Appendix H – Fibre installation (vertical and backbone)

Version 1.4
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1.0 Introduction

This Section details the required standards for Fibre Optic cabling.

2.0 Standards

The College has an established policy to install Brand-Rex fibre optic products (both micro-duct and tight buffered cable) and has generally standardised on OS1 fibre type. Due to legacy issues other types may have to be used (only if agreed with ICT).

It is a mandatory requirement that all fibre (tubes and cabling) supplied and installed is selected from the Brand-Rex “Optical Systems” range of products.

Before any blo-lite product is considered ICT needs to be informed and the reasons for installing this product explained. This is a solution to be used between areas where access is difficult or due to H&S reasons.

The optical Fibre installation shall conform to all applicable optical fibre standards.

3.0 Cable Routes

All cable routes should be agreed with ICT's representative prior to commencement of the installation of such routes.

All cables shall be either:

- Enclosed in trunking;
- Pulled in duct;
- Securely fastened to tray;

All containment shall be clearly marked at 5 meter intervals and at all concealment points with the following label:

“ICT DATA CABLES”

4.0 Cable Joints

All cables should be complete between termination points; no cable joints will be permitted unless with specific authorization of the ICT department in writing.

5.0 Cable Protection

Holes drilled through walls or floor for the routing of cables shall be suitably sleeved to prevent damage to installed cables.

6.0 Fire Protection
Where cables, trunking, tray-work and conduit, pass through floors or walls, suitable fire sealing shall be provided in accordance with IEE 16th Edition Wiring Regulations (BS7671: 1992).

In main cable routes EZ-Path cableways will be installed. These will include entry points to CWCs, risers and major thoroughfares and fire breaks.

7.0 Labelling

All termination points shall be clearly labelled.

The cable will be labelled with a securely fixed ‘traffolyte’ type engraved label, before the fibre panel, showing:

ICT
<Fibre ID> <Fibre type> <number of cores> <Cable length>
<Installer company name> - <date>
<CWC1 ID> to <CWC2 ID>

If cables are running in inside of a building add:

<Riser ID / description>

The fibre panel will be labelled with:

<Fibre type> <number of cores> <Fibre ID><CWC ID1><CWC ID2> <X>

Where CWC ID1 and CWC ID2 are the two linked CWCs and CWC ID1 is always the one with the smallest ID value.

X is the panel identifier. Starting with “A” and continuing to “B” and so forth.

Fibre ID. Please contact Imperial College ICT to obtain the ID number

e.g.:To connect CWC42 and CWC1 with OS1 24 cores would be – OS1 24 CWC1 CWC42 A. An additional connection would be - OS1 24 CWC1 CWC42 B

As a safety measure a Laser/LED information sticker will be placed on the back of the fibre trays (right hand side) and also on the front (right hand side).

Individual connectors should be labelled in accordance with circuit numbers.

8.0 Cables

All cables shall be clearly labelled at 5 metre intervals and at all points of entry and exit for concealment, indicating:

ICT
<Fibre ID> <Fibre type> <number of cores> <Cable length>
<Installer company name> - <date>
<CWC1 ID> to <CWC2 ID>
If cables are running in inside of a building add:

<Riser ID / description>

These labels will be of the same type as mentioned in the previous item.

9.0 Fibre Optic Cable Construction

The cable should be:

- Of a tight buffer construction suitable for installation in risers.
- Capable of withstanding temperatures in the range -10° to 50°C without degradation in performance;
- Suitable for installation in underground ducts (occasionally flooded) and for routing on tray work within buildings. The outer sheath shall meet fire regulations for installation within buildings.

The cable shall have a construction as below:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Core Diameter</th>
<th>Cladding Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM1*</td>
<td>62.5 micron</td>
<td>125 micron</td>
</tr>
<tr>
<td>OM2*</td>
<td>50 micron</td>
<td>125 micron</td>
</tr>
<tr>
<td>OM3 *</td>
<td>50 micron (Broadband)</td>
<td>125 micron</td>
</tr>
<tr>
<td>OS1</td>
<td>9 micron</td>
<td>125 micron</td>
</tr>
<tr>
<td>OS2**</td>
<td>9 micron</td>
<td>125 micron</td>
</tr>
</tbody>
</table>

* - These are old standards that will be used only where necessary for local compatibility. They should only be a last resource and if used should be installed in parallel with single mode fibre.

** - OS2 is currently being considered. For adoption by the College Brand Rex will be checking its seamless interoperability with OS1.

Fibres shall be individually colour coded to aid identification.

10.0 Fibre Optic Termination Points

All optical fibre cables should be terminated within termination panels mounted within a CWC’s equipment Cabinet, in accordance with the proposed cabinet layout.

Panels will be mounted in the cabinet such that the connectors are flush with the mounting rails of the cabinet. The front of the patch panel should not be recessed.

Terminations should be agreed with ICT in advance, but will in general be:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM1</td>
<td>STII</td>
</tr>
</tbody>
</table>
11.0 Fibre Optical Cable - Patching and Splicing in Termination Boxes

All fibre cores shall be terminated and tested.

After testing the contractor should make sure that all dust caps are in place.

To facilitate re-termination or splicing of fibres, sufficient slack cabling should be left to enable at least two re-terminations to be achieved.

The cable will be left with enough slack as to allow the cabinet to be moved in an emergency or unforeseen event. Please see CAT 5 cabling specifications in respect to this (Appendix F - UTP cabling)

12.0 Fibre Optic Patch Cords

Duplex patch cords should be used.

13.0 Warranty

The Fibre Optic distribution scheme should be included within the Applications and Performance Warranty.

14.0 Fibre Optic Testing

All fibres should be tested individually with an OTDR (Optical Time Domain Reflectometer).

In addition, the attenuation of each cable should be measured at both 850NM and 1300NM using a light source/power meter.

The test results shall be tabulated in a neat and legible form and signed by the installation Contractor’s representative as a record of the installation. This should be a 100% test. Testing should be carried out from each end of every fibre, as a minimum, comprise:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Wavelength</th>
<th>Maximum Attenuation</th>
<th>Modal Bandwidth (OFL)</th>
<th>Modal Bandwidth (LL)</th>
<th>Propagation Delay</th>
</tr>
</thead>
</table>
Test settings should also be recorded for each test so that results can be faithfully repeated.

The results form will record:

- The unique identifier of the fibre optic cable and fibre number
- The name of the person conducting the test
- The type and manufacture of the cable being tested
- The date of the test
- The results to be recorded on the form shall be:
  - All settings of the test equipment so that the test may be exactly recreated if necessary
  - The end of the cable from which the test is carried out
  - The measured cable length
  - The attenuation at 850nm, 1300nm and 1550nm (dB) as appropriate
  - The Bandwidth at 850nm, 1300nm and 1550nm (MHz/ km) as appropriate
  - A copy of the OTDR trace

15.0 Completion Documentation

The Contractor should, on completion of their works and prior to acceptance by ICT, submit digital copies of all records and schematics for this part of the installation.

Schematics will detail all cable runs and termination points. The installed cable capacity, cable identification reference, length and type of cable shall be identified. Records will show clearly all cable terminations and cross connections together with cable capacity and installed length.

The following documentation is required:

- Fibre Optic cabling schematics;
- Fibre Optic cable records;
- As fitted drawings;
- Fibre Optic cabling test results;
- Cabinet Layouts;
- All relevant operating and maintenance manuals;
- All documentation and drawings will be required in machine readable format, ie. CD-ROM disk. Full details of CAD formats will be provided. All drawings shall be "as fitted" and shall take account of all changes and variations.
16.0 Drawings

Please refer to Support Services Engineering Team CAD Strategy.