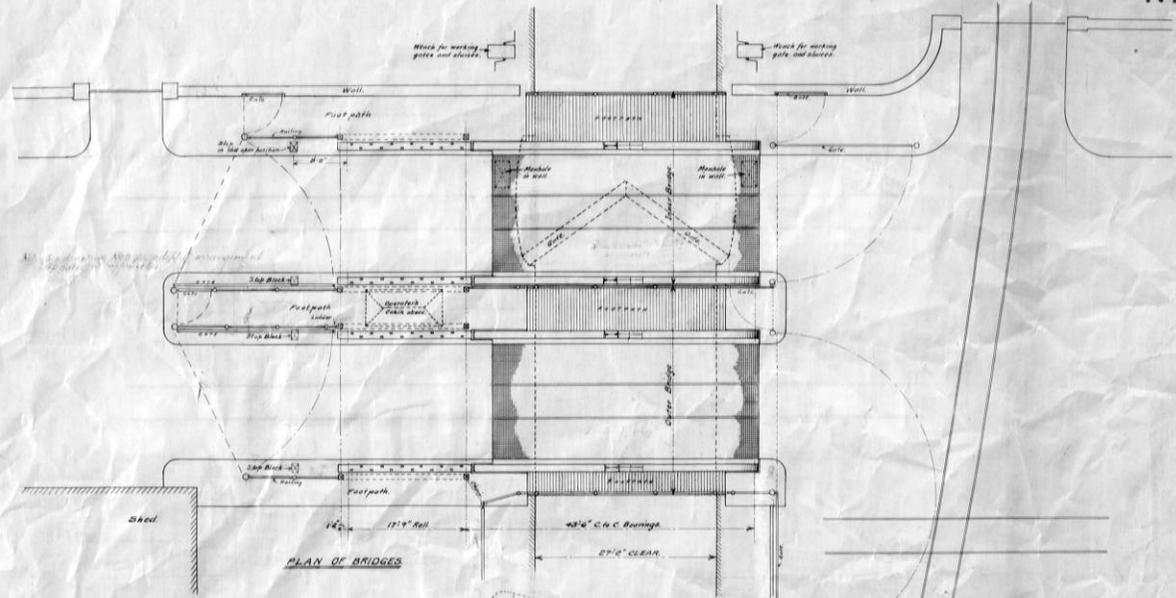
Cat.no	Content	Date
7682 *	General plans and elevations.	16 Nov 1909
7683 *	Main girder and deck sections.	10 Nov 1909
7775	Stress statistics.	13 Nov 1909
7776	Track girders and sub-frame.	11 Nov 1909
7777 *	Cabin and rack supports.	10 Nov 1909
7780 *	Gear trains.	16 Nov 1909
7781 *	Plans showing proposed sequence of construction.	9 May 1910
7782	Girder and railing detail.	13 May 1910
7799	Schematic electrical wiring diagram.	22 Nov 1910
7830	Track plate detailing.	July 1934
7837	Detail of road finishes.	31 Jan 1911

7682

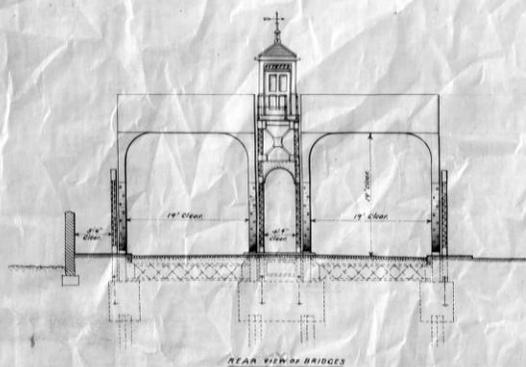
Nº 1



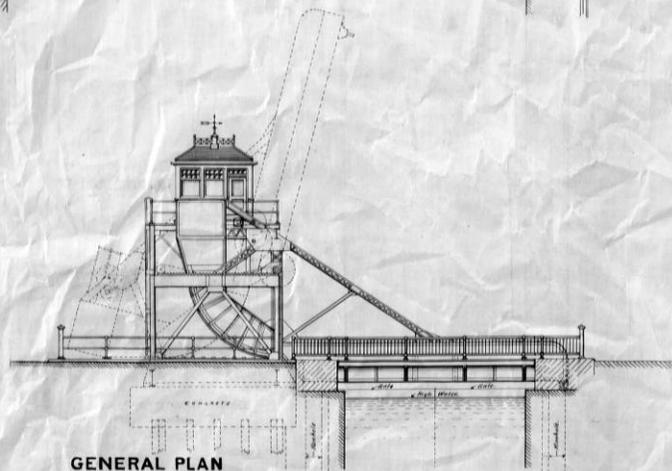
MACHINERY FLOOR PLAN



PLAN OF BRIDGES



NEAR VIEW OF BRIDGES



ELEVATION OF BRIDGES

**GENERAL PLAN**  
**"FOR TWIN"**  
**SCHERZER ROLLING LIFT BRIDGES**  
 OVER ENTRANCE TO  
**ROYAL CANAL**  
 AT  
**DUBLIN, IRELAND.**

The SCHERZER ROLLING LIFT BRIDGE Co.  
 Approved by *W. B. ...* President  
 Plan made by *W. B. ...*  
 Plan checked by *R. W. ...*  
 Correct *Wm. B. ...* Supt. Engineer

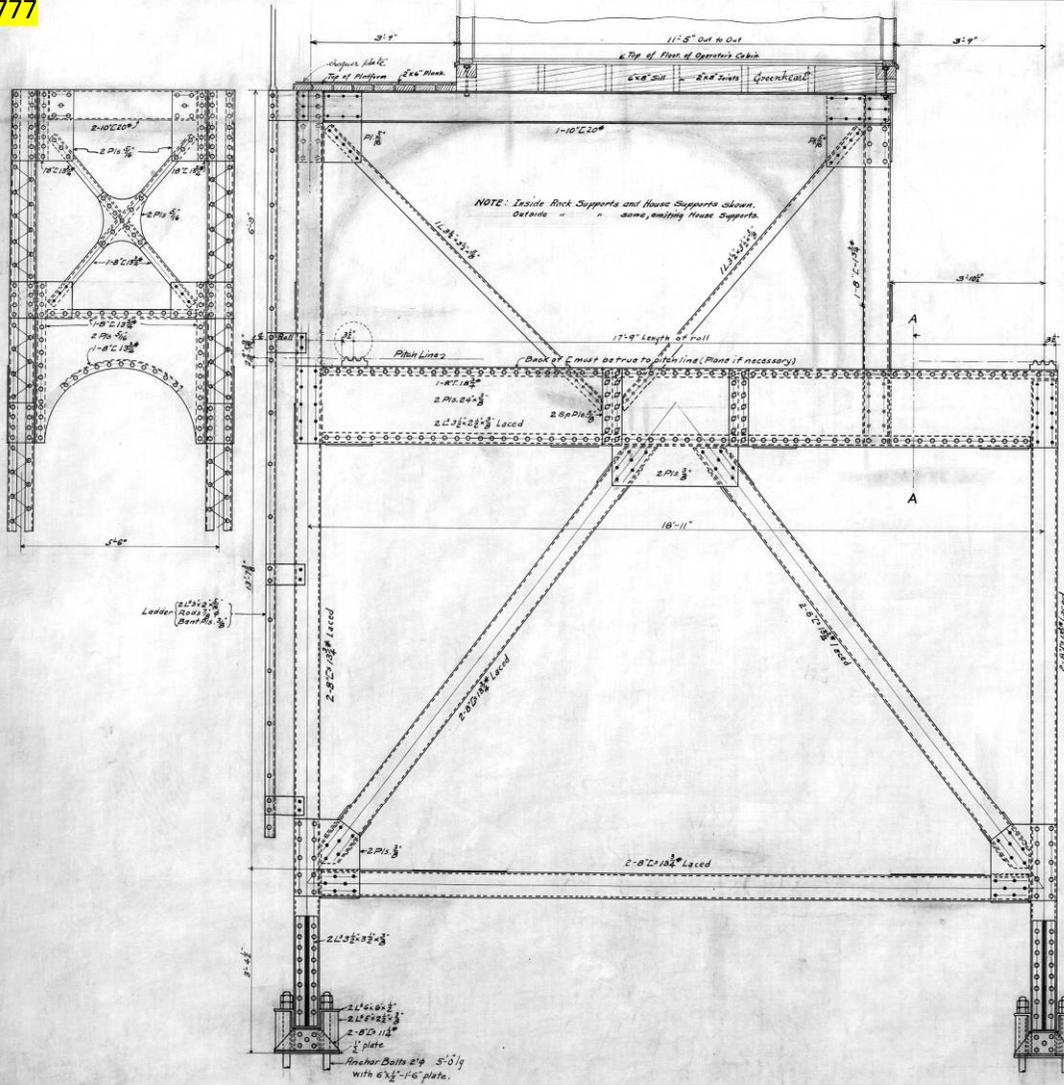
DESIGNED BY  
 The SCHERZER ROLLING LIFT BRIDGE Co.  
 (INCORPORATED IN U.S.A.)  
 INVENTED BY Wm. SCHERZER C.E. PATENTED DEC. 18. 1883.  
 PATENTS ALLOWED AND  
 PATENTS APPLIED FOR  
 NOV. 18. 1905. SCALE 1/4" = 1 FT.

U.S. PATENT OFFICE  
 No. 76 82

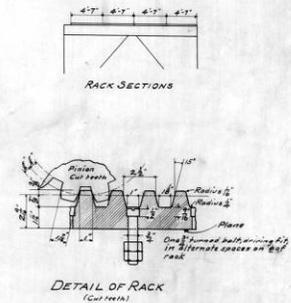
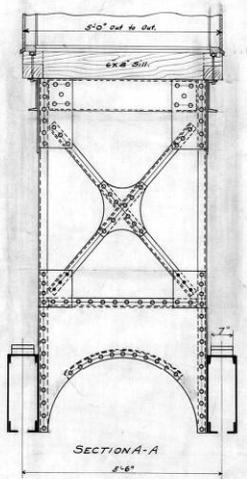
240-B-7



7777



NOTE: Inside Arch Supports and House Supports above.  
 Outside " " same, omitting House Supports.



NOTES:  
 Required 2 Cast Steel Racks per bridge—each Rack composed of 2 sections of 22 teeth each.  
 Drive both racks with rack in place and half rack to support in shop.  
 Rivets in tips of channels to be 3/4\"/>

Nº 4

1377

— PORT AND DOCKS BOARD —  
 Approved by *Abel J. Stripes* — Engineer

— THE SCHERZER ROLLING LIFT BRIDGE CO. —  
 Approved by *Wm. B. Scherzer* President  
 Planned by *H. D. R. Scherzer*  
 Plan checked by *H. D. R. Scherzer*  
 Corrected by *Wm. B. Scherzer*

**HOUSE AND RACK SUPPORTS**  
 — FOR TWIN —  
**SCHERZER ROLLING LIFT BRIDGES**  
 — OVER ENTRANCE TO —  
**ROYAL CANAL**  
 — AT —  
**DUBLIN, IRELAND.**

DESIGNED BY  
**THE SCHERZER ROLLING LIFT BRIDGE CO.**  
 188 N. MADISON ST. CHICAGO  
 Nov-10-1904 Scale: 3/4" = 1'-0"

7777

240-C-10



7781

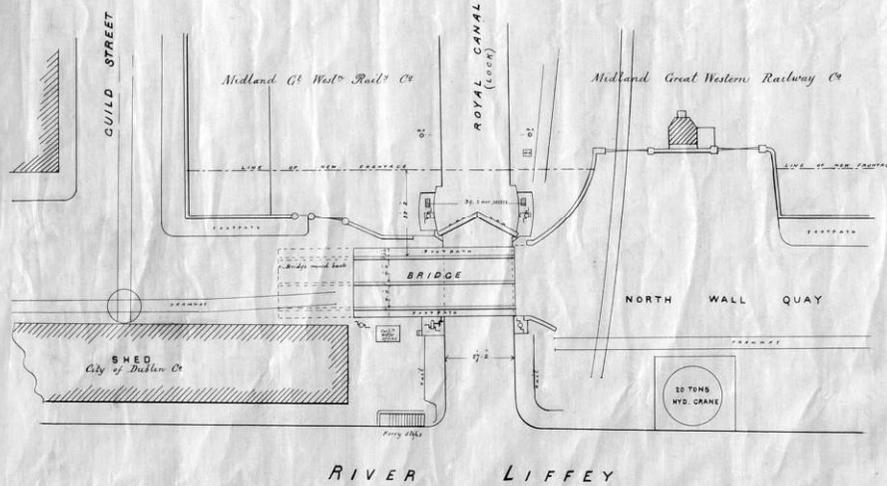
# TWIN SCHERZER ROLLING LIFT BRIDGES OVER ENTRANCE TO ROYAL CANAL.

No 9

PLAN SHEWING THE EXISTING BRIDGE & APPROACHES.

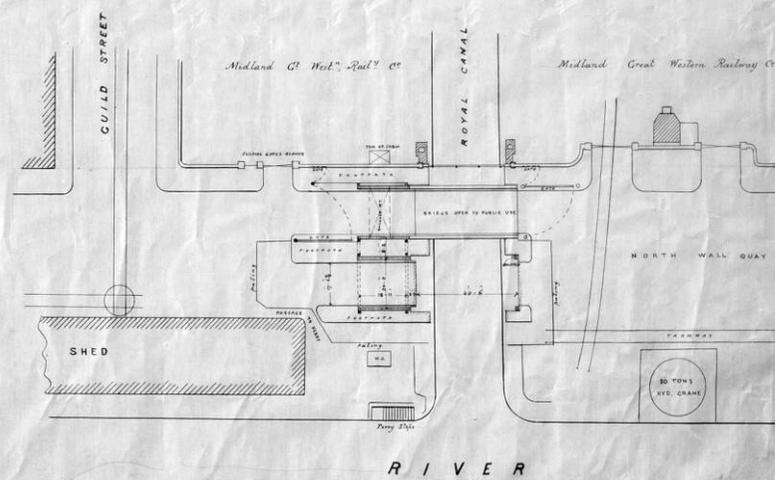
1

Scale, 3/4 inch to one foot



PLAN SHEWING NEW INNER BRIDGE OPEN TO PUBLIC USE & SITE OF NEW OUTER BRIDGE.

3



PLAN SHEWING SITE OF NEW INNER BRIDGE & APPROACHES.

2

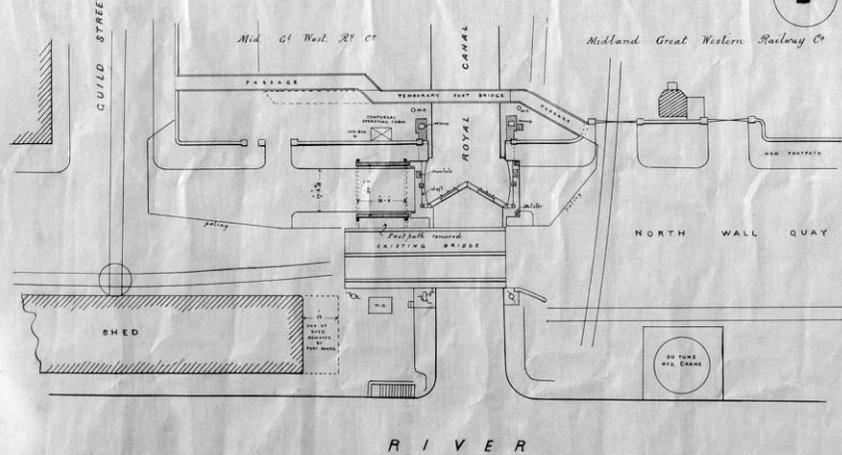
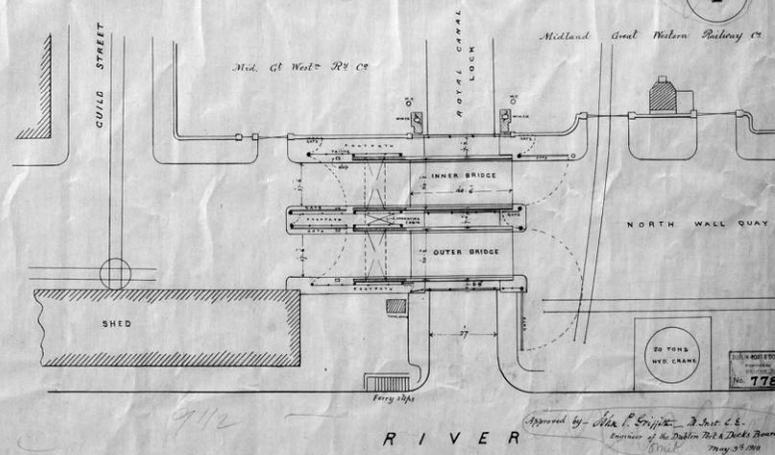


Plate No. 12

PLAN SHEWING NEW OUTER BRIDGE OPEN TO PUBLIC USE

4



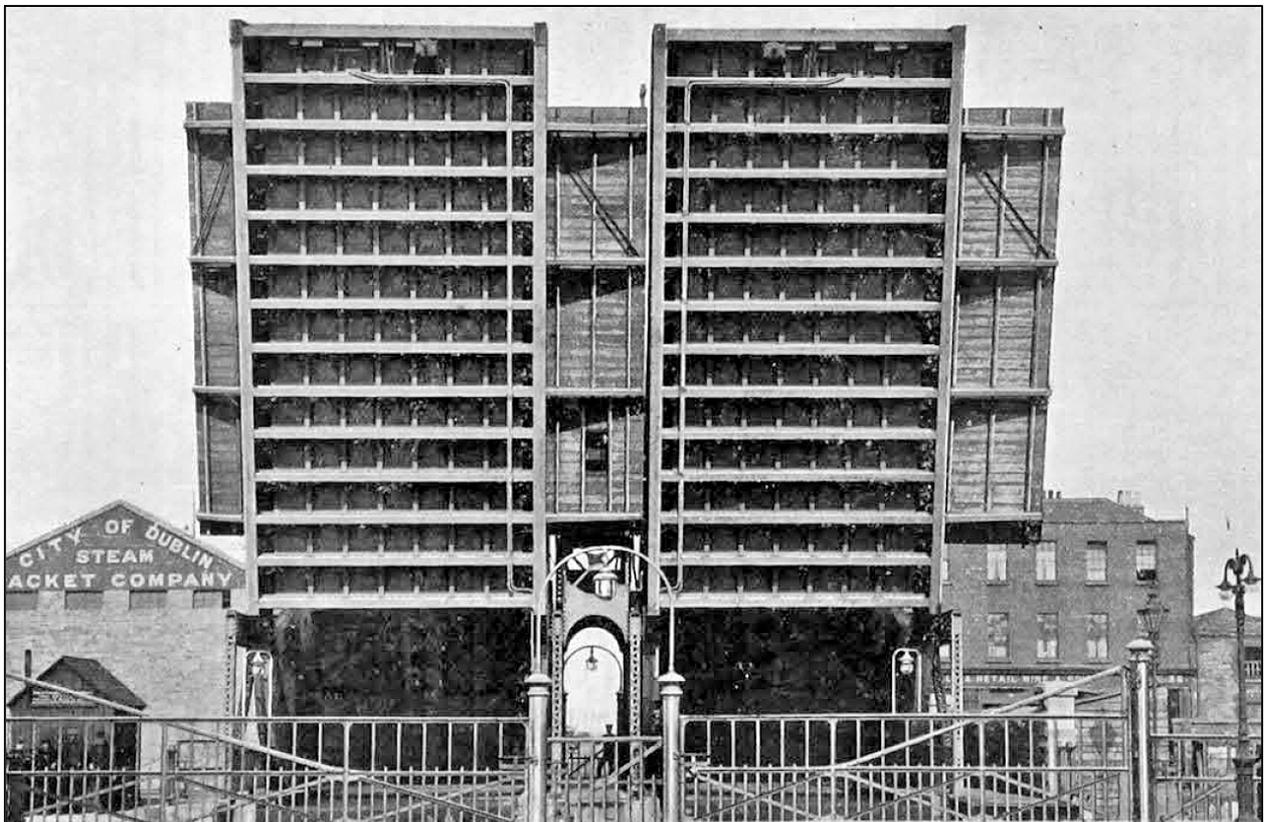
Approved by: *Wm. J. Sprague, Esq. C.E.*  
 Engineer of the Dublin Port & Docks Board  
 May 29, 1900

NO. 7781

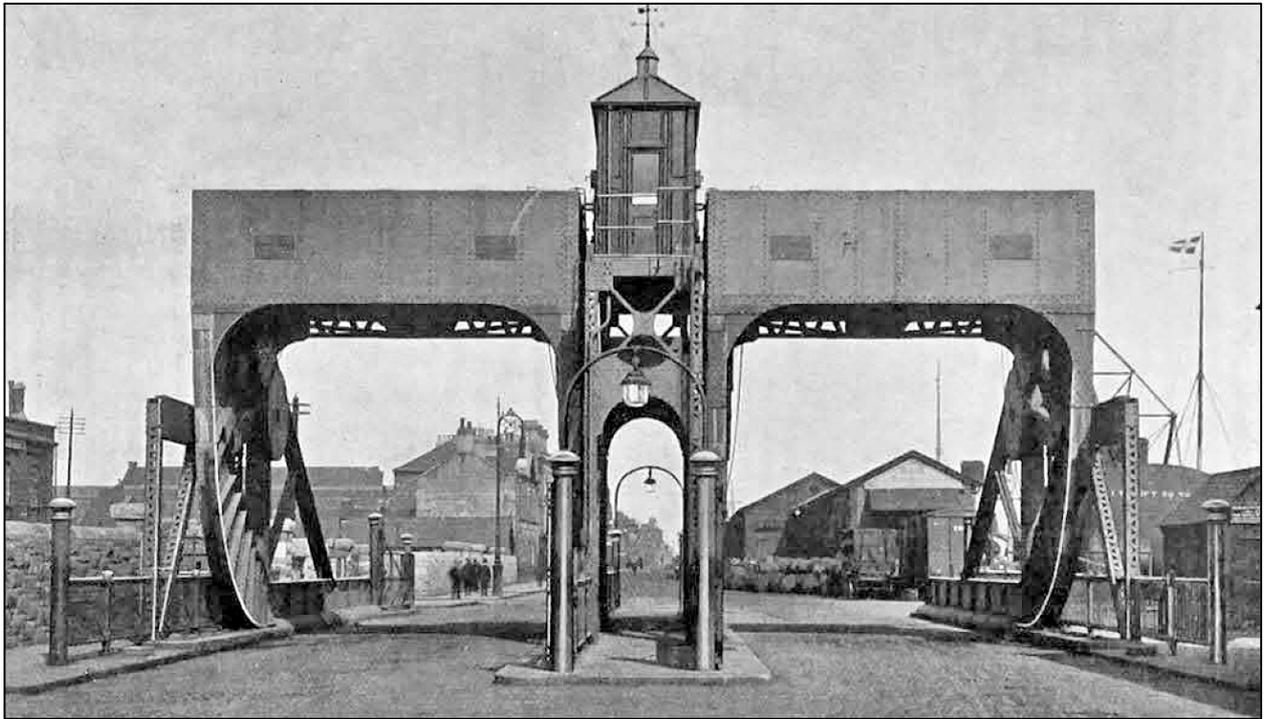
## Appendix 2.2: Historical photographs of Scherzer bridges over Royal Canal



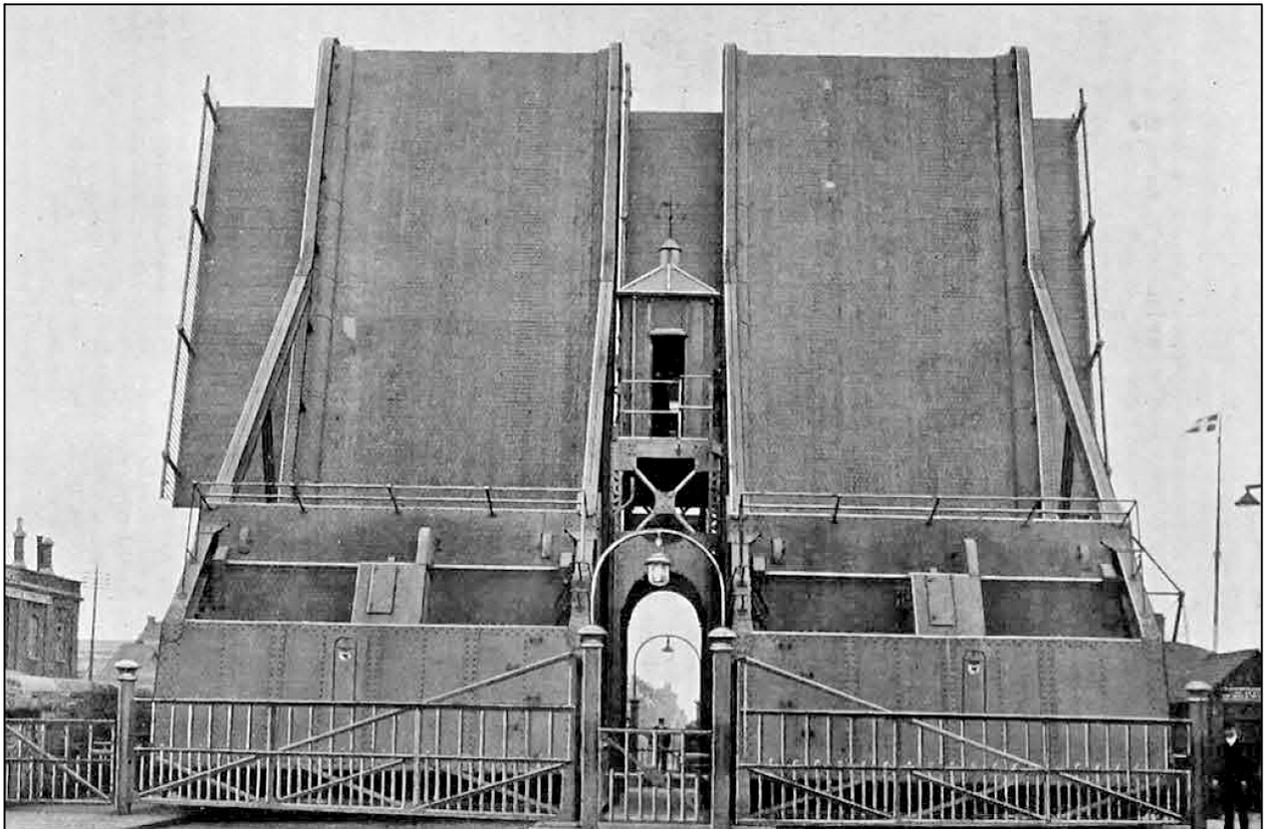
**1913** View from west towards City end showing both bridges open for road traffic. The motors which powered each of the bridges are visible half-way along each gantry in front of the overhead counterweights. (*Griffith 1913*)



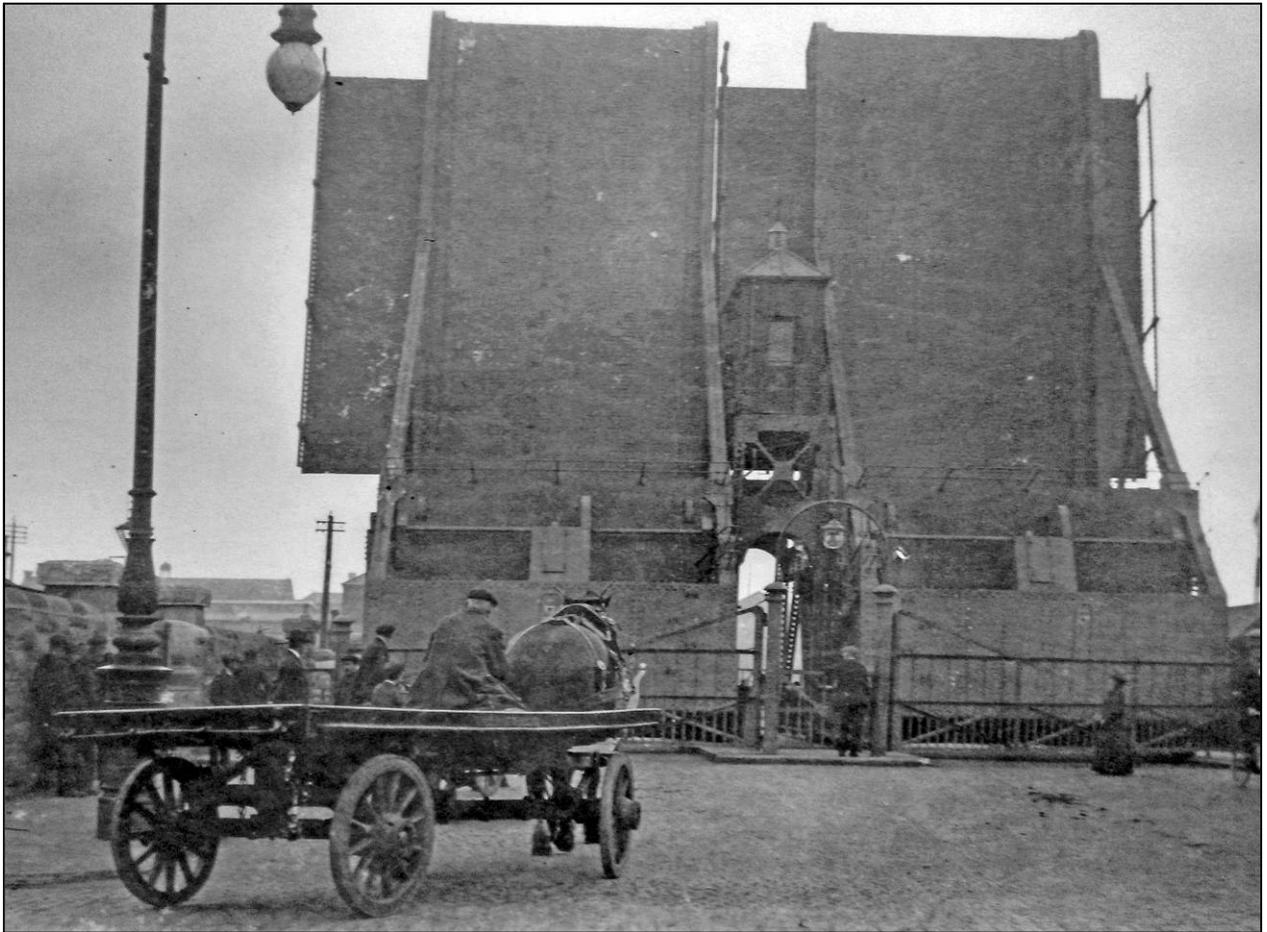
**1913** View from west towards City end showing both bridges raised to permit boats to pass through underneath. (*Griffith 1913*)



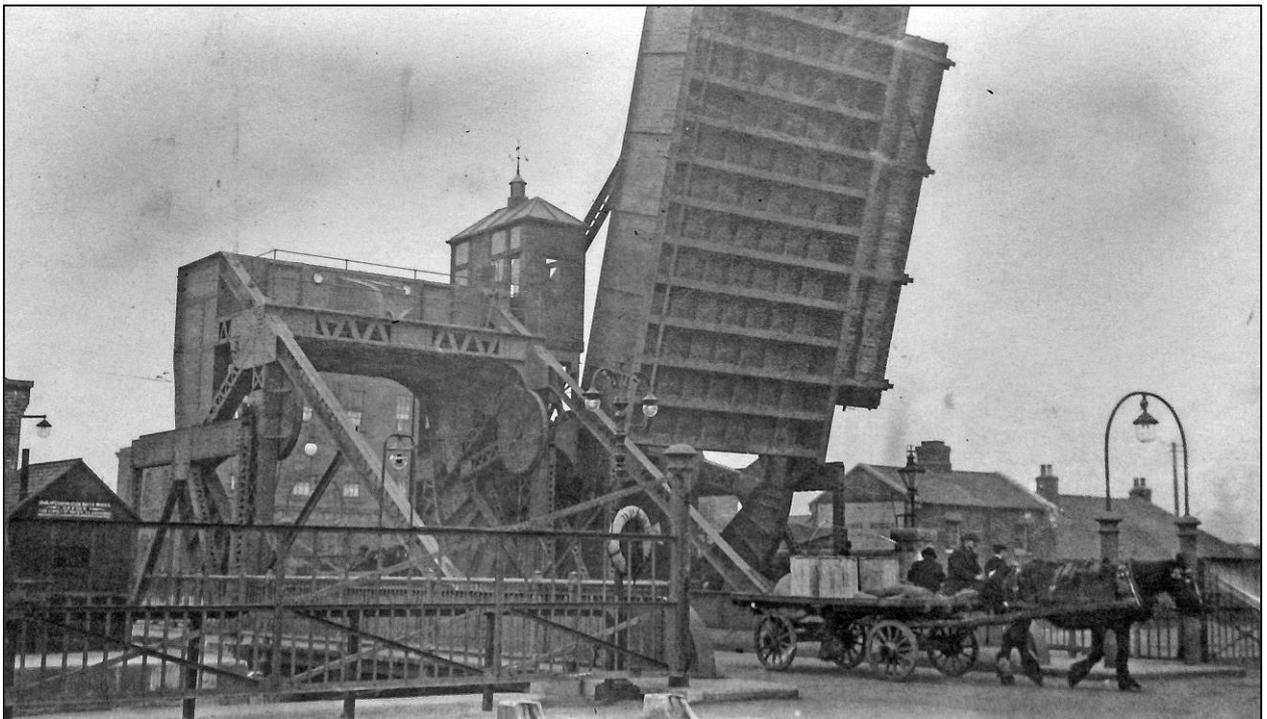
1913 View from to east from City end with both bridges open for road traffic. Note the pair of plaques attached to the faces of the overhead counterweights. (Griffith 1913)



1913 view to east from City end with both bridges lifted. The two counterweights now form a barrier to road traffic in addition to the gates. Note also the housings for the motor and gears on the platform in front of the counterweights. (Griffith 1913)



Another view (undated) of the raised spans. (DPC Archive: Image 121)



An undated view from SE with the inner span raised and the other closed. (DPC Archive: Image 122)



Undated view from City end with vehicular traffic in both directions. (*NLI Lawrence Collection, L\_ROY\_11592*)



Enlarged aerial view from NE, 1950. The original control cabin platform has now been extended towards the City end and a second cabin erected (circled in red). Note also the two winches (in yellow) which were installed to work the timber lock gates when the Inner Bridge was erected. They still exist but are no longer in use. (*Britain from Above, XAW032929*)

