

approximately the same for ground and upper floors of sheds with suitable verandahs and served by suitable quay cranes. Delivery facilities were often designed to suit particular traffic.

Finally, on Mr Hopkins's comments, it was worth bearing in mind that finger piers, common in American ports, could not have the hinterland, which was possible in the layout of a berth constructed as a continuous wharf.

The two points raised by the ICHCA in regard to cargo handling were:

- (1) Whether any part of the port-operating work now performed manually could be done mechanically if the right kind of machine were available.
- (2) That the towing of motor-cars from parking ground to ship's side by fork-lift truck seemed an uneconomic use of the truck.

In answer to (1) many operations at present manual would be done with machines already available as and when labour became more co-operative. There were few operations which could not be mechanized because the right kind of machine could not be provided. It should be emphasized, however, that in many cases premises would have to be adapted if the best results of mechanization were to be obtained.

In answer to (2), it should be pointed out that if a gang was allocated a fork-lift truck to handle palletized cargo (as it would be at many mechanized berths), then that gang would not need another type of machine for towing vehicles to the ship's side. Such work was intermittent and the ship could not receive palletized cargo and vehicles at the same hatch simultaneously.

Road Paper No. 51

Design of road intersections †

by

Kenneth Summerfield, M.Sc., A.M.I.C.E.

Correspondence

Mr W. T. F. Austin (Freeman, Fox and Partners, Consulting Engineers) stated that the Author after considering the relative merits of the acceleration and deceleration lanes in Figs 20 (a) and (b) and 9 (a) and (b), had decided that tapered lanes "are preferable on balance, but the relative merits of the two designs can be assessed thoroughly only by experiment". Mr Austin did not agree unless the lanes were very short. It was not necessarily wise to design roads to follow the tracks of most vehicles; bad driving habits, sometimes widespread, often contributed to congestion and accidents.

If an acceleration or deceleration lane was to be effective, vehicles should accelerate or decelerate clear of the main lanes. In tapered lanes that was not so; their effect was that the vehicle concerned only partly blocked the nearside main lane instead of completely blocking it, as it would do if there were no such lane. The effect upon following traffic was the same in each case; it would have to slow down or pull out and pass. In either case that constituted a hazard. An effective acceleration or deceleration lane must be of full lane width throughout its length and must be used as intended.

The lanes should be followed or preceded by tapers, additional to the length required for acceleration or deceleration, in which vehicles could weave into or out of the main traffic stream *at the speed of that stream*.

The length of the lanes should not be fixed, but determined by specified speeds and curves of acceleration and deceleration such as those given by the Author, corrected for gradient and for type of traffic.

The taper length should be settled by design speed and could be decided by experiment. The following minimum lengths (from 0 to 11 ft wide) followed American practice:—

	Motorway	50-m.p.h. highway	30-m.p.h. street
For traffic leaving	175 ft	150 ft	90 ft
For traffic entering	250 ft	200 ft	140 ft

Those lanes were particularly important for roads on which main lanes carried fairly dense traffic at high speeds. However, acceleration lanes could be dangerous on roads carrying much fast traffic. Under such circumstances the entering vehicle, after attaining the traffic speed might not find a space into which to weave. Therefore a length of hard shoulder should follow the acceleration lane for the vehicle to slow down and stop.

The correct use of acceleration and deceleration lanes, and indeed all types of highways, could surely be promoted by a suitable modification of the early warning sign and use of the Highway Code and driving test, together with the co-operation of the motoring schools, motoring associations, motoring journals, and transport trade unions.

The experiments, rightly asked for by the Author, should be carried out with drivers educated in the correct use of the facilities under test.

Mr Benjamin Cookson (Engineering Assistant, North Riding of Yorkshire County Council) suggested that the employment of a layout similar to that shown in Fig. 24 on normal two- or three-lane single carriageways as well as on dual carriageways, might prove an effective method of reducing accidents at particularly dangerous junctions. The central margin would have to be extended for about 250 to 300 yd on either side of the junction, before merging smoothly into the single carriageway. If right-out movements still caused accidents, incorporation of a baffle feature shown in Fig. 39 appeared a possible method for slowing the movement.

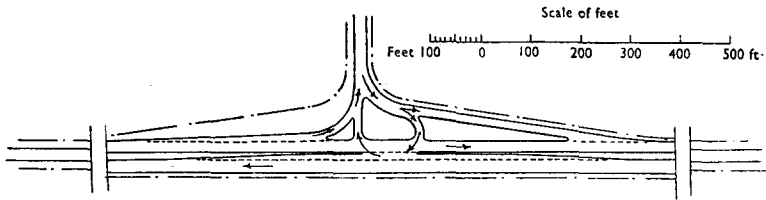


FIG. 39

Moreover, on undulating and twisty single-carriageway main roads, such short lengths of dual carriageway would considerably relieve congestion that occurred owing to the poor visibility. Their periodic use at dangerous junctions would therefore fulfil a double purpose.

In connexion with the curve radii for various speeds (Table 6), Mr Cookson also suggested the design coefficient of friction f should be adopted from considerations of passenger comfort and load safety rather than an impending skid, since in most cases those were probably the governing factors. In that connexion, observations on a 250-ft-dia. roundabout showed that the average values of f for all vehicles were 0.19 in wet weather and 0.22 in dry. A design coefficient of 0.25 or 0.30 appeared more appropriate.

With regard to the Author's omission of route numbers from the advance signs, results of the investigation he suggested, as to how far the travelling public shared his view as to their usefulness, would be valuable and interesting, particularly since that method seemed the best for conveying information at a glance.

The Author, in reply, wholeheartedly endorsed Mr Austin's plea for greater co-operation between road users and designers to ensure that the facilities provided were properly used and their purpose appreciated. He agreed, too, that it was wise to err on the generous side in the scale on which acceleration and deceleration lanes were provided. At the same time, one had to recognize that drivers were human and not automata, and therefore driver behaviour became a factor in design. From observations he had made, the Author did not believe that drivers would naturally or readily follow the course suggested by Mr Austin, but sufficient evidence could be accumulated only by full-scale trials.

Short lengths of dual carriageway at dangerous junctions, as suggested by Mr Cookson, would undoubtedly assist the right-in and right-out movements if the central margin were of sufficient width to harbour the turning vehicle, but it was difficult in practice to maintain a satisfactory carriageway alignment if a central margin of the necessary dimensions were introduced into a single carriageway, nor, in the Author's view, was it desirable that overtaking should be encouraged at a busy junction. With regard to Mr Cookson's comment on the design coefficient of friction which should be adopted, further study of driver behaviour on curves of various radii was undoubtedly necessary; the Author hoped to have the opportunity to undertake that study in the future.
