

SOUTH DUBLIN COUNTY COUNCIL
Traffic Management Centre
Roads (Traffic and Transportation) Department



REQUIREMENTS FOR THE DESIGN AND INSTALLATION
OF TRAFFIC CONTROL EQUIPMENT
FOR SOUTH DUBLIN COUNTY COUNCIL

Issue 4.0
March 2008

TRAFFIC MANAGEMENT CENTRE
ROADS (TRAFFIC AND TRANSPORTATION) DEPARTMENT
SOUTH DUBLIN COUNTY COUNCIL
COUNTY HALL
TALLAGHT
DUBLIN 24

**Requirements for the Design and Installation of Traffic Control Equipment
for South Dublin County Council**

Contents

1.	INTRODUCTION	4
1.1.	Objectives of this Document	4
1.2.	Definition of Requirements	4
1.3.	Updating of Requirements	4
1.4.	Responsibility for Compliance	4
1.5.	Documentation.....	5
1.6.	Structure of the Document.....	5
2.	GENERAL DESIGN REQUIREMENTS	6
2.1.	Design Process and Agreement	6
2.2.	Facilities for the Disabled, Pedestrians and Cyclists	7
2.3.	Selected Vehicle Priority	7
2.4.	Traffic Signal Sequences	7
2.5.	Turning Vehicles	8
2.6.	High Speed Roads.....	10
2.7.	Safety Audits	10
2.8.	MOVA (Microprocessor optimised vehicle actuation) Control	10
3.	OPERATIONAL REQUIREMENTS	11
3.1.	Controllers	11
3.2.	Remote Monitoring and DUSC	11
3.3.	CCTV.....	11
3.4.	Detection.....	11
3.5.	Control Strategies	12
3.6.	Isolated operation.....	12
3.7.	Linked operation.....	12
3.8.	Training.....	12
4.	INSTALLATION	13
4.1.	General Requirements and Procedures	13
4.2.	Controllers	13
4.3.	Power Supply.....	13
4.4.	Communications	13
4.5.	CCTV.....	13
4.6.	Detection.....	14
4.7.	Street Furniture	14
4.8.	Cabling.....	15
4.9.	Civil Engineering Works	15
4.10.	Construction.....	16
4.11.	Setting Out.....	16
4.12.	Documentation and As-built Drawings	16
4.13.	Tuning.....	17
5.	TESTING AND COMMISSIONING.....	18
5.1.	Factory Acceptance Tests	18
5.2.	Electrical Tests and Certification.....	18
5.3.	Site Acceptance Tests	18
5.4.	Commissioning	18
6.	WARRANTY, MAINTENANCE, INSPECTIONS AND PERIODIC TESTING.....	19
6.1.	Warranty	19
6.2.	Maintenance.....	19
6.3.	Inspections	19
6.4.	Periodic Testing	19

**Requirements for the Design and Installation of Traffic Control Equipment
for South Dublin County Council**

7.	ADDITIONAL INFORMATION.....	19
7.1.	Additional information or clarification may be obtained from:	19

TABLES

2.1	Traffic signal and pedestrian signal displays	7
2.2	Timings	8
2.3	Facilities for right turning vehicles	9
4.1	Street furniture	14
4.2	Ducting and minimum island widths	15

APPENDICES

A	Relevant Documentation
B	Standard Details
C	Technical Specifications
D	Standard Proformas
E	Performance Requirements for Maintenance

1. INTRODUCTION

1.1. Objectives of this Document

South Dublin County Council (the Council) is committed to managing transport in the County for the benefit of all users. The Council's Traffic Management Centre (TMC) acts as a focus for the development of the necessary operational expertise and provides a platform for the development of transport services. The safety and efficiency of such services are being improved. The cost of their provision has been reduced and installation standards improved because:

- all new equipment and installations are supplied and installed to common defined standards; and
- existing installations are, when necessary, brought up to the same standards.

This document defines the Council's general requirements for traffic control facilities and identifies where more detailed information may be found. These requirements complement normal traffic control design and installation practices and procedures.

This document supersedes version 3.1 issued by the Council in August 2005.

1.2. Definition of Requirements

Whenever possible requirements are defined by referring to existing and generally available standards and guidelines. Unless specified to the contrary the latest version of such documents should always be used. Some requirements are specifically defined using the Council's standard details and technical notes.

1.3. Updating of Requirements

The requirements defined in this document will continue to evolve with time as new techniques and technologies become available and new needs emerge. It is the responsibility of those who propose to install new equipment and installations to ensure that their proposals meet current requirements. This can be confirmed by contacting:

Traffic Management Centre
Roads (Traffic and Transportation) Department
South Dublin County Council
County Hall,
Town Centre Tallaght, Dublin 24
Tel: + 353 (0) 1 4626826
Fax: + 353 (0) 1 4626826
Email: tmc@sdblincoco.ie

1.4. Responsibility for Compliance

Responsibility for compliance with the current requirements lies with those who propose to install new equipment and installations. The Council does not accept any responsibility for any errors or omissions or any costs arising from designs undertaken by others.

If, after take-over, it becomes apparent that the works were not undertaken in accordance with the Council's requirements, appropriate action shall be taken to rectify any deficiency and the costs shall be met by those who undertook the works.

1.5. Documentation

Appendix A provides a list of relevant reference material. The Council has also issued complimentary documents and these are referred to in the text as appropriate. Copies of these documents are contained in the appendices.

1.6. Structure of the Document

The remainder of this document is structured as follows:

- Section 2: defines the general design requirements;
- Section 3: describes the operational requirements;
- Section 4: describes requirements for installation;
- Section 5: defines requirements for testing and commissioning; and
- Section 6: defines maintenance, warranty, inspection and periodic testing requirements.

The document is supported by the following Appendices:

- Appendix A: a summary of relevant documentation;
- Appendix B: copies of relevant Council standard details;
- Appendix C: a list of Council technical specifications;
- Appendix D: copies of proformas; and
- Appendix E: defines performance requirements for maintenance.

2. GENERAL DESIGN REQUIREMENTS

2.1. Design Process and Agreement

The design and agreement process shall follow the stages set out below. The Council may in certain circumstances allow stages to be combined. (Technical Specification TS04, Traffic Signal Installation Requirements, provides additional detail.)

Stage 1: Operational strategy

The operational strategy shall be discussed and agreed with the Council prior to the commencement of the design process. New, or modified installations shall, as necessary:

- incorporate appropriate facilities for disabled and able-bodied pedestrians as well as cyclists;
- provide priority facilities for selected vehicles; and
- make available appropriate vehicular capacity.

It should be noted that traffic signals could, at certain times or in certain circumstances, be used as a mechanism to influence driver route choice as part of an overall management strategy.

Stage 2: Outline design

The outline design shall be developed to support the agreed operational strategy and shall be agreed before detail design commences. The outline design shall indicate the general layout proposed, the anticipated control strategy, proposed facilities and estimated vehicular capacity based on actual count data or predicted flows as appropriate.

Stage 3: Detail design

Detail design, taking account of relevant Council requirements, shall be developed for the agreed outline design. Detailed design shall be agreed with the Council before site works commence. Detail design includes agreement of the controller specification (the 'TR2500' forms) that shall be prepared using a Word based document format (copies are available from the Council). In addition the following proformas (copies are provided in Appendix D) shall be supplied:

- Controller Build Schedule (SDCC/PF/01) ; and
- Equipment Schedule (SDCC/PF/02).

Stage 4: Installation

An agreed approach to installation, including programme, traffic management measures and temporary works, shall be finalised before works commence on site.

Prior to any installation works commencing at existing installations, a schedule of equipment at the site indicating what equipment is to be returned to the Council must be prepared using the Council's proforma (SDCC/PF/03).

**Requirements for the Design and Installation of Traffic Control Equipment
for South Dublin County Council**

2.2. Facilities for the Disabled, Pedestrians and Cyclists

All new installations in the County shall, when agreed with the Council, provide suitable facilities for disabled and able-bodied pedestrians and also cyclists. In particular:

- requirements for Pelicans and Toucans are shown on detail drawings SDCC/SD/01 and 02;
- dropped kerbs and 'L' shaped tactile paving shall be provided to assist pedestrians and shall be provided at all pedestrian crossings as shown on detail drawing SDCC/SD/03;
- tactile push button devices shall always be utilised with push buttons;
- audible (crossing or green man) signals shall be provided at all single Pelican and Toucan crossings but not double crossings. Such audible signals should be provided at traffic signal installations only if all traffic movements are stopped at red. Audible locator signals shall be provided at all installations. Vibrating arrows shall be provided at all installations.

The Council currently uses PRISMA DAPS push buttons (see Appendix F). Push buttons shall be installed so that pedestrians look towards the nearest approaching traffic when pressing the button and occasionally additional push buttons may be required.

Push buttons shall operate at ELV (extra low voltage) for safety reasons and a means of adjusting the volume of the audible signal shall be provided.

2.3. Selected Vehicle Priority

Selected vehicle priority shall be provided as follows:

- buses: when required, priority is currently provided using 'tuned loops' as described in the Council's Technical Specification SDCC/TS/01;
- LRT: details will be provided on request; and
- emergency vehicles: priority for emergency vehicles is not provided at present.

2.4. Traffic Signal Sequences

Traffic signal displays are summarised in Table 2.1.

TABLE 2.1: TRAFFIC SIGNAL AND PEDESTRIAN SIGNAL DISPLAYS									
Facility		Display required							
		Red	Green	Leaving amber	Flashing amber	Red man	Amber man	Green figure	Flashing green man
Vehicle displays	Traffic signals	√	√	√					
	Toucans	√	√	√					
	Pelicans	√	√		√				
Pedestrian displays	Traffic signals					√	√	√	
	Toucans					√	√	√	
	Pelicans					√		√	√

**Requirements for the Design and Installation of Traffic Control Equipment
for South Dublin County Council**

Permitted head configurations are shown on standard detail SDCC/SD/04. Timings shall be in accordance with current guidelines and as shown in Table 2.2.

TABLE 2.2: TIMINGS																									
Description	Comments																								
Minimum Green	The minimum green period is the shortest period of the right of way that is given to any phase. It is long enough for vehicles waiting between a detector and the stop line to start to move and clear the stop line. The minimum green period is normally 7 seconds .																								
Intergreen Period	The standard period between the end of the green display for one phase and the start of the green display for the next. This timing is dependent upon junction geometry and shall be calculated in accordance with TA/16/81. It shall in no case be less than 3 seconds amber and 2 seconds all red.																								
Pedestrian and Toucan crossing Timings	The minimum duration of the green man signal is 6 seconds . The duration of the amber man should be based on the time to cross the full width, walking at a speed of 1.2m per second . The all red times before and after pedestrian crossing should be at least 1 second but may be increased depending on road speed.																								
Pelican Timings	<p>The minimum duration of the green man signal is 6 seconds and the duration of the flashing green man should be not less than the time to cross the full road width, walking at a speed of 1.2m per second. Full timings are:</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Pedestrian Display</th> <th style="text-align: left;">Traffic Display</th> <th style="text-align: left;">Timings(seconds)</th> </tr> </thead> <tbody> <tr> <td>Red standing figure</td> <td>Steady green</td> <td>20</td> </tr> <tr> <td>Red standing figure</td> <td>Steady amber</td> <td>3</td> </tr> <tr> <td>Red standing figure</td> <td>Steady red</td> <td>1 gap/2 forced</td> </tr> <tr> <td>Green walking figure</td> <td>Steady red</td> <td>6 or 7^(a)</td> </tr> <tr> <td>Flashing green figure</td> <td>Steady red</td> <td>2</td> </tr> <tr> <td>Flashing green figure</td> <td>Flashing amber</td> <td>6 to 10^(b)</td> </tr> <tr> <td>Red standing figure</td> <td>Flashing amber</td> <td>2</td> </tr> </tbody> </table> <p>^(a) 6 seconds up to 7.5m, 7 seconds 7.5m to 10.0m crossing width; ^(b) road width in metres divided by 1.2, minimum 6 seconds;</p>	Pedestrian Display	Traffic Display	Timings(seconds)	Red standing figure	Steady green	20	Red standing figure	Steady amber	3	Red standing figure	Steady red	1 gap/2 forced	Green walking figure	Steady red	6 or 7 ^(a)	Flashing green figure	Steady red	2	Flashing green figure	Flashing amber	6 to 10 ^(b)	Red standing figure	Flashing amber	2
Pedestrian Display	Traffic Display	Timings(seconds)																							
Red standing figure	Steady green	20																							
Red standing figure	Steady amber	3																							
Red standing figure	Steady red	1 gap/2 forced																							
Green walking figure	Steady red	6 or 7 ^(a)																							
Flashing green figure	Steady red	2																							
Flashing green figure	Flashing amber	6 to 10 ^(b)																							
Red standing figure	Flashing amber	2																							

2.5. Turning Vehicles

Facilities for right turning vehicles shall be provided at T-junctions and crossroads as defined in Table 2.3. At all installations, secondary signals shall be provided for all movements. Closely associated secondary heads shall not be used without prior agreement of the Council.

**Requirements for the Design and Installation of Traffic Control Equipment
for South Dublin County Council**

It should be noted:

- 4-aspect heads should generally be vertically in line;
- for early cut-offs, the "fourth" aspect i.e. the green arrow, should only appear on the secondary head; and
- 5-aspect heads should be repeated on the secondary and offside (if there is no offside then nearside) primary head.

TABLE 2.3 : FACILITIES FOR RIGHT TURNING VEHICLES	
Description	Comments
No facility - vehicles turn in gaps	Low turning volumes
Early cut-off	Green arrow on far side secondary head terminated by the leaving amber signal.
Early/Late start	Green arrow required, terminated by full green. Opposing movement held on red.
Separately signalled (5 aspect heads)	Movements to be controlled by red/amber/green arrow (5-aspect) heads (ie a leaving amber follows the green arrow). Great care is required in siting heads to avoid confusion. Both primary and secondary heads will normally be required.
Segregated lanes	Movements to be controlled by red/amber/green arrow heads. If only one movement is controlled, the opposing movement must have closely associated secondaries. Great care is required in siting heads to avoid confusion. Both primary and secondary heads will normally be required.

Early cut-offs and late starts at separately signalled right turns (5-aspect heads) should always be demand dependent and extended by loop detectors.

Closely associated secondary heads should always be used for traffic opposing the early cut off right turn movement. When appropriate, and agreed with the Council, right turning early cut off stages may be followed by a short all red if there are no other demands. This will reduce delays to traffic by preventing the side road phase appearing unnecessarily.

Left turning vehicles often do not require any specific facilities. When appropriate, the following may be used:

- left filters;
- permanent flashing amber arrows; or
- flashing amber arrow with pedestrian phase.

The latter two can only be used in conjunction with a left splitter island.

Mast arms shall be used when there are four lanes on an approach but may, as agreed with the Council, be required for three lane approaches to traffic signals. Where mast arms are not used on three lane approaches at least one 7m pole shall be provided.

2.6. *High Speed Roads*

Double or triple speed discrimination, speed assessment or MOVA may be required for high-speed approach roads as agreed with the Council. All roads subject to speed limits greater than 50 km/h shall have speed discrimination installed as standard.

2.7. *Safety Audits*

Safety audits shall be undertaken for the outline design, detail design and pre-opening. The safety audit process shall be integrated with the general approach described in Section 2.1.

All safety audits shall be undertaken by suitably qualified staff that shall be independent of the scheme designers.

2.8. *MOVA (Microprocessor optimised vehicle actuation) Control*

Unless other wise approved by South Dublin County Council, any isolated junction whether urban or high-speed shall operate under MOVA control and shall be designed with this in mind. Only MOVA version 5 is currently approved for use, later versions may be approved by South Dublin County Council after satisfactory proven performance.

3. OPERATIONAL REQUIREMENTS

3.1. *Controllers*

All traffic signal, Pelican and Toucan controllers shall be approved to the UK specification TR2500 (formerly TR0141C) or latest version and comply with the requirements of the Council's Technical Specification SDCC/TS/01. Puffins and Puffin type pedestrian facilities are not currently used by the Council.

All controllers shall:

- be built with 8, 16 or 24 phases and pre-wired detection as agreed with the Council;
- provide red lamp monitoring to protect pedestrians;
- incorporate a UTC interface; and
- include a minimum of eight configured CLF plans with associated timetable slots. The plans shall cover AM and PM peak and if necessary the remaining plans may be copies of the peak period plans.

3.2. *Remote Monitoring and DUSC*

Controllers shall be fitted with all necessary equipment for remote monitoring / *Siemens* DUSC compatible with systems in use in the Council's Traffic Management Centre. Communication to the TMC shall normally utilise GSM but ISDN may, by prior agreement, be used.

Those responsible for the funding of the installation shall fund the installation of communications of the type specified by the Council. The Council will arrange for the installation of communication circuits.

3.3. *CCTV*

All necessary equipment for CCTV monitoring (including mast arms for supporting the cameras), compatible with the systems in use in the Council's Traffic Management Centre, shall be installed unless otherwise stated by the Council. Communications with the TMC for CCTV shall utilise dial-up, leased (ISDN) or Broadband digital IP circuits as required by the Council. Currently Broadband digital IP is the standard installation.

Those responsible for the funding of the installation shall fund the installation of communications of the type specified by the Council. The Council will arrange for the installation of ISDN and broadband communication circuits.

3.4. *Detection*

Vehicular detection shall be provided at all traffic signal installations, Pelicans and Toucans. To reduce implementation and operating costs:

- Pelican and Toucan crossings shall generally use above ground detection (MVD's) but loops may be required in some circumstances. Pedestrian presence detection and on-crossing detection may be required in some circumstances.

- traffic signals shall make maximum use of above ground detection (MVDs) or loops when this is not appropriate. At locations where both “main Road” and “side road” approaches are likely to be heavily trafficked system D loops shall be provided. At locations where side road use is likely to be light or intermittent stop line loops (calling) with MVDs (extending) may be used. No main road detection with arterial reversion may be suitable in such cases. MVDs shall always be supported by presence loops at the stopline but these are not required on the 'main road' when arterial reversion is utilised; and
- vehicle queue/flow loops may also be required to support Siemens DUSC .
- Notwithstanding the above the method of control at signalised junction shall be MOVA unless otherwise agreed and loops shall be configured and located accordingly.

3.5. Control Strategies

Traffic signals shall be designed to operate optimally in isolated mode, linked by CLF or Siemens DUSC mode of operation. Modes of operation may vary by time of day, or day of week, or in response to specific conditions (eg queues, selected vehicle etc). Other control strategies, eg Hurry Call or Bus Priority, may be required from time to time.

When within 100m of a traffic signal installation, Pelicans or Toucans shall be linked to that installation.

3.6. Isolated operation

Isolated controllers should operate in MOVA mode and make best use of maximum green timings to achieve optimum operation.

3.7. Linked operation

Linking may be achieved by utilising the time tabled (CLF) plans for predictable situations or Siemens DUSC for less predictable situations. Remote monitoring units installed in traffic signal controllers provide the Siemens DUSC facility.

The remote monitoring units generate and report to the TMC 'alarms', eg when flows exceed defined levels or when queues exist. The Plan Management software at the instation uses the alarms to determine when special plans CLF are required and informs preselected remote monitoring units. The remote monitoring units then instruct the controller to implement the selected CLF plans.

Appropriate plans shall be developed using LINSIG or TRANSYT or another agreed software package, and agreed with the Council in advance of implementation.

3.8. Training

When new equipment or systems are supplied that the Council have not previously utilised, appropriate training shall be provided for staff from the Council, the Council's Traffic Signal Maintenance Contractor and others as requested by the Council.

4. INSTALLATION

4.1. *General Requirements and Procedures*

All equipment shall be new and comply with relevant UK DETR specifications, BSEN 12368: 2000 (Traffic Control Equipment - Signal Heads), formerly UK BS 505 (1971) and also when appropriate be type-approved in accordance with the UK Highway Agency requirements.

Procedures that shall be followed for design and installation are defined in the Council's Technical Specification SDCC/TS/05.

4.2. *Controllers*

Controllers shall be installed in accordance with the Council standard detail SDCC/SD/05 and shall **not** be installed in a pedestal case. Controller cases shall be grey or black as agreed with the Council.

Controllers shall be installed so that they do not mask pedestrians from approaching vehicles or obstruct pedestrian routes, doors shall not open out onto carriageway. In addition, controllers should be located to provide a view of all approaches and not to hinder or disrupt normal activities in the vicinity. The location shall be agreed with the Council prior to commencement of any installation works.

4.3. *Power Supply*

The power supply shall be un-metered, single phase with protection against overcurrent and short circuit. The supply shall be not less than 230 volts (+/- 6 percent), 50Hz (+/- 1 percent), 30 amps for traffic signal controllers and 20 amps for pelican controllers. For larger installations larger power supplies may be required.

Power supplies shall always be terminated in a pillar of an agreed type (such as a 200mm deep by 600mm wide midi/mini pillar or agreed equivalent) not less than 2metres adjacent to the controller case.

The permanent power connection point shall be connected to a permanent ESB supply with corresponding ESB MPRN (Metre Point Registration Number). Permanent supplies from public lighting columns will not be acceptable under any circumstances.

4.4. *Communications*

Telephone circuit(s) shall be terminated within the controller utilising a standard agreed termination. A separate duct shall be used for telecommunications cable and this shall terminate at both the controller and an agreed location, usually a telecommunications company's chamber.

4.5. *CCTV*

CCTV masts shall be installed as shown in the standard detail SDCC/SD/06 and when necessary protected by crash barriers. The height, location and type of mast (wind down

**Requirements for the Design and Installation of Traffic Control Equipment
for South Dublin County Council**

cradle) shall be specified by the Council and the location of the CCTV mast(s) shall be agreed with the Council prior to works commencing.

4.6. Detection

Loop installation shall comply with the Council Technical Specifications SDCC/TS/02. All loops shall be indelibly labelled in the controller to indicate the loop reference. Approved four channel, self-tuning detectors shall be utilised and each channel shall be marked to show the loop reference.

Above ground detectors shall be of an approved type and fixed at the top of a signal pole in an appropriate manner. The detector cabling shall be terminated in an appropriate two-part weatherproof fitting. One part of the fitting shall be connected to the detector cabling and the second part located in the traffic signal head - this second fitting shall be cabled back to the pole cap connector block through the cable connector tube. This will allow simple replacement of the detector unit and will minimise the risk of vandalism. Cabling direct to the pole cap entering the pole via a bracket hole shall not be permitted.

4.7. Street Furniture

Requirements for standard items of street furniture are summarised in Table 4.1 and also in the Council Technical specification SDCC/TS/03. Requirements for other items of street furniture may be obtained from the Council. All street furniture shall be designed to provide maximum operational life, maximum resistance to vandalism and minimum maintenance.

TABLE 4.1: STREET FURNITURE	
Type	Requirements
Poles and mast arms	4.0m, 5.0m or 7.0m, pre-drilled plastic coated galvanised poles. The colour of the plastic sleeve shall be grey or black as specified by the Council.
Pole caps	Grey or black as appropriate and securely fixed to the pole.
Push buttons	PRISMA DAPS type push button units shall be used in all cases unless specified otherwise by the Council. ELV shall be used and the units should be mounted 1.1m above footpath level. The volume of the audible devices (when fitted) shall be adjustable.
Traffic signal and pedestrian heads	Compliant with BSEN 12368: 2000 (Traffic Control Equipment - Signal Heads), formerly UK BS 505 (1971), and only in the configurations shown on SDCC/SD/004. Heads shall be mounted so that the underside of the head shall be not less than 2.1m above footway or finished surface level and no part of the head is within 500mm of the nearest kerb face. Heads shall be securely fixed so that they are not affected by wind or subject to damage by vehicles - 'D' brackets shall be used for double heads or as required

Secondary traffic signal heads at free standing Pelicans and Toucans shall be fitted with primary hoods and aligned to be visible from vehicles at 50m from the stopline when typical approaching vehicle speeds are less than 60 km/h. Alignment shall be agreed with the Council for higher speed roads.

**Requirements for the Design and Installation of Traffic Control Equipment
for South Dublin County Council**

4.8. Cabling

Cabling shall be as defined in the Council Technical specification SDCC/TS/04. At least 4 spare cores shall be provided for each cable run and joints in LV cabling shall not be permitted. LV and ELV shall be segregated in different cables and not run in the same circuit path or overlap.

4.9. Civil Engineering Works

All civil engineering works shall be carried out and all materials and equipment shall comply with current Irish or British Standard specifications. Table 4.2 defines requirements for ducting and minimum island widths.

Ducting shall comprise a spinal ducting system with equipment connected to the spinal ducting chambers in an agreed manner. The spinal ducting shall comprise a minimum of triple 100mm ducts between 450mm x 450mm or 600mm x 600mm chambers. Chambers shall be located at all changes in depth/direction and at not more than 40m centres on long runs. Sufficient ducts shall be provided to allow complete re-cabling of the junction while the signals remain fully operational.

TABLE 4.2: DUCTING AND MINIMUM ISLAND WIDTHS	
Ducting	<ul style="list-style-type: none"> • all installations shall be fully ducted utilising Cooper Clarke (or agreed equivalent) chambers, pole chambers and ducts • chambers shall be utilised as shown on SDCC/SD/007 • when 4-way carriageway ducts are utilised then chambers shall be 600mm x 600mm to ensure sufficient cover • ducts shall be 100mm internal diameter, smooth bore, single wall constructed in medium density polythene with a wall thickness of not less than 5mm. Ducts shall be orange in colour marked at 1m centres in white lettering with 'Traffic Signals'. Couplers shall be orange and fixed at one end • ducts in carriageway shall be 750 mm deep and 450mm in verge/footing • one securely fixed polypropylene draw wires shall be provided in all ducts after cabling works have been completed
Splitter islands	minimum island widths are: <ul style="list-style-type: none"> • 1.5m for poles with three-in-line or 4-in-line heads; • 2.0m for poles with other head configuration, or pedestrian heads between the pole and kerb; • 2.0m when used by pedestrians; or • 3.0m when used by cyclists.

Connections from the spinal ducting system shall include:

- chamber adjacent to the controller. This chamber shall be between 450mm x 450mm chambers or 600mm x 600mm depending upon the number of ducts and cables;
- 300mm x 300mm loop chambers;
- 300mm x 300mm pole chambers with integral pole foundation; and
- CCTV masts.

Requirements for the Design and Installation of Traffic Control Equipment for South Dublin County Council

A 50mm red 'hockey stick' duct shall be installed from the ESB mini pillar to the traffic / CCTV mini pillar. An additional 50mm red 'hockey stick' duct shall be installed from the nearest public lighting column to the traffic/CCTV mini pillar.

4.10. Construction

All works shall be undertaken in a manner that has minimal impact on the safe and efficient operation of the road network including pedestrians and cyclists, vehicular traffic, public transport or emergency services, delivery vehicles, public utility plant, or the environment. In addition

- vehicular and pedestrian traffic shall be maintained at all times in a safe manner and not subject to unreasonable delay. If necessary, works shall be undertaken outside of peak periods, overnight or at weekends as agreed with the Council;
- restrictions and requirements set out by The Council for the timing or phasing of the works shall be complied with. This includes on-street Operation Freeflow Restrictions;
- temporary signs and/or diversions as agreed with the Council shall be provided and maintained. The size of all such signs and the lettering and wording thereon shall be approved by the Council before the erection of the signs and shall conform to the current version of the Road Traffic (Signs) Regulations, 1962, the Traffic Signs Manual (1996) or any amendments for the time being in force. The signs shall be reflectorised in a manner approved by the Engineer and be kept clean and legible at all times. Signs shall be repositioned, covered or removed as required during the progress of the works;
- as a minimum at each location where traffic diversions are required, the layouts indicated in 'Guidelines for Traffic Control at Rural Roadworks' published jointly by the City and County Engineers' Association and An Foras Forbartha Teo -June 1986, or any subsequent amendments thereof;
- **all heads must be securely bagged** until commissioned using tie on bags that fully obscure the traffic signal head. The type of bag shall be agreed with the Council;
- the controller shall be protected from inclement weather at all times, if necessary using a tent to prevent ingress of rain., sleet or snow; and
- all rubbish shall be removed on completion and the site left in a tidy condition.

Traffic signs shall not normally be fixed to traffic signal poles or mast arms. In those circumstances when the Council agrees signs may be fixed to poles or mast arms the detailed arrangements shall be agreed with the Council.

Prior to commencing any civil engineering works the Contractor shall determine the location of any utilities and take all necessary steps to ensure that no damage is caused.

4.11. Setting Out

Setting out and agreement of locations of poles, mast arms, controller and other traffic control equipment is critical. All proposed positions shall be agreed with TMC staff prior to any ducting or pole installation works commencing. Standard detail SDCC/SD/08 in Appendix B provides guidance for setting out of traffic signal poles.

4.12. Documentation and As-built Drawings

Controller specification documentation and as-built drawings shall also be supplied.

Controller specification documentation

Two paper copies of the full, as installed TR2500 controller specification together with the electronic copy of the specification (the Council's Word based format) shall be supplied. One copy shall be bound in a weatherproof plastic folder to be held in the controller and the other copy shall be bound in plastic and held at the TMC. This documentation shall be available prior to switch on. An electronic copy of the configuration shall also be supplied.

As-built drawings

As-built drawings shall be supplied as follows:

- a 1:500 traffic control drawing indicating road markings, poles, heads, detection, controller location, staging and cabling; and
- a 1:200 works drawing showing ducting, inspection chambers, street furniture and other relevant information.

Working copies of the drawing shall be available prior to switch on and two paper copies of the final version each drawing shall be supplied within two weeks of switch on. An electronic copy in AutoCAD format (version to match that used by the Council) shall also be supplied but the Council may, in specific circumstances waive this request.

4.13. Tuning

All sites may be "tuned" by the Council within thirty days of switch on to ensure optimum operation. Following completion of tuning any changes shall be incorporated into new EPROMs and new documentation and as-built drawings submitted.

5. TESTING AND COMMISSIONING

5.1. *Factory Acceptance Tests*

Prior to installation, controllers and other systems (excluding CCTV) shall be subject to factory acceptance testing. The Council, the Council Traffic Signal Maintenance Contractor(s) and/or others nominated by the Council may attend such tests. The date, time and venue of factory acceptance tests shall be agreed with the Council at least one week in advance of the tests.

5.2. *Electrical Tests and Certification*

Prior to site acceptance testing the following tests shall be carried out in accordance with electrical regulations (BS7671) and appropriate test sheets shall be provided to the Senior Executive Engineer, Traffic Management Centre, Roads (Traffic and Transportation) Department:

- insulation resistance test;
- mains Connection Polarity check;
- earth loop impedance test;
- where fitted, RCD test;
- loop and loop feeder cable tests;
- green conflict tests; and
- any tests deemed necessary by the Council.

Green conflict test results shall be provided on the proforma provided in Appendix D. Other test results shall be provided on proformas in accordance with BS7671.

5.3. *Site Acceptance Tests*

When all works are completed, the electrical testing and green conflict testing satisfactorily completed and the final safety audit satisfactorily completed, a site acceptance test shall be undertaken prior to commissioning and switch on.

The tests shall fully demonstrate that the works are safe, fit for purpose and fully meet Council's requirements. All tests shall be completed prior to commissioning however, in the event of minor faults, SDCC may allow commissioning subject to agreed works being completed within a defined timescale.

The Council staff, the Council Traffic Signal Maintenance Contractor(s) staff and/or others nominated by the Council may attend the tests. The day and time of the site acceptance tests shall be agreed with the Council at least one week in advance of the tests.

5.4. *Commissioning*

Commissioning and switch on of equipment or systems shall take place immediately after site acceptance tests are satisfactorily completed or as agreed with the Council. If considered necessary by the Council appropriate publicity shall be given to the bringing into operation of the facility.

6. WARRANTY, MAINTENANCE, INSPECTIONS AND PERIODIC TESTING

6.1. Warranty

A twelve month return to base warranty service shall be provided by on all equipment supplied.

6.2. Maintenance

The Council shall not accept operational responsibility until all the following have been achieved:

- satisfactory completion of commissioning;
- completion of any outstanding minor works;
- completion of “tuning”;
- contractual take-over; and
- a minimum 30 day fault free period of operation has been recorded.

The Contractor shall provide a traffic control maintenance service in accordance with the performance requirements of Appendix E until the Council accepts operational responsibility. If the Contractor fails to provide a satisfactory service the Council shall make arrangements for such a service to be provided and all costs incurred shall be recovered from those who undertook the works.

6.3. Inspections

The Council's Maintenance Contractor(s) shall undertake annual inspections of all equipment utilising the proforma provided in Appendix D.

6.4. Periodic Testing

The Council shall arrange for electrical and green conflict tests to be repeated at not greater than five year intervals.

7. ADDITIONAL INFORMATION

7.1. Additional information or clarification may be obtained from:

Traffic Management Centre
Roads (Traffic and Transportation) Department
South Dublin County Council
County Hall,
Town Centre,
Tallaght,
Dublin 24
Tel: +353 (0) 1 46 26 826
Fax: +353 (0) 1 46 26 826

Email: tmc@sdblincoco.ie