

1. INTRODUCTION

The works to be carried out under the contract for Townhead Interchange Stage 1 are shown on Figure 1. They will, when completed, provide for the immediate relief of an existing traffic bottleneck caused by the convergence of three main radial routes on Glasgow City Centre. This will be no mean achievement; the significance of the project is much greater than the short-term solution of the problem, because it has been designed as the first section of an inner ring motorway round the centre of Glasgow, as shown on Figure 2. This, in turn, is an integral part of a complete motorway plan for the Glasgow area, as shown on Figure 3.

The road programmes proposed for the next 10 years will extend the Townhead scheme, both east and west, to provide a continuous motorway route across Glasgow from the Abbotsinch airport in the west to the Edinburgh and London roads in the east - incorporating the north and west flanks of the Inner Ring Road as a motorway by-pass to the City Centre. The final plan will provide a network of urban motorway routes with the inner ring motorway as its focus, and will require the construction of more than 50 miles of new road at a cost of more than £150 million over a period of some 25 years.

2. GENERAL DESCRIPTION

This scheme is the first stage of the interchange formed by the junction of the proposed Springburn Expressway, which is to be a main radial route to the north of Glasgow, the proposed Monkland Motorway, which is to be a main radial route to the east of Glasgow, and the proposed Inner Ring Road. Each of these projects is scheduled for completion at a different period of the construction programme, and the complexity of the first stage is substantially increased by the numerous sequences through which it must pass before the road system is finally completed.

The first stage will consist of about 5,000 feet of dual carriageway motor road and the construction of a new all-purpose relief road which will overpass the motorway. The motorway will fly over Castle Street which is a main north/south trunk route and in so doing will give valuable traffic relief to this congested road.

At the western end of the scheme the contract has been extended to make provision for an improved connexion with Garscube Road and Craighall Road.

At the eastern end of the scheme traffic will be diverted to Alexandra Parade (the main Edinburgh Road) by a temporary connexion which will be cut when the Monkland Motorway is constructed. A stub extends beyond this temporary connexion to provide a traffic-free platform for connexion to the Monkland Motorway; two stubs are left for connexion to the eastern flank of the Inner Ring Road and these will be used for forming an additional temporary connexion to surface streets. Two further stubs are left to provide for the construction of the ramps which will connect to the Springburn Expressway.

The end of Alexandra Parade is to be closed and all traffic routed onto the motorway by the temporary connexion and thence to Castle Street via Ramps L, R and Q; these ramps will form part of the completed interchange but some temporary work will be involved to provide the necessary connexion in the first stage.

This project will pass through three further stages before it is finally completed. The period 1965 to 1970 is to see the completion of the north and west flanks of the Inner Ring Road by three further major contracts; this will extend the Townhead scheme from an isolated project to a part of a city centre by-pass.

The period 1970 to 1975 is to see the extension of this by-pass to join with the Renfrew By-pass in the west and the Hamilton By-pass in the east and to form with them a continuous motorway route across the Clydeside conurbation. At this stage the Townhead project becomes a link in a motorway chain which will carry volumes of up to 100,000 vehicles on an average weekday.

The next stage will be the completion of the Interchange and of the south and east flanks of the Inner Ring Road. When this stage is reached connexions will have been made to all of the stubs on Townhead Stage 1 and the project will have fallen into its final place in the Highway Plan.

The fact that the scheme is designed to fit into a final and more complex plan has many immediate physical implications. Complications are caused not only by the stubs which provide for the extension of the scheme but also by the construction of several bridges which are built in advance of their actual need because their construction would become substantially more difficult when the project is opened to traffic. The sequence also affects less obvious construction matters - such as the diversion of public utilities, the provision of drainage and the details of road layout. The completed interchange will include a system of pedestrian ways and will be landscaped and planted to present an attractive appearance. The interchange itself will be lit by 100 ft high mast lighting which is being designed by the Lighting Department of Glasgow Corporation.

3. ESTIMATED COST

The estimated cost of the contract (including the Woodside 1 extension) is £3.1 million. The starting date for the Townhead contract was the 1st November 1965, the contract period being 24 months; the extension started on the 3rd April 1967, the contract period being 15 months.

4. STRUCTURES

The structures include ten bridges, six pedestrian subways and thirteen retaining walls.

Bridges

Particulars of the bridges are given in Table 1. Typical cross sections are shown on Figure 4.

The longest and most complex bridges on this contract are Ramps J East and K. East. These bridges are approximately trapezoidal in plan the skew at the east (Ramp L) end being about 70° clockwise and at the west (Castle Street) end about 40° anti-clockwise. The form of these bridges had to be such that they could be built across a major surface street (Castle Street) without closing this road to traffic and also that they could follow the line of the motorway which consisted of a straight length joined to a 5° curve (radius 1146 ft) by a spiral.

For the above reasons an in situ post-tensioned concrete box beam construction was chosen, the box beams being connected by a haunched reinforced concrete deck slab 9 in. thick.

The box beams are constructed span by span, starting at the fixed east end of the bridge. The first span is cast to 15 ft beyond the first pier and stressed. The second span is then cast and stressed to the first span, continuity being achieved by lapping the tendons over the piers. The connecting deck slab and cantilevers are then cast. The system of post-tensioning used is the P.S.C. 12/0.6 in. Freyssinet Multi-strand system.

Both abutments are closed and are of complex design due to the heavy skew of this bridge.

Retaining Walls

These are up to 30 ft in height and are generally in situ reinforced concrete cantilever walls, faced with roughly-squared uncoursed sandstone.

5. ROADWAYS

A design speed of 50 m.p.h. for the Inner Ring Road and 40 m.p.h. for connecting ramps has been used with maximum super-elevation of 7%.

Minimum sight distances have been derived, using a perception-reaction time of 1.5 s and an average rate of deceleration of 0.35 g.

The capacity of a motorway lane has been taken as 1500 passenger car units - in the absence of weaving.

The desirable maximum for gradients is 3% with an absolute maximum of 4% up and 5% down on the Ring Road and 6% on ramps.

The pavement construction on this project is as follows:

1½ in. hot rolled asphalt wearing course

2½ in. hot rolled asphalt basecourse

10 in. bitumen-bound roadbase*

6 in. upper sub-base

6 in. minimum lower sub-base

*In accordance with the recommendations of the latest edition of Road Note 29, 8 in. thickness of bitumen-bound roadbase is being used on the extension of this contract.

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TABLE 1: Particulars of bridges.

Name	Description	Skew	Structural depth	Width	Spans	Foundations	Piers	Deck construction
Royston Road	surface street	19°30'	3 ft 9 in.	40 ft + 2x10 ft	51 ft-63 ft-60 ft-41 ft	strip rock	polygonal	cellular r.c. slab with pipe bays
Ramp J Central	motorway	18°	3 ft 6 in.	36 ft	50 ft-60 ft-70 ft-50 ft	strip rock	polygonal	cellular r.c. slab
Ramp K Central	motorway	18°-20°	3 ft 6 in.	46 ft-49 ft 6 in.	51 ft-58 ft 6 in.-70 ft-49 ft	strip rock	polygonal	cellular r.c. slab
Baird Street	surface street	35°	4 ft 6 in.	40 ft + 2x10 ft	76 ft-77 ft 6 in.-59 ft-73 ft 6 in.	strip rock	rect-angular tapered	simply supported post-tensioned box beams at 15 ft 10 in. centres with pipe bays
Ramp K West	motorway	58°	5 ft	48 ft	106 ft-86 ft-60 ft	spread rock	rect-angular tapered	continuous post-tensioned box beams at 26 ft centres
Ramp J East	motorway	40°-70° 40°-64°	5 ft	36 ft	101 ft 6 in.-108 ft 6 in.-114 ft-115 ft 6 in. 104 ft-92 ft 9 in.-82 ft-102 ft 6 in.	strip rock	rect-angular tapered	continuous post-tensioned box beams at 20 ft centres
Ramp J East K	motorway	40°-57° 40°-50°	5 ft	36 ft	107 ft 6 in.-132 ft-94 ft 110 ft 6 in.-93 ft 6 in.-89 ft 6 in.	strip rock	rect-angular tapered	continuous post-tensioned box beams at 20 ft centres
Bridge 8A	motorway	0°	2 ft 6 in.	48 ft	43 ft-46 ft 6 in.-41 ft 6 in.-43 ft	strip rock	polygonal	solid r.c. slab
Bridge 8B	motorway	3°	2 ft 6 in.	48 ft	43 ft-46 ft 6 in.-41 ft 6 in.-43 ft	strip rock	polygonal	solid r.c. slab
North Wallace St Footbridge	footbridge	0°	2 ft 6 in.	10 ft	32 ft-68 ft 3 in.-68 ft 3 in.-38 ft	spread on boulder clay	rect-angular tapered	simply supported post-tensioned and r.c. spine beam