Electrical Services Standard Specification
4.0 - Cable Tray Installation

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For
ROYAL HOLLOWAY
UNIVERSITY OF LONDON
Prepared For The Estates Division By:

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## AMENDMENTS

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4.1 INTRODUCTION

This specification relates to the requirements for the supply and installation of cable tray, ladder and basket systems.

The appropriate British Standards should be complied with at all times, particular attention shall be paid to BS7671: 2008 and its subsequent amendments.

The use and application of material covered in this specification shall be in accordance with the requirements of Royal Holloway University of London.

ALL WORKS ARE TO BE INSPECTED BY THE TENDERING CONTRACTOR PRIOR TO PRICING

HEALTH AND SAFETY STATEMENT

Health and Safety precautions are required to be taken during the process of undertaking works within buildings cannot be underestimated.

Reference shall be made to Royal Holloway University Health and Safety Policy and Contractors Guidance documents available from Royal Holloway University of London Estates Office.

The Health and Safety Executive (HSE) publish a series of guidance documents regarding different methods of protecting the workforce and people in general when undertaking potentially dangerous work activities.

Installers engaged in any work shall be registered with the Construction Skills Certificate Scheme (CSCS) and be in possession of a valid skills card.
4.2 CABLE TRAY AND CABLE BASKET LADDER INSTALLATION

4.2.1 Nature and Extent of Work

The works to be undertaken in this section cover the, supply, delivery, off-loading, storing, erection, including all fixings and brackets, installation, testing and setting to work of all cable tray basket and ladder installations.

4.2.2 Segregation of Services

Independent cable tray and ladder systems shall be provided for the cables of the following distribution networks.

(i) Lighting and Power (LV)
(ii) Fire Alarm Systems
(iii) Telephone and Data Systems
(iv) CCTV, Security and controls

4.2.3 Galvanised Cable Trays

All galvanised Cable Trays shall be manufactured from pre-galvanised mild steel, to BS EN 10142 : 2000 and BS EN 10143 : 2006 with a minimum coating weight of 275g/m². Cable tray and cable fittings shall be fully perforated, slot sizes shall be 20mm x 7mm (or similar), running parallel to the length of the cable tray and 13.5mm by 11mm (or similar) running perpendicular to the length of the cable tray and shall be:

(a) Light Duty Non-Return Flange:

Gauges shall be a minimum of 1.0mm for tray up to 225mm, 1.2mm between 225mm and 300mm, and 1.5mm above 300mm. Flange height shall be a minimum of 12mm.

(b) Heavy Duty Return Flange:

Gauges shall be a minimum of 1.0mm for tray up to 225mm, 1.2mm between 225mm and 600mm, and 1.5mm over 600mm. Flange height of 50mm and a minimum return flange of 18mm.

(c) Extra Heavy Return Flange:

Gauges shall be a minimum of 1.0mm for tray up to 225mm, 1.2mm between 225mm and 600mm, and 1.5mm over 600mm. Flange height shall be a minimum of 75mm.

(d) In general, heavy duty, return flange, pre-galvanised perforated, cable tray shall be used for mains and sub-main cabling with light duty, galvanised perforated cable tray used for fire alarm, telephones/data and security/CCTV installations.

(e) Supported on purpose-made suitably treated mild steel supports which shall permit easy adjustment and modification or by suitable channel, brackets and accessories to BS.6946 at intervals necessary to provide a rigid fixing in accordance with the manufacturers recommended fixing centres.
Channels to BS.6946 shall be manufactured from 2.5mm material conforming to BSEN 10142 : 2000 and BSEN 10143 : 2006. Brackets to BS.6946 shall be manufactured from 6mm mild steel, 40mm wide, hot dip galvanised after manufacture to BSEN ISO 1461 and shall have a minimum hole size of 14mm dia holes to accept M12 setscrews.

(f) Capable of carrying without undue deflection, the total weight of cable likely to be carried on the tray regardless of the location of the joints.

(g) Fixed to the fabric of the building by means of expansion type masonry plugs or bolts. Fixed to steelwork and purlins with proprietary fixings approved by the Structural Engineer and/or purlin manufacturer.

Fixing samples shall be submitted for approval prior to commencement.

(h) Installed with a space between the structure and supported tray as follows:

<table>
<thead>
<tr>
<th>Tray</th>
<th>Space</th>
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<tbody>
<tr>
<td>Up to 100mm wide</td>
<td>75mm minimum</td>
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<tr>
<td>Above 100mm wide</td>
<td>100mm minimum</td>
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</table>

(i) Installed using factory formed bends and tees. Where cut sections are used for sets they shall be free from sharp edges, and joined by means of fish plates or couplers bolted to each section in accordance with the manufacturers recommendations.

(j) Painted with zinc rich paint to BS.4652 where cuts have been made.

(k) Suitably protected where holes have been cut to allow cables to pass through or exit the tray.

(l) Installed and coupled together using fish plate and/or flat bar couplers secured with the appropriate number of M6 x 12mm roofing bolts and nuts or stainless steel clips as required in accordance with the manufacturers recommendations.

(m) Fitted with inverted cable tray through and extending to 300mm either side of fire barriers.

(n) Earth continuity connectors shall be fitted between each length of cable tray to ensure compliance with BS.7671. The earth continuity connectors shall be manufactured from copper braid to BSEN. 13602 complete with copper lugs to BSEN. 1976, BSEN 1978 and BSEN. 13600 or copper earth links with a minimum conductor area of 4mm² and with an electro-tinned finish. The connectors shall be fastened by M6 x 12mm roofing nuts and bolts. The connectors shall be fixed in accordance with the cable tray manufacturers recommendations.

(o) Supported by trapeze hangers up to 450mm wide by M10 threaded rods and M12 threaded rods for 600mm widths and above.

Channel nuts shall be:

(a) Manufactured from steel bar to BSEN. 10277. Channel nut shall be zinc plated to BS7371 clear passivated.
Bolts shall be:

(a) Manufactured to BS EN ISO 4018: Grade 4.6. The bolt shall be zinc plated to BS7371: Part 2: 1961 clear passivated.

Cable Tray Covers:

(a) Ventilated cable tray covers shall be provided to all external trays. The covers shall provide an adequate gap along either side through which air can circulate.

(b) Ventilated cable tray covers shall be secured using proprietary clips and fixings in accordance with manufacturers recommendations.

(c) All straight covers shall be supplied in lengths of 1.5m or 3m.

Cables shall be fixed to the tray:

(a) By means of proprietary forms of LSF or copper cable clips, hot dip galvanised cleats, saddles or straps with zinc plated or serrated bolts or nuts and washers at intervals of not more than 1200mm. Plastic tyewraps shall not be permitted. Cables on inverted or vertical cable trays shall be fixed using fire resistant cleats etc.

(b) By means of copper or brass saddles and clips where high temperatures or humid conditions are likely to be experienced. All saddles, clips, straps, etc., shall be fixed to the tray by means of brass screws or bolts and nuts.

Cables shall not be fixed to the tray:

(a) By means of strips of steel wire e.g. wire armour steels, ceiling grid, support steel.

(b) With lengths of any material not specifically intended for the fixing of cables or capable of sustaining the cables respective maximum fault level.

(c) By ‘tyewraps’ of any description.

4.2.4 Galvanised Cable Ladders

All galvanised Cable Ladder shall be manufactured from either mild steel to BS EN ISO 1461 Part 1, hot dip galvanised after manufacture to BSEN ISO 1461 or, for certain internal application, from pre-galvanised mild steel to BS EN 10142: 2000 and BS EN 10143: 2006 with a minimum coating weight of 275g/m². Rungs shall be of shallow channel profile and shall be located at the bottom of the cable ladder side to maximise the loading depth. The rungs shall be slotted to allow the use of cable cleats. Galvanised cable ladders shall be:

Extra Heavy Duty, General Purpose Cable Ladder:

(a) Minimum flange height 150mm. Material gauge 2.0mm. Rungs at 300mm centres. Rungs of shallow channel profile with slot pattern to suit cable ties and straps. Manufactured from mild steel to BS.1449 Part 1, hot dip galvanised after manufacture to BS EN ISO 1461

(b) Capable of carrying without undue deflection, the total weight of cable likely to be carried on the ladder regardless of the location of the joints.
(c) Installed using factory formed bends and tees. Where cut sections are used for vertical or horizontal offsets they shall be free from sharp edges, and joined by means of couplers bolted to each section in accordance with the manufacturers recommendations.

(d) Installed and coupled together using joint plates and/or couplers secured with the appropriate number fixings as required in accordance with the manufacturers recommendations.

(e) Supported on purpose-made suitably treated mild steel supports which shall permit easy adjustment and modification or by suitable channel, brackets, and accessories to BS.6946 at intervals necessary to provide a rigid fixing in accordance with the manufacturers recommended fixing centres. Channels to BS.6946 shall be manufactured from 2.5mm material conforming to BS.1449 Part 1, hot dip galvanised after manufacture to BS EN ISO 1461. Brackets to BS.6946 shall be manufactured from 6mm mild steel, 40mm wide, hot dip galvanised after manufacture to BSEN ISO 1461 and shall have a minimum hole size of 14mm diameter holes to accept M12 setscrews.

(f) Fixed to the fabric of the building by means of expansion type masonry plugs or bolts. Fixed to steelwork and purlins with proprietary fixings approved by the Structural Engineer and purlin manufacturer.

Sample fixings shall be submitted prior to commencement.

(g) Painted with zinc rich paint to BS.4652 where cuts have been made.

(h) Earth continuity connectors shall be fitted between each length of cable ladder to ensure compliance with BS.7671. The earth continuity connectors shall be manufactured from copper braid to BS.4109 complete with copper lugs to BSEN 1976, BSEN 1978 and BSEN 13600 or from copper strip. The conductor area shall be a minimum of 10mm² and shall have an electro-tinned finish. The connectors shall be fixed in accordance with the cable ladder manufacturers recommendations.

(i) Fitted with drop-out plates where cables exit cable ladder.

(j) Installed with a space between the structure and supported ladders as follows:

<table>
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<tr>
<th>Ladder</th>
<th>Space</th>
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<tr>
<td>Up to 300mm wide</td>
<td>150mm minimum</td>
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<tr>
<td>Above 300mm wide</td>
<td>300mm minimum</td>
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</tbody>
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(k) Supported by trapeze hangers up to 450mm wide by M10 threaded rods and M12 threaded rods for 600mm widths and above.

Channel nuts shall be:

(a) Manufactured from steel bar to BSEN 10277. Channel nuts other than M6 shall be hot dip galvanised to BSEN ISO 1461, M6 channel nuts shall be zinc plated to BS.7371.
Bolts shall be:

(a) Manufactured to BS EN 4018: grade 4.6. Bolts other than M6 shall be hot dip galvanised to BSEN ISO 1461 M6 bolts shall be zinc plated to BS.7371.

Ladder Covers:

(a) Ventilated cable ladder covers shall be provided for all external cable ladders. The covers shall provide an adequate gap along either side through which air can circulate.

(b) Ventilated cable ladder covers shall be secured using proprietary fixings in accordance with the cable ladder manufacturers recommendations.

(c) All straight covers shall be supplied in lengths of 1.5m or 3m.

Cables shall be fixed to the Ladder:

(a) By means of proprietary hot dipped galvanised cleats with zinc plated or serrated bolts or nuts and washers. Plastic tyewraps shall not be permitted.

Cables shall not be fixed to the Ladder:

(a) By means of strips of steel wire e.g. wire armour steels, ceiling grid support steel.

(b) Lengths of any material not specifically intended for the fixing of cables.

(c) Tyewraps of any description.

4.2.5 Cable Basket

Cable baskets shall comprise a welded wire grid with 4mm diameter rods at 50mm spacing (maximum) in both directions. The basket shall be electro-zinc plated to BS1706:1960 with a clear finish.

Tramlines shall be fitted the entire length of the basket and shall enable both couplings and accessories to be fitted.

Basket depth shall be 50mm and the widths shall be as stated on the drawings.

All accessories (i.e. bends, tees, risers, etc.) shall be preformed and shall not be site manufactured. All accessories shall be compatible with the cable basket system.

Lengths of cable basket shall be linked using the manufacturer's approved linkage plate in conjunction with M6 roofing bolts and shall be electrically continuous throughout its length.

Connections to final elements shall be by means of specially designed take-off plates suitable for terminating metallic flexible conduits.

When installed under raised floors the basket shall be capable of accepting plug-in under floor bus bar fixed centrally within the basket.
4.2.6 Fire Barriers

When electrical services pass through fire compartment walls or floors great care must be taken to ensure that the gaps between the services and structure are properly sealed for acoustic and fire rating properties.

The gaps shall be completely filled to the full thickness of the structure with mineral fibre having a minimum density of 150 Kg/m².

Both faces of the mineral fibre shall be coated with a fire resistant ablative mastic to dry film thickness of at least 1mm. Fire barriers shall only be installed where services pass through pre-determined fire compartments which shall be highlighted by the Installer.

It shall be the responsibility of the Installer to ensure that all holes surrounding are filled for both acoustic and fire rating properties. It is the Installer’s responsibility to fill all trunking internal spaces/voids with mineral fibre as detailed above.

4.2.7 Manufacturers

Davis, Swift, MITA or w equal.