

## **INTERIM ADVICE NOTE 68/06**

### **Infrastructure changes to improve emergency access to and egress from the trunk road network in England**

**Note.**

This memorandum should be read in  
conjunction with IAN 75/06

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## 1. Introduction

### 1.1 Scope

- 1.1.1 This Interim Advice Note (IAN) contains details of the infrastructure changes necessary to improve the provision of emergency access and egress to and from the all-purpose and motorway trunk road network in England. This IAN shall be implemented with immediate effect.

### 1.2 Background

- 1.2.1 The Highways Agency (HA) is concerned about the plight of road users whose vehicles become trapped on the network when one, or both, carriageways become totally blocked. This may be as a result of a major incident or adverse weather conditions.

### 1.3 Purpose of this IAN

- 1.3.1 This IAN has been developed as part of the overall strategy for Traffic Incident Management. The objective is to detail the infrastructure changes which may be implemented as part of the development of route specific, emergency access and egress procedures, to contribute to the significant reduction in the delays to road users when an incident or adverse weather has resulted in a blocked carriageway.
- 1.3.2 Route Performance Managers need to ensure that this IAN and the corresponding Code of Practice IAN 75/06 are fully considered when preparing or updating their Emergency Access and Egress Procedure for a route.
- 1.3.2 The Access and Egress Procedure prescribes network prioritisation, and an implementation of changes in procedures and to the infrastructure, to comply with the Code of Practice IAN 75/06. Reference to individual elements of the IAN should not be made without following the entire process outlined in the implementation flowchart in Code of Practice IAN 75/06.
- 1.3.3 Certain options are only appropriate for dual carriageway roads (e.g. the procedure for implementing the emergency egress of trapped road users via the central reserve.) However, this IAN should always be considered in its entirety before a view is taken on the appropriateness of the best suited options with respect to the road under assessment.

### 1.4 Implementation

- 1.4.1 This IAN does not apply in **Wales, Scotland and Northern Ireland.**

### 1.5 Definitions

- 1.5.1 Many of the definitions set out below are not industry standard definitions and apply only in the context of this IAN.
- 1.5.2 **Trunk roads:** all-purpose and motorway trunk roads unless otherwise specified.
- 1.5.3 **Category 1 Incident:** Severe incidents creating stationary traffic on the network for three hours or more.

- 1.5.4 **Category 2 Incident:** Intermediate incidents creating stationary traffic on the network for between one and three hours.
- 1.5.5 **Category 3 Incident:** Minor incidents creating stationary traffic on the network for less than one hour.
- 1.5.6 **Access:** Access to the trunk road network for the emergency services (or other authorised users) from the secondary carriageway or local road network.
- 1.5.7 **Egress:** Egress from the trunk road network for the emergency services (or other authorised users) and road users to the secondary carriageway or local road network. (Note – this does not apply to the emergency evacuation of road users to another location without their vehicles, as sometimes happens in the event of a hazardous chemical spillage, fire, or in extremely adverse weather conditions).
- 1.5.8 **Link:** Section of trunk road network between two junctions, unless otherwise specified.
- 1.5.9 **Single closure:** The complete closure of the trunk road carriageway in one direction.
- 1.5.10 **Double closure:** The complete closure of the trunk road carriageway in both directions.
- 1.5.11 **Emergency Central Reserve Crossing Point:** A purpose built cross over point to enable access for emergency services and egress via the secondary carriageway, in accordance with this IAN.
- 1.5.12 **Emergency Turnaround Area (ETA):** An area of hard standing located in the verge to assist with the turning of vehicles as part of the egress procedures.
- 1.5.13 **Rearward relief procedure:** A procedure to allow the movement of trapped users by performing a u-turn on the same carriageway. Sometimes referred to as controlled reverse directional flow.
- 1.5.14 **Emergency access and egress procedure:** A procedure specific to a route which enables emergency services access to and from the trunk road network, but only emergency egress for other road users.
- 1.5.15 **Secure Carriageway:** A carriageway where all access points have been closed and any broken-down vehicles have been removed.

## 1.6 Glossary

A glossary of acronyms used throughout this document can be found in Annex 1.

## 2. Potential changes to network infrastructure

### 2.1 General

2.1.1 This document refers to those options that would require some major or minor physical change to the network infrastructure to develop new emergency access and egress procedures or to support those existing.

#### **Major Changes**

- Central reserve crossing points;
- Purpose built connections to a parallel road;
- Purpose built connections to an overbridge / underpass.

#### **Minor Changes**

- Hard standings for the emergency services or other authorised users;
- Emergency turnaround areas situated in the verge;
- Modifications to junction geometry;

2.1.2 Each link on the network must be assessed independently. Table 2-c identifies some of the disadvantages associated with each of the options identified above. Further detailed information is in Section 3.

2.1.3 It is recommended that options be considered in the order they are presented in Section 3.

### 2.2 Major Projects and Major Maintenance Renewal Schemes

2.2.1 For new construction or major maintenance schemes, where AADT exceeds 15,000 vehicles per day in a single direction, a major change should be implemented to provide egress every 5km, (as detailed in section 2.1.1).

2.2.2 Where possible, links should be split into sections of an even length. The distance between egress points must not exceed 5km (e.g. the egress point on an 8km link should split the link into two 4km sections. For a 12km link, two egress points should be installed to create three 4km sections).

2.2.3 Central reserve crossing points shall be no less than 2km apart (as detailed in section 3.4.13).

2.2.4 Issues relating to siting of major infrastructure changes are detailed in section 3.

### 2.3 Frequency of Major Changes

2.3.1 On secured sections of motorway or dual carriageway trunk road, where AADT exceeds 15,000 vehicles per day in a single direction, a major change should be implemented to provide egress or access for emergency services every 5km, (as detailed in section 2.1.1).

2.3.2 Table 2-a indicates the number of major changes required for set link lengths. These should be positioned to split links into sections of an even length and the distance between access/egress points must not exceed 5km.

**Table 2-a: Number of major changes to network infrastructure on secured carriageways**

AADT	Distance between Junctions (km)					
	<5	≥5<10	≥10<15	≥15<20	≥20<25	≥25<30
<15,000	0	0	0	0	0	0
≥15,000	0	1	2	3	4	5

2.3.3 On dual carriageway trunk roads where numerous at-grade access points prevent the securing of the carriageway, unescorted rearward relief could not be operated, therefore major changes should be implemented every 3km. Major changes should be positioned to split links into even sections where possible, providing the distance between them does not exceed 3km. Table 2-b indicates the number of major changes required for set link lengths.

**Table 2-b: Number of major changes to network infrastructure on unsecured carriageways**

AADT	Distance between Junctions (km)					
	<3	≥ <6	≥6<9	≥9<12	≥12<15	≥15<18
<15,000	0	0	0	0	0	0
≥15,000	0	1	2	3	4	5

2.3.4 If central reserve crossing points are to be implemented, the distance between them should be no less than 2km, as detailed in section 3.4.13.

2.3.5 Calculations relating to the spacing of changes are contained in Annex 2.

**Table 2-c: Disadvantages of options for changes to network infrastructure**

Option	Disadvantages
Hard standing for the emergency services	Potential for unauthorised use
Emergency turnaround area	Potential for unauthorised use
Modifications to junction geometry	Only useful in conjunction with rearward relief procedure
Central reserve crossing point	Risks to operatives when using
	Potential impact upon secondary carriageway flow when used for emergency egress.
	Implementation timescales may prevent full chapter 8 traffic management requirements being achievable.
Purpose built connection to a parallel road	Potential increase in maintenance requirement of central reserve crossing points compared to adjacent barrier.
	Risks to operatives when using
	Security issues related with creating an additional access / egress point on the network.
Purpose built connection to overbridge / underpass	Political impact related to creating additional access / egress points on the network.
	Objection from Local Authority
	Risks to operatives when using
Purpose built connection to overbridge / underpass	Likely to be the highest cost option
	Political impact related to creating additional access / egress points on the network.
	Objection from Local Authority

### 3. Network infrastructure options

#### 3.1 Hard Standings for the Emergency Services and Other Authorised Users

- 3.1.1 **General:** Hard standings considered at strategic points on the network to allow the emergency services and other authorised users to park in readiness to attend an incident. Ideally located at a junction to provide access to the network in both directions, without restricting the ability of the emergency services to attend a non-trunk road related incident.
- 3.1.2 Strategic planning of locations could save valuable time in reaching the incident, providing benefits towards achieving safety and congestion targets.
- 3.1.3 **Design Considerations:** Should be designed to safely accommodate the largest vehicle and operatives likely to use the hard standing and be designed to allow safe access and egress to the network.
- 3.1.4 Consideration should be given to construction from a cellular grassed paving system, which is likely to be less costly and less attractive to unauthorised users.
- 3.1.5 Alternative surfacing materials should also be considered, but in all circumstances the hard standings must be designed to be self-draining.
- 3.1.6 It is recommended that these locations be furnished with a sign advising 'Authorised Vehicles Only' or similar approved message.
- 3.1.7 **Siting:** The Route Performance Manager, in consultation with emergency services and other authorised users should determine the hard standing location. In all circumstances, the following issues should be considered:
- Hard standings should be in a location that has acceptable communication coverage for the emergency services and other authorised users.
  - Hard standings should not be located so as to encourage unauthorised use, e.g. near an emergency telephone.
  - Platforms should not be sited so as to intrude on the privacy of residential properties adjacent to its position.
- 3.1.8 **Routine Maintenance:** hard standings are to be low maintenance, but to a standard that would not hinder vehicles when in use.
- 3.1.9 **Network Operation:** Hard standings will not involve significant changes to existing network operations; however, the following will need to be addressed:
- Documented identification of locations;
  - Guidance for safe use;
  - Notification of location and safe use guidance to all authorised users.



3.1.10 **Other Innovations:** The options for changes to the network infrastructure, to improve existing access and egress should not be limited to those outlined below or in Code of Practice IAN 75/06.

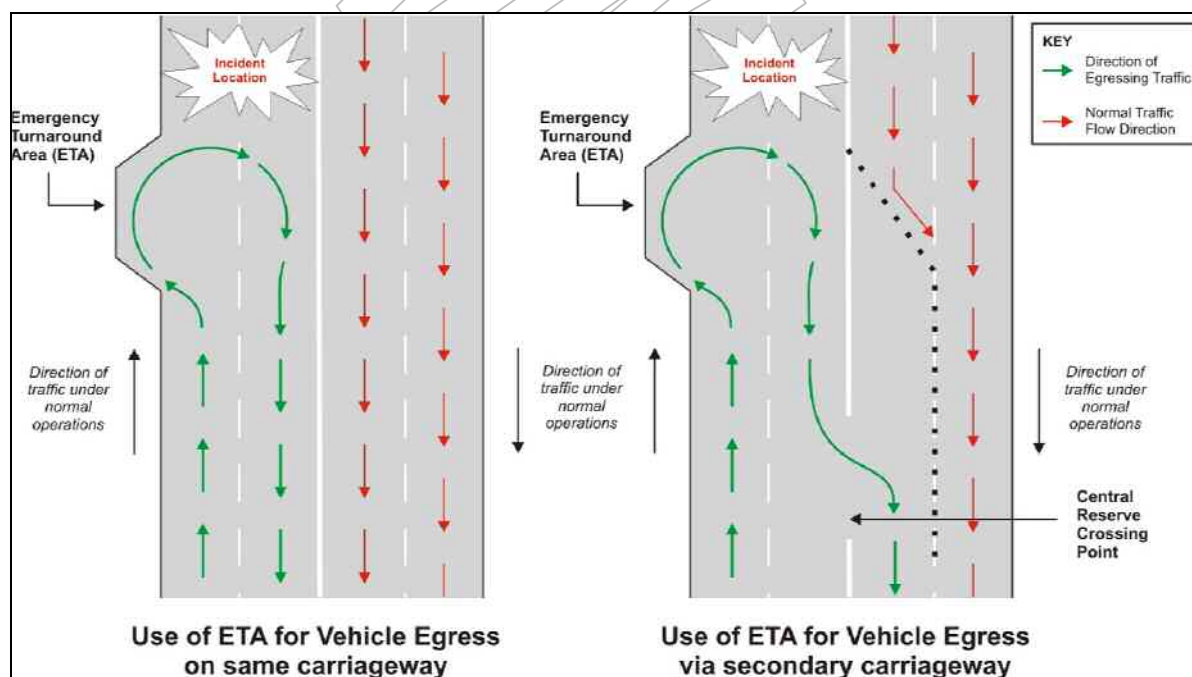
### 3.2 Emergency Turnaround Areas (Situated in Verge)

3.2.1 **General:** Emergency turnaround areas (ETAs) could be used to assist in facilitating the egress of road users from the network and could be used in conjunction with either of the following situations:

- Turning vehicles onto the same carriageway (i.e. rearward relief);
- Turning vehicles around on the secondary carriageway via the central reserve.
- A combination of both

3.2.2 Figure 1 gives two examples of potential modes of operation for an emergency turnaround area. NOTE: It will be the Route Performance Managers responsibility to determine the most appropriate mode of emergency turnaround operation for any link length in their area.

**Figure 1: Potential Modes of Operation for an ETA**



A standard detail for this option is provided in Annex 3.

3.2.3 It is unlikely that ETAs will be necessary where the link is a 3 or 4 lane carriageway with hard shoulder. However, carriageways of lesser widths may present difficulties in turning certain types of vehicle around and an ETA may be of benefit.

3.2.4 **Design Considerations:** Standard details for ETAs are provided in Annex 3. Wherever possible they should be designed to facilitate the turning circles of the largest vehicles on the network. The table in the standard details in Annex 3 provides guidance as to the potential requirements for ETAs on various standard width

carriageways (typical lane widths of 3.65m have been assumed) for turning around a 7.5T box van and a 16.5m articulated vehicle.

- 3.2.5 The table in Annex 3 is only provided as a guide. Swept path analyses should be undertaken as part of the design process to determine the precise requirements of the ETAs.
- 3.2.6 If, on the link under assessment, there are frequent lay-by areas or Emergency Refuge Areas (ERAs) these may be used as an ETA, providing they can be utilised in a safe and controlled manner.
- 3.2.7 Where maintenance hard standings are provided to the requirements of TD27, these may also be used as an ETA in an emergency situation, providing that the minimum requirements outlined in Annex 3 are achieved. When assessing the design and siting of a maintenance hard standing, consideration should be given to use as an ETA.
- 3.2.8 ETAs are not to be signed, but must be identified in the Area incident management plan.
- 3.2.9 **Siting:** When determining the location for an emergency turnaround area, consideration should be given to the following; -
- Topographical and land ownership issues;
  - Potential monitoring using existing CCTV;
  - Existing crossing points in the central reserve (see section 3.4.9);
  - Existing lighting.
- 3.2.10 In locations where engineering issues in the construction of an emergency turnaround area would involve substantial costs, consideration should be given to more cost effective locations.
- 3.2.11 Construction can be from any approved cellular concrete type material. Construction from such a material is likely to be more cost effective and will provide a less conspicuous refuge to unauthorised users. The hard standings should be designed to be self-draining.
- 3.2.12 It is preferable for an ETA to be located on a lit section of network; however, this is not a mandatory requirement. Further details can be found in Code of Practice IAN 75/06.
- 3.2.13 **Routine Maintenance:** ETAs are intended to be low maintenance, however, an approved cellular concrete construction would require the grass to be maintained at a level that would not adversely affect the intended use.
- 3.2.14 **Network Operation:** ETAs are to be used as an aid to traffic incident management and would require the following:

- Documented identification of locations;
- Guidance for use;
- Incorporation into existing traffic incident management plans;
- Procedures and protocols for use in a controlled turnaround operation.

3.2.15 The locations should be identified in all existing and future area maintenance/management contracts. All agencies likely to be involved in their operation must be made aware of their availability and location.

### 3.3 Modifications to Junction Geometry

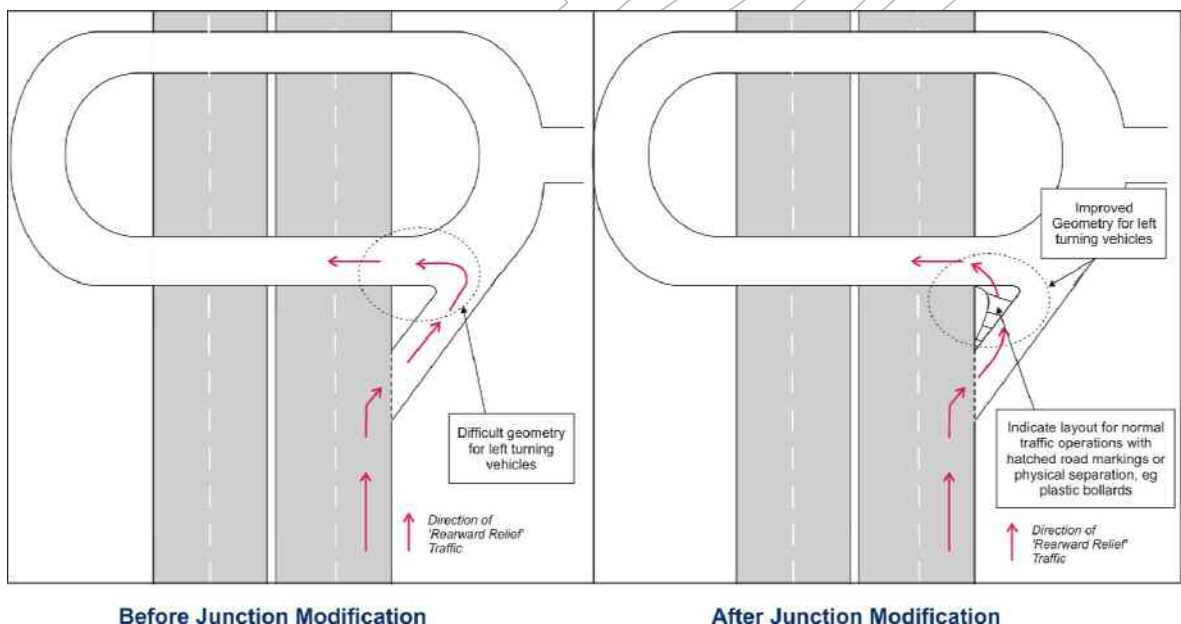
3.3.1 Modifications to the geometry of junctions may be considered in support of rearward relief procedures.

3.3.2 All changes to highway geometry must be in accordance with relevant design standards.

3.3.3 The current Traffic Officer procedure for rearward relief advises that local junction layouts will determine whether the turned traffic should leave the network via the access slip or the exit slip.

3.3.4 Figure 2 indicates how the geometry at a grade-separated roundabout may be modified to assist with easier egress of traffic via the access slip. Other options may be implemented and will be dependant on the existing layout of the junction under consideration.

**Figure 2: Example of Junction Modification to Assist with Rearward Relief Procedure**



3.3.5 Junction modification would not necessitate major changes to network operation, but would facilitate easier egress from the network if required. .

- 3.3.6 A junction modification option should be given priority where the network links to a planned diversion route.

### 3.4 Central Reserve Crossing Point

- 3.4.1 Central reserve crossing points could facilitate the egress of road users from the network by utilising the secondary carriageway.
- 3.4.2 The central reserve opening must be secured with a section of vehicle restraint that is easily removed and replaced, in line with the requirements of section 3.4.8. The system must at least meet the containment standard of the adjacent barrier and must meet a minimum of N2 containment standard.
- 3.4.3 The crossing point must be able to be quickly and effectively opened or closed by trained operatives when require and be of suitable width to enable vehicles to pass through at low speeds and on to the secondary carriageway. A standard detail of such a solution is provided in Annex 3.
- 3.4.4 **Important note when in close proximity to tunnel operation:** Any central reserve crossing point provided for emergency access and egress purposes should be located between 430m and 2km from a tunnel portal. These would be in addition to any MCP provided for tunnel operational, emergency and maintenance purposes.
- 3.4.5 Ensure the tunnel operator and emergency services are consulted in determining the optimum emergency access or egress point, and consider issues such as the tunnel ventilation system, the road layout geometry, surrounding topography etc. In some cases, a special study may be required.
- 3.4.6 **Design Considerations (Dimensions):** The crossing point must be designed to a minimum length of 16m and a maximum length of 25m. Greater widths may create operational difficulties. To determine the dimensional requirements of the crossing point, a location specific swept path analyses should be undertaken during the design stages.
- 3.4.7 **Design Considerations (Barrier / Fence):** Solutions for this option must comply with the Interim Requirements for Road Restraint Systems (IRRRS) and the appropriate sections of EN 1317. (Note TD19 will replace IRRRS when published in summer 2006.)
- 3.4.8 When designing a removable central reserve barrier the following should be considered as a minimum:
- The minimum level of containment must be N2 or the equivalent standard of the adjacent barrier, whichever is the greater;
  - The equipment to remove the central reserve barrier must be lightweight and suitable to be transported in a standard Traffic Officer or ISU vehicle;
  - The opening of the crossing point may only necessitate a closure of the outside lane in the secondary carriageway;
  - The crossing point must be able to be opened and closed within 30 minutes by a maximum of three suitably trained operatives, using non-specialist equipment;

- 3.4.9 Where possible, a central reserve crossing point should be provided in conjunction with an ETA. (See Section 3.2 for guidance regarding ETAs). ETAs should be no more than 500m downstream of a central reserve crossing point.
- 3.4.10 **Siting:** Where possible, existing, suitably constructed central reserve crossing points should be utilised (e.g. at an existing ECP / MCP location or other forms of hardened central reserve). Note TD27 recommends techniques for reducing maintenance liabilities within central reserves, including hardening, to provide scope for a combined project. Any hardened areas should be suitable for being trafficked without damage.
- 3.4.11 A new section of hardened central reserve should only be considered when a suitable existing crossing point is not available. The pavement construction of any new sections of hardened central reserve must comply with the requirements of TA 92 to facilitate the passage of HGVs and avoid settlement that could hamper the operation of the removable barrier.
- 3.4.12 Crossing points at locations with a wider section of central reserve will be better able to facilitate the turning circles of larger vehicles.
- 3.4.13 Central reserve crossing points shall be sited no closer than 2km apart on any given link. This facilitates the following:
- Where the management of a major incident would benefit from the simultaneous operation of two central reserve crossing points, a distance of 2km will better enable the merging of vehicles into moving traffic if necessary. When simultaneously operating central reserve openings, the safety of the dual operation must be paramount, and the openings must be of a suitable distance apart to ensure they serve the purpose of the traffic management without compromising the safety of the road users.
- 3.4.14 Where possible, central reserve crossing points should be located on lit sections of the network.
- 3.4.15 **Routine Maintenance:** Full consideration must be given to the maintenance implications of the installation of a removable central reserve barrier. This is to include the maintenance requirements of any moving parts such as wheels, hinges, etc. This is unlikely to have any additional barrier maintenance requirements (in terms of lane closures and exposure of operatives to live traffic) over and above that already undertaken on existing metal central reserve barriers, but may impact when placed in concrete barriers.
- 3.4.16 **Network Operation:** The primary mode of operation for a removable central reserve barrier would be to enable trapped vehicles to perform a U-turn onto the secondary carriageway and exit the network via the next junction. This is a complex operation which would require a significant amount of resource and training to perform safely and successfully.
- 3.4.17 The Central Reserve removable barrier may be used in conjunction with other alternatives such as ETAs. In such instances it may be possible to direct trapped road users to an ETA downstream of the central reserve crossing point to perform a rearward relief procedure back to the central reserve crossing point, and then onto the secondary carriageway.

- 3.4.18 More information regarding operational and procedural considerations is provided in Code of Practice IAN 75/06.
- 3.4.19 **Concrete Central Reserve Barriers:** When considering a central reserve crossing point, it is important to be aware of the HA policy regarding the implementation of concrete central reserve barriers as detailed in IAN 60. This prescribes the provision of concrete central reserve barriers on the network.
- 3.4.20 If, on the link under assessment, there are imminent improvements or major maintenance works, concrete central reserve barrier is likely to be installed and the appropriate systems for providing a central reserve crossing point should be considered on this basis.
- 3.4.21 Further details on the frequency of central reserve crossing points can be found in Section 2.2.
- 3.4.22 Where concrete central reserve barrier is already in-situ or is to be installed the following options for a removable barrier are available:
- A system as described in section 3.4.8. NOTE: approved transition pieces for concrete are only available to tension corrugated beam fence (TCB) and open box beam fences (OBB), and a length of either of these types of fence would have to be provided either side of the moveable section of barrier to fix the removable section;
  - A removable section, approved to EN1317, specifically designed to match the profile of the concrete central reserve barrier.
- 3.4.23 Central reserve crossing points in concrete central reserve barriers must achieve the performance specification, as set out in paragraph 3.4.8, as a minimum.

### 3.5 Purpose Built Connection to Parallel Road

- 3.5.1 **General:** The construction of a short, direct connection to an alternative road system (i.e. another trunk road or the local road network) which runs parallel to the network. To prevent unauthorised use, this connection would be securely gated at each end. A standard detail for this option is provided in Annex 3.
- 3.5.2 The relevant authorities must be consulted at an early stage to ensure adverse traffic conditions are not created elsewhere. Such an option should be considered as part of the Diversionary Route strategy.
- 3.5.3 **Design Considerations:** There will be network locations where this option is particularly suitable. These locations would be where the distance between the network and the parallel road is relatively short, has minimal gradient and no significant obstructions. Consideration must be given to topographical and land ownership issues.
- 3.5.4 At each end of the connection, a sign displaying the legend 'Authorised vehicles only' must be installed, on the nearside and offside verges. The legend shall be white, on a blue background, with a white border. The sign would need to be authorised on a site specific basis.

- 3.5.5 Where the connection to the parallel road is made through an existing safety barrier, noise fence or other type of fencing a removable barrier must be installed to the same containment standard and specification as existing.
- 3.5.6 **Siting:** Many of the issues relating to siting are covered in section 3.4.10. The following issues should also be considered:
- 3.5.7 The condition, construction, classification, capacity, distance from major junction and clearance from overhead bridges etc, of the adjacent network should be considered prior to the siting of the connection road.
- 3.5.8 The adjacent road (whether another trunk road or a local authority road) should preferably be part of an approved diversion route as these are more likely to be able to sustain the traffic flows required to perform egress from a motorway or trunk road, albeit on a temporary basis.
- 3.5.9 A left turn manoeuvre is advised for vehicles leaving the connection road to join the adjacent network.
- 3.5.10 The placing of flap type signs on the emergency diversion route will assist in the traffic management once the road users leave the trunk road network.
- 3.5.11 If the adjacent road is not part of an approved diversion route, an assessment must be undertaken as to its suitability for various categories of vehicle traffic. Such a connection may only be suitable for access or egress by emergency services.
- 3.5.12 **Maintenance:** Existing maintenance regimes should be adapted to inspect and ensure the integrity of the network security measures used.
- 3.5.13 The connection will need to be inspected and any defects rectified after usage.
- 3.5.14 **Network Operation:** The use of the connection to a parallel road system will be in accordance with all appropriate procedures, for the safe and effective operation of the network (Code of Practice IAN 75/06 contains further information relating to network operation and safety).
- 3.6 Purpose Built Connection to Overbridge / Underpass**
- 3.6.1 **General:** This option involves the construction of a direct connection to an alternative road (i.e. another trunk or local road) which crosses the network via an overbridge or an underpass. To prevent unauthorised use, the connection would have to be securely gated at each end.
- 3.6.2 The construction of a new purpose built emergency access / egress point to an overbridge or an underpass, should only be considered in the event that all other options (both operational and changes to network infrastructure) have been fully examined and found to offer no real benefits to road users at the time of major incident action.
- 3.6.3 Issues specified in section 3.5 should be considered. Additional issues, specific to this option are detailed below.

- 3.6.4 **Design Considerations:** Construction design must ensure the connection is suitable for the implementation of emergency access and egress procedures, with special consideration being given to gradient and design geometry. A maximum 10% gradient is recommended where ever practical.

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#### 4. References

1. Interim Requirements for Road Restraint Systems. Revision 1.
2. Crossover and Changeover Design. Design Manual for Roads and Bridges, Volume 8, Section 4, Part 6: TA 92/03.
3. The Introduction of a New Highways Agency Policy for the Performance Requirements for Central Reserve Safety Barriers on Motorways. IAN 60/05.
4. Cross Sections and Headrooms. Design Manual for Roads and Bridges. Volume 6, Section 1, Part 2. TD 27/05.
5. Code of Practice for Emergency Access to and Egress from the Trunk Road Network. IAN 75/06

Annex 1 Glossary

The following table contains a general glossary of abbreviations and acronyms that have been adopted throughout the document:

<b>Abbreviation / Acronym</b>	<b>Description</b>
AECP	Area Emergency Contingency Plan
CCTV	Closed Circuit Television
ECP	Emergency Crossing Point
ERA	Emergency Refuge Area
ETA	Emergency Turnaround Area
HA	Highways Agency
HGV	Heavy Goods Vehicle
IAN	Interim Advice Note
IRRRS	Interim Requirements for Road Restraint Systems
ISU	Incident Support Unit
MA	Managing Agent
MCP	Maintenance Crossing Point
MSA	Motorway Service Area
OBB	Open Box Beam
RCC	Regional Control Centre
TMC	Term Maintenance Contractor
TOD	Traffic Operations Directorate
TCB	Tension Corrugated Beam

## Annex 2 Spacing of changes to infrastructure

A2.1 These calculations relate to the Section 2 of this IAN.

A2.2 The number of cars per lane km was calculated, based on the percentage of HGVs, using Table A2-a. The assumptions made in the calculations in Table A2-a are shown in section 2.3 below.

**Table A2-a: Total vehicles per lane km**

Percentage HGV	Ration cars to HGV	Lengths		Space (m)	Number of spaces	Total Length 1 unit (m)	Units Per km	Total cars per km	Total HGV per km
		Avg Car	Avg HGV						
5	19.0	4.7	14	1	20	123.3	8.1	154	8
10	9.0	4.7	14	1	10	66.3	15.1	136	15
15	5.7	4.7	14	1	7	47.6	21.0	119	21
20	4.0	4.7	14	1	5	37.8	26.5	106	26
25	3.0	4.7	14	1	4	23.1	31.2	93	31
30	2.3	4.7	14	1	4	29.0	34.5	81	35

A2.3 Assumptions:

- Average car length: Ford Focus 4.3m, Ford Mondeo 4.7m, Ford Transit SWB 4.8m, Ford Transit LWB 5.9m. 4.7m used as an average;
- Max legal lengths of HGVs: Rigid 12m, Artic 16.5m. 14m used as an average;
- Assume 1m spacing between vehicles once they have stopped in a queue;
- 1 unit = 1 HGV + correct number of cars + correct number of spaces. Dependant on percentage of HGVs.

A2.4 Approximate time taken to remove vehicles from the network, using a major infrastructure change as described in section 2, estimated.

A2.4 Assumptions

- All traffic management and required personnel are in place;
- Carriageway is secured and all vehicles are sent to exit point unescorted;
- Rearward relief procedure used to move vehicles back to exit point;
- 3 lane carriageway;
- 15% HGVs;
- Large vehicles are stacked until all cars are removed;
- Turning a vehicle takes an average of 10 seconds;
- Travel time from turning point to exit point ignored, as it is undertaken as a continual process.
- Time taken to remove traffic management is not included.

## A2.5 Calculation

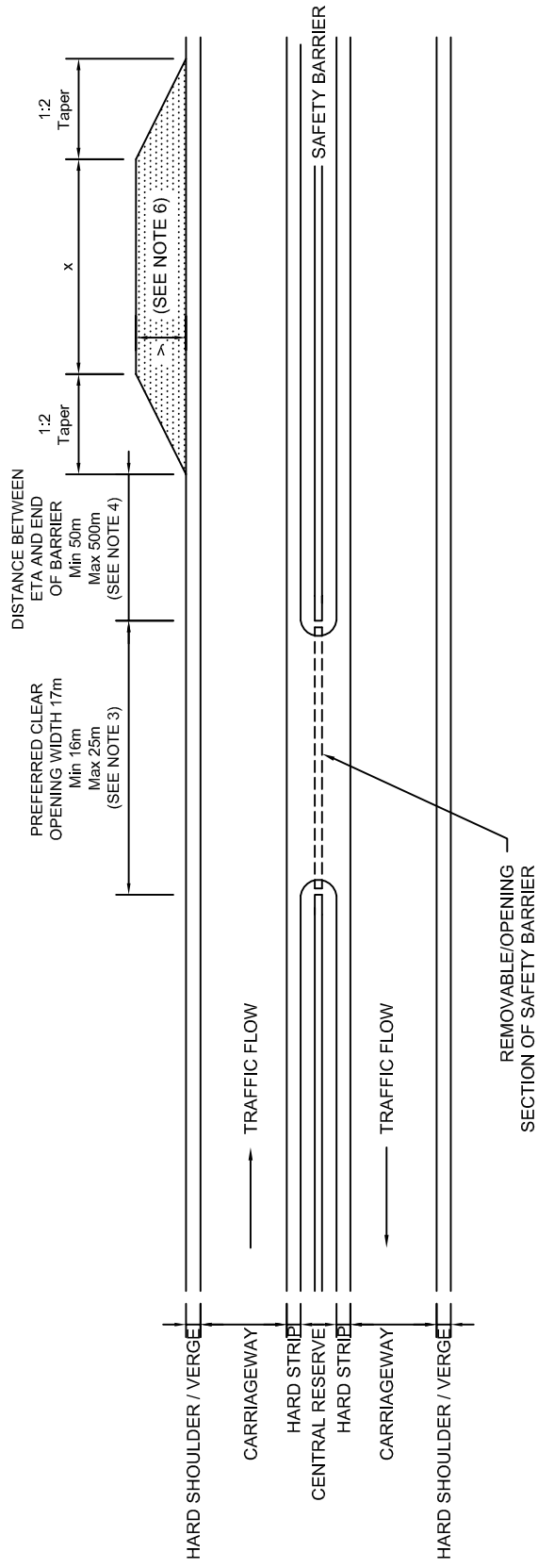
3 Lanes x 119 cars per lane x 10 seconds = 3,570 seconds per km

= 1 hour per km

- A2.6 Removing 5km of traffic using this method would take approximately 5 hours, plus the time taken to set up traffic management before the operation commenced.
- A2.7 On unsecured carriageways, vehicles may need to be escorted to the exit point when using rearward relief. This is a more time consuming procedure and therefore the spacing of exit points is reduced to 3km.

Annex 3 Standard Details





**KEY**



CELLULAR GRASS PAVING SYSTEM OR SIMILAR.

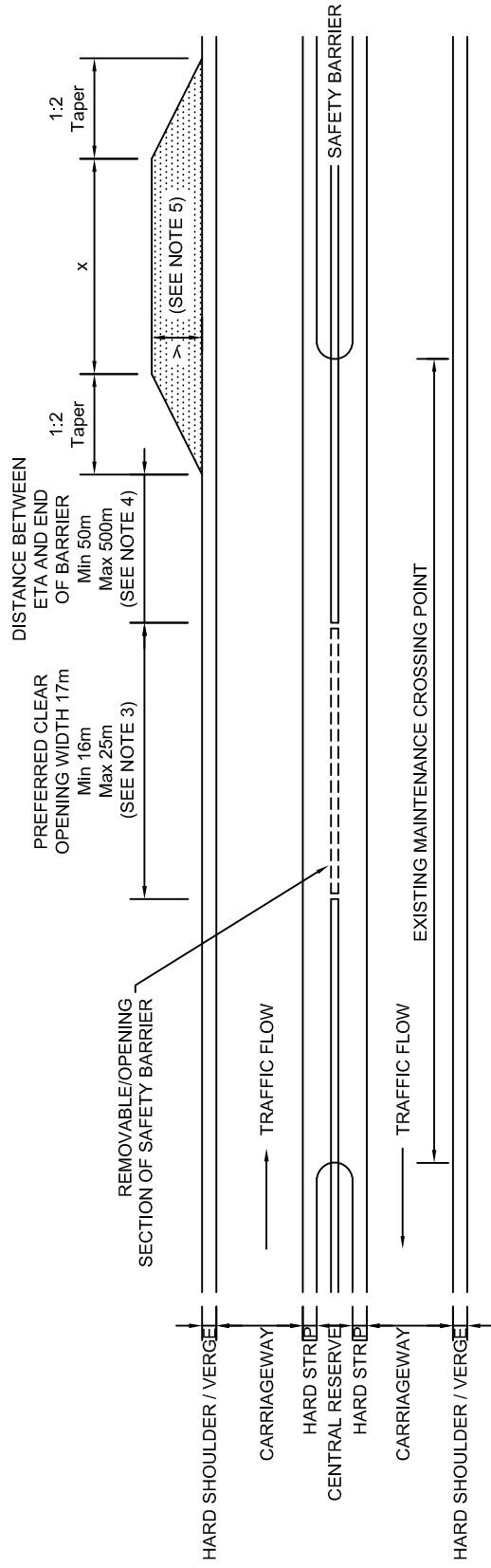
**SUGGESTED MINIMUM ETA DIMENSIONS (SINGLE U-TURN MANOEUVRE OF ARTICULATED VEHICLE)**

ROAD TYPE	x	y
2 LANE NO HARD SHOULDER	17m	8m
2 LANE HARD SHOULDER	15m	6m
3 LANE HARD SHOULDER	15m	4m

(SEE NOTE 1)

**NOTES**

- EXACT DIMENSIONS TO BE DETERMINED DURING LOCAL DESIGN INCLUDING SWEEP PATH ANALYSIS. DESIGNERS SHOULD NOTE THE DIMENSIONS ARE MINIMUMS, AND AS SUCH SEVERAL VEHICLES INCLUDING LARGE RIGID HGVS AND COACHES MAY HAVE DIFFICULTY TURNING IN THE SPACE PROVIDED DEPENDING ON SITE CONDITIONS. THE MINIMUM DIMENSIONS MAY NEED TO BE INCREASED IF RIGID HGV OR COACH NUMBERS ARE HIGH.
- THE 25M SAFETY BARRIER OPENING HAS A DESIGN SPEED OF 15MPH. A SLOWER OPERATIONAL SPEED SHOULD BE CONSIDERED DURING DESIGN IF A SMALLER OPENING IS TO BE USED.
- IT IS RECOMMENDED THAT THE LENGTH OF REMOVEABLE / OPENING SAFETY BARRIER IS RESTRICTED TO 25M TO ENSURE EASE OF OPERATION AND REDUCE SPEEDS DURING OPERATION.
- OFFSET BETWEEN END OF BARRIER AND START OF ETA TO BE DETERMINED ON BASIS OF PREFERRED MODE OF EGRESS OPERATION (SEE ANNEX 4, A4.12)
- THE CONSTRUCTION OF THE CENTRAL RESERVE OPENING TO BE CONTINUALLY REINFORCED CONCRETE PAVEMENT (CRCP) AND DESIGN TO HD26/01.
- ETA CONSTRUCTION DEPTH OF CELLULAR GRASS SYSTEM TO BE DESIGNED TO HA STANDARDS. MINIMUM SAND BLINDING LAYER OF 30MM. A MINIMUM DEPTH OF 150MM TYPE 1 GRANULAR SUBBASE IS REQUIRED. FOR CBR VALUES OF LESS THAN 4% AN ADDITIONAL DEPTH OF SUBBASE OF 75MM PER 1% REDUCTION IS REQUIRED. EXACT LAYBY CONSTRUCTION DEPTHS TO BE DETERMINED ON EACH SITE FOLLOWING SITE INVESTIGATIONS AND CBR TESTING.



**KEY**



CELLULAR GRASS PAVING SYSTEM OR SIMILAR.

**SUGGESTED MINIMUM ETA DIMENSIONS (SINGLE U-TURN MANOEUVRE OF ARTICULATED VEHICLE)**

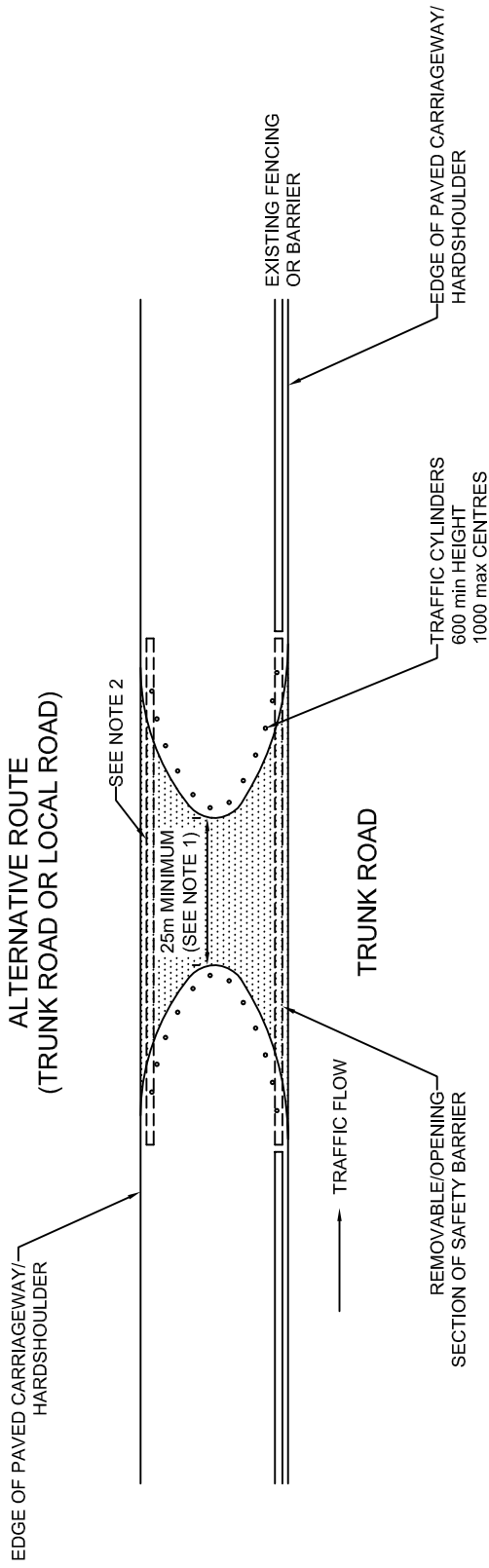
ROAD TYPE	x	y
2 LANE NO HARD SHOULDER	17m	8m
2 LANE HARD SHOULDER	15m	6m
3 LANE HARD SHOULDER	15m	4m

(SEE NOTE 1)

**NOTES**

- EXACT DIMENSIONS TO BE DETERMINED DURING LOCAL DESIGN INCLUDING SWEEP PATH ANALYSIS. DESIGNERS SHOULD NOTE THE DIMENSIONS ARE MINIMUMS, AND AS SUCH SEVERAL VEHICLES INCLUDING LARGE RIGID HGVS AND COACHES MAY HAVE DIFFICULTY TURNING IN THE SPACE PROVIDED DEPENDING ON SITE CONDITIONS. THE MINIMUM DIMENSIONS MAY NEED TO BE INCREASED IF RIGID HGV OR COACH NUMBERS ARE HIGH.
- THE PREFERRED CLEAR OPENING WIDTH IS 17m. IT IS RECOMMENDED THAT THE LENGTH OF REMOVEABLE/ OPENING SAFETY BARRIER IS RESTRICTED TO 25M TO ENSURE EASE OF OPERATION AND REDUCE SPEEDS DURING OPERATION.
- THE 25M SAFETY BARRIER OPENING HAS A DESIGN SPEED OF 15MPH. A SLOWER OPERATIONAL SPEED SHOULD BE CONSIDERED DURING DESIGN IF A SMALLER OPENING IS TO BE USED.
- OFFSET BETWEEN END OF BARRIER AND START OF ETA TO BE DETERMINED ON BASIS OF PREFERRED MODE OF EGRESS OPERATION (SEE ANNEX 4, A4.12)
- ETA CONSTRUCTION DEPTH OF CELLULAR GRASS SYSTEM TO BE DESIGNED TO HA STANDARDS. MINIMUM SAND BLINDING LAYER OF 30MM A MINIMUM DEPTH OF 150MM TYPE 1 GRANULAR SUBBASE IS REQUIRED. FOR CBR VALUES OF LESS THAN 4% AN ADDITIONAL DEPTH OF SUBBASE OF 75MM PER 1% REDUCTION IS REQUIRED. EXACT LAYBY CONSTRUCTION DEPTHS TO BE DETERMINED ON EACH SITE FOLLOWING SITE INVESTIGATIONS AND CBR TESTING.

Annex 3b: Central Reserve Crossing Point Within Existing Maintenance Crossing Point and Emergency Turnaround Area (ETA)



**KEY**



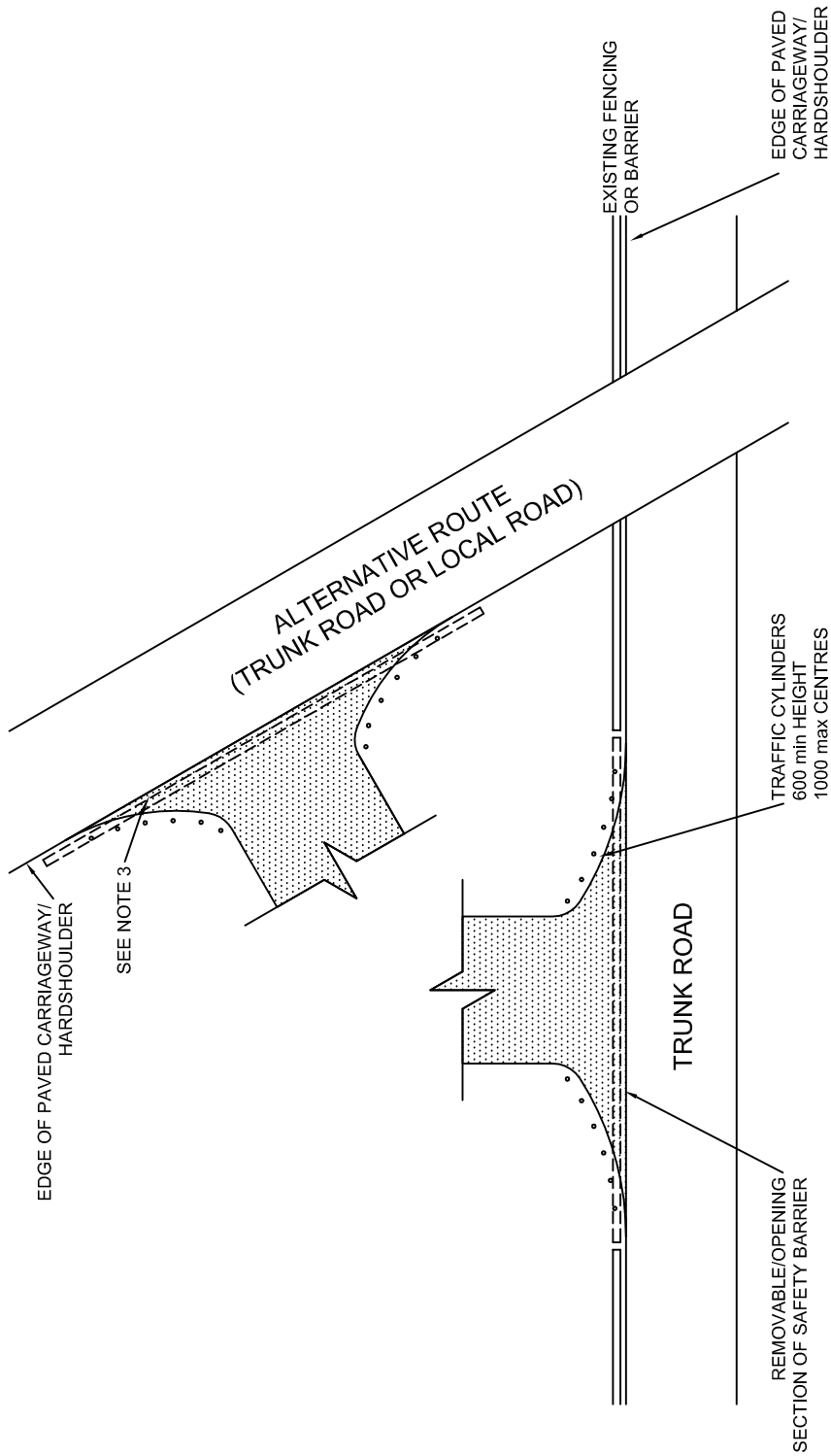
CELLULAR GRASS PAVING SYSTEM OR SIMILAR.

**NOTES**

1. EXACT DIMENSIONS TO BE DETERMINED DURING LOCAL DESIGN INCLUDING SWEEP PATH ANALYSIS.
2. FOR SECURITY REASONS THERE MAY BE BENEFIT IN SECURING THE CONNECTION WITH AN APPROPRIATE REMOVABLE BARRIER OR GATE.
3. CONNECTION CONSTRUCTION DEPTH OF CELLULAR GRASS SYSTEM TO BE DESIGNED TO HA STANDARDS. MINIMUM SAND BLINDING LAYER OF 30MM A MINIMUM DEPTH OF 150MM TYPE 1 GRANULAR SUBBASE IS REQUIRED. FOR CBR VALUES OF LESS THAN 4% AN ADDITIONAL DEPTH OF SUBBASE OF 75MM PER 1% REDUCTION IS REQUIRED. EXACT CONNECTION CONSTRUCTION DEPTHS TO BE DETERMINED ON EACH SITE FOLLOWING SITE INVESTIGATIONS AND CBR TESTING.

Annex 3c : Connection to Parallel Alternative Road





**KEY**



CELLULAR GRASS PAVING SYSTEM OR SIMILAR.

**NOTES**

1. IT IS NOT POSSIBLE TO SHOW THE PRECISE LAYOUT OF THE CONNECTION BETWEEN THE TWO END POINTS DUE TO LOCATION VARIANCES AROUND THE NETWORK. THE LAYOUT OF THIS ELEMENT OF THE CONNECTION SHOULD BE DETERMINED THROUGH DETAILED DESIGN CONSIDERING FACTORS INCLUDING TOPOGRAPHY AND LAND OWNERSHIP ISSUES.
2. EXACT DIMENSIONS TO BE DETERMINED DURING LOCAL DESIGN INCLUDING SWEEPED PATH ANALYSIS.
3. FOR SECURITY REASONS THERE MAY BE BENEFIT IN SECURING THE CONNECTION WITH AN APPROPRIATE REMOVABLE BARRIER OR GATE.
4. THE CONNECTION PAVEMENT CONSTRUCTION SHOULD BE DESIGNED SO THE SURFACING MATERIAL HAS A SKID RESISTANCE APPROPRIATE TO THE GRADIENT OF THE CONNECTION.

Annex 3d : Connection to Non Parallel Alternative Road (e.g. Overbridge/Underpass)