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**VOLUME 9 NETWORK - TRAFFIC  
CONTROL AND  
COMMUNICATIONS  
SECTION 4 SYSTEMS DESIGN**

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**PART 2**

**TA 73/97**

**MOTORWAY EMERGENCY  
TELEPHONES**

**SUMMARY**

This Advice Note describes the design and provision of emergency telephones. It also contains advice on the siting of emergency telephones.

**INSTRUCTIONS FOR USE**

This is a new document to be inserted into the manual.

1. Insert TA 73/97 into Volume 9 Section 4.
2. Archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from the Stationery Office Ltd.



**THE HIGHWAYS AGENCY**



**THE SCOTTISH OFFICE DEVELOPMENT DEPARTMENT**



**THE WELSH OFFICE  
Y SWYDDFA GYMREIG**



**THE DEPARTMENT OF THE ENVIRONMENT FOR  
NORTHERN IRELAND**

# **Motorway Emergency Telephones**

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**REGISTRATION OF AMENDMENTS**

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

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**Contents**

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1. Introduction
2. References
3. Enquiries

# 1. INTRODUCTION

## 1.1 General

1. This Advice Note describes the design and provision of emergency telephones. It also contains advice on the siting of emergency telephones.

## 1.2 Scope

2. This Advice Note is applicable to the design and provision of emergency telephones within the National Motorway Communications Systems. It can be used within motorway communications, motorway construction and improvement schemes.

3. The specific requirements for each Overseeing Organisation are contained in the relevant Annex to this Advice Note, they are as follows:

Annex A for England.

Annex B for Scotland.

Annex C for Wales.

Annex D for Northern Ireland.

4. This Advice Note is intended to be used by Overseeing Organisation staff, their consultants, Agents and maintenance contractors.

## 1.3 Related Standards and Advice Notes

5. There are no Technical Directives related to the design of emergency telephones. References for the standard of provision applicable to each Overseeing Organisation is given in the appropriate Annex.

6. The following Advice Notes are of relevance:

TA 70: Introduction

TA 71: Design and Implementation (Overview)

TA 72: National Motorway Communications Systems (NMCS)

## 1.4 Implementation

7. The appropriate Annex should be used forthwith on all motorway communications, motorway construction and improvement schemes currently being prepared provided that, in the opinion of the Overseeing Organisation, this would not result in significant additional expense or delay progress. Design Agents should confirm its application to particular schemes with the Overseeing Organisation.

## 2. REFERENCES

TA 70: Introduction (DMRB 9.2.1)

TA 71: Design and Implementation (Overview) (DMRB 9.3.1)

TA 72: National Motorway Communications Systems (NMCS)(DMRB 9.4.1)

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All technical enquiries or comments on this document should be sent in writing as appropriate to the above.

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**PART 2**

**TA 73/97 Annex A (England only)**

**MOTORWAY EMERGENCY  
TELEPHONES**

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1. Introduction
2. Siting of Telephones
3. Telephone Infrastructure
4. Telephone Equipment
5. Telephone System
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# A1. INTRODUCTION

## A1.1 General

1. This Annex is for the specific requirement of motorway communications in England.

### DMRB Structure

2. Section 1 of Volume 9 of the Design Manual for Roads and Bridges (DMRB) contains Technical Directives (TD) which detail the Standards of Provision.

3. Section 2 onwards contains Technical Advice (TA) Notes which reflect current practice in the field of motorway communications and control.

### Design Loop

4. Figure A1.1a shows the 'Design Loop' illustrating the general sequence in the iterative design process which starts with the design for emergency telephones and signals followed by transmission and control office designs. Last in the cycle is the design of the infrastructure that will be required to support all communications equipment and systems.

### Glossary

5. A Glossary of Terms is given in Chapter A8.

### Standard Drawings and Specifications

6. Standard MCX and MCY drawings and MCH and TR specifications are issued by the Highways Agency (HA).

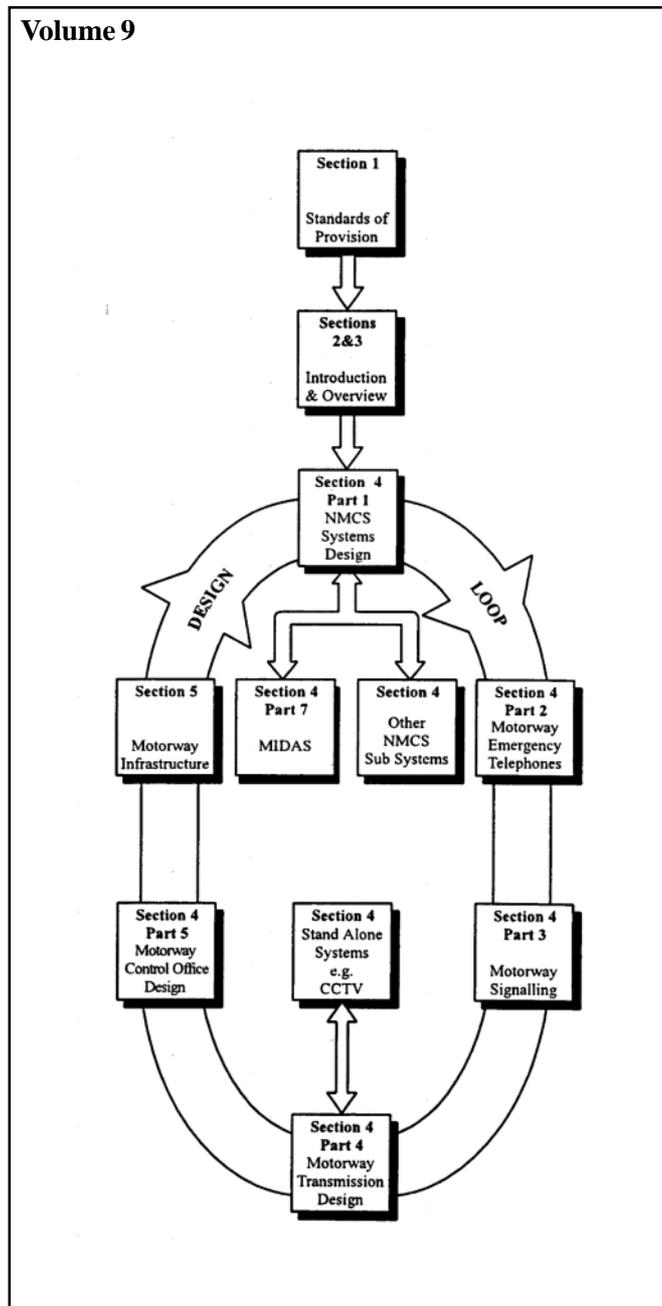


Figure A1.1a Structure of Volume 9 of the Design Manual for Roads and Bridges

## A2. SITING OF TELEPHONES

### A2.1 Overview

1. This chapter details the siting of Motorway Emergency Telephones on standard dual carriageway motorways
2. The standard for Link Roads and for provision on All Purpose trunk roads will be specified in future Standards and Advice Notes.

### A2.2 General

#### Between Junctions

1. Motorway telephones are normally installed at  $1.5\text{km} \pm 10\%$  intervals on the verge adjacent to the hard shoulders. On 4 or more lane motorways, the spacing is normally reduced to  $1\text{km} \pm 10\%$ . On dual carriageway sections of motorways, telephones are normally provided in pairs opposite each other. This minimises the risk of a stranded motorist seeing only the telephone on the other carriageway and attempting to cross the motorway.
2. To discourage motorists who break down near the start or finish of the motorway from leaving it to obtain assistance, telephones should be provided within the first and last 300m. These telephones are sited first, followed by telephones at junctions. The remaining lengths of motorway are then infilled with telephones at even spacing within the  $1.5\text{km} \pm 10\%$  limit.

#### Junctions and Interchanges

3. At junctions, it is desirable to provide one pair of telephones each side of the junction. They should be sited approximately 300m beyond the slip roads. This position should coincide with a signal.
4. A further pair of telephones should be sited in the centre of the junction to minimise the risk of stranded motorists crossing slip roads to reach a telephone.
5. The arrangement of telephones within interchanges should eliminate the need for stranded motorists to cross slip roads. It is necessary to ensure that any motorist approaching a merge with traffic on his left (or who has just passed a diverge to his left) will be able to see either a telephone or a telephone symbol on a marker post.

6. Telephones should be sited so that it does not appear easier to get to a telephone which is not the safest to reach.

#### Additional Considerations

7. Where hard shoulders have discontinuities telephones should be provided on every continuous stretch of hard shoulder unless otherwise agreed with the Highways Agency (HA). In situations where no hard shoulder exists, lay-bys should be provided at telephone sites.
8. Where telephones are located within the verge, provision should be made for an area of paving as shown on MCX 0143.
9. To achieve maximum visibility, care should be taken to avoid siting telephones near structures (eg, bridge piers), particularly where these are close to the hard shoulder on left hand bends.
10. There are maintenance, safety and other advantages in siting telephones and signals opposite each other. When tentative sites chosen for telephones and signals do not coincide they should be checked and adjusted if practical.
11. Telephones should not be sited at positions where it is dangerous to stop.
12. There are difficulties in installing telephones on viaducts, bridges or elevated sections. It is preferable to avoid these sites where practicable. However, where this is not possible, the mounting of the telephones and the routing of the cables should be provided for when designing the bridge.
13. Where a telephone is provided behind a safety fence, its orientation should be as shown on MCX 0135.
14. Where safety fence is not provided and there is a risk of users falling down a step or slope near a telephone, guard railing should be provided.

### **Recabling/Upgrading**

15. Where existing telephones are being replaced, the replacement telephones should be located within 10 metres of the existing site where possible. This will allow the same telephone address to be used and also the existing cable ducts can be re-used without significant changes to cable lengths. Where this is not possible, due either to an omission in the original design or a change in policy since the original design was implemented, justification for a departure from the above standard should be submitted to the HA.

### **A2.3 Safety**

1. Marker posts occur at intervals of 100m in the motorway verge. They are marked with an arrow and a telephone symbol showing the direction the stranded motorist should travel to the nearest 'safe to reach' emergency telephone. On all schemes, the location of these symbols should be checked by the Design Agent and renewed if incorrect.
2. The concept of 'safe to reach' should be borne in mind by all designers. The stranded motorist should not be tempted to cross or stray into any carriageway to reach a telephone. A telephone that is sited in the middle of a junction should not be signed as the nearest 'safe to reach' telephone on any marker posts other than those in the middle of that junction.
3. If necessary, extra telephones should be provided to dissuade the stranded motorist from crossing a carriageway or slip road. Fatalities have occurred due to pedestrians on the carriageway trying to find a telephone.

### **A2.4 Problem Areas**

1. The HA should be consulted at an early stage on the standards of provision, location, access and design of telephones in the following situations:
  - (i) Link roads
  - (ii) Narrow hardshoulders
  - (iii) Discontinuous hardshoulders
  - (iv) Where concrete barrier is used.

## **A3. TELEPHONE INFRASTRUCTURE**

### **A3.1 Civil**

1. The installation of Emergency Telephones is detailed on MCX 0143 and 0811.
2. At sites where the motorway is on an embankment a guard rail should be provided for the safety of users.
3. At sites where the motorway is in cutting a retaining wall may need to be constructed around the telephone hardstanding.
4. A preformed plastic chamber is installed adjacent to the telephone post. This chamber contains a Cable Joint Enclosure. In the event of damage to the telephone post the telephone can be disconnected at the CJE allowing the replacement of the post without disturbing the cable network.

### **A3.2 Communications/Electrical**

1. The telephone is connected via a quad cable to the local cable joint enclosure (CJE) which is in turn connected to the longitudinal cable. Connection details at the telephone are shown on MCX 0135.
2. A CJE is installed in the chamber adjacent to the telephone post. The purpose of this CJE is to isolate the telephone instrument from the cable network for testing and commissioning, it also allows for the replacement of either the telephone or the local quad cable. A coil of quad cable is housed in this chamber to allow for retermination.
3. Labelling details for Emergency Telephones are shown on MCX 0147.

## A4. TELEPHONE EQUIPMENT

### A4.1 Typical Arrangement

1. Table A4.1a lists the equipment required for an Emergency Telephone.

Equipment	Type	Qty
Telephone Housing	611D	1
Telephone Instrument	352	1
Telephone Post	71	1
Lightening and Transient Protection Device	21A	1

Table A4.1a

2. The Lightning Protection Device Type 21A is fitted between the connection cable pair and earth.

3. Figure A4.1a shows schematic details for telephones within an NMCS2 installation:

- (i) Remote Site - Figure A4.1a (i);
- (ii) Responder Site - Figure A4.1a (ii).

### A4.2 Telephones Not in Use

1. Telephone 'Not in Use' bags are available as Bulk Purchase items to cover telephones in the following situations:

- (i) When telephones have been installed but not commissioned. This is particularly important on upgrading contracts when existing telephones remain working adjacent to the new telephones.
- (ii) Where telephones have been decommissioned, but not replaced by new telephones.

(iii) Where traffic management is in operation and the use of telephones has been deemed unsafe by the Project Manager or by the Police. In this case, either telephones are disabled or additional temporary telephones are provided. In these situations options include having breakdown recovery vehicles which provide a free tow to the end of the road works site, and temporary CCTV.

(iv) Where damage to cables or other motorway communications equipment causes telephones to be out of service. The responsibility to cover the telephones with the 'Not in Use' bags will normally be with the specialist Regional Maintenance Contractor (RMC) in these circumstances.

### A4.3 Breakdown Contractor's Caravan

1. On major schemes where a free tow breakdown recovery service is to be provided, the Project Manager should arrange for a telephone link to be installed between the breakdown contractor's caravan and the police Control Office. This will be undertaken by the RMC as additional works and will be charged to the scheme.

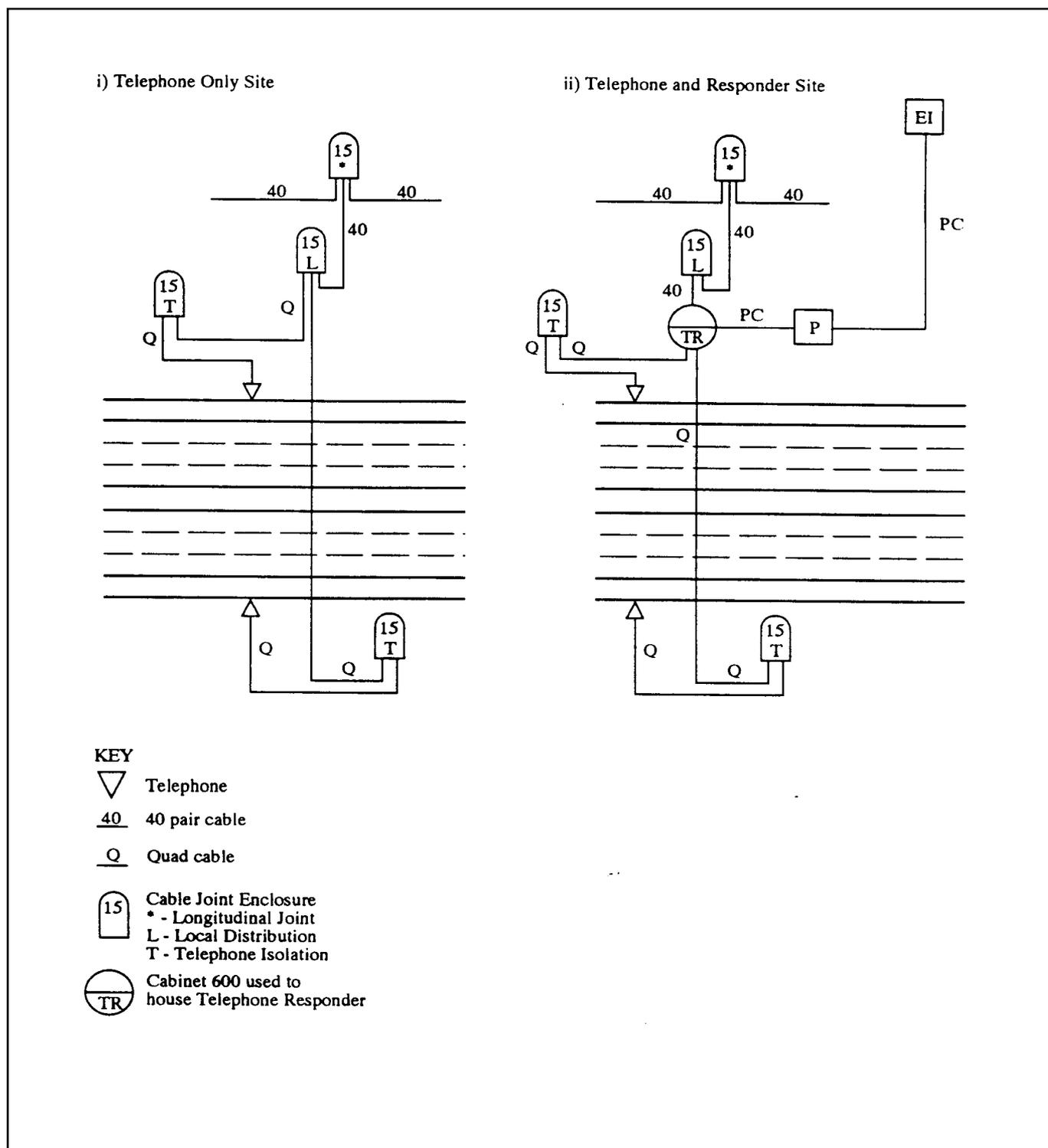


Figure A4.1a Schematic diagram for Emergency Telephone Installation

## A5. TELEPHONE SYSTEM

### A5.1 Introduction

1. There are 2 telephone systems currently in operation:

- (i) Phase 2 Telephone System;
- (ii) Phase 3 Telephone System.

### A5.2 Phase 2 Telephone System

1. The NMCS1 telephone system is also known as the Phase 2 Telephone System.
2. Phase 2 telephones operate using NMCS1 Responders (Type 700A) via one of two NMCS1 Central Processors (CP).
3. The CP acts like a clearing house within a Control Office Area by searching for telephone addresses and routing calls to that Control Office (CO). The CP forwards calls to the three operational lines in sequence. It can answer up to three calls at a time, if more than three calls are present at any one time the additional calls are handled on an omnibus circuit. This omnibus circuit is also used in an equipment failure mode.

### A5.3 Phase 3 Telephone System

1. The NMCS2 telephone system is known as the Phase 3 telephone system.
2. Phase 3 telephones are connected to Telephone Responders which are controlled by Telephone Line Controllers (TLC).
3. Each TLC controls the switching of a telephone circuit allowing the Operator at the CO the speak to particular phones, and to hold and disconnect callers as required.

4. Unlike the NMCS1 Responder which connects both signals and telephones, the NMCS2 Phase 3 Responder is a dedicated telephone-only device.

### A5.4 Phase 2 to Phase 3 Telephone Conversion

1. Upgrading of motorway communications for NMCS1 to NMCS2 normally involves the concurrent operation of Phase 2 and Phase 3 Telephone Systems.
2. To enable the conversion, NMCS1 Responders (Type 700A) are replaced by NMCS1 Telephone-Only Responders until changeover from Phase 2 to Phase 3 telephone systems, and by 21-bit NMCS2 Transponders to replace existing NMCS1 Responder Signalling capacity.

### A5.5 Further Information

1. For information on the design of Phase 2 and Phase 3 telephone systems, refer to TA 72: National Motorway Communications Systems.

## A6. GLOSSARY

### ***Bulk Purchase***

Standard items of motorway communications equipment are purchased by the Highways Agency in quantity. This ensures the equipment conforms to the relevant specifications, is available from several sources and benefits from economies of scale.

### ***Cable Joint Enclosure (CJE)***

Environmentally sealed enclosure housed in underground chambers used to contain cable terminations, and in some cases, loading coils. CJE are available in the following types:

Type 15	Use	No of Cables to be Accommodated	Comments
1	Longitudinal 40 pair joint	3 x 40 pair	Unloaded.
2	Longitudinal 40 pair joint	3 x 40 pair	As 15-1, with additional module providing 22 circuits loaded at 22mH.
3	Longitudinal 40 pair joint	3 x 40 pair	As 15-1, with additional module providing 6 circuits loaded at 88mH.
4	Longitudinal 40 pair joint	3 x 40 pair	As 15-1, with additional module providing 28 circuits loaded at 22mH.
L	Local distribution	3 x 40 pair and 6 x quad	
RSI	Rural signal interface	4 x quad	
HFC	High frequency carrier joint	4 x carrier quad	
F	Optical Fibre Cables	3 x 24 fibre	

Note: Type RSI are housed in Cabinets Type 609

### ***Central Processor (CP)***

The main computer used in the Computer Centre, used to control, via the Control Offices, the motorway telephone and signals a number of COs. CPs in current use are:

**CP303** (Ferranti Argus) at Coleshill

**CP305** (Ferranti Argus) at Westhoughton

The CP is the central component in an NMCS1 system.

### ***Closed Circuit Television (CCTV)***

A system using remotely controlled television cameras to monitor traffic patterns at sites susceptible to traffic congestion such as tunnels junctions and interchanges. The images are transmitted from the camera to the Control Office (CO) over the fibre optic cable infrastructure.

### ***Control Office (CO)***

The Control Office (CO) is the location from where the Highways Agency's motorway communications equipment, for the motorways in a given Police Force Area, are controlled. The CO is used by the Police Authority for day-to-day control of motorway traffic. More than thirty Police Authorities are involved in operating the national system, each Police Authority being issued with a code of practice approved by the Association of Chief Police Officers, in order to standardise the use of motorway signals for each region.

### ***Longitudinal Cable***

The 40 pair copper and 24 fibre cables (two separate cables) running parallel to the motorway in the duct network, each pair and fibre is dedicated to a specific purpose. Historically 20 pair NMCS1 and 30 pair NMCS2 cables were direct buried. The 20/30 pair copper cables may be augmented by composite copper/optical fibre cables dedicated to CCTV or carrier circuits.

### ***Motorway Emergency Telephone***

A telephone provided by the Highways Agency in the verge of motorways and all-purpose roads for use in the event of an incident or vehicle breakdown. Emergency telephones are linked, via the NMCS, to police Control Offices.

### ***National Motorway Communications System 1 (NMCS1)***

A combined signalling and telephone system controlled from Regional and National central processors, installed up to 1988.

### ***National Motorway Communications System 2 (NMCS2)***

A system using locally based distributed processing to control telephones and signals, installed from 1988.

***Omnibus Circuit***

A telecommunications circuit which is available to a group of users at all times. Generally, there is no hierarchy and no one user has control of the circuit.

***Phase 2 Telephone System***

The system of telephones installed along motorways as part of the first generation National Motorways Communications System, controlled by the Central Processor for call identification and switching.

***Phase 3 Telephone System***

The system of telephones installed along motorways as part of the second generation National Motorways Communications System (NMCS2).

***Quad Cable***

A 4 wire cable in which all the wires are twisted (laid) together, rather than in 2 pairs. This reduces cross pair interference where the pairs are used as the same channel.

***Regional Maintenance Contractor (RMC)***

A Contractor responsible for the day to day maintenance of instation and outstation equipment. Also has first line responsibilities for the transmission equipment in their region.

***Responder***

An NMCS1 outstation which controls telephones and signals.

***Telephone Line Controller (TLC)***

An NMCS2 telephone system instation unit. The TLC links an Operator's Interface to the Inter Panel Link Unit and controls the outstation telephone status and switching on one of a set of parallel circuits serving all, or a selection of, responders within a Control Office Area.

***Telephone 'Not in Use' bags***

A plastic covering for placing over motorway emergency telephones which have not been commissioned. The bags carry the legend 'Not in Use' and are secured with a padlock. They are Bulk Purchase items.

***Telephone Only Responder***

A device used in conjunction with 21-bit Transponders. It can drive up to 8 Phase 2 telephones from 2 NMCS1 Responder addresses.

***Telephone Responder***

A motorway based mini telephone exchange controlling the connection of telephones with an NMCS2 Control Office.

***21-bit Transponder***

This item of equipment is a derivative of the Standard Transponder (ST), modified to allow communication with an NMCS1 Central Processor, to enable control of NMCS2 signals in a NMCS1 Control Office (CO) Area.

## A7. REFERENCES

The 21-bit Transponder translates and interprets messages received from NMCS1 and controls the signal accordingly. The term 21-bit is derived from the NMCS1 21 bit word length.

MCX Drawings

TA 72: National Motorway Communications Systems (DMRB 9.4.1)