

# Standard Specification

## Data Communications Installations

Revision J

# Context

This document applies to works carried out under the control of Estates and Facilities (including their appointed Contractor(s) and their sub-Contractors.)

University staff not appointed by Estates and Facilities are not permitted to work on any University fixed electrical installations.

Copies of this document can be found on the University Intranet.

# Document Issue Record

ISSUE	DATE	ORIGINATOR	DESCRIPTION OF AMENDMENT
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Previous issues of this document are to be destroyed or marked SUPERSEDED.

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## Introduction

The specification of materials and practices specifically for data installations is the work and responsibility of the University of Reading's Estates and Facilities Department (E&F) and also Information Technology (IT).

The University of Reading Estates and Facilities Department (E&F) is responsible for other aspects of installations including Electrical, Mechanical, and Building Work.

E&F also acts as Project Manager and Contract Administrator.

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## Standards Reference

This specification makes reference to the following standards:

<b>Standard</b>	<b>Title</b>
	The University of Reading Standard Electrical Specification;
BS 7671	IEE Wiring Regulations; 17 <sup>th</sup> Edition including all amendments;
NJUG	National Joint Utilities Guides for the positioning and colour coding of Utilities underground apparatus;
BS 6701:-2010	Telecommunications Cabling and Equipment;
BE EN 50173	1 to 4 : 2007, IT – generic cabling systems;
BSEN 50174-1: 2009	IT cabling installations, specification and quality;
BSEN 50174-2: 2009	IT cabling installations, internal;
BSEN 50174-3: 2003	IT cabling installations, external;
TIA/EIA-568-A	Commercial Building Telecommunications Cabling Standard;
TIA/EIA TSB67	Link Performance Transmission Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems;
ISO/IEC 11801	Information Technology- Generic Cabling for Customer Premises;
BS 7718 : 1996	Code of Practice for Installation of Fibre Optic Cabling
BS EN 60825-1 : 1994	Safety of Laser Products. Equipment Classification, Requirements and User's Guide

## **Specification**

## **1 Standards, Regulations and Workmanship**

- 1.1 All data communications installations shall be in accordance with this Standard Specification and the drawings and Supplementary Specification particular to individual contract.
- 1.2 It is essential that all contractors carrying out UTP or fibre installations should have access to and be familiar with all of the standards noted in the reference section, notably all parts of BS EN 50173, BS EN 50174 and BS 7718.
- 1.3 The University Standard Technical Specification for Electrical Services shall apply to the contract other than where herein varied.
- 1.4 In addition other relevant specifications for general building and mechanical work, safety and site practices must be observed, as advised by E&F.
- 1.5 This **Standard Specification** may be augmented by a **Supplementary Specification** for a particular project or part of a project: in such case the Supplementary Specification must also be observed. Where such Supplementary Specification differs from the Standard Specification the former shall take precedence.
- 1.6 Should any queries be raised regarding this specification they should be passed to Estates and Facilities.

## **2 Health and Safety**

- 2.1 The installer must fully comply with all aspects of the University Safety Manual as related to the above works. A copy of this is freely available from E&F.
- 2.2 As hazardous substances and environments may be encountered on the University campus, contractors must ensure that they have authority to commence work in any particular area. The University will indicate from whom this authority should be obtained.
- 2.3 Contractors must ensure the safety of themselves and others whilst working, in particular:
  - 2.3.1 Working areas should be signed and cordoned-off where possible whilst allowing necessary access (e.g. when working in corridors).
  - 2.3.2 Care must be taken when drawing cables into ceiling voids that hanging cables do not pose a hazard to passers-by.
  - 2.3.3 Where cables are installed below a false floor the working area must be clearly marked, or closed off, to prevent danger to others due to missing floor tiles.
  - 2.3.4 When working above areas accessed by UoR staff and students, either on ladders, staging or scaffold, stringent steps must be taken to prevent materials and tools from falling. The use of netting, HERRAS fencing and hoardings should be considered rather than signs and chapter 8 barriers.
  - 2.3.5 Debris should not be allowed to accumulate, and must be removed entirely when works are completed.
- 2.4 Upon completion contractors should inform the contracts administrator and the building manager that they have completed the work.
- 2.5 Contractors installing optical cables should be familiar with section 4 of BS 7718 - (**Optical fibre safety**) and ensure that they have the relevant procedures in place to ensure that those carrying out such work follow the guidelines which are issued there.

## **3 Unshielded Twisted Pair (UTP) Installations**

### **3.1 Standards**

- 3.1.1 The installation shall be compliant with **EN 50173:1996 Link class D** (100 MHz).
- 3.1.2 Test results will be provided which shall show conformance **EN 50173:1996 Link class D**. Results from test equipment designed to show conformance with either **TIA/EIA-568-**

**A Category 5E**, using an **EIA/TIA TSB67 level II** classification test instrument, or **ISO/IEC 11801** will also be acceptable.

- 3.1.3 Cables shall be sheathed with a low smoke and low toxic gas emitting material as currently approved by E&F as being suitable for the area of installation concerned.

### **3.2 Outlet Ports**

- 3.2.1 Outlet faceplates shall fit BS4662 single gang or double gang wall boxes.
- 3.2.2 Outlet ports shall have a means of clearly indicating, by means of icons representing a telephone and a computer, whether the circuit is configured for data or voice usage. The means of indication must be tamper-resistant, e.g. if the labels bearing the telephone and computer icons are removable without a special tool then they must not be reversible, to prevent unauthorised changes to the indication. Where a tool is required to change the label then at least three such tools must be supplied to IT.
- 3.2.3 Outlet ports shall have sprung slide shutters over RJ45 sockets.
- 3.2.4 Outlets shall be mounted so that contacts are at the top of the socket, except where the sockets are angled at 45° to the faceplate, in which case the sockets shall face downwards.
- 3.2.5 Connectors shall have IDC terminations.
- 3.2.6 Modules shall be capable of insertion into a wall plate of dimensions 86mm x 86mm single gang with double aperture of 50mm x 50mm suitable for two full modules. Wall plates shall be flat face with no installers' logos showing.

### **3.3 Patch Panels**

- 3.3.1 Patch panels shall be suitable for modular RJ45 sockets and shall be 24 way only.
- 3.3.2 Terminations shall be IDC.
- 3.3.3 If patch panels are conductive then they shall be bonded to an electrical earth for safety purposes.
- 3.3.4 Cables must be terminated on patch panel outlets in accordance with manufacturers' recommendations.

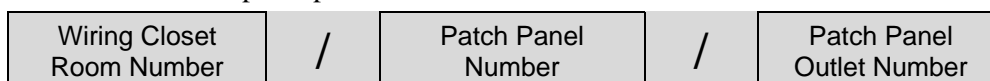
### **3.4 Labelling**

A summary and illustration of the scheme for labelling and identifying UTP cables, patch panels and outlets is given in **Appendix A**.

- 3.4.1 Patch panels shall be numbered sequentially from the top (and from the left if there is more than one bay) starting with number 1.
- 3.4.2 Patch panel outlets shall be numbered sequentially from left to right and top to bottom, and shall also be labelled to identify the room outlet to which each patch outlet is connected:



- 3.4.3 Outlet sockets shall be marked with the patch panel outlet number and the number of the room where the patch panel end of the circuit is located:



### **3.5 Installation Practices**

- 3.5.1 Installers must be aware of and observe good installation practices. Some guidelines are given in **Appendix D**.

### **3.6 Documentation**

- 3.6.1 Contractors shall submit the following documentation to the Contract Administrator (see **Appendix E**):
  - 3.6.1.1 A list of cables installed. This shall be supplied on electronic, and optionally also on paper media. The list shall be in the format described in **Appendix B**.
  - 3.6.1.2 Test results showing compliance with the standards as specified. Each circuit tested will be identified as in the format specified in **Appendix B**. Test results shall be supplied on electronic and paper media. The records of these results may be combined with the cable list specified above.
  - 3.6.1.3 A record of the Make, Model and Serial Number of each item of test equipment used in testing the installation along with photocopies of valid calibration certificates carrying the serial number of the test equipment. The Contractor may be required to produce the original calibration certificate for inspection. All equipment must be calibrated at periods recommended by the manufacturer by a testing organisation approved by the manufacturer.
  - 3.6.1.4 As-fitted drawings showing the location of the outlets and labelled as the outlets themselves are marked. Where possible E&F will provide building layout diagrams in AutoCAD format to facilitate this process.

## **4 Fibre Optic Cable Installation**

### **4.1 Standards**

- 4.1.1 Contractors installing optical cables must be familiar with section 4 of **BS 7718 (Optical fibre safety)** and ensure that they have the relevant procedures in place to ensure that those carrying out such work follow the guidelines which are issued there.
- 4.1.2 Fibre optic installations shall have performance characteristics which meet the requirements of section 6.4 of **BS EN 50173:1996** - Generic cabling with optical fibre links.
- 4.1.3 Cables that run within buildings shall be sheathed with a low smoke and low toxic gas emitting material as currently approved by E&F as being suitable for the areas of installation concerned.
- 4.1.4 External cabling must be capable of withstanding, without degradation in performance, temperatures in the range -15C to +60C.
- 4.1.5 Internal cabling must be capable of withstanding, without degradation in performance, temperatures in the range 0C to +50C.
- 4.1.6 Where multi-mode fibre is specified it shall be graded-index optical fibre waveguide with nominal 50/125 µm core/cladding diameter and shall be OM3.
- 4.1.7 Where single mode fibre is specified it shall be graded-index optical fibre waveguide with nominal 9/125 µm core/cladding diameter and shall be OS1 or OS2 as required for the particular application.

### **4.2 Testing**

- 4.2.1 See BS 7718: 1996 Annexe A for further information on optical fibre test methods.
- 4.2.2 Optical Time Domain Reflectometer (OTDR) measurements shall be made at the following wavelengths and in accordance with the manufacturer's instructions and specification:

OM3	850nm	1300nm
OS1	1310nm	1500nm
OS2	1310nm	1500nm

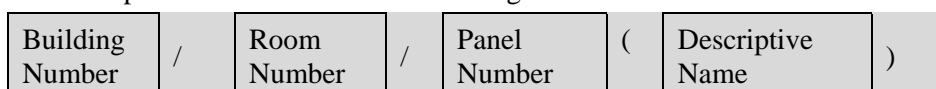


- 4.2.3 Details of measurement procedures shall be provided together with the type, serial number and proof of calibration of the measurement equipment. The following information shall also be recorded:
  - 4.2.3.1 Fibre optic span identification or, if prior to installation, the span(s) for which it is intended.
  - 4.2.3.2 Location of the OTDR during testing.
- 4.2.4 **Pre-installation** testing shall be carried out in accordance with **BS 7718:1996 section 7 Cabling component acceptance**. The OTDR test results supplied by the contractor shall contain the following information:
  - 4.2.4.1 Length using the refractive index as supplied by the manufacturer for the cable used.
  - 4.2.4.2 A measure of the attenuation coefficient.
- 4.2.5 **Post-installation** testing shall be carried out in accordance with **BS 7718:1996 section 10 Final cabling acceptance (stage II) tests**. The OTDR test results supplied by the contractor shall contain the following information and shall be made from each end of the fibre optic span:
  - 4.2.5.1 Fibre optic span length using the refractive index as supplied by the manufacturer for the cable used.
  - 4.2.5.2 A measure of the attenuation coefficient.
  - 4.2.5.3 Connector insertion loss.
  - 4.2.5.4 Joint insertion loss as detailed in **BS 7718 : 1996 figure A.1**
- 4.2.6 OTDR launch leads shall be of a length suitable to give unambiguous readings of the optical fibre and cabling components under test.
- 4.2.7 Loss measurement of the installed fibre optic span shall be carried out using a light source-power meter combination as described in **BS 7718: 1996 section A.4.4.2 (configuration A)**. This shall be carried out at the appropriate wavelengths as described in section 10.2.1. The results obtained shall be recorded together with the following:
  - 4.2.7.1 Identification of the fibre optic span
  - 4.2.7.2 Location of light source during test
  - 4.2.7.3 Location of power meter during test
  - 4.2.7.4 The optical losses budget for the fibre optic span (for comparison with the measured result).
- 4.2.8 The connector end faces shall be subjected to visual inspection using a microscope to ensure compliance with the visual standards specified in **BS 7718 sections A.7.2 and A.7.3**.
- 4.2.9 Mechanical stability of the mating connectors shall be ensured by inspection in accordance with **BS 7718 sections A.7.4.2 to A.7.4.4**.

### 4.3 Labelling

A summary and illustration of the scheme for labelling and identifying fibre-optic cables is given in **Appendix C**.

- 4.3.1 Fibre-optic patch panels shall be numbered sequentially from the top (and from the left if there is more than one bay) starting from 1.
- 4.3.2 Patch panels shall be labelled indicating the location of the remote end of the fibre:



where the Building Number and Room Number refers to the far end of the fibre cable, the Panel Number identifies the patch panel on which the cable is terminated at the far end, and

the Descriptive Name is a convenient reference for the destination of the cable (see the example in **Appendix C**). Where both ends of a fibre-optic cable terminate in the same building the Building Number may be omitted from the identification labels.

- 4.3.3 The individual fibre cores within a cable shall be numbered sequentially from left to right where they terminate on patch panel outlets (i.e. each fibre terminated in an SC duplex connector will be numbered).
- 4.3.4 Where a cable uses only part of a patch panel, and/or where a cable is terminated on an existing partly-populated patch panel, the division of the panel between the cables must be clearly marked.
- 4.3.5 All fibre cables where exposed in underground service walkways, plant rooms and above false ceilings shall be labelled at 5m intervals for the full length of the cable run as described below. Further, at any position along the route where there is a manhole cover or trap and at entrance and exit points to individual buildings, the fibre optic cable shall be labelled as shown:

*IT Fibre Optic Cable*

*Building No / Room No -- Building No / Room No -- Identification No*

- 4.3.6 All individual fibres in each cable shall be uniquely colour coded.

#### **4.4 Application of Cable Types**

- 4.4.1 For information regarding optical cable design concepts see **BS 7718: 1996 section B.7.3.1**.
- 4.4.2 If an optical cable is to be installed through a duct or other conduit then a loose tube construction cable or sheath construction cable with a central- or sheath embedded/bonded- strength member is required. This strength member should be used as tensile load protection during cable installation.
- 4.4.3 Tight buffer constructions incorporating longitudinally laid aramid yarns acting as strength members may be installed through duct or other conduit using the strength members as tensile load protection provided that evidence supporting its use is provided by the manufacturer and copies provided to the Contracts Administrator.
- 4.4.4 Tight buffer constructions incorporating wrapped, braided or wound aramid yarns may be employed over shorter cabling routes. However, the use of the aramid yarn as tensile load protection during cable installation should be avoided.
- 4.4.5 A UV stabilised sheathing material shall be used for outdoor applications in which the cable is to be subjected to UV radiation e.g. sunlight.
- 4.4.6 Where Fibre Optic cables are installed in vertical runs particular attention must be given to manufacturers' recommendations for the type of cable used and the method of installation to avoid damage due to the weight of unsupported fibre in e.g. loose-tube cables.

#### **4.5 Closures**

- 4.5.1 Closures shall be capable of withstanding temperature variations in the ranges specified for cables.
- 4.5.2 The material of construction shall eliminate external light being coupled to the optical fibres contained within the closure.
- 4.5.3 The sealing properties of closures used in external applications shall prevent the ingress of moisture.
- 4.5.4 Strain relief shall be provided for each cable entering the closure.
- 4.5.5 The design of the closure and/or its immediate surroundings shall allow for storage of service loops of optical cable. The loops shall be sufficient to allow the removal of the

closure from its specified location to a position that will allow access to the optical fibres contained for purposes of repair, rework or modification.

- 4.5.6 Closures should be bonded to an electrical earth for safety purposes.
- 4.5.7 Optical safety labels in accordance with **BS EN 60825** shall be applied adjacent to all accessible optical interfaces.
- 4.5.8 Internal physical features of the closure shall provide the features of: protection, identification and restraint as described in **BS 7718: 1996 section B.8.3.1**.

#### **4.6 Connectors**

- 4.6.1 Duplex SC connectors shall be used except where otherwise specified. The connectors must be installed with the polarising cutout facing **up**.

#### **4.7 Installation Practices**

- 4.7.1 The precautions, procedures, tests, preparations and protection of the cable during installation shall comply with **BS 7718: 1996 section 8**.
- 4.7.2 Jointing and termination shall be carried out in accordance with **BS 7718: 1996 section 9**.

#### **4.8 Documentation**

Contractors shall submit the following documentation to the Contracts Administrator (see **Appendix E**).

- 4.8.1 Test results of pre- and post-installation testing as described in the section on testing.
- 4.8.2 A record of the Make, Model and Serial Number of each item of test equipment used in testing the installation along with photocopies of valid calibration certificates carrying the serial number of the test equipment. The Contractor may be required to produce the original calibration certificate for inspection. All equipment must be calibrated at periods recommended by the manufacturer by a testing organisation approved by the manufacturer.

### **5 Equipment Housing**

#### **5.1 Selection of Housing**

- 5.1.1 Where equipment is to be installed in a wiring closet dedicated to data (and possibly also voice) communications an open frame type of housing without front or rear doors shall be used.
- 5.1.2 Where equipment is to be installed in any other location an enclosed cabinet shall be used.
- 5.1.3 Enclosed cabinets shall have a glazed door to the front of the rack only.
- 5.1.4 Doors and removable panels shall be lockable. Three keys shall be supplied to IT.

#### **5.2 Mechanical**

- 5.2.1 Equipment housing shall have 19" mounting strips at the front. Where the housing has a door there shall be 100mm clearance between the mounting strips and the door.
- 5.2.2 Mounting hardware (cage nuts, bolts and washers) to fit the 19" mounting strips shall be supplied in quantity sufficient to populate half of all the mounting holes left spare after installation of patch panels and cable management accessories.
- 5.2.3 Equipment housings shall be designed and installed to permit ready access to the rear of installed equipment.
- 5.2.4 **Floor-standing housings**
  - 5.2.4.1 The height of the housing shall be 2200mm / 47U.

- 5.2.4.2 The width of the housing shall be 800mm.
- 5.2.4.3 The depth of the housing shall be 800mm.
- 5.2.4.4 Cable management strips shall be fitted at the front of the housing, at each side of the equipment mounting area.
- 5.2.4.5 Enclosures must be fixed so as not to move easily, whether by being screwed or bolted to the floor, standing on a plinth or on feet which resist slipping. The housing must not be free to move on wheels or castors.
- 5.2.4.6 Open frames must be fixed securely to the floor or otherwise prevented from toppling over.
- 5.2.4.7 Multiple floor-standing open frame housings installed side by side must be mechanically fixed together.

### 5.2.5 **Wall mounting housings**

- 5.2.5.1 Wall mounted housings shall normally be enclosures, rather than open frames.
- 5.2.5.2 The height of the housing will normally be specified for the particular job: otherwise the tallest housing practicable in the space available should be used.
- 5.2.5.3 The width of the housing shall be 600mm.
- 5.2.5.4 The depth of the housing shall be 500mm.
- 5.2.5.5 The fixing to the wall must be capable of withstanding a load of 100Kg applied to the front of the housing.
- 5.2.5.6 Wall mounted enclosed cabinets shall have facilities for cable entry from top and bottom.
- 5.2.5.7 Particular attention should be paid to provision of access to the rear of equipment as specified in 5.2.3, e.g. by having hinges at the rear as well as the front of the enclosure. If the housing has a rear hinge then cables must be installed to allow this hinge to operate freely and without danger of trapping cables when closing the hinged part.
- 5.2.5.8 Enclosed equipment housings must be vented for heat dissipation and must be capable of being fitted with additional forced ventilation units retrospectively.

### 5.2.6 **Cable entry facilities**

- 5.2.6.1 It must be possible to install further cables without damaging or excessively disturbing existing installed cables.
- 5.2.6.2 It must be possible to remove or dismantle the cabinet leaving existing installed cables attached to patch panels (e.g. to replace a damaged cabinet or replace a cabinet with a larger unit).
- 5.2.6.3 Cable entry cutouts in panels shall be fitted with protection for cables from rough edges of the panel.

## 5.3 **Electrical**

- 5.3.1 Electrical installations shall generally conform to the **The University of Reading Standard Specification for Electrical Services** and **BS 7671: 17<sup>th</sup> Edition of the IEE Wiring Regulations**.
- 5.3.2 Each equipment housing shall be fitted with a mains power distribution unit with 6 no 13A sockets.
- 5.3.3 The distribution strip shall have an illuminated indicator to show that mains is present.
- 5.3.4 The power distribution strip shall normally be vertical, running the full height of the frame; unless this would provide fewer than 6 mains sockets in which case a 6 outlet horizontal distribution unit shall be used.
- 5.3.5 The distribution strip shall be mounted to the rear of the frame in such a way that it does not take up the space available for rack-mounting equipment in the front of the housing. Where a horizontal strip is used it shall be mounted at the bottom of the frame.

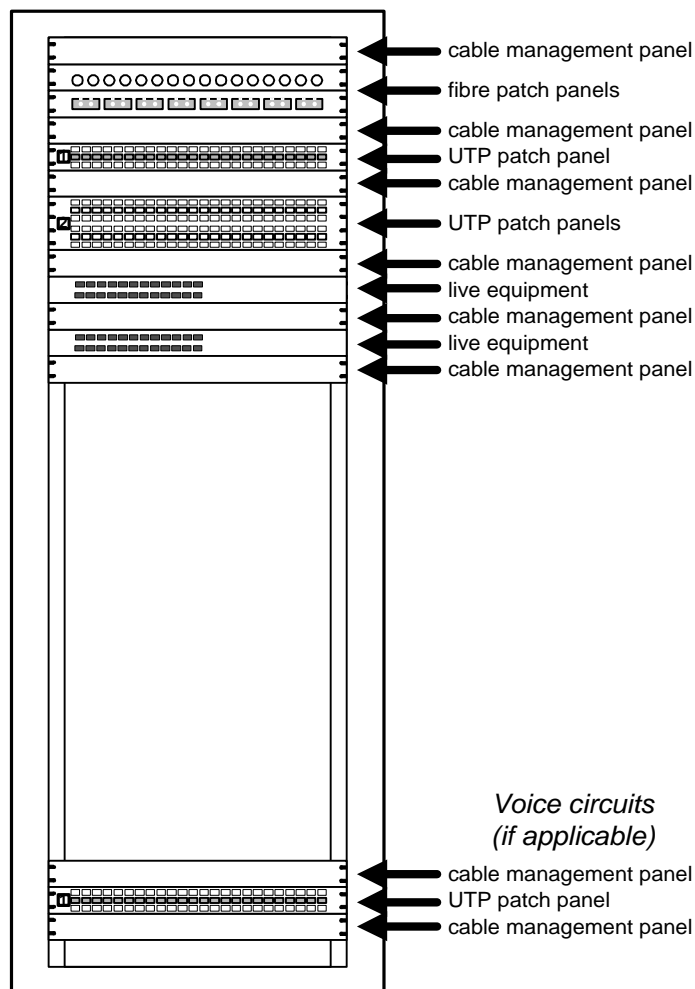
- 5.3.6 The distribution strip shall be connected to the 240V mains power supply by an unswitched fused connection unit with illuminated indicator.
- 5.3.7 Where an unswitched fused mains power connection is to be provided it shall be wired from an independent circuit at the local distribution board, as advised by E&F.
- 5.3.8 The fused spur from which the equipment cabinet is supplied shall be labelled:

**DO NOT DISCONNECT  
OR REMOVE POWER  
WITHOUT PERMISSION  
OF IT**

- 5.3.9 Equipment housings shall have points suitable for earth bonding of patch panels.
- 5.3.10 Equipment housings shall be connected to mains earth by a secure connection separate from the mains supply cable to the housing.
- 5.3.11 Where more than one housing is installed each shall be connected separately to mains earth.
- 5.3.12 In addition to the protective earth provided with the power supply, all cabinets shall be provided with additional functional earth cables.

**5.4 Patch Panels and Cable Management Accessories**

5.4.1 Panels shall be installed in the order illustrated below:



5.4.2 Cable management panels shall be 1U high comprising guide hoops or similar.

- 5.4.3 Additional cable management panels shall be fitted between patch panels: one 1U cable management panel below every 2U of UTP patch panels or 4U of fibre patch panels. Where patch panels are larger than these heights extra cable management facilities shall be provided below and/or at the sides of the panels.
- 5.4.4 Patch panels for voice circuits shall be mounted at the foot of the rack.
- 5.4.5 Where additional patch panels are installed in an existing equipment housing the existing panels and live equipment shall, if necessary, be repositioned so that the new panels can be installed in the order specified above. The Contractor shall liaise with IT to ensure that no damage or avoidable disruption to existing equipment or services is caused in so doing.

## **5.5 Documentation**

- 5.5.1 Details of the make and model of housings installed, their locations, and mains connections shall be supplied as described in **Appendix E**.

## **6 Trunking, Tray and Ductwork (containment)**

### **6.1 Trunking and Tray**

- 6.1.2 The materials, choice of routes, methods of installation etc. for trunking and cable tray shall generally be as covered by the electrical specifications for building and electrical work, with the following specific provisions:
- 6.1.3 Where new trunking or cable tray is to be installed it shall be sized to have the capacity to carry double the currently planned installation of cables.
- 6.1.4 Where multi-compartment trunking already exists the contractor must use the compartment provided for communication services.
- 6.1.5 Where multi-compartment trunking is to be provided each compartment must be large enough to accommodate BS4662 standard single and double size faceplates without intrusion into the other compartment.
- 6.1.6 At corners and junctions means shall be provided to prevent UTP and fibre-optic cables from being bent more sharply than the minimum bend radii specified in the appropriate standards.
- 6.1.7 Where metal trunking or tray is cut or drilled rough edges must be smoothed to avoid damage when drawing cables.
- 6.1.8 PVC trunking shall be fixed according to the specifications of E&F.
- 6.1.9 The segregation of wiring categories shall be in strict accordance with the latest edition of **BS 7671 Requirements for Electrical Installations** including amendments.
- 6.1.10 Under no circumstances must trunking be installed on the outside of walls or structures.

### **6.2 Duct**

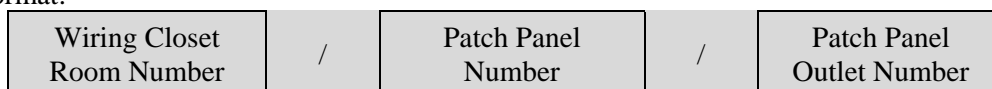
- 6.2.1 PVC ducts shall be 100mm, and shall be installed in accordance with the National Joint Utilities Guide for Services in the Highway.
- 6.2.2 The routes and methods of installation for ductwork shall generally be as covered by the electrical specifications for building and electrical work and the Supplementary Specification for the particular job. Where additional cables are drawn into ducts the draw wire must be replaced for subsequent use.

## Appendix A Identification and Labelling of Cat-5 UTP cables

This appendix summarises and illustrates the scheme specified in section **Error! Reference source not found.**

### Outlet Ports

Outlets must be labelled to identify the circuit at the patch panel. The information on the label must be in the format:



### Patch Panels

Patch panels must be numbered (starting from 1).

Patch panel outlet sockets must be numbered (most panels are supplied already numbered).

Patch panel outlet sockets must also be labelled with the number of the room where the wall-box outlet end of the circuit is terminated.

### Cables

Cables are identified (e.g. on test results) by the combination of the building number plus the two codes above (see the example below).

### Example

(See diagram overleaf.)

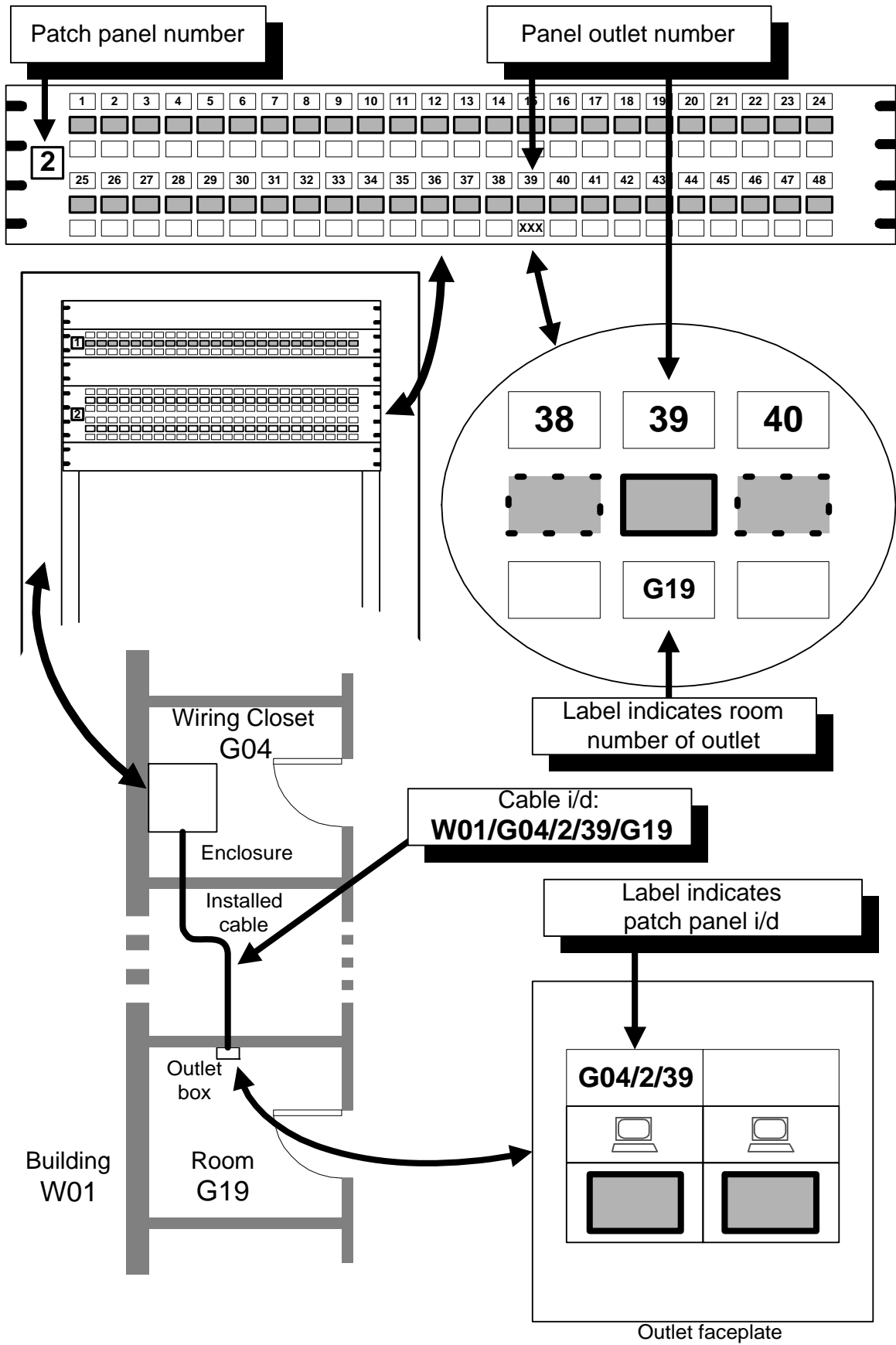
The code

**W01/G04/2/39/G19**

identifies a cable in building **W01**, which is terminated at the following points:

1. in room **G04**  
on patch panel number **2**  
on outlet number **39** (of a 48-way patch panel)
2. in room **G19**  
on an outlet labelled **G04/2/39**

The following diagram illustrates this scheme:





**Appendix B**  
**UTP Cable List format**

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The list of UTP circuits installed is in the form of a table:

<i>Column Title:</i>	<b>Building</b>	<b>Wiring Closet</b>	<b>Patch Panel</b>	<b>Patch Outlet</b>	<b>Room</b>
<i>Contents:</i>	Building Reference	Room Reference	Patch panel number	Patch panel outlet number	Room Reference

**Example:**

<b>Building</b>	<b>Wiring Closet</b>	<b>Patch Panel</b>	<b>Patch Outlet</b>	<b>Room</b>
W012	G.01	1	1	G.02
W012	G.01	1	2	G.02
W012	G.01	1	3	G.02
W012	G.01	1	4	G.03
...	...	...	...	...
W012	G.01	1	24	G.19
W012	G.01	2	1	G.19
W012	G.01	2	2	G.20
...	...	...	...	...
W012	103	1	1	100
W012	103	1	2	100
W012	103	1	3	101
...	...	...	...	...

(where ... indicates more records)

This list may be supplied as an ASCII file, a tab- or comma-separated ASCII file, or as a spreadsheet in the native format of Microsoft Excel (version not greater than Office '97).

This list may be supplied as part of the list of test results for these cables provided that the fields above are present in the order shown, i.e. the test results may be incorporated as additional columns appended to the right of the table.

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## Appendix C Identification and Labelling of fibre-optic cables

This appendix summarises and illustrates the scheme specified in section **Error! Reference source not found.**

### Patch Panels

Fibre-optic patch panels must be numbered (starting at 1 for the top (left) panel).

The terminations of each fibre core on the patch panel must be numbered (starting at 1) so each SC duplex connector will have two numbers (1+2, 3+4 etc.)

The patch panel must be labelled to show clearly which fibres are part of each cable (e.g. the first 8 cores are on one cable and the next 8 on another).

The patch panel must carry a label indicating where the other end of the fibre is terminated, in the format:

Building Number*	/	Room Number	/	Panel Number	(	Descriptive Name	)
------------------	---	-------------	---	--------------	---	------------------	---

### Cables

Cables must be identified (by physical labels, and on drawings and test results etc.) in the format:

Building Number*	/	Room Number	--	Building Number*	/	Room Number	--	Identification number
------------------	---	-------------	----	------------------	---	-------------	----	-----------------------

The first building number must be the alphanumerically lower of the two e.g. building W04 should come before W27, and L29 should come before either.

*\* Where both ends of a fibre-optic cable terminate in the same building the Building Number may be omitted from the identification labels.*

The identification number is to distinguish between multiple fibre cables installed between the same end-points: the first cable will have identification number 1 etc.

Cables must be physically labelled at intervals with their identification code on labels as shown:

<p><b>Fibre Optic Cable</b></p> <p><i>Building No* / Room No – Building No* / Room No – Identification No</i></p>
---

#### Example 1

(See diagram.)

The code

**W04 / G12 — W27 / 101 -- 1**

identifies the first cable installed between building **W04** room **G04**, and building **W27**, room **101**.

The cable is terminated on patch panel **1** in **W27/101** and on patch panel **5** in **W04/G12**: this information is clear from the labels on the patch panels.

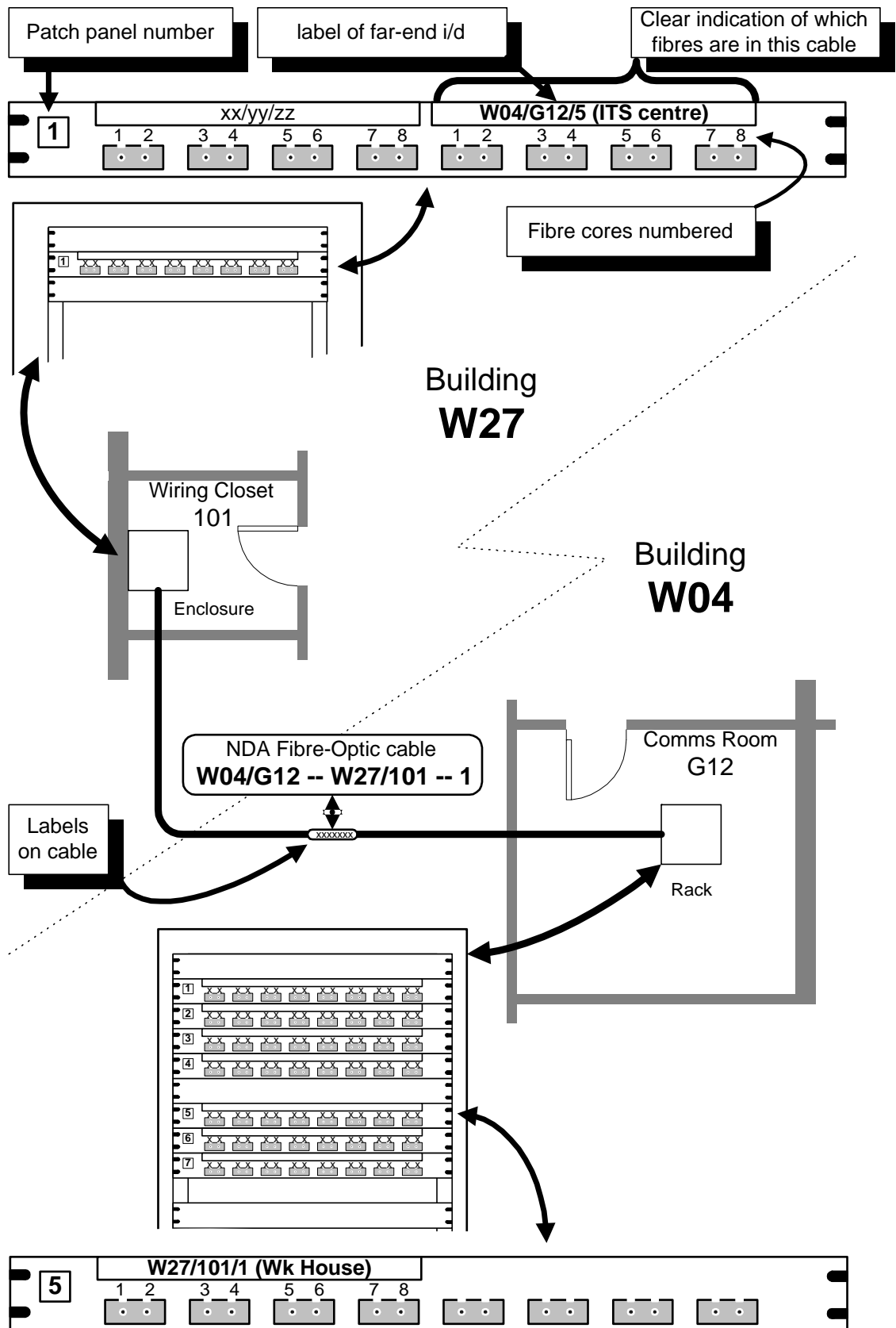
The following diagram illustrates this scheme.

#### Example 2

The code

**G03 — 101 -- 2**

identifies a cable within a building, installed between room **G03** and room **101**. This is the second cable installed between these points: the first should be identified as **G03 — 101 – 1**.



## **Appendix D Installation Practices**

Cable installers must be aware of the limitations specified by the manufacturers on the force which can be applied when pulling in cables before damage to the cable results, and must take care to ensure that damage does not result from the use of excessive force. Extra care must be taken when pulling bundles of cables which are not taped, as the force will not be evenly applied across all cables.

Cables should not be pulled through more than two 90° bends. To do so may exceed the maximum pulling strength and could lead to cable damage.

When pulling in cables the minimum bend radius of eight times the overall cable diameter must be observed.

Where cables are pulled onto cable trays or wire baskets allow a minimum of 10% extra slack at each bend.

Bundles of cables should be marked:

**WARNING  
Datacoms Cable  
Maintain Separation Distances**

at intersections and other suitable points along the path of the cable.

Where Fibre Optic cables are installed in vertical runs particular attention must be given to manufacturers' recommendations for the type of cable used and the method of installation to avoid damage due to the weight of unsupported fibre in e.g. loose-tube cables.

When installing UTP patch panels and outlets in dusty environments e.g. sites undergoing building construction or refurbishment work, precautions must be taken to prevent ingress of dust into connectors. Such measures may include taping over outlets and/or enclosing panels and outlets in plastic bags taped closed over the cables whilst construction work and concomitant dust persists. Especial care must be taken with outlets mounted in underfloor boxes which are particularly susceptible to contamination with dust.

On completion of installation and before the works are accepted into the University, E&F will carry out a 'white glove' check on all parts of the communications rack to ensure that the installation is fit for installation of datacoms switching equipment. All parts of the rack must be sparkle cleaned in advance of this inspection to ensure that it is clear of all debris and loose dust that may interfere with the equipment.

**Appendix E  
Documentation**

**General**

Please copy and complete the following form, and other forms below as applicable, and return to the Contract Administrator with the relevant documentation (test results, calibration certificates etc.).

Contractor	Company name	
	Telephone	
	Fax	
	Email	
Job	E&F reference (WREN number)	
	Contractor's reference No.	
Dates of work	Start	
	Finish	
Types of work	UTP cable installation	
	Fibre-optic cable installation	
	Equipment housing installation	
	Trunking/tray/ductwork	
	Other ( <i>please specify</i> )	
Location(s) of work	Building/room name/number (1)	
	Building/room name/number (2)	
	(3)	

**UTP installations**

		Tick
Cable List	Electronic	
	Paper <i>(optional)</i>	
Test Results	Electronic	
	Paper	
		Fill in details
Test Equipment	Make	
	Model	
	Serial Number	
	Copy of calibration certificate	
	Other equipment ( <i>Details as above</i> )	
		Tick
As-fitted drawings	Electronic	
	Paper	

**Fibre installations**

				Tick
Test Results	Pre-installation	OTDR	Electronic	
			Paper	
	Post-installation	OTDR	Electronic	
			Paper	
		Power meter	Electronic	
			Paper	
				Tick
				Fill in details
Test Equipment	OTDR	Make		
		Model		
		Serial Number		
		Copy of calibration certificate		
	Power meter	Make		
		Model		
		Serial Number		
		Copy of calibration certificate		
	Other equipment	<i>Details as above</i>		
As-fitted drawings			Electronic	
			Paper	

**Equipment housings**

For each equipment housing please copy and complete the form below:

Location	Building name	
	Building number	
	Room number	
Type of housing	Enclosure/open frame	
	Manufacturer	
	Model	
Keys	Key type/number	
	Number of keys supplied	
Electrical	Location of mains distribution board	
	Identification of circuit at distribution board	