

# University of Oxford IT Services Infrastructure Specification Project

## ISP-01-002: University of Oxford IT Services Entrance Facilities - Accommodation requirements

### 1 INTRODUCTION

#### 1.1 Scope

This document specifies the accommodation of the products used in the provision of the University of Oxford IT Services Entrance Facilities installed in each of the premises served by the University of Oxford IT Services external cabling infrastructure.

An overarching objective of this series of documents is to ensure that University of Oxford IT Services, the customer (defined as the college or University, as appropriate) together with those organisations delegated with design and planning responsibilities have discharged the obligations of “the owner of the premises” as specified in BS 6701 and by the other standards referenced normatively from BS 6701; specifically but not exclusively BS 7671, BS EN 50174-1, BS EN 50174-2 and BS EN 50310.

#### 1.2 Responsibilities

Figure 1 shows a schematic of the elements used to create the University of Oxford IT Services Entrance Facilities and how they relate to the other cabling-related functional elements within the premises served. Figure 1 uses the definitions and abbreviations of clause 1.3 of ISP-00-001.

While the elements of the University of Oxford IT Services Entrance Facilities are the property of University of Oxford IT Services they are accommodated within the customers’ premises served and the ownership of that accommodation lies with the customer.

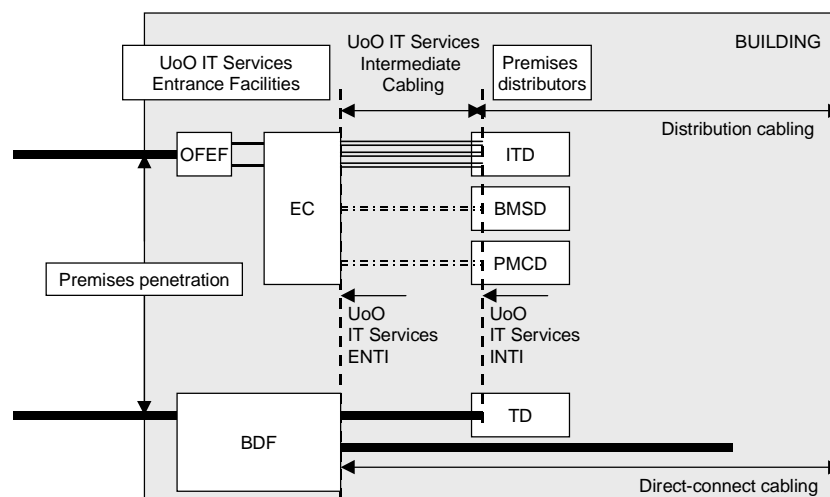


Figure 1 - Schematic of premises infrastructure served by University of Oxford IT Services

## 2 ACCOMMODATION OF THE FUNCTIONAL ELEMENTS

### 2.1 General

This document specifies the pathways and pathway system(s):

- between the premises penetration and the BDF/OFEF;
- accommodating the OFEF-EC link cables.

In addition, this document specifies the accommodation of:

- the BDF;
- the OFEF;
- the EC.

### 2.2 Accommodation of external balanced cabling from the premises penetration to the BDF

#### 2.2.1 Pathways at the BDF

The pathway selected for the external balanced cables shall provide the segregation between external balanced cables and mains power cabling described in 2.2.2 and 2.2.3.

In order to prevent the ingress of contaminants into the closures via the cable gland (if present) pathways shall enter box- or cabinet-based BDFs from below. There are no requirements for the pathway routes into frame-based BDFs.

#### 2.2.2 General segregation requirements for external balanced cables and mains power cabling

The segregation of external balanced cables and mains power cabling shall be in accordance with BS 6701 with regard to safety and protection. Segregation in accordance with the requirements of this document will ensure conformance to BS 6701 for mains power cabling of up to 600 VAC.

#### 2.2.3 Segregation of external balanced cables and electromagnetic interference sources

##### 2.2.3.1 General

BS EN 50174-2 contains clear requirements regarding segregation of balanced cables and power supply cables. This document applies the requirements of BS EN 50174-2 in total but sub-clauses 2.2.3.2 and 2.2.3.3 provide a simple, but limited, reference to those requirements.

##### 2.2.3.2 Segregation of external balanced cables and power supply cabling

The separation requirement "A" is calculated by multiplying the minimum separation distance "S" obtained from Table 1 by the power cabling factor "P" from Table 2.

Where mains power cables (other than single core cables operating at voltages exceeding AC 600 V) pass through a fire barrier it is possible to reduce the calculated separation requirements of this sub-clause provided that:

- the total distance over which the reduction in the separation occurs is not greater than the thickness of the fire segregation barrier plus 0,5 m on either side;
- the external balanced cables and mains power cables are enclosed in separate metal trunking or conduit;
- national regulations concerning fire barriers are complied with;
- the requirements of BS 7671 are complied with.

78

**Table 1 - Minimum separation distance "S" for external balanced cables**

Separation without electromagnetic barrier	Containment applied to information technology or mains power cabling		
	Open metallic containment <sup>a</sup>	Perforated metallic containment <sup>b, c</sup>	Solid metallic containment <sup>d</sup>
300 mm	225 mm	150 mm	0 mm
<sup>a</sup> Screening performance (0 MHz to 100 MHz) equivalent to welded mesh steel basket of mesh size 50 mm x 100 mm (excluding ladders). This screening performance is also achieved with steel tray (trunking without cover) of less than 1,0 mm wall thickness and/or more than 20 % equally distributed perforated area. <sup>b</sup> Screening performance (0 MHz to 100 MHz) equivalent to steel tray (trunking without cover) of at least 1,0 mm wall thickness and no more than 20 % equally distributed perforated area. This screening performance is also achieved with screened power cables that do not meet the performance defined in footnote d. <sup>c</sup> The upper surface of installed cables shall be at least 10 mm below the top of the barrier. <sup>d</sup> Screening performance (0 MHz to 100 MHz) equivalent to a steel conduit of 1,5 mm wall thickness. Separation specified is in addition to that provided by any divider/barrier. The assumption underlying the material performance of the conduit is that the product of the permeability and conductivity is greater than 38 H•S/m <sup>2</sup> . This performance is not provided by stainless steel, aluminium and non-magnetic materials.			

79

80

**Table 2 - Power cabling factor**

Electrical circuit type <sup>a, b, c</sup>	Quantity of circuits	Power cabling factor <i>P</i>
20 A 230 V 1-phase	1 to 3	0,2
	4 to 6	0,4
	7 to 9	0,6
	10 to 12	0,8
	13 to 15	1,0
	16 to 30	2
	31 to 45	3
	46 to 60	4
	61 to 75	5
	> 75	6
<sup>a</sup> 3-phase cables shall be treated as 3 off 1-phase cables. <sup>b</sup> More than 20 A shall be treated as multiples of 20 A. <sup>c</sup> Lower voltage AC or DC power supply cables shall be treated based upon the their current ratings, i.e. a 100 A 50 V DC cable = 5 of 20 A cables ( <i>P</i> = 0,4).		

81

82

### 83 2.2.3.3 Separation of external balanced cables and specific electromagnetic interference sources

84 The separation requirements of Table 3 shall be applied where information technology cabling is installed in proximity to the  
85 EMI sources listed.  
86

87

**Table 3 - Separation requirements for specific EMI sources**

Source of disturbance	Minimum distance (mm)
Fluorescent lamps	130
Neon lamps	130
Mercury vapour lamps	130
High-intensity discharge lamps	130
Copiers	400

88

89

## 2.2.4 Pathway system selection for external balanced cables in accordance with CW 1308B

### 2.2.4.1 Management of fire performance

If the Network Operations Manager has given express authority to use an external balanced cable that does not comply with either the minimum recommended performance requirements of BS EN 60332-1-2 or EuroClass E<sub>ca</sub> of BS EN 13501-6 then, unless the BDF is located within 2 metres of the point of internal penetration of the external fire barrier, the pathway system shall be either:

- a fully enclosed (acting as a fire barrier) steel conduit in accordance with BS EN 61386-1 (and relevant part 2);
- or
- a fully enclosed (acting as a fire barrier) steel duct in accordance with EN 50085-1 and the relevant part 2 (EN 50085-2-1 for ceilings and walls, EN 50085-2-2 for underfloor, flush-floor and onfloor).

BS 6701:2016 Amendment 1:2017 requires certain cables inside buildings to meet EuroClass C<sub>ca</sub>-s1b,d2,a2 of BS EN 13501-6. As a result, cables that do not meet the requirements of BS 6701:2016 Amendment 1:2017 shall not be installed inside buildings and other structures without the express authority of the Network Operations Manager.

Cables that do not meet the requirements of or EuroClass C<sub>ca</sub>-s1a,d2,a2 of BS EN 13501-6 shall only be installed in accessible locations in fire compartments that cannot become evacuation routes. Otherwise they shall be treated as if they do not comply with the minimum recommended performance requirements of BS EN 60332-1-2 or EuroClass E<sub>ca</sub> of BS EN 13501-6 (see above).

BS EN 50174-1 and BS EN 50174-2 contain clear requirements regarding selection of pathway systems. This document applies the requirements of BS EN 50174-1 and BS EN 50174-2 in total but details the following requirements as a simple reference.

Cables that do comply with EuroClass C<sub>ca</sub>-s1b,d2,a2 of BS EN 13501-6 may be installed in pathway systems of the types listed below which shall comply with the relevant European standards:

- non-flame propagating conduit systems: BS EN 50086-1 and the relevant part 2 (see Normative References);
- non-flame propagating trunking and ducting systems: BS EN 50085-1 and the relevant part 2 (see Normative References);
- non-flame propagating tray and ladder systems: BS EN 61537.

Unless the express authority of the Network Operations Manager has been obtained then pathway systems shall be of a non-flame propagating type as defined the standards listed above.

### 2.2.4.2 Dimensions

The dimensions of the pathway systems shall allow the external balanced cables to be installed;

- on a phased basis without risk of damage to the cables;
- while maintaining the bend radius of the cables (200 mm).

The minimum dimensions of the pathway systems are shown in Table 4.

**Table 4 - Dimensions of external balanced cable pathway system**

Number of external balanced cables served by pathway system	Pathway cross-sectional area (mm <sup>2</sup> )	Pathway cross-section for tray/basket
1	600	30 mm x 50 mm
2	1925	30 mm x 75 mm
3	2900	30 mm x 100 mm
4	3800	30 mm x 125 mm
5	4775	30 mm x 150 mm
6	5750	30 mm x 150 mm
7	6700	30 mm x 225 mm
8	7650	30 mm x 300 mm

The following recommendations apply:

- enclosed shapes provide the best electromagnetic protection to the installed cables by reducing the common mode coupling;
- trays with small slots, for easy attachment of cable, parallel to the axis of the tray provide the best electromagnetic protection to the installed cables;
- tray with slots, for easy attachment of cable, perpendicular to the tray axis should not be used.

## **2.2.5 Pathway system selection for external balanced cables in accordance with CW 1128**

### **2.2.5.1 Management of fire performance**

See 2.2.4.1.

### **2.2.5.2 Dimensions**

BS EN 50174-1 and BS EN 50174-2 contain clear requirements regarding selection of pathway systems. This document applies the requirements of BS EN 50174-1 and BS EN 50174-2 in total but details the following requirements as a simple reference. The dimensions of the pathway system shall allow the external balanced cables to be installed;

- on a phased basis without risk of damage to the cables;
- while maintaining the bend radius of the cables (200 mm).

The minimum dimensions of the pathway systems are shown in Table 4.

## **2.3 Accommodation of external optical fibre cabling from the premises penetration to the OFEF**

### **2.3.1 Pathways at the OFEF**

In order to prevent the ingress of contaminants into the OFEF both from the cable and via the cable gland (if present) pathways shall enter the OFEF from below.

### **2.3.2 Pathway system selection for external optical fibre cables**

#### **2.3.2.1 Management of fire performance**

See 2.2.4.1.

#### **2.3.2.2 Dimensions**

BS EN 50174-1 and BS EN 50174-2 contain clear requirements regarding selection of pathway systems. This document applies the requirements of BS EN 50174-1 and BS EN 50174-2 in total but details the following requirements as a simple reference. The dimensions of the pathway system shall allow the external optical fibre cables to be installed;

- on a phased basis without risk of damage to the cables;
- while maintaining the bend radius of the cables (100 mm).

The minimum dimensions of the pathway systems are shown in Table 5.

**Table 5 - Dimensions of external optical fibre cable pathway system**

Number of external optical fibre cables served by pathway system	Pathway cross-sectional area (mm <sup>2</sup> )	Pathway cross-section for tray/basket
1	180	30 mm x 50 mm
2	360	30 mm x 50 mm
3	540	30 mm x 50 mm
4	720	30 mm x 50 mm
5	900	30 mm x 50 mm
6	1080	30 mm x 50 mm
7	1260	30 mm x 50 mm
8	1440	30 mm x 50 mm

## **2.4 Accommodation of optical fibre cabling from the OFEF to the EC**

### **2.4.1 Pathways at the EC**

In order to prevent the ingress of contaminants into the EC both from the cable and via the cable gland (if present) pathways shall enter the EC from below.

### **2.4.2 Pathway system selection for external optical fibre cables**

#### **2.4.2.1 Management of fire performance**

See 2.2.4.1.

#### **2.4.2.2 Dimensions**

BS EN 50174-1 and BS EN 50174-2 contain clear requirements regarding selection of pathway systems. This document applies the requirements of BS EN 50174-1 and BS EN 50174-2 in total but details the following requirements as a simple reference.

The dimensions of the pathway system shall allow the OFEF-EC cables to be installed;

- on a phased basis without risk of damage to the cables;
- while maintaining the bend radius of the cables (100 mm).

## **2.5 Pathway system installation**

BS EN 50174-2 contains clear requirements regarding installation of pathway systems. This document applies the requirements of BS EN 50174-2 in total but details the following requirements as a simple reference.

Pathway systems shall be installed:

- in accordance with instructions provided by the manufacturer(s)/supplier(s) of the pathway systems;
- to allow installation and removal of the cable without risk of damage to the cable;
- without sharp edges or corners that could damage the cabling installed within or upon them;
- to ensure that water or other contaminant liquids cannot collect.

Where required by University of Oxford IT Services, sections of pathway systems shall be jointed to prevent ingress of gases, liquids, etc.

Where a conducting pathway system is installed, sections shall be bonded to earth in accordance with BS 7671 in order that the pathway system acts as a parallel earthing conductor (PEC).

## **2.6 Cable installation**

BS EN 50174-2 contains clear requirements regarding installation of cables. This document applies the requirements of BS EN 50174-2 in total but details the following requirements as a simple reference.

When installing cables, cords or jumpers appropriate techniques shall be applied to:

- eliminate cable stress as caused by:
  - tension in suspended cable runs;
  - tightly cinched cable bundles;
- ensure that minimum bend radii are never less than those specified in the product standard (rollers or other devices shall be used to avoid damage);
- ensure that the maximum pulling tensions taken from the cable specifications are not exceeded;
- prevent pressure marks (e.g. through improper fastening or crossovers) on the cable sheath or the cable elements;
- avoid joints other than those in accordance with the installation specification.

When installing cables into cable tray, the bundles created shall be lower than the sidewalls of the tray.

The installation process shall not degrade the intended environmental performance of the pathway/pathway system e.g. water seals and fire barriers shall be re-fitted upon completion of the installation. Cable ends shall remain sealed during installation to prevent the ingress of water and other contaminants.

Under no circumstances shall cables that are not terminated in a cabinet, frame or rack be routed within the physical boundaries of that cabinet, frame or rack.

## 2.7 Accommodation for BDF, EFOF and ECs

BS EN 50174-1 contains clear requirements regarding accommodation of cabinets, frames and racks. This document applies the requirements of BS EN 50174-1 in total but details the following requirements as a simple reference.

The location of cabinets, frames and racks shall:

- allow subsequent measurements, repair, expansion or extension of the installed cabling may be undertaken without risk of injury to personnel;
- be consistent with the space, floor loading and other services required for information technology equipment;
- allow the installation of the necessary cabling together with the delivery and removal of larger items of apparatus;
- provide a minimum clearance of 1,2 m on all faces of the where access is required;
- allow for the installation of additional cabling without major disruption.

Cabinets, frames and racks shall not be installed:

- in toilet facilities and kitchens;
- in emergency escape ways;
- in ceiling or sub-floor spaces;
- within cabinets or closures containing fire hose reels or other fire-extinguishing equipment.

Cabinets, frames and racks (or the closures within them) shall provide the necessary levels of physical and environmental protection for the information technology cabling and equipment installed and shall achieve the necessary protection by their location, design features or a combination of both. Where necessary, atmospheric control shall be provided within the space and/or the frames and cabinets.

The design and dimensions of the frames and cabinets, together with clearances (including those above and below them, as appropriate) shall ensure that:

- it is possible to install the initial quantity of cables in accordance with the minimum bend radii (installation and operating) - where multiple cable types are involved, the largest minimum bend radius shall apply;
- additional cables can be subsequently installed in accordance with the minimum bend radii (installation and operating) - where multiple cable types are involved, the largest minimum bend radius shall apply;
- facilities for the management of cables and cords are provided.

## 3 OTHER DOCUMENTS IN THIS SERIES

IISS-00-001: Infrastructure Installation Specification Strategy: Overview

IISS-00-002: Infrastructure Installation Specification Strategy: Distributed building services

IISS-01-001: Assessment of balanced cabling test results

IISS-01-002: Installation and acceptance testing of singlemode optical fibre cabling

ISP-00-001: Infrastructure Specification Project: Overview

*ISP-00-002: Access to University of Oxford IT Services facilities (later)*

ISP-01-001: University of Oxford IT Services Entrance Facilities - Product and design specification

ISP-02-001: University of Oxford IT Services Intermediate cabling (INTI-ENTI) - Product and design specification

ISP-02-002: University of Oxford IT Services Intermediate cabling (INTI-ENTI) - Accommodation requirements

ISP-03-001: Distribution cabling - Recommendations: Overview

ISP-03-002: Direct-connect cabling - Recommendations: Telecommunications infrastructure

ISP-03-003: Distribution cabling - Recommendations: IT infrastructure

ISP-03-004: Distribution cabling - Recommendations: Distributed building services infrastructure

276 **NORMATIVE REFERENCES**

277 The following documents shall be applied in a normative manner (i.e. mandated) by the users of this document.  
278

BS 6701:2016 + Amendment 1:2017	Telecommunications equipment and telecommunications cabling - Specification for installation, operation and maintenance
BS 7671:2018	Requirements for electrical installations: IEE Wiring Regulations: 18th edition
BS EN 13501-6	Fire classification of construction products and building elements. Classification using data from reaction to fire tests on electric cables
BS EN 50085-1:2005 + Amendment 1:2013	Cable trunking systems and cable ducting systems for electrical installations. General requirements
BS EN 50085-2-1:2006 + Amendment 1:2011	Cable trunking systems and cable ducting systems for electrical installations. Cable trunking systems and cable ducting systems intended for mounting on walls and ceilings
BS EN 50085-2-2:2008	Cable trunking systems and cable ducting systems for electrical installations. Particular requirements for cable trunking systems and cable ducting systems intended for mounting underfloor, flushfloor, or onfloor
BS EN 50174-1:2018	Information technology - Cabling installation - Part 1: Installation specification and quality assurance
BS EN 50174-2:2018	Information technology - Cabling installation - Part 2: Installation planning and practices inside buildings
BS EN 60332-1-2	Tests on electric and optical fibre cables under fire conditions. Test for vertical flame propagation for a single insulated wire or cable. Procedure for 1 kW pre-mixed flame
BS EN 61386-1:2008	Conduit systems for cable management. General requirements
BS EN 61386-21:2004 + A11:2010	Conduit systems for cable management. Particular requirements. Rigid conduit systems
BS EN 61386-22:2004 + A11:2010	Conduit systems for cable management. Particular requirements. Pliable conduit systems.
BS EN 61386-23:2004 + A11:2010	Conduit systems for cable management. Particular requirements. Flexible conduit systems
BS EN 61386-24:2010	Conduit systems for cable management. Particular requirements. Conduit systems buried underground
BS EN 61537:2007	Cable management. Cable tray systems and cable ladder systems

279  
280  
281 **BIBLIOGRAPHY**

282 The following documents are considered useful reference sources for the users of this document.  
283

BS EN 50310:2016	Information technology - Telecommunications bonding networks for buildings and other structures
------------------	---

284