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Longton by-pass

ROAD AND BRIDGEWORKS

General description and note of progress

The Ministry of Transport and Civil Aviation

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LOCATION AND LENGTH

Longton by-pass is on the Liverpool-Preston-Leeds trunk road, A.59, some four miles west of Preston. It is 2·56 miles in length and by-passes a length of 2·9 miles of existing narrow and tortuous road which passes through the straggling village of Longton.

BRIEF HISTORY OF SCHEME

The scheme was considered to be necessary before the last war and most of the land was purchased at that time. A tender had been let and some preliminary work commenced, when construction was halted because of the war. With the increased traffic in post-war years the scheme is now even more necessary.

Certain changes have been made in standard design and layout since the first scheme. The major alterations are the deletion of standard cycle tracks throughout the length of the by-pass, increased width of carriageways and amendments to the width of the central reservation at various parts of the by-pass. In general the same line has been followed but as the overall width is now less than in the original

scheme for which the land was purchased, the line has now been swung from side to side of the acquired strip as the occasion demanded.

One beneficial result of the revised standard of layout is that land has been conserved for agricultural use.

LAYOUT AND DESIGN

The layout of the by-pass provides dual carriageways 24 ft. wide with a central reservation varying in width from 10 ft. at the south end to a nominal width of 26 ft. at the north end, widening at one point to 40 ft. to avoid excessive tree felling.

The central reservation is widened to 26 ft. at two junctions with Class III roads and one junction with an unclassified road. As two of these junctions occur at the north end, in a length on which the Preston Southern by-pass will eventually commence, the 26 ft. width is maintained between the two junctions. At these junctions acceleration and deceleration lanes are also provided. At two other junctions with unclassified roads which carry very light traffic, no widening of the central reservation or carriageways is provided.

A new roundabout, with a 180 ft. diameter island, is provided at the south end of the by-pass where it meets the existing trunk road, and the existing roundabout at the north end is being slightly modified. To meet local conditions there is one footway on two-thirds of the length, and two footways on the remainder. A short length of two-way cycle track is provided for the benefit of pupils attending a nearby grammar school.

Curvature of the by-pass varies from a radius of 3,183 ft. to 40,000 ft. and the design speed is 60 m.p.h.

Gradients vary from 1 in 250 to 1 in 30, the latter being on the approaches to the bridge which carries the by-pass over the Preston to Southport railway.

EARTHWORKS AND DRAINAGE

The land covered by the by-pass is flat in character, and consequently no deep excavation could be undertaken because of the difficulty of finding drainage outfalls; a balance of cut and fill was therefore found to be impossible. Excavated material, which is boulder clay, is used in filling under verges and footways, while for filling under carriageways burnt colliery shale is imported and compacted to a dry density of 110 lb. per cu.ft.

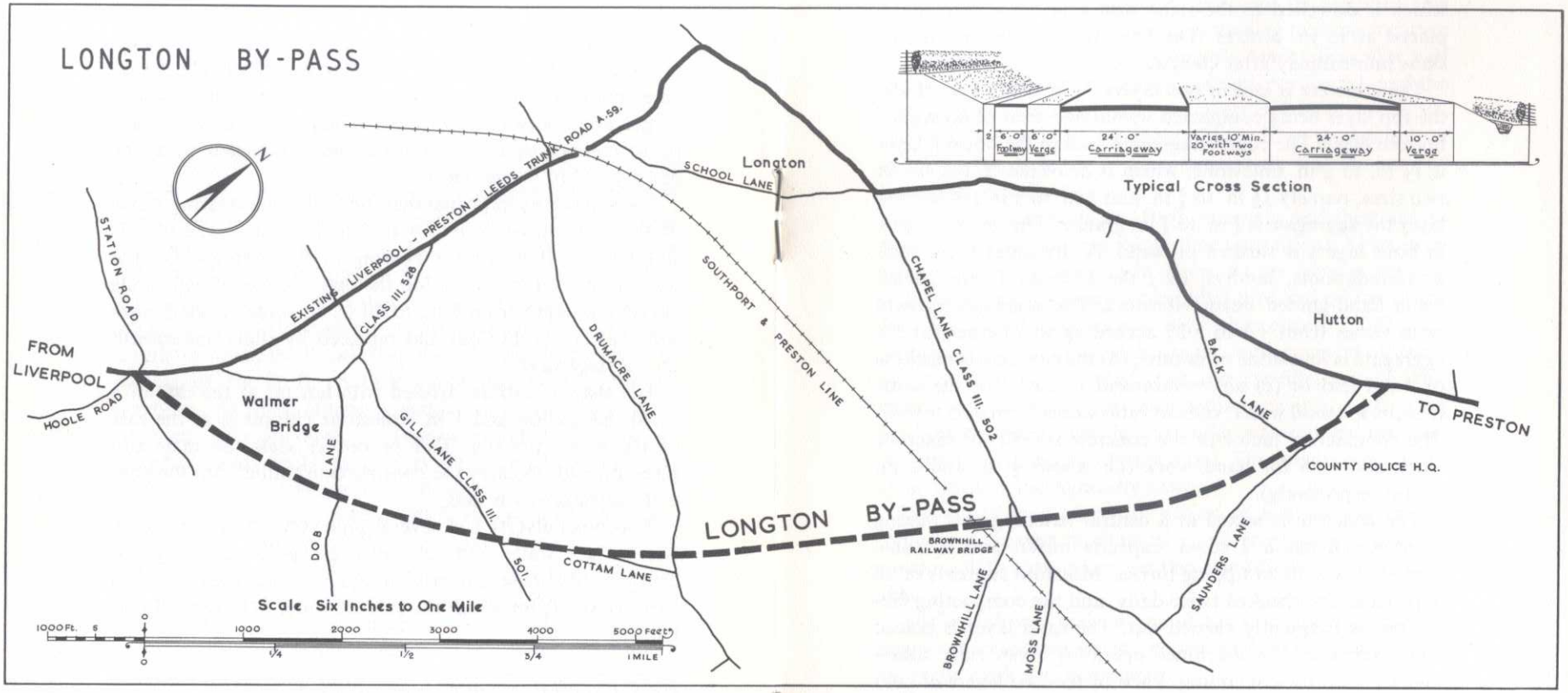
The soil survey indicated that the California Bearing Ratio of the clay varied from 2·4 to 9·6; in general the clay is suitable for filling or for bearing in the cuttings. On the formation level in excavation the clay is covered with shale varying in depth from 6 in. to 10 in. In some isolated cases soft material is dug out and replaced by shale underneath the carriageways.

The shale is surface dressed with hot tar at the rate of 4 sq.yd. per gallon and ½ in. limestone chippings at the rate of 100 sq.yd. per ton. This procedure seals the shale and gives strength to carry the construction traffic until the concrete carriageway is laid.

Two box culverts and several pipe culverts are provided, and surface water and sub-soil drainage is generally discharged into these culverts. A drain is provided for each carriageway from which the surface water is drawn off into gullies.

CONCRETE CARRIAGEWAYS

The carriageways are of 10 in. reinforced concrete of a minimum specified compressive strength of 4,000 lb. per sq.in. at 28 days, machine laid to a width of 26 ft. and constructed on a 1 in. bed of sand compacted on the surface-dressed shale. The concrete slabs are 2 ft. wider than the


LONGTON BY-PASS
N
EXISTING LIVERPOOL - PRESTON - LEEDS TRUNK ROAD A.59.
STATION ROAD
CLASS III. 528
FROM LIVERPOOL
HOOLE ROAD
Walmer Bridge
LANE
D.O.8
GILL LANE CLASS III.
501.
DRUMACRE LANE
COTTAM LANE
SCHOOL LANE
Longton
SOUTHPORT & PRESTON LINE
CHAPEL LANE CLASS III. 502
Hutton
BACK LANE
TO PRESTON
COUNTY POLICE H.Q.
LONGTON BY-PASS
BROWNHILL RAILWAY BRIDGE
BROWNHILL LANE
MOSS LANE
SAUNDERS LANE
Scale Six Inches to One Mile
1000 Ft. 5 0 1000 2000 3000 4000 5000 Feet
0 1/4 1/2 3/4 1 MILE
2'
6'-0" Footway
6'-0" Verge
24'-0" Carriageway
Varies, 10' Min. 20' with Two Footways
24'-0" Carriageway
10'-0" Verge
Typical Cross Section

carriageways to allow 7 in. × 4 in. splayed concrete kerbs to be laid on the slabs. The kerbs are backed with concrete which is dowelled to the slabs with ½ in. bars, 5 in. long, placed at 15 in. centres. The bars are hammered into the slabs immediately after compaction.

The concrete is laid in two layers 7½ in. and 2½ in. thick, the top layer being compacted within one hour of laying the bottom layer. The coarse aggregate used in the bottom layer is 1½ in. to ⅜ in. limestone, which is delivered to the site in two sizes, namely 1½ in. to ¾ in. and ¾ in. to ⅜ in.; in the top layer the aggregate is ¾ in. to ⅜ in. granite. The fine aggregate in both layers is washed pit sand. At irregular areas such as roundabouts, lay-bys, etc., the concrete is compacted using hand-guided beam vibrators. The aggregate: cement ratio varies from 7·5 to 5·25 according to whether (a) the aggregate is limestone or granite, (b) the concrete is machine or hand laid or (c) air entrainment is used; for the same reasons the total water: cement ratio varies from 0·55 to 0·47. The compacting factor of the concrete is 0·82 for machine work and 0·85 for hand work (i.e. about ½ in. and 1 in. slump respectively).

The concrete is mixed at a central batching and mixing plant which has a 2 cu.yd. capacity mixer, and is transported to the site in tipping lorries. Moisture contents of all aggregates are checked twice daily, and the compacting factor test is frequently carried out. The sand layer is placed and compacted by machines operating from rails subsequently used for concreting. Each of the two layers of concrete is laid by a separate train of plant, consisting of one spreading and one finishing machine. The surface of the concrete is brush finished, and on the lay-bys and acceleration and deceleration lanes the concrete is coloured pink by means of a coloured cement.

One carriageway is singly reinforced with 14·27 lb. per.

sq.yd. of fabric, placed on the top of the compacted bottom layer. The concrete in both courses is air-entrained to give a total air content of about 4½ per cent by volume. This carriageway is being constructed according to a specification provided by the Cement and Concrete Association. One half length of the other carriageway is singly reinforced, and the remainder is reinforced with two layers of 7·88 lb. per sq.yd. of fabric, the bottom layer being 2½ in. from the bottom of the slab. The latter is in accordance with the Ministry of Transport specification.

Expansion joints are at 150 ft. intervals, and there are no intermediate contraction joints. The joint filler is 8½ in. deep and the sealing groove 1½ in. deep. At the joint at the end of a day's work a sponge rubber fillet is placed on top of the filler for the vibrator to pass over, thus ensuring full compaction to the end of the slab. On recommencement of work, the joint filler is concreted over and the fillet groove later sawn out mechanically. At intermediate expansion joints the machine concretes over the joint filler material and the sealing groove is subsequently sawn out. The longitudinal joint, 1¾ in. deep, is mechanically sawn.

The concrete is cured by means of a white pigmented compound sprayed mechanically and provision is made for covering with tents when weather conditions are unfavourable.

A trial slab was laid on one of the side roads to test the organization and resolve any constructional problems before the main work was commenced.

The cycle track is in concrete, and the footways are finished in fine cold asphalt. Side road connections are laid on pre-mixed waterbound macadam, and are surfaced with bituminous macadam.

The Cement and Concrete Association have co-operated closely in the design and construction of the concrete car-

riageways and are providing a wet surface profilometer to measure irregularities in the finished surface.

BRIDGEWORKS

Brownhill Railway Bridge carries the by-pass over the Preston-Southport railway line. It has a square span of 26 ft. 6 in. and a skew span of 32 ft. 4½ in. and is 90 ft. 9 in. between parapets.

The abutments, pilasters and wing walls are of mass concrete faced with brickwork. The face brickwork is of 2 in. sand-faced brick with ½ in. horizontal joints in stretcher bond to accentuate the horizontal effect. The vertical joints are $\frac{5}{16}$ in. thick and are pointed with coloured mortar to match the brickwork.

The deck consists of steel beams with welded flange plates in combination with precast concrete jack arches spanning between the beams. The concrete surround is cast on the beams in the factory when they are under load. The effect of this procedure is to induce a permanent compressive stress in the concrete. The deck is provided with pipe bays for services in the outside verges and central reservation. The machine-laid reinforced concrete carriageway slabs are continued over the bridge deck.

The string course and coping to the parapet are of artificial stone.

Special fill has been placed behind the abutments, the top layer of which is lean concrete, to minimize settlement immediately behind the abutments.

PROGRESS

Work commenced in July 1956, and by the end of February 1957, in spite of the heavy rainfall during the preceding

summer and autumn, most of the earthworks, drainage and laying of the shale sub-base and the abutments and wing walls of the bridge were completed. Side road alterations were also almost completed. Some of the permanent fencing has been erected. The work should be completed by October 1957.

AUTHORITY AND CONTRACTORS

The scheme is being carried out by the Lancashire County Council, as agents for the Ministry of Transport and Civil Aviation.

The contractors are Messrs. Tarmac Limited, Civil Engineering Contractors, Ettingshall, Wolverhampton.

The amount of the tender is £451,240.