THE HIGHWAYS AGENCY TA 57/87

THE SCOTTISH OFFICE DEVELOPMENT DEPARTMENT

THE WELSH OFFICE
Y SWYDDFA GYMREIG

THE DEPARTMENT OF THE ENVIRONMENT
FOR NORTHERN IRELAND

Roadside Features

Summary: This Advice Note gives recommendations on the location, use and layout of certain roadside features with regard to traffic operation and safety. It is applicable to existing, new and improved rural roads.

VOLUME 6 ROAD GEOMETRY
SECTION 3 HIGHWAY FEATURES

TA 57/87

ROADSIDE FEATURES

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INTRODUCTION

In 1968 the Ministry of Transport, in conjunction with the Scottish Development Department and the Welsh Office produced an advisory manual entitled 'Layout of Roads in Rural Areas' (LRRA). It was to accompany the manual 'Roads in Urban Areas' published previously (1966).

Several major topics have been reviewed and updated by a series of Departmental Standards and Advice Notes notably TD 9/81, TA 20/84, TA 42/84, TA 43/84, TD 16/84, TD 22/86, TA 48/86. These documents deal generally highway link and junction designs.

This Advice Note supersedes and augments LRRA to cover those topics which have not already been superseded by other Departmental Standards for the improvement of the environment and safety on existing or new all-purpose trunk roads. Highway Authorities for other roads should find the advice contained is applicable in general circumstances and are encouraged to adopt the recommendations made. With the publication of this Advice Note TA 57/87, LRRA becomes obsolete except for recommendations concerning the elimination of roadside hazards. It is the intention of the Department to deal with these in a separate document.

SCOPE

This Advice Note is applicable to both new and existing rural trunk roads. In some circumstances the recommendations can be adopted within urban areas, however there may be circumstances when reference to 'Roads and Traffic in Urban Areas' (ref 1) may be more appropriate.

Pedestrians, cyclists and ridden horses have a right to pass along all-purpose roads. The particular requirements of these highway users should be provided for as part of the overall road design. Grade separation for pedestrians is not covered and it is intended to give advice on this separately.

References are made to related sources which should be consulted for comprehensive information on particular topics. Certain subjects, which have dispersed sources of information, are however covered in greater length within this Advice Note.

1. KERBS AND EDGINGS

1.1 General

1.1.1 In this section advice concerning the provision and placement of kerbs is given in general terms. Features which need to be considered or examined further are highlighted.

1.1.2 Kerbs accentuate the boundary between the carriageway and adjacent highway areas and can have an important function concerning drainage or structural support of the carriageway. Road markings and studs can in certain instances be used to delineate the edge of carriageways.

1.1.3 Urban all-purpose roads, urban motorways and slip roads are generally kerbed at all carriageway edges.

1.1.4 On rural all-purpose roads without adjacent footways, kerbs are not recommended other than in localised areas of particular drainage problems or in special cases where the road requires safety fencing or parapets such as on structures or in tunnels. On major roads the edge treatment will generally be 1m hard strip marked with edge lines. On minor roads this strip may be reduced to 0.3m.

1.1.5 Where kerbing is not provided on heavily trafficked roads which are unlit and have poor alignment, edge lining in accordance with table D of the Traffic Signs Manual (ref 2) should be considered.

1.1.6 Where extensive lengths of kerbing are to be placed then machine laid in situ concrete or asphalt upstand splayed edgings may be considered; the latter being unsuitable where over-running is likely to take place. The associated code of practice BS 5931 should be consulted on this topic (ref 3) when appropriate.

1.1.7 New or replacement concrete kerbs should be to British Standard 340 for standard sized and shaped concrete kerbs and edgings; straight kerbs are recommended for use except where curves of 12m or less radii are to be constructed (ref 4).

1.1.8 Recent studies of accident rates and road characteristics (ref 5) on 350 kilometres of all-purpose dual carriageways with speed limits of 60mph or more have shown by regression analysis that the presence of offside kerbs is significant. Kerbed roads in the sample have higher accident probabilities which could not be explained by any other variable surveyed. Roads with offside metre strips were found to be safer but this may have resulted from the higher design standards of modern roads with this edge treatment.

Off-Side Kerbing	With Safety Fencing	Without Safety Fencing
Present	4.74	7.56
Absent	2.77	4.12

1.2 Dropped Kerbs

1.2.1 A lowering of the kerb to the carriageway level to aid crossing by disabled persons (see section 1.8), or cyclists (see section 8.5), should be applied where private vehicular entrances, footpaths, and cycle tracks gain access to the carriageway. If a water check is required this should be limited to about 12mm high.

1.1.2 The minimum width of dropped kerb to serve Pelican & Zebra crossings should be 2.4m. Increased widths of 0.5m should be provided for each 125 pedestrians/hour over 600 up to 5.0m maximum. Intermittently high pedestrian flows, such as at exits from large buildings, may require a greater width of dropped kerb to allow pedestrians to line up on the kerb without blocking the footway at controlled crossing points.

1.3 Upstand Kerbs

1.3.1 These are required universally in built-up areas and where the carriageway has an adjacent footway. These kerbs can give structural support to the adjacent footway or verge and make road channel sweeping more effective.

1.3.2 Kerbs with full batter, i.e. splayed at 45 degrees, with around 100mm upstand above the carriageway, are appropriate for rural locations where a verge separates a footway from the carriageway and these can be used to demarcate traffic islands and roundabouts.

1.3.3 Where footways are closer than 1.3 metres from the carriageway half batter kerbs (i.e. those with twelve-and-one-half-degree batter) are normally required.

1.3.4 A kerb that is raised acts as a form of minor restraint to light traffic and can be usefully placed to reduce the risk of vehicles overrunning the verge. Where flat verge overrunning takes place at rural junctions with corner radii of 10m or less and without any adjacent footpath, raised kerbs may be considered.

1.3.5 Upstand kerbs are not generally recommended in rural areas without footways. Where positive vehicle restraint is required, safety fencing (ref 6) or, exceptionally, barrier-type kerbing (see paragraph 1.6.3) should be considered. Where kerbing may be required for positive drainage purposes on high-speed roads, the upstand should preferably be 75mm and not exceeding 100mm. A vertical upstand kerbs should not be used in these circumstances within 300mm of a running lane.

1.4 Flush Kerbs

1.4.1 These kerbs offer less danger of damage and offer little restraint to errant vehicles resulting from impact. They can serve as a means for defining the carriageway edge without requiring extra fill for adjacent verges and can be useful in areas where considerable snow-ploughing may otherwise cause damage to raised kerbs.

1.4.2 In flat areas where it is impractical to artificially create longitudinal gradients for channels or drainage, flush kerbs can be employed to allow for continuous over-edge drainage of carriageway run-off.

1.4.3 Rumble kerbs created by a serrated or ridged surface to the kerbing may be considered as one means of alerting the drivers of errant vehicles.

1.4.4 The practice of placing granite sets into the carriageway, initially flush, across the mouth of minor roads at junctions and at laybys, should be avoided wherever possible. These sets often become raised or polished and can cause a danger, particularly to cyclists and pedestrians.

1.5 Lay-bys

1.5.1 Where lay-bys are provided, kerbing should be located at the outside edge of the carriageway pavement. In the absence of existing roadside kerbing, the kerbing should start within the approach taper using a dropped kerb initially leading to half batter kerbing fully around the parking bay. The extent of kerbing beyond the parking bay will be affected by drainage and verge profile considerations.

1.5.2 Where 1m hardstrips have been added to existing roads, kerbing sited within this strip has created severe accidents involving cyclists and vehicles travelling in the hardstrip, and it is recommended that these sections of kerb obstructing the metre strip should be removed and infilled to carriageway level.

1.5.3 For type 1a lay-by (refer to section 2.4) the raised dividing island should be provided either with profiled edges on its approach nosing, or kerbed using half batter kerbs laid flat to form an incline rising 70-110m. This will allow islands to be occasionally traversed by slow-moving vehicles without damage to wheels or suspension. Under poor visibility or snow conditions, overrunning of the island is possible and therefore 45-degree batter kerb should be provided on the outside of the dividing island adjacent to the metre strip.

1.6 Roundabouts

1.6.1 At roundabouts, kerbing is recommended for the central island perimeter, the external edge of the circulatory carriageway and all entries and exits. Attention is drawn to figure 6 of the Department Standard TA 42/84 (Geometric Design of Roundabouts) (ref 7) concerning alignment of carriageways and relationship to edge lines and kerbs.

1.6.2 Deflecting islands may have continuous raised kerbs except at the points where they are crossed by pedestrian routes. Where there is serious risk of overrunning the island, such as at a layout with segregated left turn, and the delineation cannot be adequately made by road markings, then splay kerbs should be considered to limit vehicle damage. Kerbing on the central islands of roundabouts may be omitted where the layout fully complies with TD 16/84 (ref 8) and TA 42/84 (ref 7).

1.6.3 On roundabouts where approach speeds are limited to 55 kph, the use of 300mm upstand barrier-type safety kerbs can be particularly effective in preventing overrunning of footways by heavy vehicles. The use of this type of barrier kerbing is not recommended on high-speed roads and siting requires careful consideration to avoid the creation of a potential hazard.

1.7 Cycle Tracks

1.7.1 Where cycle tracks join or cross carriageways, dropped kerb flush with the carriageway should be used as carriageway edging. Concrete kerbing of 125 x 250 mm cross-section in conjunction with special dropped kerbs or 450 x 250 mm quadrants are typical for urban areas.

1.7.2 Edge kerbing around 50mm wide can be utilised to define boundaries where footpaths and cycle tracks are adjacent (see paragraph 8.3.3) where there is a difference in level of between 50mm and 100mm.

1.8 Disabled Persons

1.8.1 Highway authorities are required under the Disabled Persons Act 1981 to have regard to disabled persons when considering the provision of ramps at appropriate places between carriageway and footpaths. Dropped kerbs can pose problems for visually impaired persons and textured paving at these locations is recommended by the Department's Disability Unit Circular 1/86 (ref 9) for crossing where the pedestrian has right of way across the carriageway.

1.8.2 At Zebra and Pelican crossings, and at junctions controlled by signals which have a pedestrian phase, the kerb should dropped to carriageway level. A textured surface should be provided on the ramp and across the footway in accordance with the Circular 1/86 (ref 9). Such surfaces, which may be formed of special paving slabs, may require authorisation as a traffic sign. A textured service should not be used at side-roads with no formal crossing provision or on driveways or in conjunction with cycle tracks.

1.8.3 Ramped approaches for disabled persons should be continuous and should not be stepped.

1.9 Other Considerations

1.9.1 The British Standard Codes of Practice for Laying Precast Concrete Flag and Kerb should be consulted for detailed criteria (ref 3).

1.9.2 It is recommended that kerbs be lined and levelled along both top and front faces and be backed and founded on concrete complying with class C7.5 of BS 5328.

1.9.3 Where kerbs are not founded on the adjacent roadbase or sub-base, or footway sub-base extended 150mm beyond the back of the kerb they should be placed on an independent concrete foundation complying as above to BS 5328. Sub-base material should comply with the Department of Transport Specification for Highway Works (ref 10).

1.9.4 Stone or other suitable composite construction for kerbs may be considered in conservation areas or for lay-bys within areas of natural beauty.

2. LAY-BYS

2.1 General

2.1.1 The advice in this section is primarily for rural roads but some of the principles may be beneficially applied to urban areas. The purpose of lay-bys and/or parking places is to serve as halting places on long journeys, for broken-down vehicles, for the enjoyment of places of scenic interest and for safe parking whilst making telephone calls. For some of the purpose rest areas should be considered as a safer and superior provision.

2.1.2 Accident studies (ref 11) on certain rural trunk roads have indicated that the number of accidents involving stopped vehicles on the carriageway may be as high as 14% of all accidents. The studies were limited in extent but the conclusions indicate that the provision of lay-bys help to reduce the number of accidents and therefore lay-bys are an integral part of the general highway provision for the safe passage of vehicles.

2.1.3 The national accident statistics for rural roads for the years 1979-1985 (ref 12) involving stationary vehicles including accidents involving parked vehicles and vehicles overtaking stationary vehicles show the proportion to be 6-7% of the total and slowly reducing. The total figure (3226) is still very high and can be reduced by good design and layouts.

2.1.4 Stationary vehicles on the carriageway are a cause of accidents as well as an impediment to traffic and therefore their elimination should be the general aim. Clearway standards are desirable for all important roads and in order to apply these standard successfully it is essential to provide standing areas off the carriageway. Where clearway standards are not applied, adequate provision of parking lay-bys and bus lay-bys is desirable. Experience has indicated that where they are properly provided they are well used.

2.1.5 There is also evidence from accident statistics (ref 12) that accidents at lay-bys represent about 0.7% of all injury accidents on rural roads. Between 1979-1985 an average of 3498 injury accidents occurred each year on rural roads where parked vehicles and vehicles overtaking stationary vehicles were involved. A severity rate of 40% was recorded.

2.1.6 An average of 398 injury accidents on rural roads were recorded each year between 1979-1985 that involved vehicles entering, leaving or parked at lay-bys or hard shoulders. This included vehicles hitting pedestrians at lay-bys and hardshoulders. The overall severity rate of the accidents was 41%. These figures emphasise the need for improvements in the design of lay-bys and also serve to highlight the importance of siting lay-bys at suitable positions with adequate visibility for all road users.

2.2. Siting

2.1.1 It is essential to good design that the sites of lay-bys are determined at an early stage in the design process. Their siting should have regard particularly to horizontal and vertical alignments, and should preferably not be sited on the inside of curves or on sharp crests. They may advantageously be located at or near the bottom of gradients where downhill speeds are not too high. They should always be sited away from bridges and other structures, and it is advantageous if their surfacing can be distinctive from that of the carriageway.

2.2.2 Unless toilet facilities are provided, lay-bys should be sited away from houses, woods and adjacent ground cover to discourage fouling. Superseded lengths of carriageway resulting form local diversions of the main road or road improvements often provide suitable lay-by sites but may require greater attention to detail to prevent abuse or nuisance. (See also reference to picnic sites). If less than 2m wide the land between the superseded carriageway and the new road should be grass verge or paved.

2.2.3 New trunk route schemes tend to by-pass communities and therefore any provision of toilet facilities should be considered in conjunction with rest areas (chapter 3). Toilets should only be provided where they can be regularly observed and serviced, otherwise vandalism may take place.

2.2.4 Lay-by sties on single carriageway roads should not be directly opposite each other but staggered by at least 150m clear so that the nearside one is seen first to discourage right turns across the carriageway.

2.3 Frequency

2.3.1 The frequency of lay-by provision that has been achieved along new trunk roads is less than recommended in LRRA due to constraints imposed by junction locations, structures and alignment. This is taken into account in the frequency of provision, given in paragraph 2.3.2 below, which should be achieved for all new trunk road schemes where reasonably possible. This is recommended also for other classes of well-trafficked road. Section 2.4 below gives details of the recommended layouts for lay-bys (Types 1A-1C) appropriate to carriageway type and traffic volume.

2.3.2 For existing or opening year flow levels, lay-bys should be provided at the following intervals in each direction:

(a) on all dual carriageway roads - 2.5 km;

(b) on single carriageway roads (maximum-minimum provision):-

(i) traffic flow greater than 8000 vehicles AADT: 2-5 km

(ii) traffic flow 2500 - 8000 vehicles AADT: 5-8 km

(iii) traffic flow 1200 - 2500 vehicles AADT: 8-12 km.

2.3.3 The provision of rest areas needs to be considered in determining optimum lay-by frequency. In certain circumstances rest areas may be considered as an alternative to lay-bys where the demand for off-carriageway stopping of vehicles is high. Refer to Chapter 3.

2.4 Layout

2.4.1 The following factors can be a source of criticism in the provision of lay-bys and should be borne in mind:-

(a) Insufficient segregation from the main traffic stream on high-speed roads.

(b) Pollution caused by litter, and fouling of adjacent land where toilet accommodation is not provided.

(c) Noise, dust and fumes caused by the main traffic flow affect their function as a place to halt and relax for short periods.

(d) Safety or inadequate space because of unauthorised trading, including food caravans, some of which may be unhygienic.

(e) Blockage due to their use for overnight stops.

(f) Poor siting, particularly where close to other junctions.

2.4.2 The recommended rural road geometric layout standards for lay-bys are given in Figure 1.

2.4.3 Lay-by Type 1A is appropriate for all dual carriageway roads and for those single roads carrying a traffic flow in excess of 8000 vehicles/day AADT or where physical separation from the carriageway is needed due to high traffic speeds. Parking-bay length should be based on an estimation of local demand, within the length limits shown. A full-width lay-by should be at least 60m long where stopping buses also use the facility as described for Type 1B below. Where a high proportion of heavy goods vehicle use is expected or provision is to be made for abnormal or long loads, the parking bay should be constructed to the 3.0m width with the maximum length reasonably achievable. Advance signs to diagram 801 of the Traffic Signs Regulations and General Directions 1981 (ref 53)

with distance sub-plates are advised unless lay-bys are constructed at regular spacing along the road.

2.4.4 Lay-by Type 1B is appropriate for single-carriageway roads carrying less than 8000 vehicles/day AADT or where traffic speeds are not generally high. Where required the length of full-width lay-by may be increased to 45m to serve the dual purpose of lay-by and bus stopping place. The bus stopping area should be clearly defined by carriageway markings to prevent other vehicles stopping on it. Use of markings to diagram 1025.2 and 1025.3 as detailed in the Traffic Signs Manual (ref 13) is appropriate.

2.4.5 Standard lay-by types 1A and 1B or parking areas are not intended as bus-only stopping places. Lay-by Type 1C is the standard bus bay which is appropriate where the bus stopping place does not coincide with a lay-by position.

2.4.6 A footway may be provided adjacent to the lay-by, as indicated in Fig 1, and should be separated from the vehicle parking area by a raised kerb. The extent of kerb provision on the tapering section of lay-by should generally be the minimum required to facilitate drainage, but under no circumstances should raised kerbs encroach within the 1.0m hard strip.

2.4.7 With Type 1A lay-bys, the segregating island should be raised and of solid construction for ease of maintenance rather than grassed. This allows for occasional over-riding by long vehicles and avoids possible obstruction to visibility, caused by long grass. Kerbing on the lay-by side should be arranged to minimise the effects of vehicle overrunning during snow or bad visibility (see paragraph 1.5.3). The metre strip should be brought into the lay-by diverging lane as a protection and guide for cyclists or other users of the metre strip. For application of Type 1A lay-bys to kerbed roads the carriageway edge line shall be no closer than 300mm from the outside of the segregating island.

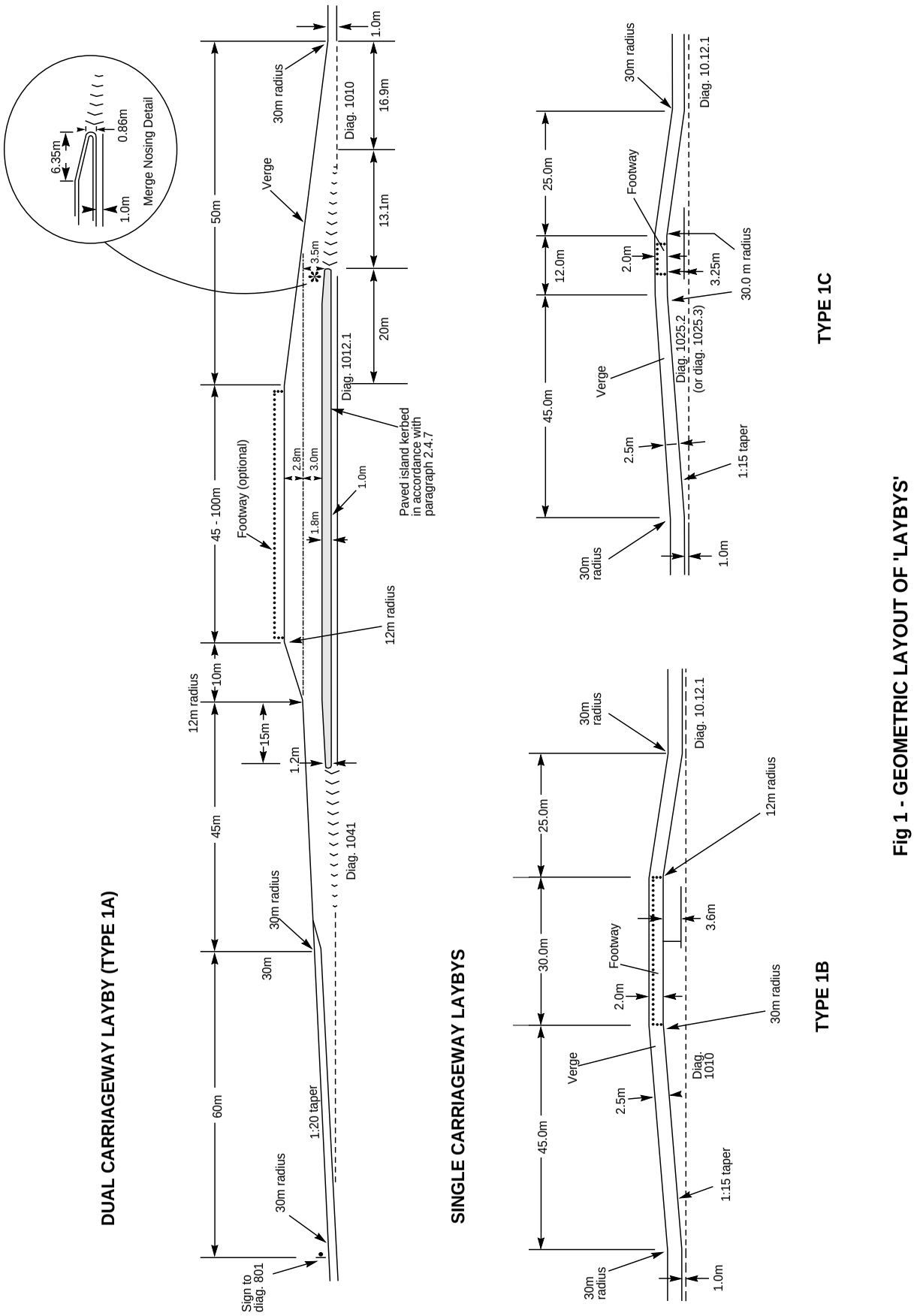


Figure 1 Geometrical Layout of 'Laybys'

2.4.8 A road-marking strip 100mm-wide may be laid at the back of the parking bay area to facilitate identification where unlit conditions exist. Where the dividing island is considered inconspicuous it is recommended that it be surfaced in a different colour to the lay-by. In situations where the lay-by is approached from a bend, consideration should be given to marking the nosing of the dividing island by reflectorised paint rather than initial solid construction.

2.4.9 Consideration should be given to inviting the telephone companies to install public telephone kiosks in lay-bys on the approaches to bypassed towns and villages.

2.4.10 Lay-bys are not intended to accommodate roadside trading although where mobile canteens are safely located and not an environmental nuisance they are tolerated by highway authorities. Where in the usage of such facilities roadside traders cause a safety hazard, various powers exist to remove them. However, such use may also indicate a need for a rest area. See Appendix 3.

3. REST AREAS

3.1 General

3.1.1 Rest areas may be provided on rural roads as a safe place for motorists to pull off the highway and leave the vehicle. There are statutory restrictions on the maximum working hours for commercial drivers who will require rest or lay-over periods of some duration. Without adequate facilities, rural lay-bys that do exist could be used to excess, thus limiting their provision for emergency usage.

3.1.2 The types of facility which can be grouped together under the general heading of rest areas include service areas and picnic areas.

(a) Service Areas include full facilities (open 24 hours) such as toilets, telephones, quick snack-type meals or restaurant facilities, car-parking, fuel station and heavy vehicle facilities. The highway authority may provide land for Service Areas on Motorways but the Secretary of State has no power to acquire land for the provision of such facilities on all-purpose trunk roads. The development of properly designed facilities on trunk roads may be allowed if these meet road users' essential needs for fuel, parking, restaurant and toilet facilities, unless there are particular safety objections to a new access to a trunk road or to increased use of an existing access which makes the development acceptable.

In general, on new all-purpose trunk roads, the aim should be to avoid the need for travellers to divert into bypassed communities to reach the facilities which they require. However, there may be in some cases be amenity or other objections to developing new facilities on the line of the new road. In these cases, or where there is inadequate provision on the trunk road itself, it may be appropriate to sign existing facilities on the bypassed roads.

(b) Rest Areas incorporating Picnic Sites can be provided on rural trunk roads. These may include toilets and facilities for the provision and consumption of meals and refreshments (ref 14). County Councils also have powers to provide picnic areas and erect toilets adjacent to those highways for which they are the Highway Authority. A maintenance interest (see paragraph 3.4.8) will be necessary for upkeep and to prevent vandalism.

3.2 Frequency

3.2.1 In determining the provision of rest areas incorporating picnic sites a route strategy is advised. A significant length of route (say 80km) should be examined for the provision of lay-bys, rest areas and also private off-carriageway stopping facilities. Preferably rest areas should be provided at not more than 45km intervals on each side of the road in addition to lay-bys and preferably no further than 30 (average) driving time apart.

3.2.2 Closer spacing may be needed on roads attracting holiday traffic or near locations such as ports, where vehicles may need to wait considerable periods of time for access to facilities where no alternative provision exists.

3.2.3 In circumstances where demand i shigh for off-carriageway stopping the construction of rest areas incorporating picnic sites may be preferred an an alternative to the usual lay-by provision. This is likely to be appropriate for recreational areas such as national parks, where the picnic area might be a journey destination rather than an interim stopping place. Such sites should be designed in consultation with the appropriate local authority.

3.3 Siting

3.3.1 Factors to be considered in choosing locations for picnic sites are:

(a) Selection of the best sites available with attractive features which will provide the designer with a clear opportunity in planning the site. Such features could be a woodland setting, water feature, interesting view or a sheltered location.

(b) The site requires the availability or construction of a potable water-supply, sewage disposal facilities and electrical supply.

(c) Location relative to the adjacent highway. All the potential rest area sites to be investigated much have safe visibility for access and departure.

(d) The possibility of using any small severed areas of land adjacent to the highway. Contractors borrow pits or spoil dumps may provide low-cost areas of opportunity.

(e) Size. Estimation of parking spaces is preferably made from local knowledge of the potential of alternative sites to meet the requirements of route strategy, recreational demands and including the prevention of accidents attributed to tiredness or misjudgment. A sample pro-forma for basic size determination is included in Appendix 2.

(f) The site should not be close to existing dwellings.

3.3.2 The precise locations of picnic sites should be determined at en early stage in the design process before the alignment and nearby junction positions have been finalised, in order to make horizontal and vertical alignment of access compatible with the main carriageway. The siting of rest areas and picnic sites should therefore be considered as an integral part of the scheme design within a route strategy.

3.3.3 Picnic sites should not be sited within 250m of the access or egress points of a junction and the design should provide for main carriageway traffic in accordance with TA 20/84 (ref 37). Alternatively, to provide for the necessary high standard of access/egress with the trunk road, site access may be combined with other public highways nearby at junctions.

This strategy has advantages on single carriageway roads, where sites cannot be paired, to lesseen the problems of right-hand turns across the carriageway.

3.3.4 The locating of picnic sites will depend greatly on local conditions and the availability of land; sometimes areas of disused carriageway can be used (see 3.4 below). It is preferable that sites are positioned on either side of a carriageway, so that a site on the nearside is reached first. To discourage drivers from turning right into a site on the offside, advance signs for the next easily available nearside site should be provided.

3.3.5 Picnic sites and rest areas are preferably located some distance away from the carriageway to minimise the effect of noise, fumes and dust caused by passing traffic on users. A degree of traffic screening can be created effectively by a landscaped 1.5-2.5m-high earth mound on land between the picnic site and the road. However, other factors, including personal safety should be considered.

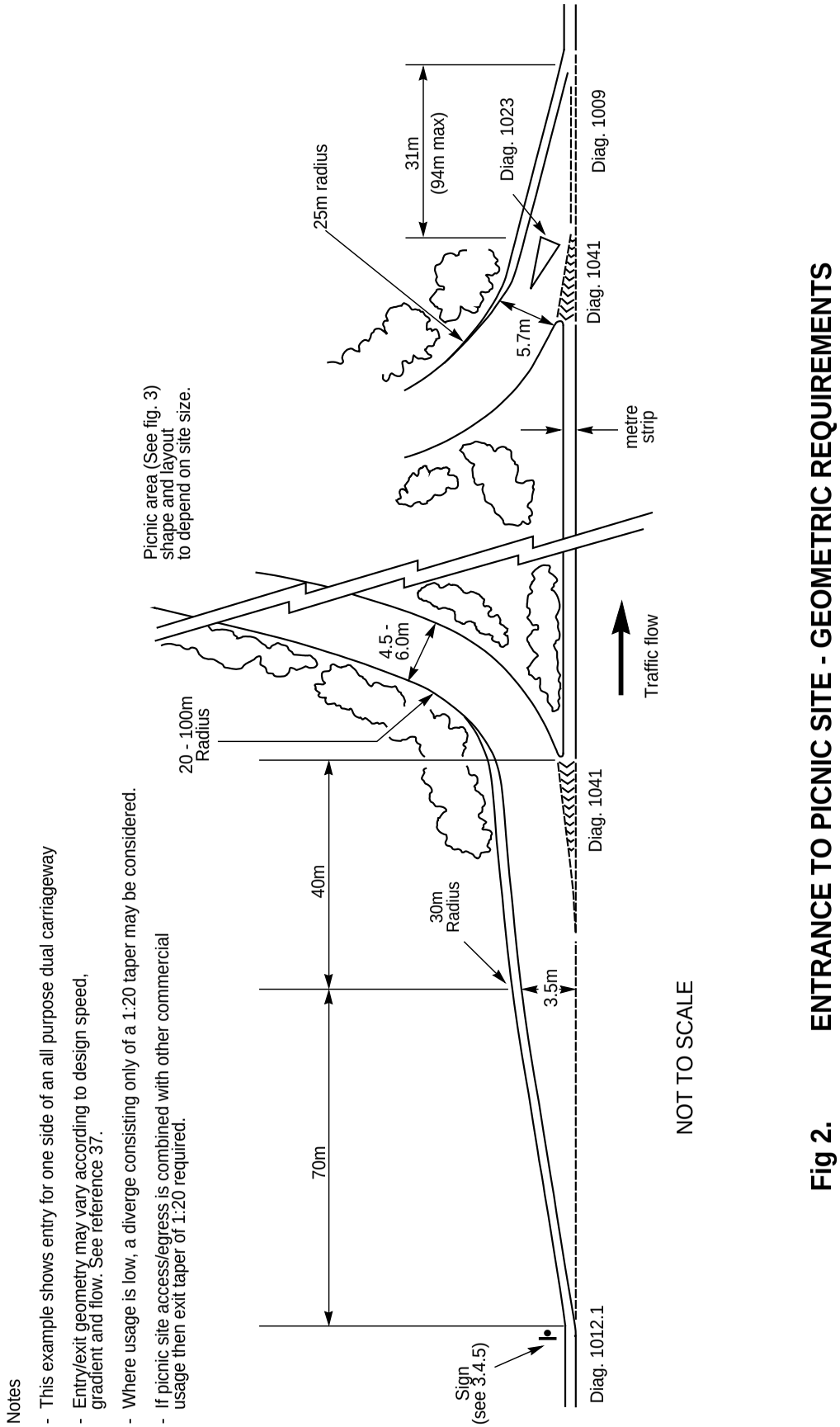


Fig 2. ENTRANCE TO PICNIC SITE - GEOMETRIC REQUIREMENTS

Figure 2 Entrance to Picnic site - Geometric Requirements

3.4 Layout and Facilities

3.4.1 The aim should be to provide picnic sites located in attractive surroundings with adequate parking facilities in separate areas for cars and heavy lorries. The parking area should be well screened to avoid unsightly intrusion on the landscape. A well designed landscape treatment of the parking area will help to create the required screen, but the parking area and the eating areas, which should be provided with picnic tables, should be within site of each other or well signposted if they are to be used effectively.

3.4.2 The geometry of the entrance into the picnic site from all high-speed roads should be as indicated in Fig 2. The exit from the picnic site should be designed to conform to the visibility recommendations of the current Advice Note for the design of major/minor junctions (ref 37). This arrangement may need to be enhanced where the site shares access to the road with any development, such as a petrol filling station.

3.4.3 Facilities at picnic sites which should be considered:-

(a) Sufficient litter bins of a suitable design and a regular collection service, preferably with the District Authority or by agreement with the concessionaries are essential. This is in contrast to the practice of not providing litter bins at lay-bys and should be part of a routine service.

(a) Sufficient litter bins of a suitable design and a regular collection service, preferably with the District Authority or by agreement with the concessionaries are essential. This is in contrast to the practice of not providing litter bins at lay-bys and should be part of a routine service.

(b) Drinking water supply and toilets should be provided at every site.

(c) The provision of robust, low-maintenance picnic tables and seats, set into concrete bases.

(d) Toilet blocks should be centrally sited, of a design compatible with the environment and of simple and robust construction with access suitable for the disabled. Lighting on low-height mounting should be provided.

(e) Cesspit or connection to main sewerage as necessary.

(f) Telephone companies should be invited to install public telephones at the larger sites, possibly in conjunction with the food selling facility. This provision could assist in emergencies and breakdown recovery.

(g) The site should be adequately fenced to prevent trespass on to adjacent land.

(h) A comprehensive information service developed in conjunction with local interests in the form of maps and diagrams is desirable. Information to be displayed should typically give details of the locations of nearby facilities such as eating places, toilets, telephones, garage services and overnight accommodation. It is recommended this notice board be sited centrally.

(i) Opportunities for the private provision of 'franchises' under the control of the highway authority.

3.4.4 In some cases, it will be possible for the picnic site to serve a secondary purpose, such as the base for forest walks or nature trails in conjunction with the Countryside or Forestry Commissions.

3.4.5 It is essential that picnic sites are adequately signed in accordance with the Traffic Signs Manual, in advance of the entrance to the site and at the entrance itself. The signs should also indicate whether or not toilets and telephones are provided at the site. Signs to Diagrams 746.2, 752.1, 801, 802.1, 804.2 and 804.3 are appropriate. (Ref 55). A limited amount of advance signing is recommended between lay-bys and nearby rest areas.

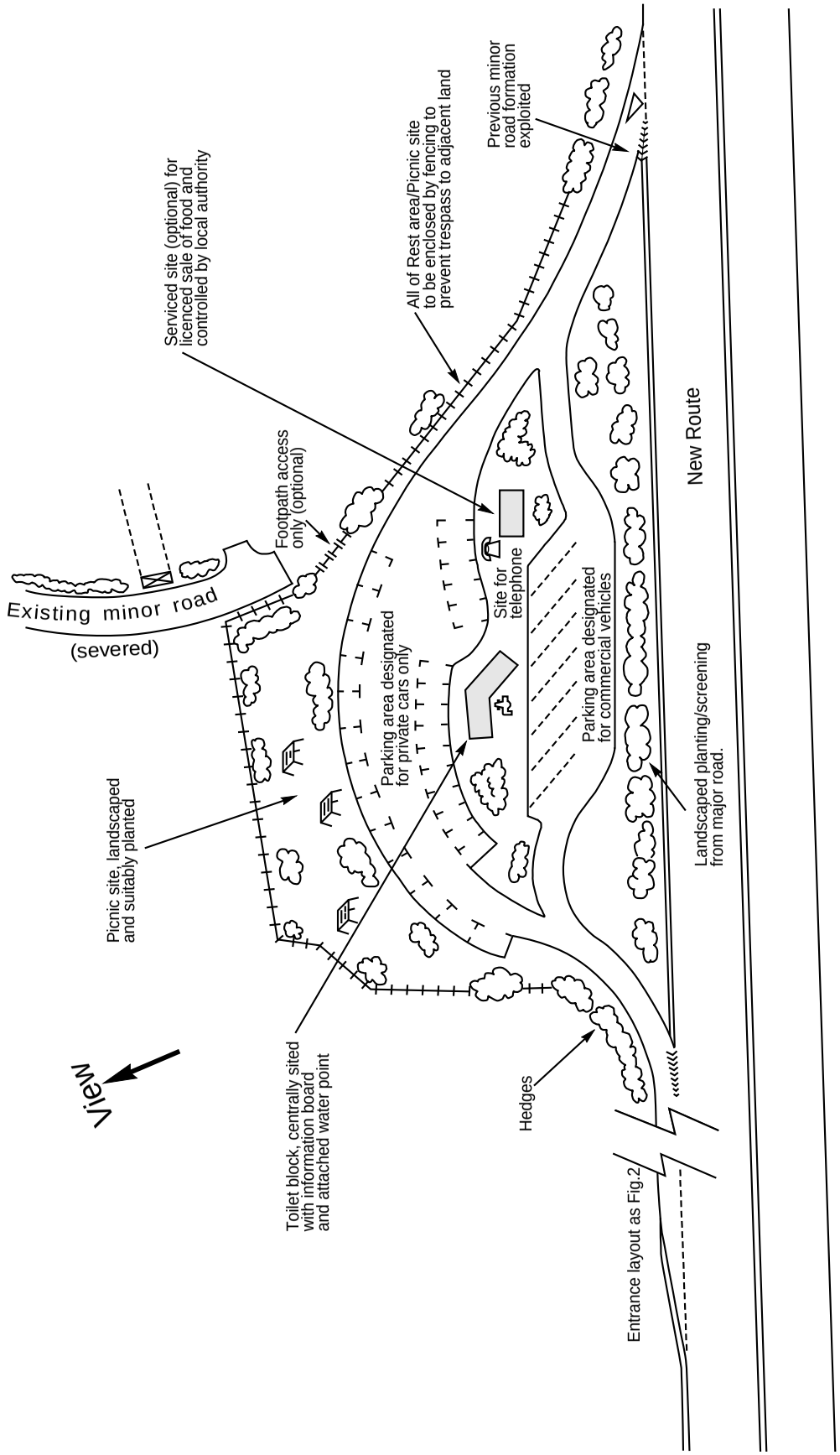


Fig .3 EXAMPLE OF PICNIC SITE LAYOUT

Figure 3 Example of Picnic Site Layout

3.4.6 Overnight stopping by caravaners or campers should not be incorporated into the design of picnic area sites unless controlled by the local authority. This should be given full consideration before the picnic area site is chosen to prevent abuse of these sites. If necessary, restrictions may need to be introduced limiting the length of stay at a site to, say, four hours.

3.4.7 Where lengths of existing highway have been superseded by new roads, surplus areas of land may exist which are suitable for use at picnic sites. A typical layout of such a site is shown in Fig 3.

3.4.8 A poor quality or neglected picnic area site will attract vandalism which is likely to then discourage further patronage of the site. It is therefore important that regular and reliable maintenance and servicing is arranged. Management of a trunk road picnic site and toilets may be delegated to the local authority. This may include the provision of buildings and licensing of trading within the site for the sale of meals or refreshments and other services.

3.4.9 Standard layouts are not appropriate as each location will have individual constraints that may have significant bearing on the design.

3.5 Other Considerations

3.5.1 Whilst the highway engineer will usually design the connections between the site and the road, it would be appropriate for a landscape architect to advise on detail and a zoning plan for the internal layout in order to provide the best arrangements.

3.5.2 As in the provision of traffic signs, the expenses of providing rest areas and picnic sites are not susceptible to individual cost/benefit justification locally. These sites are provided to serve perhaps 45km of road particularly for the longer distance traveller and as a result of the legislation restricting continuous driving hours. Some direct local benefits that may be identified are reductions in verge re-instatement at over-used lay-bys, and related accidents due to stationary vehicles not being able to park off the running carriageway (see paragraph 2.1.5).

4. PEDESTRIAN GUARDRAILING

4.1 General

4.1.1 In both rural and urban areas, highway designers should balance the needs of pedestrians with those of vehicular traffic. The choice of a particular highway feature should be on consideration of the benefits and costs to all road users. Guardrailing should be used to assist, rather than to impede, pedestrians by channelling them to the point at which they may cross in greatest safety and its use should therefore be carefully considered.

4.1.2 The use of pedestrian guardrailing on rural roads is not as extensive as on urban roads and is usually associated with Pelican Crossings and less frequently, Zebra Crossings, footbridges and subways. Advice on the design of these crossings is contained in the current Departmental Advice Note and Standard TA 51/87 and TD 28/87 (refs 15 & 16). The function of guardrailing is to prevent pedestrians stepping on to the carriageway near locations where safer facilities exist and to guide them on to the crossings. The minimum length of guardrail to achieve this is 10m at each side of the crossing, but longer lengths are effective if circumstances allow, provided an excessive detour is not created from the pedestrians' intended route of travel.

4.1.3 Guardrailing between carriageways may act as a deterrent to crossing the road at unsuitable places but should be used with caution (see also paragraph 4.3.2). It is generally less effective than barriers sited on the footway. Footway widening may be necessary to provide a 1.2m desirable minimum footway width before guardrails are erected. It is good practice to set guardrailing in a paved strip, rather than in grass to avoid mowing problems.

4.1.4 Where long lengths of barrier are planned, gates or removable panels may be needed to allow loading and unloading in urban locations. The effectiveness of the guardrailing is lessened if gaps are left open.

4.1.5 At school exits guardrailing should be located to prevent 'run-out' accidents and should be extended to a safe crossing or roadside pick-up point. At locations where large numbers of small children are likely to be contained adjacent to the road crossing points, special guardrailing which gives improved visibility is desirable (see paragraph 4.2.2).

4.1.6 At bus stops the railing should fully contain the queuing length and where street furniture requires a break in the railing the gaps should be small enough to prevent the passage of pedestrians.

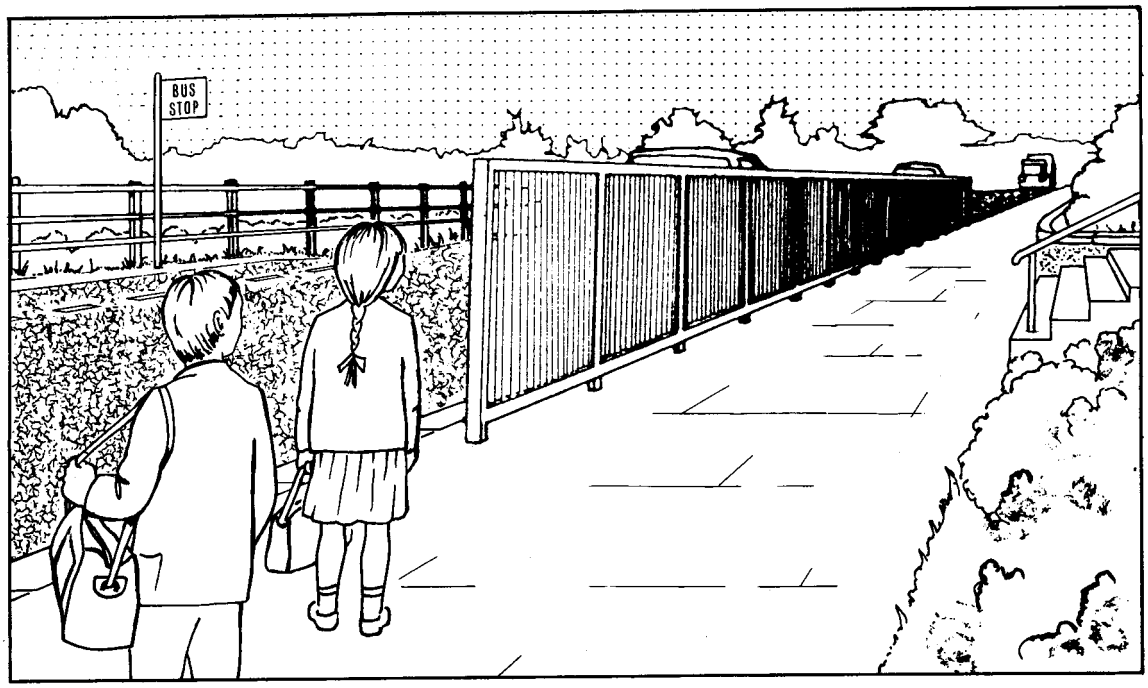
4.2 Design Features

4.2.1 Guardrailing should comply in all respects with the current British Standard No 3049 (ref 17).

4.2.2 Care should be taken in the design and location of pedestrian guardrailing to avoid obstructing inter-visibility between drivers and pedestrians of all ages and heights. Preference should be given to those designs which afford increased visibility. An example of such a design is illustrated in Fig 4 where the infill panel is arranged to maximise visibility.

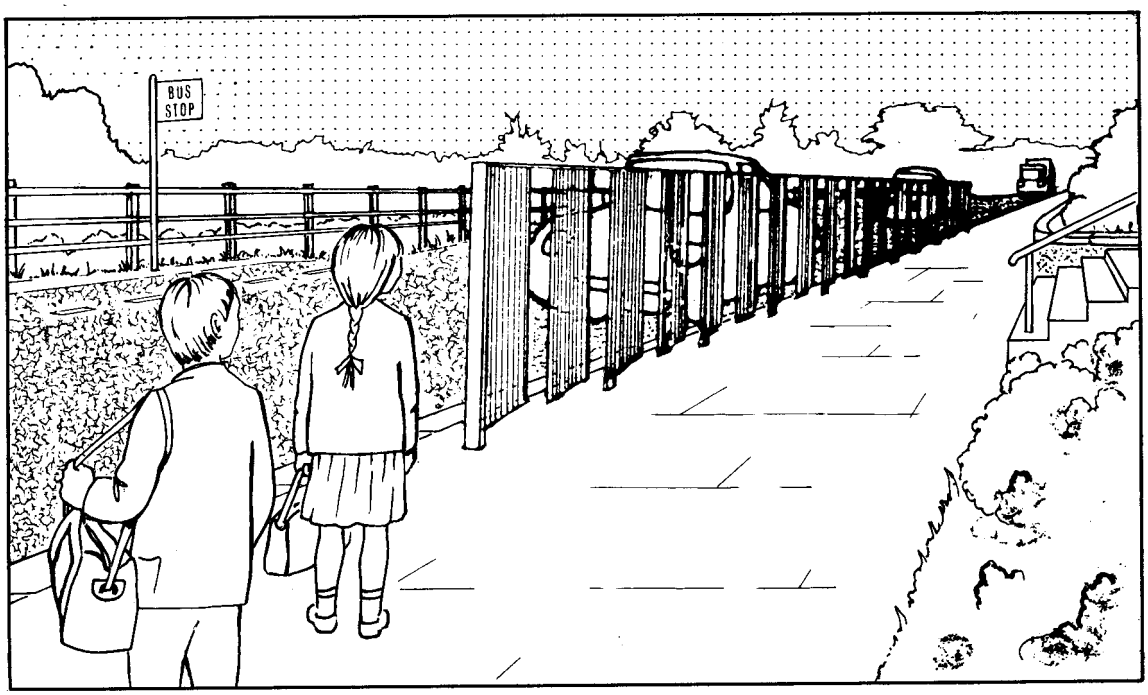
4.3 Safety Considerations

4.3.1 The use of pedestrian guardrailing, properly designed as described above, helps to improve pedestrian safety by restraining the pedestrian. However, it must be emphasised that pedestrian guardrails do not provide full protection from a vehicle impact. Its use also constitutes a potential hazard to vehicles and their occupants in a similar manner to other roadside furniture, particularly in view of its continuous linear nature and its proximity to the edge of carriageway (450-600m usually).



POOR VISIBILITY

- Conventional railing masks lateral visibility at a pedestrian crossing point for children.
- Similar restrictions to safe sight distances can also occur at road junctions particularly where the railings follow a curve.



IMPROVED VISIBILITY

Note : A variety of propriety railing designs exist which offer enhanced visibility, this example does not preclude the usage of other railing designs.

Figure 4 Examples of Guardrail Design

4.3.2 On roads designed for speeds above 60 kph the guardrailing and its end posts should in general be protected by safety fencing provided in accordance with the current Departmental Standard TD 19/85 (ref 6). The gaps for pedestrians crossing the road must be maintained; so protection by safety fencing throughout the length of the hazard is not possible. The preferred layout for guardrailing with safety fencing on single and dual carriageway roads is indicated in Figure 5 and should be provided in new construction and at new pedestrian crossing installations where guardrailing is used.

4.3.3 At sites where space is limited, and where the extra space required behind the safety fencing is not available, consideration should be given to providing safety fencing as illustrated in Fig 6.

4.3.4 The clearances between the safety fence and the guardrail should not exceed 250 mm to prevent children walking along this gap. Depending on available space a Departure from Standard TD 19/85 may be considered to bring the guardrailing within 50mm of the back of the safety fence but with this minimum clearance vehicular impact of the safety fence can affect the guardrailing. Compliance with paragraph 4.2.1 above is important if secondary damage is to be minimised.

4.3.5 Full clearance between barriers in accordance with TD 19/85 (ref 6) is desirable when the guardrailing also protects highly vulnerable pedestrians such as those with mobility handicaps.

4.3.6 In rural locations the effect of guardrailing can be an environmentally sensitive issue and account should be taken of this aspect when considering guardrail provision.

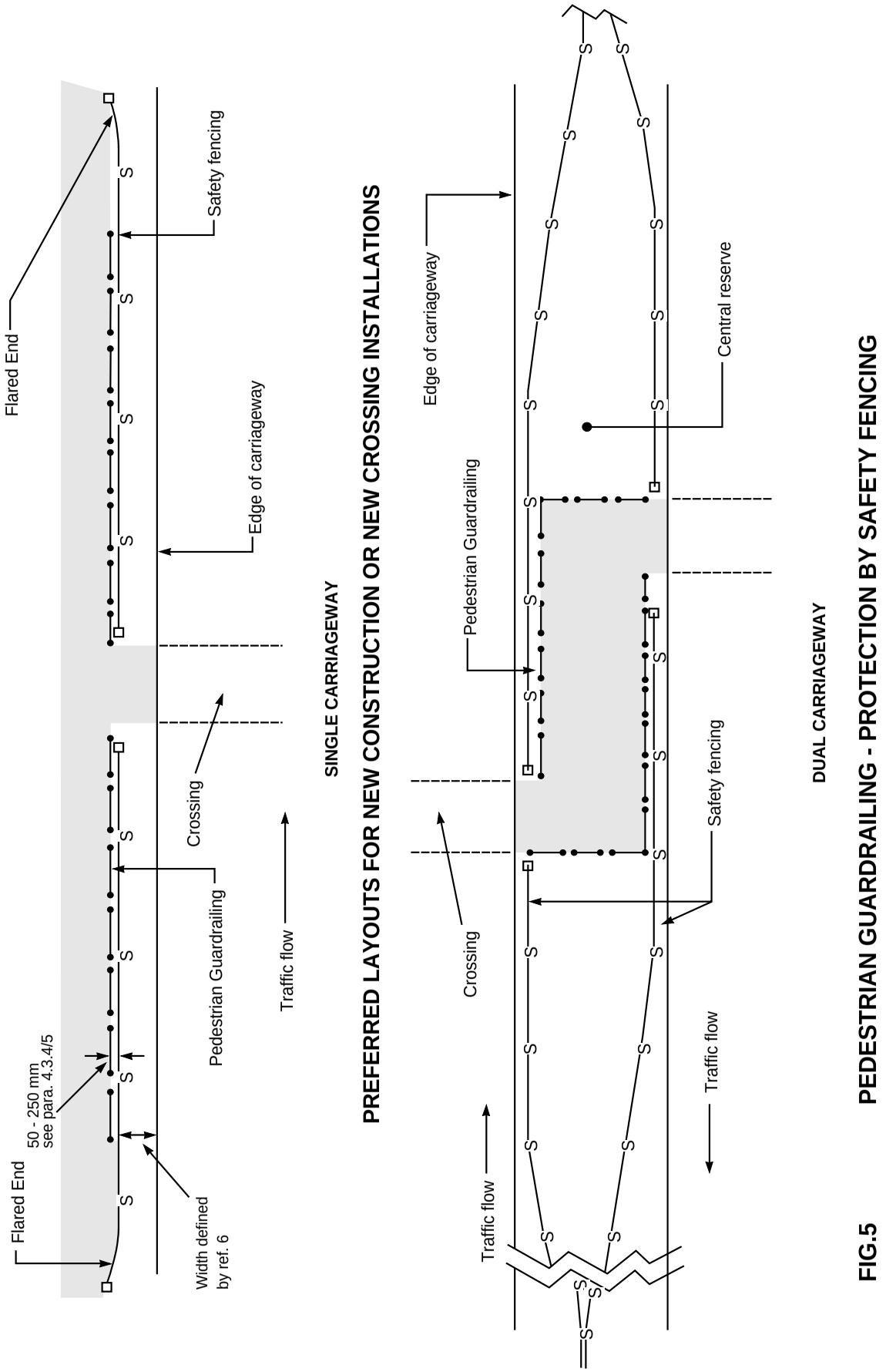


Figure 5 Pedestrian Guardrailing - Protection by Safety Fencing

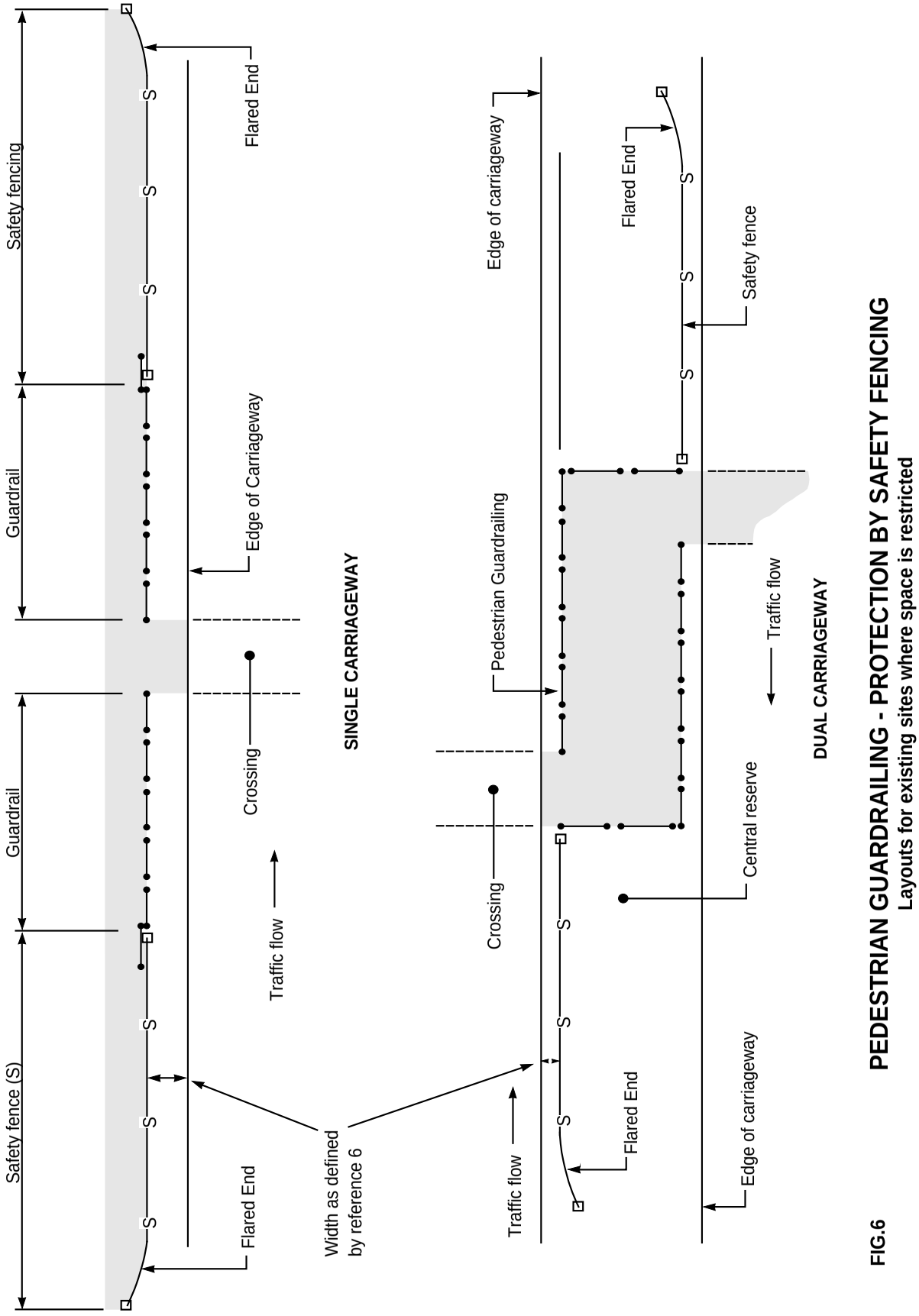


Figure 6 Pedestrian Guardrailing - Protection by Safety Fencing
Layouts for existing sites where space is restricted

5. ANTI-DAZZLE FENCES

5.1 General

5.1.1 The advice given for this topic is applicable to both rural and urban roads.

5.1.2 The purpose of an anti-dazzle fence or screen is to cut off light from oncoming vehicle headlights. They should be designed so that light directed towards the driver at oblique angles (12 degrees to 20 degrees) is reduced whilst relatively open vision (around 70 degrees) is maintained in the sideways direction. The minimum height to effectively screen light from all types of vehicles including lorries is around 1.75m.

5.1.3 Screens can be made of expanded metal mesh, or of a knitted polyester matrix supported on posts and lockbars. Where a screen is to be erected in a grass verge is is desirable that it is set in a paved strip to avoid grass mowing problems. Screens of angled vanes made of dense polyethylene mounted at 0.8m centres (ref 18) have also been found effective in meeting anti-dazzle requirements in the central reserve of a divided rural highway.

5.1.4 Research (ref 19) carried out on central reserve fencing showed no major objections to coloured vanes. Most drivers were not even aware of the screen.

5.1.5 The effect of barrier shyness (ref 20) caused 3% of all car drivers in the middle and offside lanes of a D3 motorway, to change their position away from the fence of distances between 150-250mm. Anti-dazzle fencing has been recorded as creating extra usage of mainbeam lights to the extent that drivers of preceding vehicles are aware of this. However, there is no significant difference of injury accident rates between screened and unscreened lengths of fencing when tested (ref 18); the effects of non-injury accidents were not determined.

5.2 Considerations

5.2.1 Anti-dazzle fences in central reserves appear not to significantly alter accident rates. However, at certain locations in built-up areas, fences might have the ancillary function of blocking distractive or confusing signs not removable under local planning laws or adjacent roads (see chapter 10). For example, where an access road within an industrial estate lies very close to the trunk road boundary.

5.2.2 Anti-dazzle fencing may be ineffective where there is severe undulation of the highway alignment, particularly where the proportion of heavy goods vehicle traffic is high. At exposed locations fencing can also act as a sun block to the carriageway, creating potential for frost or ice hazards. Where the highway alignment contains tight right-hand curves, 'over-the-top' visibility may also be detrimentally obscured by anti-dazzle screens leading to greater accident risk.

5.2.3 The police division responsible for road surveillance and patrol should be consulted prior to the erection of fencing which may severely restrict the police view of the opposing carriageway. These visibility restrictions can also create problems for safe usage of any necessary central reserve crossing points by emergency vehicles.

5.2.5 Anti-dazzle fences can be particularly effective alongside fast major roads which have an adjacent minor road at the same level where, in darkness, opposing headlamps on the nearside cause confusion. Suitable safety fencing (ref 6) may also need to be erected on high-speed roads. At rural locations where swept headlamp paths persistently cross drivers' vision, short lengths of anti-dazzle fences should be considered.

6. ARRESTER BEDS

6.1 General

6.1.1 This section gives advice on the installation and layout of arrester beds in rural locations, and draws attention to the main features which need to be considered.

6.1.2 The purpose of arrester beds is to stop, without serious injury or serious damage to vehicles or to adjacent property or other road users, those vehicles whose brakes fail on long downhill gradients. The gravel-filled type of arrester bed is the most effective permanent means of stopping runaway vehicles. A lightweight aggregate fill material (eg Lytag) is preferred.

6.1.3 Research and field tests in UK, North America and Australia (refs 21-26) have been carried out in recent years to consider the effect of the various parameters of arrester beds. The results may be used for detail design purposes.

6.1.4 Deceleration of between 0.5g and 0.6g is obtained by a full-width level bed without use of the vehicle brakes. About half these values is obtained for one-track beds which accommodate only one set of wheels. A 10% downgradient on the bed surface can reduce the deceleration by 0.1g. Under high decelerations inadequately restrained vehicle occupants or inadequately attached cargo may not be safely contained.

6.2 Criteria for Provision

6.2.1 On existing hills where there is a history of accidents involving runaway vehicles consideration should be given to the provision of arrester beds. A measure of effectiveness can be assessed by an analysis of personal injury and damage only accidents plus the incidence of damage to property based on local records.

6.2.2 On new construction, where long steep gradients are unavoidable, and where the probability of damage caused by runaway vehicles is greater than normal, the provision of arrester beds should be considered as an integral part of the scheme design. As a guide for provision, where gradients are over 5%, an arrester bed should be considered if the gradient value (in percent) squared, multiplied by the approach length from the crest in kilometres, is over 60, ie if (gradient %) x (length km) [mathematical sign here] 60.

6.2.3 On long, straight stretches of down gradient where a sufficiently steep or long up-grade occurs before any bend is met, observations of HGV driver choice indicates that arrester beds are unlikely to be used.

6.3 Design Features

6.3.1 Layout

(a) Suggested layouts for an arrester bed immediately adjacent to the carriageway are shown in Fig 7 and, for a bed segregated from the road, in Fig 8. Single-track beds with safety fences have half the effect of full-width beds but may be considered where long lengths can be installed on the down gradient without detrimental frontage effects. These may require adjacent untensioned or hydraulically sprung safety fencing, which on deflection is flush with the kerb edge remove from the carriageway.

(b) Length of Bed. The length of bed which will be required to halt runaway vehicles is dependent on the predominant vehicle type; the likely speed of entry into the bed; the type and depth of aggregate used, and the arrested bed slope. See refs 26-27 and figures 7 and 8 where well drained and maintained lightweight aggregate is to be used. Where the bed surface is aligned on a down gradient its length should be increased by 3% for each one degree of slope.

The bed length for all-purpose roads should cope with the critical design vehicle, identified in research as a large articulated vehicle with multiple axle groups. This vehicle is likely to have the highest entry velocity and the lowest average deceleration rate. The bed length should be designed assuming deceleration values corresponding

to unbraked vehicles, and should include a factor of safety to cover uncertainties in the assessment (eg entry velocity, variations in maintenance, frozen aggregate). Suggested lengths, increasing by a factor of 1.25 for safety, are given in figure 7.

(c) Width of Bed. As a general guide a constant bed width of 4.0-5.0m is adequate. Barrier kerbing with a 300m upstand should be installed at the side of the bed remote from the carriageway to assist in restricting sideways movement. The use of safety fencing may also be desirable. The bed should be separated from the main carriageway, where possible, by at least 2.0m, and flush kerbing may be required locally where the road is provided with 1.0m wide hardstrips.

(d) Depth of Bed Material. Where entry velocities are less than 75km/hour, vehicle deceleration is significantly higher for beds which contain greater depths of bed material, whereas above 75 km/hour decelerations tend to be independent of bed depth. Beds should have depths between 300mm and 450mm with the depth gradually increasing over an initial length in order to provide for smooth vehicle entry. The greater (450mm) depth gives around 50% higher stopping ability than the minimum (350mm) provision and should be considered where bed length is restricted.

(e) Type of Material. To achieve a high deceleration rate it is necessary that vehicle tyres sink into the bed material. Rounded uncrushed gravel or similar artificial lightweight aggregate has performed satisfactorily in tests and should be used in preference to angular gravel (ie crushed rock) or sand, which tend to restrict wheel penetration and compact with time and usage.

Arrester bed material must be free draining and adequate drainage should be provided so that in freezing conditions it still retains its function of wheel penetration, thereby bringing vehicles to a standstill. A suitable specification for the bed material is given below as a guide. This may need to be modified to use locally available suitable materials in the light of further experience and testing.

Typical specification for Arrester Bed Material: The material should be clean, uncrushed, hard durable natural gravel consisting primarily of smooth round particles. Alternatively, an appropriate artificial lightweight aggregate may be used. The following particle size distribution is suitable:

BS Sieve Size	Percentage by Mass Passing
10 mm	100%
5 mm	0%

6.3.2 Location

(a) On both new and existing roads, engineering judgement is required to determine the location of arrester beds. Relevant factors to be considered include: the location of previous accidents; the length of downgrade; the conditions at the bottom of the grade, the percentage of heavy vehicles, existing street lighting, horizontal alignment and topography (ie effect on earthworks costs).

(b) Arrester beds should not be located in verges on the outside of right-hand curves if possible, or at any other location where there is a likelihood of vehicles mistakenly entering the bed during the hours of darkness. Where arrester beds are constructed in built-up areas, local schools should be informed that these are dangerous locations so that children are discouraged from playing in the bed.

(c) Where considerations of accident locations is the main factor in determining arrester bed siting, it will be necessary for the position of the facility to be a a little distance uphill of the point where accidents occur most frequently. The actual distance will depend on site conditions (eg topography, alignment, visibility, land availability) but it should be kept small to minimise the chance of brake failure occurring between the bed location and the accident-producing hazard.

(d) The entrance to the bed must be clearly signed for drivers of runaway vehicles and clearway restrictions should be applied so that the entrance is kept freely accessible. Details of the advance 'Escape Lane Ahead' sign

are given in DTp drawing No WBM 377 and DTp HQ authorisation of its use is required. Adequate visibility to the entrance must be available to give drivers time to manoeuvre their vehicles into the bed and, as a minimum requirement, visibility equal to the desirable stopping sight distance appropriate to the anticipated maximum speed of runaway vehicles should be provided. Consideration should also be given to the provision of a bifurcated road marking arrow with legend "Escape Lane" marked on the carriageway.

6.3.3 Maintenance

Maintenance requirements for arrester beds fall into two categories normally and are specified in the Departmental Guide to Highway Maintenance (ref 39):

(i) Work required following the use of the bed and
(ii) Routine maintenance.

Maintenance due to usage.

(a) When a vehicle uses the facility, bed material may be thrown on to the carriageway and this may constitute a nuisance or danger to pedestrians and traffic. Its prompt removal by emergency road sweeping is essential. Use of lightweight bed material (ref 21) may help to reduce damage during the period before the carriageway is swept.

(b) Raking is necessary to reshape and smooth the surface and to loosen the aggregate after each use.

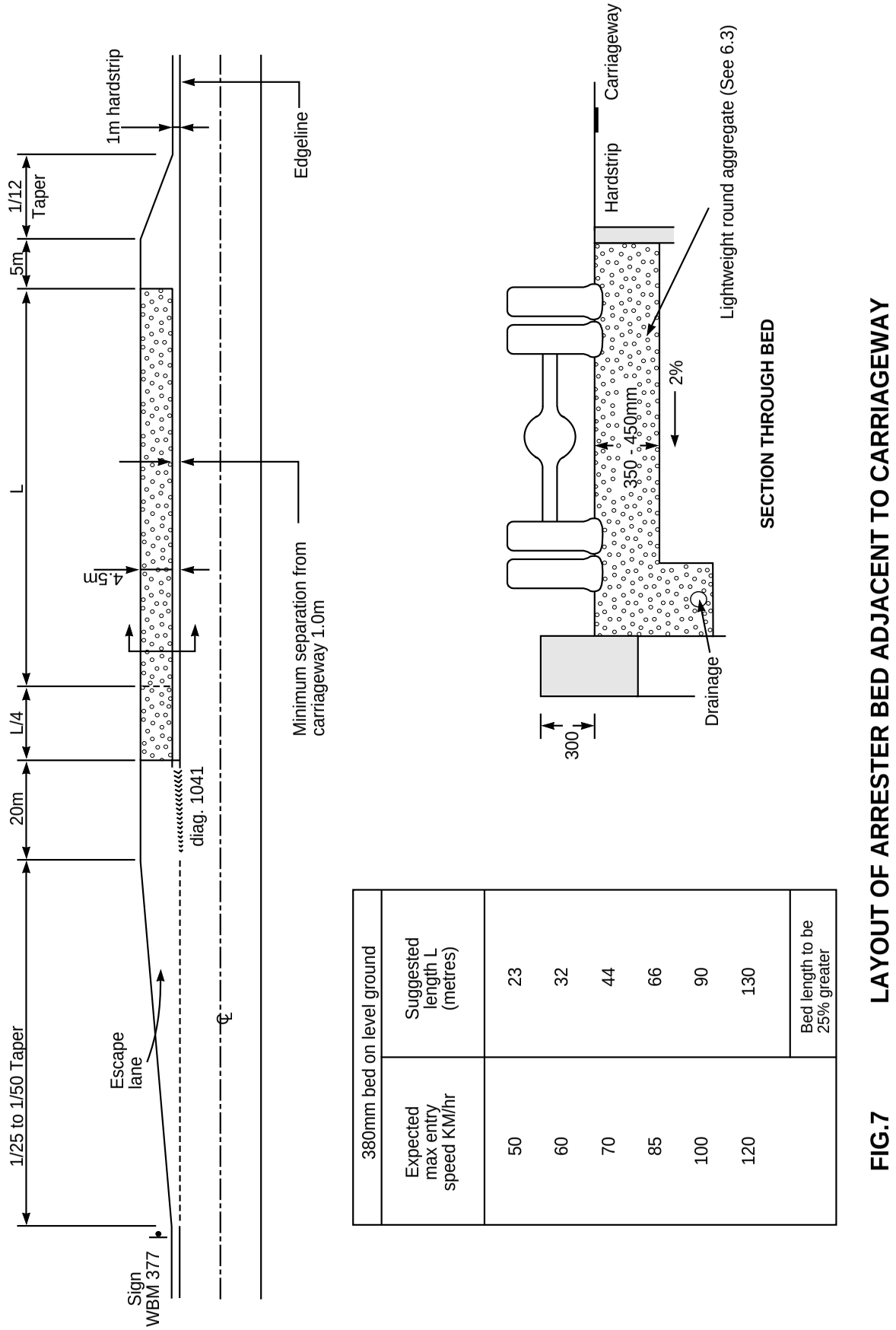
(c) In exposed, windy locations it is necessary to cover lightweight aggregate with protective netting, tucked into the sides of the bed, to prevent the material blowing on to the adjacent areas. The netting should not be so stiff as to prevent wheels sinking into the bed material.

(d) The cost of vehicle removal is directly borne by the arrester bed user. Maintenance plant and labour may be involved in traffic management and kerb and bed material replacement which are also chargeable to the user.

Routine Maintenance

(e) Periodic replacement of the bed material will be necessary when accumulated fines alter the grading of the material. Weedkiller should be applied, preferably in a more persistent granular form to prevent vegetation taking root and affecting the arresting function of the bed material.

(f) During freezing conditions it may be necessary to treat the bed material with de-icing salts.



380mm bed on level ground	
Expected max entry speed KM/hr	Suggested length L (metres)
50	23
60	32
70	44
85	66
100	90
120	130
	Bed length to be 25% greater

FIG.7 LAYOUT OF ARRESTER BED ADJACENT TO CARRIAGEWAY

Figure 7 Layout of Arrester Bed Adjacent to Carriageway

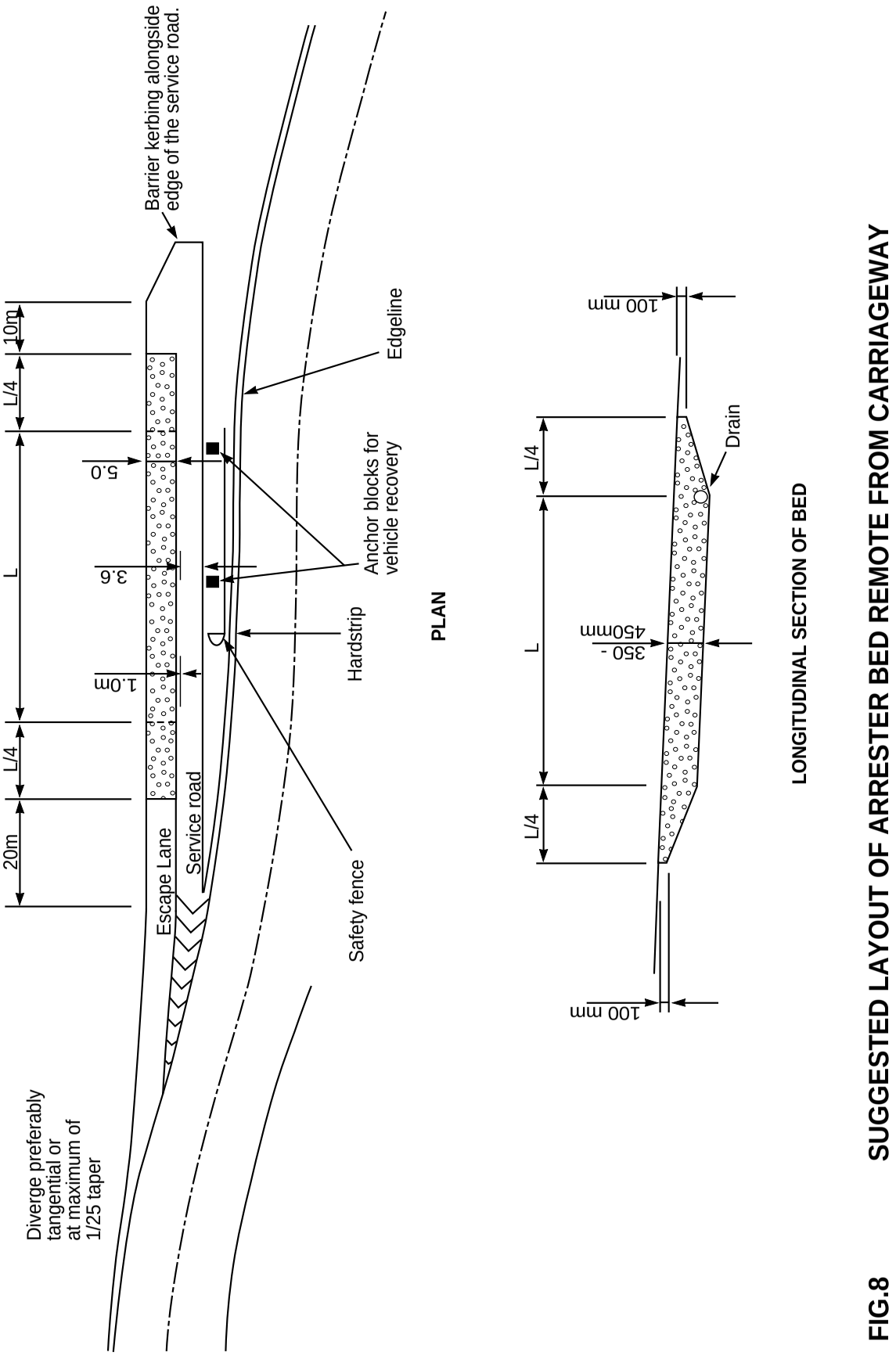


Figure 8 Suggested layout of Arrester Bed Remote from Carriageway

7. CATTLE GRIDS

7.1 General

7.1.1 This section gives general advice on cattle grids which are found mostly in rural areas. However, there are some instances on urban roads, eg deer parks or sheep grazing areas, where these principles need to be observed.

7.1.2 A cattle grid is a device designed to prevent the passage of animals but allow the passage of certain types of wheeled traffic. It normally consists of a number of transverse bars supported over a pit and includes adjacent fencing and an alternative, gated means of passage for animals and people.

7.1.3 The responsibility for animals straying or lying on or at the side of the highway lies with their keepers (Section 155 of Highways Act 1980), and also the Animals Act 1971). This does not apply to highways passing over common, waste or unenclosed ground.

7.1.4 On existing routes, experience has shown that the maintenance of fencing and control of farm gates giving access to the highway has been generally effective in preventing animals straying on to the highway rather than providing cattle grids for example, on motorway access roads.

7.1.5 Design of cattle grids is covered by BS 4008 (ref 28). In general a minimum grid length of 2.6m is required to be effective, with pit depths of around 250mm.

7.1.6 It is recommended that a sloping ramp 150mm wide not steeper than 1 in 3 be constructed leading from the floor to the edge of the pit to allow for the escape of small animals, such as hedgehogs, which would otherwise be trapped.

7.1.7 Cattle grids may be ineffective in deterring the passage of some types of sheep. Special fencing is required where the adjacent land is used by deer.

7.2 Siting

7.2.1 Attention is drawn to Sections 82-88 of the Highways Act 1980 concerning provision, removal, maintenance and supersession of cattle grids. The usual objective is to prevent access by animals to the highway by suitable provisions. Cattle grids can also be sited to restrict the extent of movement of animals along a road.

7.2.2 Cattle grids require vehicles to cross at relatively low speeds, they may also cause skidding. Their design may necessitate the imposition of weight limits for passage and they can also be a source of noise nuisance. Cattle grids should only be provided on trunk roads where other alternatives have been fully investigated and found to be unavoidable.

7.2.3 On new roads, consideration should be given to the provision of accommodation crossings or underpasses (ref 29) where regular passage of domestic of wild animals such as ponies or deer across the highway route exists. On the boundaries to common land, partial fencing of an environmentally sympathetic design may need to be considered as a means of avoiding numerous cattle grids at frontage accesses to the highway or extensive fencing of the highway boundary.

7.2.4 Cattle grids should be placed on straight sections of road. A location on bends should be avoided due to the potential skidding of vehicles on the grid bars. Cattle grids can be hazardous to pedal cycles and motor cycles, and should therefore be designed to be clearly visible on the approaches.

7.2.5 Notice of warning of cattle grid presence (Diagram 552 ref 55) and any loading restriction should be posted so that approaching vehicles can reduce speed safely to around 20 km/h and take alternative routes if overweight.

7.2.6 At railway level crossings where the adjacent land is used for grazing, the automatic half barrier type will need

a highway cattle grid on the roadway on one or both sides of the crossing as appropriate.

7.2.7 If cattle are likely to be driven over the level crossing of if there is horse traffic, then manually operated gates should be provided adjacent to the grids and normal cattle-cum-trespass guards placed across the track.

7.3 Typical Drawing

7.3.1 Department of Transport drawing no B109/1D shows a typical cattle grid design.

7.3.2 Steelwork should be to BS4360 grade 50C except on the occasions where rectangular hollow sections are used, in which case grade 50B applies.

7.3.3 Type A standard grids apply to all roads other than very minor roads with low flows (less than 100 AADT) or farm accesses where type B may apply. Both types require provision of internal ramps in accordance with paragraph 7.1.6.

7.3.4 Drivers may lose control of vehicles on cattle grids due to the excess wear resulting from vehicles braking on the grid bars. Treatment of grid bars with non-skid epoxy screeds, as well as being expensive, is not a long-term solution and difficult situations should incorporate measures to achieve a reduction of vehicle approach speeds to within the grid design criteria.

8. FACILITIES FOR CYCLISTS

8.1. General

8.1.1 This section gives guidance on the design, treatment and provision of facilities for cyclists within both rural and urban situations. The statutory responsibilities and powers of highway authorities concerning traffic management and road safety which include cyclists are: the Road Traffic Regulation Act 1984 (Section 122), the Road Traffic Act 1974 (Section 8) and also the Cycle Tracks Act 1984.

8.1.2 Specialist advice concerning cycle facilities is issued by the Traffic Advisory Unit, Traffic Policy Division, DTp. A number of publications are available including Local Transport Notes on signing, shared use by pedestrians and cyclists, and road crossings for cyclists (refs 30-33). Specialist officers within DTp Regional Offices and local authorities should be consulted at an early planning stage.

8.1.3 The design of facilities for cyclists should take into account their vehicular rights and their particular vulnerability as road users. The provision of facilities for cyclists should therefore be considered during the planning stages of new or improved highways and traffic management schemes. Where changes in cycling demand or accident levels merit consideration of improved conditions or safety for cyclists, the existing design should be reviewed.

8.2 Rural Areas

8.2.1 In rural areas of low population density the cycle may be the chief means of transport for considerable numbers of people, in particular schoolchildren. The level of demand should be ascertained by site survey but where more information is required, it may be appropriate to circulate questionnaires, for example at local schools. These should be made simple to complete and analyse in order to identify desire lines, trip frequency and purpose, and route details.

8.2.2 Use of high-speed rural roads by cyclists is not positively encouraged due to the high risk and vulnerability of the cyclist in road accidents (ref 34). The signposting of alternative routes which do not involve excessive diversion for cyclists should be considered in conjunction with the highway authority. Where new or upgraded highway schemes are under preparation and where an alternative route does not exist, consideration should be given to the provision of cycle tracks or wide edge strips.

8.2.3 Cycle tracks should be provided where cyclist flows are heavy on busy carriageways, especially where the heavy goods vehicle proportion is in excess of 15%. Consideration should be given to the provision of a cycle track in the road verge where adequate space and opportunity exists if cyclists number upwards of about 200 per day. The cycle track should be properly signed (ref 31) and constructed, with ideally a 2m verge between the cycle track and the carriageway, and where applicable, segregation from the footway (ref 33).

8.2.4 Where due to limitation of space or other unavoidable restrictions, purpose-built cycle tracks may not be possible, consideration should be given to allowing cyclists use of little used rural footways or footpaths. The formal conversion of all, or part of a footpath to a cycle track is permitted under Section 3 of the Cycle Tracks Act 1984. Conversion of all or part of a footway to a cycle track requires use of Section 66(4) of the Highways Act 1980 to "remove" the footway and use of Section 65(1) to then "construct" the cycle track. Details of these procedures and others for shared use by cyclists and pedestrians are covered by the Department's Transport Note (ref 31). Unsegregated joint facilities have been shown to operate safely with combined pedestrian/cycle flows of 100-200/hour on a 2m width.

8.2.5 The incorporation of one metre edge strips alongside new all-purpose rural roads is not intended primarily to serve was with-flow cycle lanes but it is recognised that the edge strips are extensively used by cyclists to gain a measure of separation from passing traffic. In the absence of alternative provision this use is acceptable but good maintenance of the edge strip is important.

8.2.6 Cyclists are more adversely affected than motor vehicles by glass or other debris which occurs particularly on sections of the carriageway not regularly traversed by motor vehicle wheels. Where even moderate use of the road is made by cyclists it is important to maintain regular sweeping of such roads. Drainage grids and gratings should comply to B 497 (ref 35) by having slots at angles not likely to affect the passage of cyclists and be set flush with the carriageway. Road markings should not project above the road surface by more than 6mm nor should the use of close-spaced roadsteads or kerbs (below 100mm) be employed to delineate lanes or ghost islands. Overhand sealing of cracks which should be treated in accordance with advice given in HA 21/82 (ref 36). Cyclists swerving to avoid these potential hazards are a risk to themselves and to other road users.

8.2.7 Where a cycle track or shared use footway is crossed by accesses to the carriageway and where there is a risk of obstruction to the cyclist facility, by parking or deposition of farm equipment, then protective posts may be used. These may be of wood 150mm square by 1.2 m high, set at 1.8 m spacing across the mouth of the cycle route with retro-reflective banding around the posts in rural areas. Metal or concrete posts may be considered for urban situations. Care should be taken to ensure that protective posts do not constitute a roadside hazard.

8.2.8 It is important that the cyclist has a safe passage through junctions. In TA 20/84 (ref 37) the 'give way' line for minor roads without diverge lanes corresponds to the back of the hardstrip, thus allowing free major road passage for cyclists.

8.3 Urban Areas

8.3.1 In urban areas the widespread use of the bicycle and the volume of cycle traffic may justify the erection of cycle routes and a cycle network. From the road safety point of view an independent network for cyclists is preferable but directness of route, priority of that route over other traffic and a well maintained and swept surface are important to cyclists. Cyclists may not be attracted to use the alternative provision unless it is well planned and designed.

8.3.2 Recommendations concerning provision of facilities are given in the Local Transport on Ways of Helping Cyclists in built-up areas (ref 30) and guidelines produced by the Institution of Highways and Transportation (ref 38).

8.3.3 Where footpaths or footways are adjacent to cycle tracks, they should wherever possible be separated by use of kerbing, barrier, verge, white line or difference of level (with the footway higher than the cycle track) (ref 33).

8.3.4 The transfer of large numbers of cyclists from congested streets, by alternative provision, can be useful for traffic management as well as improving safety. The creation of an attractive cycle route may also encourage some transfer from motor vehicles to cycle. Designated bus lanes can be advantageously used by cyclists owing to their similar link speeds. This also have the advantage of maintaining the cyclist at the kerb-side part of the carriageway and giving a shared use facility at minimal cost. Bus land use can be incorporated as part of specific provision or as part of a general cycle route. Contra-flow cycle lanes can be considered as a means of avoiding long or hazardous detours for cyclists, for example in a one-way system. A cycle lane may abe provided in the opposite direction to the general traffic flow with the lane defined by a solid white line and surfaced in a colour recognisably different to the adjacent carriageway. The preferred width of contra-flow cycle lanes is 2.0 metres.

8.3.5 For traffic signal design the cycle is attributed a pcu value of 0.2, but at roundabouts and priority junctions they have a pcu value of 1.0 in the priority stream and zero in the minor stream.

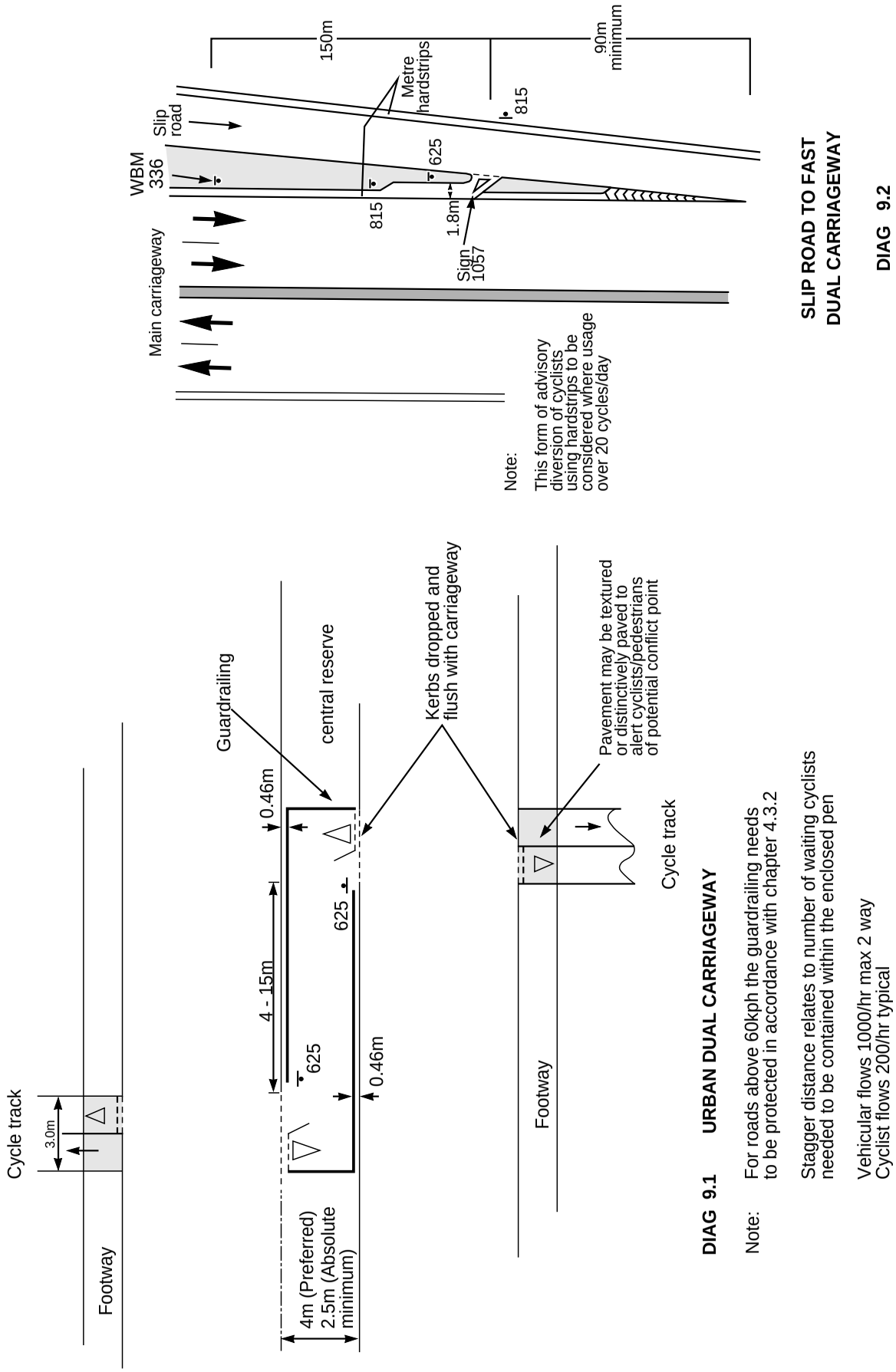


Figure 9 Carriageway Crossings for Cyclists

8.3.6 The ability of pedal cyclists to progress to the head of traffic queues does not appear to be a significant delaying factor to motor vehicles due to the cyclists' relatively fast acceleration from a statutory position. However, parked cars may cause cyclists to swerve out, bringing increased accident risk with motor vehicles as they compete for roadspace. Control of parking on through streets with over 100 cycles/peak hour should be considered and particular attention should be paid to unlawful parking in streets with designated cycle routes.

8.3.7 Attention to maintenance should be carried out as described in the appropriate Code of Practice (such as ref 45) and the regular inspections which take place for routine maintenance should not cyclist usage of the various streets and their particular vulnerability to potholes and debris.

8.4 Road Crossings and Junctions

8.4.1 Local Transport Note (ref 32) deals specifically with road crossings and junctions, and should be consulted for details. When designing facilities, the cyclist should be considered as a vehicle rather than as a pedestrian and adequate sight lines provided to intersections. Thus cycle/pedestrian road crossing facilities whether controlled or not should be parallel and not shared.

8.4.2 Where a cycle track crosses a lightly trafficked road, a 'give way' type junction should be created where visibility is in accordance with TA 20/84 (ref 37). This type of crossing has been found to work satisfactorily with a two-way vehicular flow of 400 vph. The means of crossing a divided carriageway are shown in diagram 9.1. This may be adapted to shared use in certain circumstances in rural areas, if safety fencing is provided in addition to the pedestrian guardrails.

8.4.3 Signal controlled cycle crossings (ref 32) should be considered where cycle flows in excess of 30-40/hour require to cross 500 vph of traffic, or where their location would be significant in ensuring the use of cycle route. At these signals pedal cycles can be detected by uni-directional inductive loops beneath the cycle track.

8.4.4 Studies have showing (ref 40) that at roundabouts the circulating cyclists are particularly vulnerable to accidents involving motor vehicles entering/leaving the roundabout. Wide entry widths and small diameter central islands have been shown to increase this kind of accident. A cycle route avoiding this kind of roundabout is preferable and it may be possible to convert parts of surrounding footways to cycle tracks or to increase vehicle deflection on entry so that vehicle speeds are controlled.

8.4.5 The removal of cyclists from the circulating traffic at roundabouts should be considered using grade separated road crossings by means of subway. These are covered by Departmental Standard TD 3/79 (ref 41). Where there is a cycle track on an overbridge, the balustrading should be at a height of 1.4 to 1.5m. In shared use facilities, cyclists should be required to dismount where there are inadequate widths. This requirement may also be needed where there is no economic alternative to steep ramps or steps. In order to enforce this the former may need to have staggered barriers.

8.4.6 At grade separated junctions where slip roads enter and leave high-speed roads, treatment at the merge/diverge point may be necessary (see figure 9) to enable cyclists to cross the merging traffic. Early indications are that this technique may be successful in reducing pedal cycle accidents. Savings of up to 40% have been recorded. This principle may also apply at the entrance to Type 1A lay-bys as described in paragraph 2.4.3, where a less oblique crossing by cyclists is preferred. Drainage, gully gratings and channels at the nosing of such lay-bys may also cause difficulty for cyclists who may be better directed into and through the lay-by.

8.5 Construction Considerations for Cycle Tracks

8.5.1 A cycle track should be upwards of 1.5m minimum width. Wider tracks may be provided on flows, adjacent obstructions such as wells or kerbs, and space available. Criteria for design are covered in references 30-35 and 38. Departmental Standard TD 3/79 for Combined Pedestrian and Cycle Subways (ref 41) shall apply where appropriate. Where headroom clearance is below standard (2.4m) it should be clearly marked.

8.5.2 There should be a desirable minimum clearance of 0.5m from obstructions on either side of a cycle track for safety. Where new routes are defined, street furniture and all vegetation except grass within this distance from the

edges of the route should be removed. Essential maintenance precautions include examination of gully gratings to ensure they will not entrap wheels, and any necessary repairs to gully frames, potholes and pavement crazing. Ponding of water or the formation of ice on the track or carriageway is a dangerous hazard to cyclists and should be avoided.

8.5.3 Cyclists are more sensitive to uneven or broken surfaces than motorists, therefore cycle tracks should not be prone to deformation and should provide a smooth regular surface. A typical new cycle track construction should have a minimum of 100mm granular sub-base supporting 40mm of bound macadam with a 15mm medium textured wearing course both complying with B 594 or 4987. Flush edging with full bed and backing can ensure full depth construction at the edge avoiding subsequent breaking up and loss of width. Where there is no separating kerb to an adjacent footpath, verges should be flush with or rise away from the track. Cross section and longitudinal profile should take account of the need for adequate drainage particularly in hollows.

8.5.4 A verge, kerbed at one or both sides, may separate the cycle track from the carriageway. Where the cycle track crosses the verge to connect with, or cross the carriageway, any kerbing should be dropped flush with the carriageway and any necessary upstand limited to 12mm at the interface between cycle track and carriageway.

8.5.5 A right-angled approach to any crossings of kerbing should be designed as far as possible. Where acute crossing angles cannot be avoided, non-slip kerb surfacing should be considered if the kerbing is not fully flush with the carriageway.

9. ACCESS

9.1 Provision and Control

9.1.1 Controls under planning legislation can be applied to planning applications in order to help provide safe access to and from a site and minimise the detrimental effect on passing traffic. Access to development is not normally provided to motorways, where access to land and property is required it is obtained directly from other classes of road. All-purpose rural primary roads often provide access to land and property and advice on the provision of new accesses to existing trunk roads is given in Advice Note TA 4/80 (ref 43).

9.1.2 Local highway authorities have exercised power under Article 12 of the Town and Country Planning, General Development Order (GDO) 1977 to direct refusal or impose conditions on planning applications referred to them by the local planning authority. In addition they may give advice. Changes (ref 44) that amend the power of direction and replace it with an expanded consultation role still allow the local highway authority to play a full part in development control.

9.1.3 Planning applications affecting trunk roads are referred to the Secretaries of State for Transport or for Wales for direction only if they involve new or altered access to motorways; or new or altered access to stretches of all-purpose trunk roads on which speeds in excess of 40 mph are permitted; or land which would be within 67 metres of the centre lines of future trunk roads; or proposed improvements to existing trunk roads (ref 44) for which a preferred route has been agreed and published. Local planning authorities however may seek advice from the Secretary of State on road safety issues affecting applications for which the Secretary of State for Transport has no power of direction.

9.1.4 In addition, the local planning authority is required to consult the Secretary of State under Article 15b of the GDO on applications which will result in a material increase in the volume of traffic entering or leaving a trunk or designated road. If local planning authorities propose consenting to a planning application not already notified to the Department of Transport and Welsh Office under Article 11, they should notify these highway authorities in order to consider whether there is a need for a vehicle crossing (Section 184 of the Highways Act 1980).

9.2. Existing Accesses

9.2.1 It is not the specific responsibility of the highway authority to ensure that existing accesses are safe to use but it has a general responsibility for the safety of road users and therefore control as described below may be required.

9.2.2 Where an existing access is likely to cause, or has caused, danger to road users it may be stopped up under the provisions of Section 124 of the Highways Act 1980. In general, an alternative access has to be provided. Improvement of an otherwise dangerous access may be made under the powers to improve the highway.

9.2.3 Owners of existing accesses are expected to use them safely and if necessary to make improvements to them (such as by improving sight lines) to increase safety. Private accesses which are causing, or are likely to cause, accidents can be treated under Section 124 for closure or Section 184 for improvement.

9.2.4 Where observations to visibility lie within the highway then priority should be given to their removal. Attention is drawn to the Code of Practice for Routine Maintenance (ref 45) on cutting of grass verges at accesses to prevent obstruction to visibility.

9.3 New Accesses

9.3.1 In 1985 60% of all personal injury accidents on roads occurred at junctions of which 10,736 (or 4.45) were described as private drives or entrances. Consideration should be given to combining accesses if possible to minimize the nunber of entry points to the highway.

9.3.2 The distance between accesses to the major route should preferably be such that for rural roads a new access should be further than the desirable minimum stopping sight distance, as defined in TD 9/81 from any adjacent access in regular use.

9.3.3 The geometric layout of new or improved accesses on existing roads should be determined following considerations similar to those contained in Advice Note TA 20/84 (ref 37), and should be related to the traffic speed of the major road (see ref 47) and the size of vehicles using the access. The layout should be designed to cater for the longest vehicle using or likely to use the access. For goods vehicles, the minimum corner radius should be 6 metres. Visibility splays should be provided to enable drivers using the access to have adequate visibility in each direction to see oncoming traffic in sufficient time to make their manoeuvre safely. This also applies to vehicles from the major road turning right into the access. The layout requirements for visibility recommended for the design of major/minor junctions in the current Departmental Advice Note (ref 37 para 8.2) should also apply to accesses. However, a verge width of 3.5 metres, if clear of obstructions to visibility, will normally give an adequate 'x' distance for little used private accesses, eg to single dwellings. The distance between the head of a seated driver and the front bumper of a private car is generally around 2.4 metres.

9.3.5 Where possible, new or improved accesses should be positioned on level groud or in sags in preference to locations at or near crests, to enable drivers to appreciate the layout of the access. A downhill gradient on the access towards the main carriageway should be avoided as accident rates for these junctions have been observed to be 2.5 to 5.9 times higher than for those on the level (ref 48).

9.4 Farm Accesses

9.4.1 Road schemes may require the closure of existing crossing and accesses with an obligation to provide alternatives under Section 125 of the 1980 Highways Act. As advisory (ref 49) on the provision of farm crossings should be consulted.

9.4.2 At gated accesses, the gates should open away from the road and sufficient space should be provided off the carriageway to accommodate a standing vehicle. If necessary the gate should be set back to allow long farm vehicles to stand off the carriageway. Where field accesses are to be frequently used by wheeled vehicles, consideration should be given to constructing a hardened approach strip to assist in the removal of mud from tyres and equipment prior to entering the highway.

9.4.3 One of the factors affecting traffic flow on rural roads arises from the movement of farm animals - eg either twice for milking herds or by periodic movements for changes of grazing. Some of the methods which may be employed to avoid this problem on new roads are: land exchange; the provision of internal farm tracks; re-siting of certain farm buildings; and the use of transportable milking bails. In some cases, this may require the widening of roadside verges, which may need to be adequately hardened, drained or fenced, with consideration given to the location of road signs to allow unobstructed passage.

9.4.4 Many of these methods are preferred on economic grounds to the provision of cattle creeps (unless used as joint provision for ridden horses - see 11.2.3) which may prove unnecessary in the long-term due to changes in farming methods. In certain circumstances where it is impractical to provide an overbridge or underpass and where adequate visibility and moderate traffic speeds exist, key-operated flashing lights as advised in TA 56/87 (ref 50) may also be considered, although they require special approval by DTp HQ (ref 57). This provision is mainly for existing roads and would be exceptional for new roads.

9.4.5 The recommended dimensions for farm underpasses and overbridges are given in a Department of Transport report (ref 29). The approach gradients should not exceed 1 in 10.

9.4.6 On dual carriageway roads breaks in the central reserve to provide access should be kept to a minimum to improve safety and confined, where possible, to the more important road junctions constructed to layouts as given in TA 20/84 (ref 37). Access across the central reserve at other junctions should be avoided by restricting access to left in/out movements and providing a U-turn facility at appropriate adjoining junctions. Central reserve gap closures can often be associated with the revised provisions for grade separation of junctions. Reference should be made to the Standard TD 22/86 (ref 51) and Advice Note TA 48/86 (ref 52).

10. ROADSIDE ADVERTISEMENTS

10.1 General

10.1.1 This section gives advice on roadside advertisements applicable to both rural and urban situations. In exercising their control over advertisements under Circular 11/84 (ref 53) local planning authorities (LPAs) should seek advice of highway authorities where factors affecting the public safety of roads need to be considered.

10.1.2 Regulation 18(1)(b) (Ref 53) requires LPAs to consult with the Department of Transport for trunk roads where the safety of users may be affected by the display of advertisements. Only authorised traffic signs are permitted on land acquired for motorways and advertisements on all-purpose trunk road and motorway highway land are not normally permitted.

10.1.3 This advice also applies to the siting and removal of contractors' signs associated with works that affect the highway.

In this case the directional road sign becomes lost against the similar letter height and image size of the commercial advertising boards. Removal of advertisements under Town and Country Planning (Control of advertising Advertisements) Regulations 1984 by the local authority is desirable.

10.2 Safety

10.2.1 The siting of advertisements should accord with the separation and other factors as recommended for traffic signs (ref 2). In particular, types of advertisement likely to cause danger to road users, and are open to control on public safety grounds are those that:-

- Impair sight-lines at corners, bends, junctions or accesses

- Obstruct traffic signs or signals or are likely to distract road users because of their unusual nature

- Leave insufficient clearance for vehicles on the carriageway

- When illuminated

  (a) have spotlights or other means are directly visible from the carriageway

  (b) could be confused with or mistaken for traffic lights or authorised signals

  (c) could result in glare or dazzle, particularly in wet or misty weather

- Resemble traffic signs as defined in Section 54 of Road Traffic Regulation Act 1967. This gives the highway authority discretionary powers to remove anything which resembles but is not legally a "traffic sign".

- Contain traffic directions which involve an unsafe manoeuvre (eg turn right against fast-moving traffic).

10.2.2 Particular consideration should be given to sites where drivers need to take exceptional care as at junctions, approaches to low bridges or other places where special traffic hazards may exist. Advertisements at such locations should be discouraged.

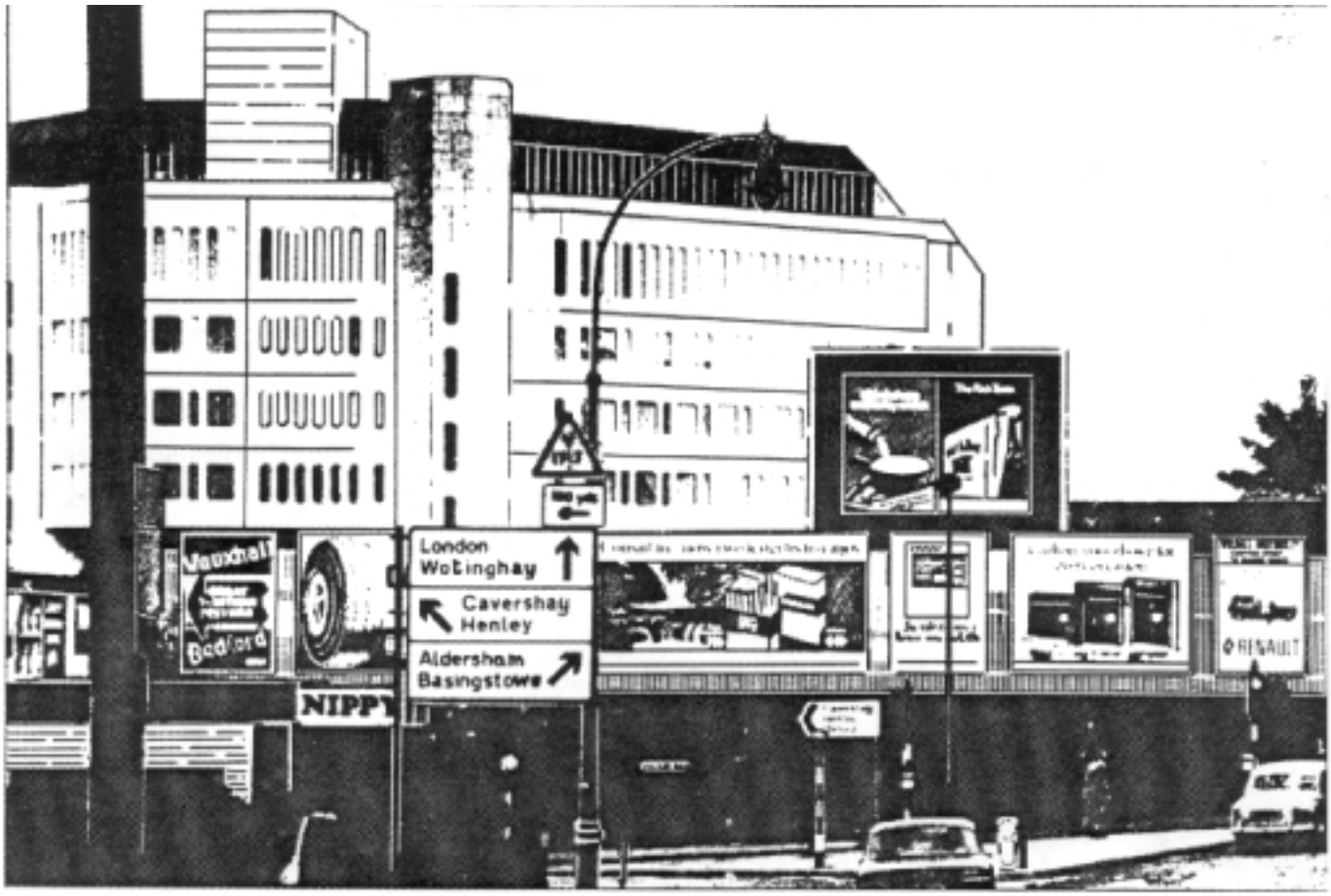


Figure 10 Example of Advertisement Positioning Detrimental to Road Users

In this case the directional road sign becomes lost against the similar letter height and image size of the commercial advetising boards. Removal of advertisements under Town and Country Planning (Control of advertising Advertisements) Regulations 1984 by the local authority is desirable.

11. ROADSIDE FACILITIES FOR RIDDEN HORSES

11.1 General

11.1.1 Section 71 of the Highways Act 1980 places a duty on highway authorities to provide, in or by the side of a highway, adequate margins where they consider it necessary, or desirable, for the safety of ridden horses.

11.1.2 The use of high-speed all-purpose roads by horses and riders can create a potential hazard. Although there are no reliable national statistics available, some evidence indicates that the number of accidents involving horses is increasing and it is reasonable to predict that in the future, with an increase in this leisure activity, the potential for accidents may tend to increase.

11.1.3 Horses often cannot be held by their riders safely at the road edge without encroaching on to the carriageway and when crossing a road, a horse can reach unpredictably, and may stop suddenly. Due to their greater size and different behaviour, horses require longer headway between vehicles than pedestrians, to allow an adequate margin of safety for crossing. The longer gaps in traffic necessary for at-grade crossings for ridden horses result in longer waits alongside busy routes. This requires particularly firm control of the horse which may be beyond the ability of inexperienced riders. Therefore it is recommended these crossings be avoided where sufficiently long gaps in traffic are infrequent and other means of crossing investigated.

11.1.4 The use of grass verges of highways by ridden horses may also have an indirect effect on road safety. Superficial damage to the surface of the verge may cause drivers to avoid the use of the verge as a refuge in an emergency, and in addition the drainage system may be damaged, causing flooding of the carriageway. In areas where there is no hardened footway, damaged verges may result in pedestrians being forced to walk in the carriageway.

11.2 Provisions of Facilities

11.2.1 Identification of tracks well used by ridden horses and bridleways which are affected should be made during the initial consultation states of route planning. It should be noted that not all such tracks and crossings are found on the County Definitive Maps. Road safety is considerably enhanced when such tracks are physically separated from the road. Where a well used track follows a road, consideration should be given to the provision of a trackway beyond the verge possibly separated from vehicular traffic by a barrier, such as a fence or hedge. Occasional openings in such a barrier will assist maintenance and also identify the trackway as part of the highway.

11.2.2 Uncontrolled crossing of a new high-speed carriageway by ridden horses should be avoided. Tracks and bridleways should be diverted to a suitable bridge or subway if possible. Ridden horses can be expected to divert moderate distances of 1km or more without difficulty. The extent of acceptable change to existing bridleways will depend on site circumstances and is best gauged by public consultation.

11.2.3 Joint use of bridges or underpasses for bridleways and private agricultural crossings can sometimes be an advantage. (The effects of public access to a private right have to be noted in side-road orders and occasionally the private user may insist that the public and private rights of way are separated.) Where it can be agreed, shared use of agriculture road crossings (ref 29) can often provide an acceptable solution. The desirable headroom for underpasses is 3.7m but for short crossings headroom may be reduced to 2.7m provided suitable facilities for the rider to dismount can be provided.

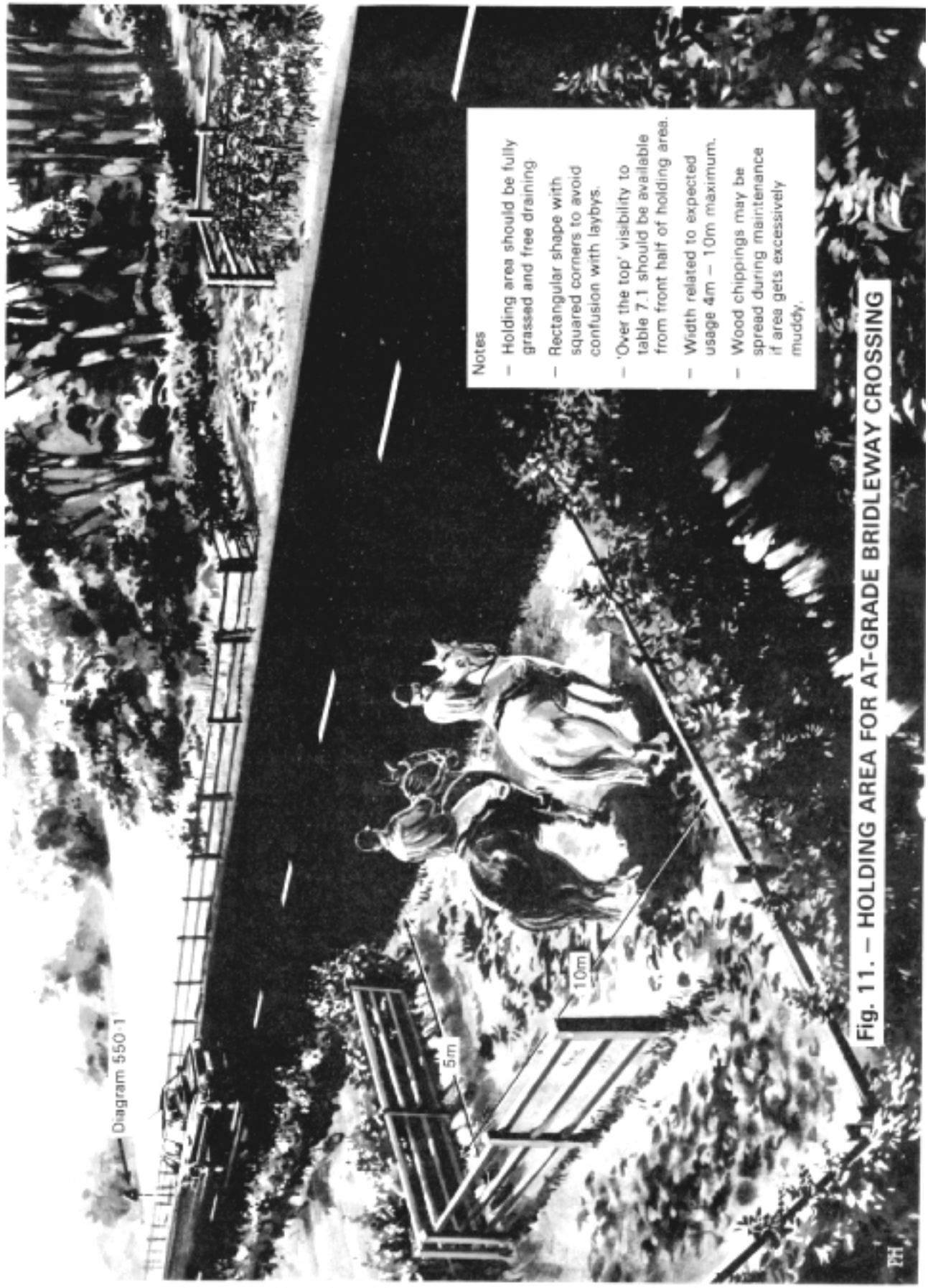


Fig. 11. – HOLDING AREA FOR AT-GRADE BRIDLEWAY CROSSING

11.2.4 At-grade crossings of dual carriageways are not recommended. Generally, limited opportunity exists for safe at-grade crossing of dual carriageway roads for horses. Traffic flows in excess of 20,000 AADT at opening may require, for safe operation, a design for the effective exclusion of non-vehicular traffic from an all-purpose road. In these circumstances the provision of bridleway overbridges or underpasses may be considered in accordance with the Departmental Standard on Cross Sections and Headroom TD 27/86 (ref 54). Considerable problems can also exist for crossings of wide single carriageway designs where three or more lanes may need to be traversed. On these roads two-way flows in excess of 10,000 AADT should be considered as difficult to cross by ridden horses. However, owing to relatively high costs alternative diversion arrangements are preferred to any specific provision.

11.2.5 Where only occasional use of road verges by ridden horses is expected which would not justify a wider grass margin or separate bridleway, filter drains having a gravel surface in the verge should be avoided. Where extensive usage of verges exists (suggested 100 passages/week) consideration should be given to appropriate hardening of verges. The siting of roadside furniture on verges used by ridden horses should take account of their passage so as not to present undue obstruction. The provision of continuous margins for ridden horses around bridge abutments can be costly and alternative routes should be considered with due regard to road safety. The use of the verge, or any other part of the highway, for the purpose of regular exercise of horses is not considered to be a proper exercise of a right of way.

11.2.6 At points on existing roads where ridden horses regularly cross the carriageway and a suitable bridge or underpass cannot be provided, it will be necessary to provide a clearly visible at-grade crossing which should be at right angles to the carriageway. The Traffic Signs Regulations and General Directions (ref 55) provides for the use of warning signs (Diagram 550.1), which will assist in alerting drivers of vehicles to the hazard. In deciding where a bridleway should cross a road at grade, the following desirable visibility 3m back from the edge of a carriageway should be provided.

85 Percentile approach speed (kph)	50	60	70	85	100	(120*)
Desirable Visibility (m)	135	168	211	270	345	451

Table 2 - Visibility Requirements for Bridleway Crossings

* at grade crossing to be avoided if possible

These distances are greater than those normally required for vehicles but the effects are reduced as the rider's view height may be taken as 2.7m above ground level with the sightline to the road as described in TA 20/84 (ref 37) and to the design speed as described in TD 9/81 (ref 46).

Note that these requirements are for fixing a suitable location of the bridleway crossing and should not be used to determine road alignment in design.

11.2.7 For roads were at-grade crossings are unavoidable and likely to be well frequented, the grass verge should be extended back on each side of the road at the point of crossing to provide a 'holding area' for horses with at least a 5 metre grassed width of verge for a length not exceeding 10 metres.

11.2.8 To prevent horses from going straight across a road without check, it can be beneficial to stagger the bridleway at its approach to the crossing (see figure 11). However, where there is a footway, the stagger should not be too long.

11.2.9 On existing heavily trafficked roads with speed limits of 50 kph or less where riding schools and stables are adjacent to the road and circuits regularly cross the route, it may be possible to rationalise the rides to reduce the numbers crossing but where this is not possible consideration should be given to the provision of push-button-operated traffic signals.

11.3 Other Safety Considerations

11.3.1 Accidents between ridden horses and high-speed traffic can be very serious for all concerned, including vehicle occupants. Reduction of potential hazards by suitable provision of safe road crossing facilities is a desirable objective.

11.3.2 Where new hors riding establishments are proposed, involving new or altered access to trunk roads, the highway authority should comment to the planning authority on the potential effects on road safety of the proposed riding circuits.

11.3.3 Present national accident statistics do not differentiate between horses and other classes in the "non-motor vehicle" group. Accidents involving horses, especially those involving no other vehicles, are frequently under-reported. Riding associations may provide useful information on which to base the provision of measures necessary to improve the safety for ridden horses.

11.3.4 The visibility distances recommended in table 7.1 are considerably greater than the driver-to-driver requirements for junction design in TA 20/84 (ref 37). Without full "over-the-top" visibility available to riders, it may be hazardous for ridden horses to cross major roads at typical rural junction locations.

11.3.5 The values in table 2 figures are derived from allowances for a reaction time between rider perception and the horse initiating movement (2.0 seconds) and the time taken for the horse to move fully into the carriageway (2.6 seconds). At this point it becomes a visible hazard to the motorist and desirable stopping sight distance requirements (ref 46) are applied.

12. PEDESTRIAN FEATURES AT RAILWAY LEVEL CROSSINGS

12.1 General

12.1.1 The Railway Construction and Operation Requirements of level crossings for all road categories are covered by a current Departmental Requirement (ref 56) including a recent supplementary Section 16 concerning protection of pedestrians. Level crossings on trunk roads are, however, not often encountered as Departmental policy is to provide railway grade separation wherever practicable for trunk roads.

12.1.2 For safety and operational reasons, the criteria for the type of level crossing to be provided depends primarily on the speed and number of trains and the road traffic flow. The provision for pedestrians on the chosen type of crossing is now incorporated in Section 16 of the Railway Construction and Operation Requirements (ref 56). This proposes a hierarchy of provision for pedestrians, which gives increasing space and separation from road and rail traffic as traffic level increases to ensure that pedestrians do not have to use part of the carriageway.

12.1.3 A continuing modernisation programme of railway crossings involves the replacement of manned gates by automatic crossings at around 120 conversions a year. Initially automatic crossings were mostly installed at locations with light pedestrian flows and/or relatively few trains. More recently automatic crossings have been installed at a variety of sites which have widely differing pedestrian and rail traffic conditions and for which there is limited experience of performance.

12.2 Principles of Design

12.2.1 Route Definition
The points at which a pedestrian should approach, stop, cross and emerge from a level crossing should be clear and unambiguous, with appropriate signing and a layout giving clear physical separation between the pedestrian and vehicular traffic. The width of the pedestrian route should be determined by expected pedestrian numbers and must be continued beyond the crossing threshold to enable pedestrians to emerge safely from the crossing without any need to step on to the carriageway.

12.2.2 Light Traffic Conditions
Crossings with light pedestrian and train flows are found in both urban and rural areas, such crossings should provide a 1.5m wide footway. Where no footways exist on the approaches, a footway splay (termed funnel) prior to the crossing, must always be provided (see fig 13 category D) for flows of more than 25 pedestrians per day. Prior approval from Railway Inspectorate DTpis required for reduced footway widths down to 1m, or for the omission of any approach funnel, at crossings with daily flows of less than 25 pedestrians per day.

12.2.3 Medium Traffic Conditions
At automatic crossings where flows of pedestrians and road traffic are heavy and trains are relatively frequent, a higher grade of physical separation between pedestrians and trains should be considered. Guardrails on the approaches, between the footway and carriageway (see paragraph 5.4.6) may be considered under special circumstances, provided 1.8m clear width remains for the footway. These guardrails are useful to mark out clearly the route to the crossing from, say, a school, and also delineate the area within which pedestrians can wait safely when audible and visual warnings signal the approach of a train. At automatic half-barrier crossings, the 'threshold guardrail' would generally only be required on that side of the crossing without the barrier (see Figure 12, Category A).

12.2.4 Heavy Traffic Conditions
At crossings which have both heavy pedestrian and train traffic, automatic barriers may be inappropriate and manually controlled barriers should be considered in conjunction with the railway authority if the road traffic movement if not high. These may also be justified, even if road traffic is light, where there are higher potential risks to pedestrians from crowd effects for example, where the crossing is close to a school.

12.2.5 The Wicket Gate
The use of wicket gates at any type of level crossing, has been discontinued as their presence is likely to put pedestrians at greater risk than if no gate is provided. Crossing proposals should therefore include teh removal of any existing wicket gates.

12.2.6 Guardrails
The provision of guardrails has been observed to encourage pedestrians to stand in the carriageway with traffic stationary at a closed crossing, putting them at risk once the traffic begins to move. Pedestrian guardrails should only be provided where absolutely necessary in situations requiring pedestrian confinement or where large pedestrian flows could spill into the carriageway. An increase in the pedestrian holding area may also be necessary in these cases.

Guardrails should be erected parallel to the carriageway and terminate 1m on the approach side of the traffic signal on the same side of carriageway. They should never be erected where the width of footway or approaches is restricted.

With heavier pedestrian flows where there is also a demand to cross the road, a double row of non-reflecting studs to indicate a safe crossing location may be considered. This situation is most likely to occur where a level crossing is immediately adjacent to a station exit or footpapth approach from one side.

12.3 Warning Signals and Signs

12.3.1 Visual Warning

Traffic signs, road marking and light signals help to alert both vehicular and pedestrian traffic to the presence of a railway crossing. The signs, markings and signals appropriate to a particular type of level crossing should conform to the current Traffic Signs Regulations and General Directions (ref 55). More information is contained in the Secretary of State's requirements for level crossings (ref 56). Highway authorities have a responsibility to maintain and regularly inspect traffic signs and road markings in use at public highway level crossings of teh railway.

12.3.2 Audible Warning

Details are provided in the Section 16 supplement (ref 56). To aid visually handicapped persons, texture pattern paving to identify different installations may be considered. Firm guidelines are not yet available but it is important that whatever system is used must not be that employed for disabled persons at Pelican crossings - see paragraph 1.8.2.

12.4 Standard of Provision

12.4.1 The various pedestrian and train flows at which the different provision apply, are given in Table 3. The peak hour of pedestrian movement is the controlling factor. Account should also be taken of local factors which may increase flow levels, cush as change of land use or new developments in the vicinity of the crossing.

12.4.2 Cyclists are advised to dismount when traversing railway crossings and, for the purpose of calculation, their numbers should be considered as pedestrians.

12.4.3 Table 3 gives the categories of pedestrian provision. In exceptional circumstances where there may be concentrations of the most vulnerable groups of pedestrians in the locality of a level crossing a higher level of pedestrian provision should be considered including wider footways, enhanced signing and guardrailings. Such provision may be considered necessary where there are primary schools or hospitals, or establishments for the mentally and physically handicapped persons in the neighbourhood.

12.4.4 The treatment details of pedestrian routes are consistent with the existing Requirements (ref 56) which covers signing and signals. Typical layouts are given in figures 12 and 13.

Table 3 - Categories of Pedestrian Provision

Pedestrian Flow per hour	No of Trains per hour			
	2 or less	3 - 4	5 - 10	11 or more
less than 10	D	D	D	D
10 -80	D/C	D/C	C	B
81 -100	C	C/B	B	B
201 - 500	B	B/A	A	A
greater than 500	B/A	A/X	X	X

Standards of Pedestrian Provision

Category	Description	
D	(i)	1.5m desirable (1.0m absolute minimum) footway width on crossing and immediately beyond leading into an approach funnel.
	(ii)	This indicates minimum provision typical of a rural crossing without footways on the highway.
C	(i)	1.5m space on each side of crossing leading directly into similar width footways within the highway.
B	(i)	As for C but with 1.8m footway width.
	(ii)	Pedestrian warning lights on both approaches.
	(iii)	Where adequate off-carriageway space is available, guardrails may be considered.
X	(iii)	With large pedestrian flows, consideration should be given to retaining a manually controlled barrier. However, vehicular flows typically above 2000/day at higher tarin frequenceis may require alternative suitable arrangements to be agreed with the Department of Transport Railways Division.

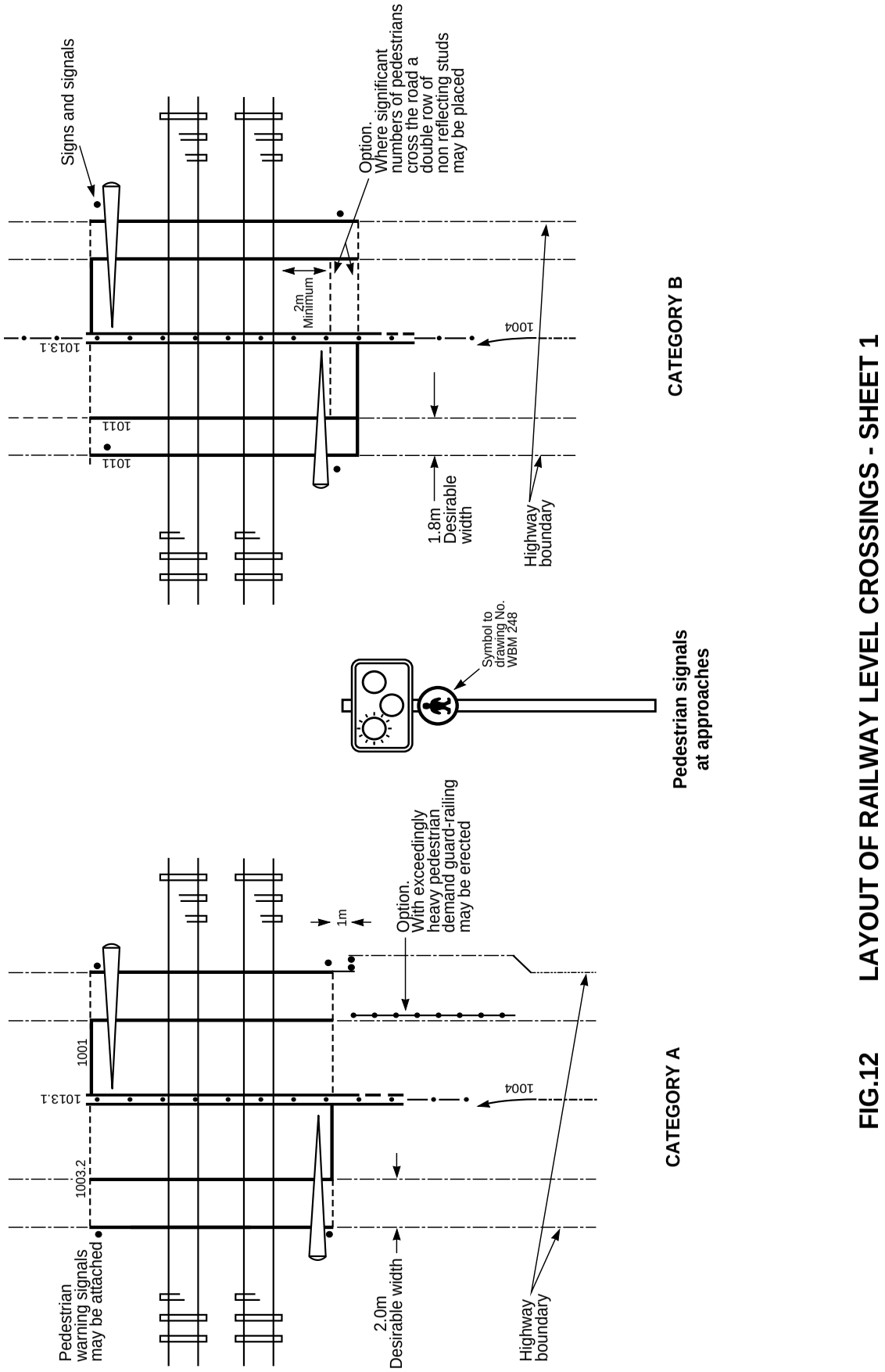


Figure 12 Layout of Railway Level Crossings - Sheet 1

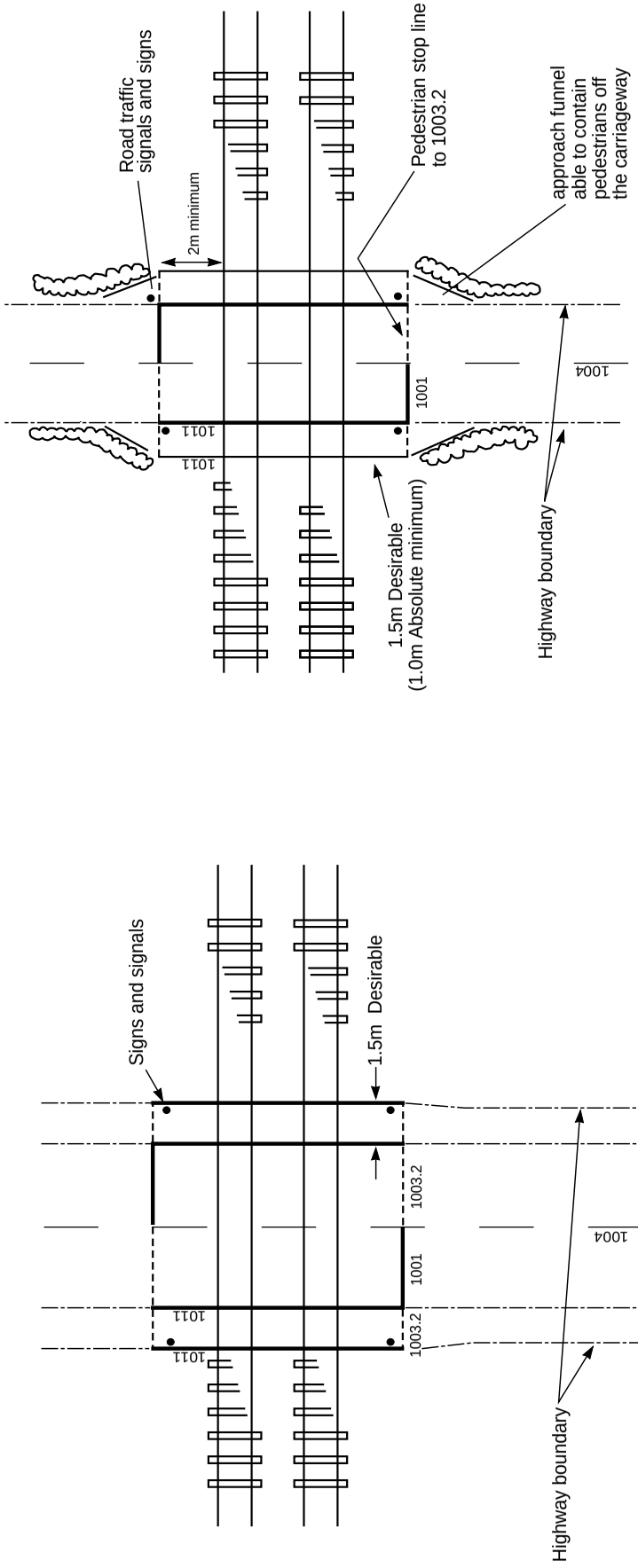


Figure 13 Layout of Railway Level Crossing - Sheet 2

12.4.5 The movement of cattle or horses at crossings is dealt with under Sections 7.2 and 11.2 of this document.

12.4.6 Pedestrian guardrails should only be provided in situations requiring pedestrian confinement, typically where large pedestrian flows could spill into the carriageway. In all cases the guardrailing should terminate 1m before the traffic signals post on the same side of the carriageway. Guardrails should never be erected where the footway width or approach is restricted.

13. LIST OF FIGURES

14. LIST OF FIGURES

15. LIST OF REFERENCES

1. Roads and Traffic in Urban Areas - INT/DTp 1987.

2. Traffic Signs Manual: Chapter 1 - Introduction: DTp:/SDD/WO 1982.

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16. ENQUIRIES

FLOW ADJUSTMENT FACTORS FOR RESTRICTED LANE WIDTH AND LATERAL CLEARANCE TO OBSTRUCTIONS

Table 4

Distance from Edge of Travelled Carriageway to obstruction		Obstuction on One Side of Roadway				Obstruction on Both Sides of Roadway			
		Lane Width (m)							
	Metres	3.66	3.35	3.05	2.74	3.66	3.35	3.05	2.74
D2	1.8	1.00	0.97	0.91	0.81	1.00	0.97	0.91	0.81
	1.2	0.99	0.96	0.90	0.80	0.98	0.95	0.89	0.79
	0.6	0.97	0.94	0.88	0.79	0.94	0.91	0.86	0.76
	0	0.90	0.87	0.82	0.73	0.81	0.79	0.74	0.66
D3	1.8	1.00	0.96	0.89	0.78	1.00	0.96	0.89	0.78
	1.2	0.99	0.95	0.88	0.77	0.98	0.94	0.87	0.77
	0.6	0.97	0.93	0.87	0.76	0.96	0.92	0.85	0.75
	0	0.94	0.91	0.85	0.74	0.91	0.87	0.81	0.70
S4 (2 lanes in each direction)	1.8	1.00	0.95	0.89	0.77	-	-	-	-
	1.2	0.98	0.94	0.88	0.76	-	-	-	-
	0.6	0.95	0.92	0.86	0.75	0.94	0.91	0.86	-
	0	0.88	0.85	0.80	0.70	0.81	0.79	0.74	-

Note: The above table can be used to estimate broadly the effect of reduced capacity arising from roadside obstructions present over a continuous length of road, in the absence of other information. However wide bridge abutments or piers with extensive lengths of associated safety fencing may create conditions of reduced capacity. (Derived from the Highway Capacity Manual - ref 58).

TYPICAL ANALYSIS FOR PICNIC SITE / REST AREA DESIGN

1. DESIGN FACTORS

Design Hour Factors DF = Ratio of design hour to average flow. (Suggested values are 2.3 for inter-urban and 3.0 for recreational routes)

Stopping Factor SF = Section Length x % vehicles stopping/Base Length (25 miles)

Holiday Factor HF = Daily 3 Summer Month Usage/Average Daily Usage (optional for non-recreational route locations)

2. DETERMINE SPACES REQUIRED

Spaces = AADT x DF x SF x HF/(Turnover of vehicles using each space per hour x 24). A separate calculation to be done for both cars and lorries if data permits.

3. WORD SHEET

Investing a route strategy as advised in chapter 3.2.1.

Section from.....to.....

Length =.....miles

Stopping Factor SF = ...% x Miles/25=.....%

Spaces = AADT .....x SF..... x (DF..... x HF...../turnover rate) div 24 use 0.1 as a default value.

Separate calculation to be done for cars and lorries if data permits.

Factors should be derived on a site specific basis. Typical values are:-

HF = 1.1 urban, 1.2 inter-urban, 1.4 recreational
SF = 0.8 - 4.5%
Car:HGV = 88.12
Turnover = 2.2 cars per space/hour

4. DESIGN

Design should be based on safe access/egress as defined in section 9.3 for the space requirements identified. Food sales, enhanced picnic or local countryside recreational facilities are likely to increase potential demand not measurable under the recreational Stopping Factor SF suggested above.

LAY-BYS : ROADSIDE TRADING

Lay-bys are an integral part of the general highway provision for the safe passage of vehicles. This provision is not intended to accommodate roadside trading although where mobile canteens are safely located and are not an environmental nuisance, they may be tolerated by highway authorities. Various powers exist to remove roadside traders and offences which may be caused by such trading particularly where they cause a safety hazard and are defined in the following Statutes:-

(i) Highways Act 1980, Sections 137,143,147A,148;

(ii) Road Traffic Regulation Act 1984, section 1 (Clearway Orders or Restriction of Waiting Orders) for areas outside London. Section 6 covers the former GLC area.

(iii) Local Government (Miscellaneous Provisions) Act 1976, Section 7 (Control of Road-side Sales) and also Local Government (Miscellaneous Provisions) Act 1982, Section 23 Control and Road-Side Sales).

(iv) Town and Country Planning Act 1984, Section 3 (Allow issue of a special enforcement notice to seek an end to unauthorised development on Crown land).

Similarly, local planning authorities may take enforcement action against roadside trading which does not enjoy planning permission. In addition, under section 3 and Schedule 4 to the Local Government (Miscellaneous Provisions) Act 1982, district councils may license, consent to or prohibit street trading in their areas. Other powers of control are available under the Control of Advertisement Regulations and Public Health legislation.