Information Communications Technology
Structured Cabling Infrastructure
Guidelines

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1.0 Introduction

1.1 Many Colleges, Schools and Support Services of the University of Edinburgh will continue for some years to work in office environments that were created long before the concept and application of Information Communications Technology (ICT). It is obvious that no thought was ever given to Structured Cabling. Therefore, it is the original construction of the building that dictates the degree of adaptation to meet the needs of the modern office. Cabling this type of building presents several problems.

1.2 The importance of a Structured Cabling infrastructure is similar to that of other fundamental building utilities such as heating, water and electricity. As with other utilities, interruptions to service can have a serious impact. Because of this, and the additional fact that the useful life of a building may span several decades, it is essential that the design and construction of a new or refurbished building be done with due care and attention given to Structured Cabling. Poor quality of service due to lack of planning can threaten a department’s effectiveness.

1.3 Structured Cabling is a vital component in today's information-based environment. The use of Structured Cabling, using high performance components, can offer long-term support for the delivery of the most demanding network solutions.

1.4 To meet the ever-changing ICT demands, the University of Edinburgh has standardised on ADC KRONE TrueNet Structured Cabling Solution. This product set has been selected for its high degree of reliability, quality and performance. By standardising on the ADC KRONE product set a standard warranty for voice and data has been set for all buildings within the University of Edinburgh.

1.5 All installation work must be covered by an ADC KRONE warranty. To ensure this happens, only ADC KRONE Approved Contractors shall be used.

2.0 Scope

2.1 The aim of this document is to provide sufficient information for the successful delivery of a Structured Cabling Solution which has high reliability, is easy to maintain and can support the applications and services of today and the future.

2.2 It is hoped the following information will prove useful to architects, electrical/data consultants, main contractors, suppliers, installers, or anyone responsible for the design, specification, planning or installation of Structured Cabling infrastructure.

2.3 This information is an overview and is not intended to provide an in-depth consideration of cabling or working practices.

2.4 Whilst every care has been taken to ensure that the following information is correct we submit the following as an advisory guide only. For clarification, the relevant standard, specification, manufacturer’s instructions or code of practice must be consulted at all times.

2.5 University of Edinburgh Information Services (I.S.) policy is one of continuous development and improvement. This information will be re-issued when the
upgrading of products, specifications or installation techniques requires it. Please check that you have the most up-to-date version of this document.

3.0 Definitions and Abbreviations

For a definition of terms and abbreviations used in this document refer to the relevant British Standard, as indicated below.

4.0 Roles and Responsibility

4.1 In order to minimise any ambiguity, it is recommended that the responsibilities of the planning and installation of each ICT project are clearly defined using a template of the form shown in Table B.1., BS EN 50174-2.

4.2 I.S. will appoint a Network Installation Project Manager who shall act as ICT advisor during the design, specification, planning, installation and commissioning phases.

4.3 The ADC KRONE Approved Contractor shall supply and install all passive Structured Cabling components.

4.4 I.S. shall supply and install all active equipment.

5.0 Project Management

5.1 Close liaison between I.S., E&B, architect, electrical/data consultant, main contractor, and installer is imperative for the successful completion of the project to the relevant British Standards.

5.2 On large projects, meetings between the electrical/data consultant and the Network Installation Project Manager will be held at least once a month to discuss planning and progress of the project.

6.0 British Standards

6.1. To ensure a high-spec installation, architects, electrical/data consultants, main contractors, sub-contractor, suppliers, installers, or anyone responsible for the design, specification, planning or installation of Structured Cabling infrastructure should have a thorough working knowledge of, and must adhere to, the three main British Standards associated with data cabling:

   BS 6701: Telecommunications equipment and telecommunications cabling - Specification for installation, operation and maintenance.
   BS EN 50173 series: Information Technology - Generic Cabling Systems.
   BS EN 50174 series: Information Technology - Cabling installation.

6.1.1 Please Note: The latest edition of British Standards (including any amendments) applies.
6.1.2 For further information about other standards relevant to Structured Cabling infrastructure see Appendix 1; List of Relevant standards.

6.2 During the design phase of a contract the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the design of the Structured Cabling infrastructure, should refer to; BS EN 50173.

6.2.1 The above British Standard specifies the structure and configuration of generic cabling systems.

6.2.2 Particular attention is drawn to the following clauses:

- Clause 4, BS EN 50173 -1
- Clause 5, BS EN 50173 -1
- Clause 7, BS EN 50173 -1
- Clause 8, BS EN 50173 -1
- Clause 9, BS EN 50173 -1
- Annex A, BS EN 50173 -1

6.3 During the specification phase of a contract the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the specifying of the Structured Cabling infrastructure, should refer to; BS EN 50174 -1.

6.3.1 The above British Standard is concerned with specification, quality assurance, documentation and administration of information technology cabling to be installed. It sets out the responsibilities of cabling installers and premises owners or appointed representatives separately, and is intended to be referenced in relevant contracts.

6.3.2 Particular attention is drawn to the following clauses:

- Clause 4, BS EN 50174 -1
- Clause 5, BS EN 50174 -1

6.4 During the planning phase of a contract the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the planning of the Structured Cabling infrastructure, should refer to; BS EN 50174 -1, BS EN 50174 -2 and BS EN 50174 -3 and BS EN 30310.

6.4.1 The above British Standards are intended to be used by the personnel directly involved in the planning aspects (of the specification phase) and installation phase of cabling for both inside and outside buildings.

6.4.2 Particular attention is drawn to the following clauses:

- Clause 4, BS EN 50174 -2
- Clause 6, BS EN 50174 -2
- Clause 7, BS EN 50174 -2
- Clause 5.2, BS EN 50310
- Clause 6.3, BS EN 50310
6.5 During the **installation phase** of a contract the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the installation of the Structured Cabling infrastructure, should refer to: BS EN 50174 -1, BS EN 50174 -2, BS EN 50174 -3, BS EN 30310 and BS EN 50346

6.5.1 The above British Standards are concerned with the planning, installation and testing of cabling.

6.5.2 Particular attention is drawn to the following clauses:

- Clause 5, BS EN 50174 -2
- Clause 6, BS EN 50174 -2
- Clause 5.2, BS EN 50310
- Clause 6.3, BS EN 50310
- Clause 4, BS EN 50346
- Clause 5, BS EN 50346
- Clause 6, BS EN 50346

7.0 **Structured Cabling System. Building Design - general**

7.1 Each item of a building’s Generic Cabling System can be broken down as follows: Campus Distribution (CD), Building Distribution (BD), Floor Distribution (FD) and Telecommunications Outlet (TO).

7.2 For further information consult the following;

- Clause 4, BS EN 50173-1
- Clause 4, BS EN 50173-2

7.3 The number and type of subsystems that are included in a Structured Cabling System depends upon the geography and size of the campus or building, and upon the strategy of the user. Usually there would be one CD per campus, one BD per building,
and one or more FD(s) per floor or area.

**7.4 An example of the basic construct of a typical building is shown below.**

![Diagram of generic cabling system]

**7.5 Campus Backbone Cabling Subsystem**

The Campus Backbone is the cabling system that provides data and/or telecommunication services between buildings. It connects two or more BD(s) and will almost always be in the form of fibre optic cabling. Occasionally, for very remote sites, a suitable wireless technology may be required.

**7.6 Building Backbone Cabling Subsystem**

The Building Backbone is the cabling system that provides telecommunication services between floors or areas within a building. It connects the BD to the FD(s) and will usually consist of both fibre optic and copper links.

**7.7 Horizontal Cabling Subsystem**

The horizontal cabling is the cabling system that provides telecommunication services from the FD to the TO(s). It will almost always be in the form of copper cabling but occasionally fibre optic may be required.

**7.8 During the ICT project the Network Installation Project Manager shall issue a schematic drawing detailing Campus Backbone, Building Backbone and Horizontal Cabling.**

**7.9 Appendix 2 gives an example of a Typical Schematic.**
8.0 Telecommunications Rooms and Equipment Rooms

8.1 CDs, BDs and FDs shall be located in Telecommunication Rooms or Equipment Rooms.

8.2 A Telecommunications Room is an enclosed space for housing telecommunications equipment, cable terminations, and cross-connect cabling.

8.3 Experience shows, the design and location of Telecommunications Rooms is very often ‘a last minute thought’, resulting in telecommunications equipment being housed in inadequate, unventilated, overpopulated spaces, without allowing room for future expansion. To avoid this, the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the specifying of the Telecommunications Rooms should seek advice from the Network Installation Project Manager as early as possible.

8.4 Correct specification of Telecommunications Rooms is vital during the preliminary architectural design phase of a project and will ease the implementation and operation of both the cabling and the applications supported.

8.5 To ensure smooth transition from installation to operation, Telecommunications Rooms require detailed specification in terms of location, space and environmental aspects.

8.6 A Telecommunications Room should provide all the facilities for passive components, active devices, and external network interfaces housed within it. Each Telecommunications Room should have direct access to the Backbone Cabling System.

8.7 An Equipment Room is an area within a building where telecommunications equipment is housed and may or may not contain distributors. If a Telecommunications Room houses more than one distributor (e.g. a BD and an FD) it should be considered an Equipment Room.

8.8 Equipment Rooms are treated differently from Telecommunications Rooms because of the nature or complexity of the equipment (e.g. PBXs, Servers, A/V services, CCTV, Door Entry Controllers, etc). They are likely to be larger than Telecommunication Rooms, requiring a more detailed specification, and are often referred to as Main Comms Room.

8.9 Appendix 3 gives an example of a Typical Telecommunications Room Layout.
9.0 Telecommunications Room- general

9.1 The Telecommunications Room must be designed with expansion and maintenance as the foremost thought, taking into consideration:

- Telecommunications outlet capacity of the building
- Available cable routes
- Permissible cable distances

9.2 Other considerations are:

- Power requirements
- Earthing
- Ventilation/Air Conditioning/Cooling
- Lighting
- Raised access floor

9.3 Telecommunications equipment may be endangered or adversely effected by other services or conditions which may be obvious or hidden within the fabric of the building. In particular, water/steam pipes should never be installed directly above or in the same room as telecommunications equipment.

9.4 The Telecommunications Room shall be sized to meet the present and future requirements. Where the requirements are not known, the following guideline should be used:

- Provide 0.07m² of Telecommunications Room space for every 10m² of work area space.

- The Telecommunications Room shall be designed to a minimum of 14m².

9.5 When planning the location, size and number of Telecommunications Rooms required, the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the design and planning of the Structured Cabling infrastructure should keep in mind the 90m rule for the Horizontal Cabling Subsystem. This is the distance from the FD to the TO. This distance must not be exceeded and all design and planning must adhere to this rule.

9.6 Minimum clearance height in the Telecommunications Room shall be 2.5 metres without obstructions.

9.7 The door of the Telecommunications Room shall be a minimum of 926mm wide and 2040mm high, and hinged to open outward. Alternatively, a double door arrangement, 826mm/413mm, may be used in some areas.

9.8 The walls, floors and ceilings shall be light in colour, and shall be chosen such as to reduce dust.

9.9 Lighting should not be lower than normal office level.
9.10 It is essential that a safe route be established to the Telecommunications Rooms, with suitable access, to allow the passage of personnel together with necessary apparatus and equipment.

9.11 Please Note: All Telecommunications Rooms shall house only equipment directly related to the Structured Cabling infrastructure, associated electronics and its environmental support systems. Equipment and services not directly related to the support of the Telecommunications Room or Structured Wiring System shall not be installed in, pass through, or enter the Telecommunications Room. It is not permissible for other parties to store or install equipment within these rooms.

9.12 Should 'alien' equipment be required in the Telecommunications Room then the location of such equipment must first be agreed with the Network Installation Project Manager.

9.13 During the ICT project the Network Installation Project Manager shall issue a Telecommunications Room layout.

9.14 Appendix 3 gives an example of a Typical Telecommunications Room Layout.

10.0 Communications Cabinets (aka Racks or Units)

10.1 Communications Cabinets are required to house the termination of the backbone and horizontal subsystems, and associated electronics.

10.2 Communications Cabinets shall be housed in Telecommunications Rooms or Equipment Rooms and shall not be installed in:

- Direct sunlight
- Toilet facilities
- Boiler/plant/switch/machine rooms
- Emergency escape ways
- Ceiling or sub-floor spaces
- Areas subject to flooding
- Areas containing fire hose reels or other fire-extinguishing equipment

10.3 The location of the Communications Cabinets should provide physical and environmental protection for the telecommunications equipment. This protection may be achieved either by choice of appropriate location or by specific design and should address the following aspects:

- Temperature
- Humidity
- Vibration
- Exposure to ultraviolet radiation
- Ingress of dust, fluids or other contaminants
- Physical damage (accidental or malicious)
- Security
- Electromagnetic interference
- Presence of other hazards
Communications Cabinets shall allow adequate access and should be provided with illumination and temperature conditions suitable to allow installation and maintenance of a Structured Cabling System and associated electronics.

The following recommendations are made for all Communications Cabinets:

10.5.1 Communications Cabins shall be located such that subsequent measurements, repair, expansion or extension of the installed cabling can be undertaken in safety.

10.5.2 The minimum clearance on all faces of the Communications Cabinets where access is required shall be 1.2 metres.

10.5.3 Cable terminations and electronics shall be set at a safe working height to allow measurement, repair and reconfiguration, i.e. no higher than 2.5 metres and no lower than 1 metre.

10.5.4 Within the Communications Cabinets, cables shall be supported to provide strain relief and prevent kinking, and in such a way that mechanical damage is avoided during later access to the patch panels or electronics.

10.5.5 When installed side-by-side, Communications Cabinets shall be bayed together using the appropriate baying kits.

Please Note: The University of Edinburgh use the term ‘Unit’ to refer to one or more Communications Cabinets.

10.7 During the ICT project the Network Installation Project Manager shall issue a Cabinet layout - detailing Unit I.D., subsystem terminations, equipment locations, etc.

10.8 Appendix 4 gives an example of a Typical Communications Cabinet Layout.

10.9 Appendix 5 provides a list of suitable Communications Cabinets to be used on premises belonging to the University of Edinburgh.

11.0 Telecommunications Room - detail

11.1 Power

11.1.1 A distribution board dedicated to, and housed in, the Telecommunications Room should be seriously considered. Where possible, this distributing board should be fed from the nearest essential services distributing board.

11.1.2 Power shall be provided to all Communications Cabinet that house active equipment. A minimum of two 16A commando sockets shall supply each active Communications Cabinet. Each commando socket shall be fed direct from the local distribution board.

11.1.3 Two 10 way vertical sequential start PDU strips shall be mounted to the rear of
each active Communications Cabinet, one each side. Each 10 way PDU shall be connected into a separate commando socket.

11.1.4 Appendix 5 provides a list of suitable PDUs to be used on premises belonging to the University of Edinburgh.

11.2 Earthing

11.2.1 A suitable Main Earthing Busbar shall be installed within the Telecommunications Room.

11.2.2 A single direct earth connection shall be made from Main Earthing Busbar to each of the Communications Cabinet housed within the Telecommunications Room. This connection shall be as short as possible and of low impedance and no less than 16mm.

11.2.3 Equipotential Bonding should be maintained throughout the ICT installation and shall be carried out in accordance with BS EN 50310 and BS 7671.

11.3 Ventilation/Air Conditioning/Cooling

11.3.1 It is essential the architect, consultant, main contractor or sub-contractor evaluate the current and future ventilation, air conditioning and cooling requirements. Experience has shown that heat dissipation continues to rise as processors become more powerful and, as more and more equipment is becoming IP based, this trend looks likely to increase.

11.3.2 The following should be used as a general guide.
Potential heat dissipation per Communications Cabinet:

Approx 2500 watts maximum  
Approx 8500 BTU/hour maximum

11.3.3 The temperature and humidity shall be controlled to provide continuous operating ranges of 18°C to 22°C with 45% to 55% relative humidity.

11.4 Lighting

11.4.1 The luminance shall be a minimum of 450 lux in the horizontal and 200 lux in the vertical plane. Diffusers shall be used to ensure an even spread of light throughout the Telecommunications Room.

11.4.2 For further information, Architects, electrical/data consultants, main contractors, suppliers, installers, or anyone responsible for the design of the Telecommunications Room, should refer to; BS EN 12464-1.

11.5 Raised Floor

11.5.1 A raised access floor is preferred in the Telecommunications Room and shall provide a void of a minimum height of 400mm. For larger Telecommunications
Rooms, i.e. with four or more Communications Cabinets, 600mm should be provided. The structure of the raised floor should allow unrestricted access to the void.

11.5.2 Consideration should be given to the installation of a water detection system in the floor void.

11.5.3 For further information, Architects, electrical/data consultants, main contractors, suppliers, installers, or anyone responsible for the design of the Telecommunications Room, should refer to; BS EN 12825.

11.6 Fire protection

11.6.1 A fire in a Telecommunications Room can lead to extensive physical damage and serious disruption to operations and services. Measures must also be taken to safeguard the lives of I.S. personnel and provide a means of escape in the event of a fire.

11.6.2 Each Telecommunications Room shall have a smoke alarm fitted in a central ceiling location. This alarm shall be the same type and manufacture of the building fire detection system. The alarm must be linked into the existing building fire detection system.

11.6.3 For further information, Architects, electrical/data consultants, main contractors, suppliers, installers, or anyone responsible for the design of the Telecommunications Room, should refer to; BS 6266.

11.7 Lightning

It is beyond the scope of this guide to discuss in detail the effects of lightning discharges on ICT equipment. Architects, electrical/data consultants, main contractors, suppliers, installers, or anyone responsible for the design of the Telecommunications Room should be aware that such effects exist and can cause serious damage or fire, and should refer to; BS EN 50468.

11.8 Security

11.8.1 Access to the Telecommunications Rooms shall be restricted to authorised personnel only, as specified by the Network Installation Project Manager, thus maintaining a degree of network security and minimising the risk of damage which could threaten the integrity of the network. Also, some active equipment is essential to teaching, and any downtime would have a detrimental effect.

11.8.2 The level of security required for any ICT installation and the physical measures needed to provide that security, should be assessed at the planning stage. Guidance on the implementation of physical security is found in BS 7799 and BS 8220: Part 2.

11.8.3 All doors that have direct access to a Telecommunications Room must fitted with swipe card access or have security lock ASSA 9EA1734A 1-3 fitted. These locks
are reserved for I.S. Telecommunications Rooms and are available from E&B.

11.8.4 All windows within the Telecommunications Room must be fitted with opaque glass that is obscure to level 5. Security bars must be fitted to the inside of the windows.

11.9 Surface Finishes

Finishes should be smooth and resistant to dust collection. Surfaces beneath raised floors and above suspended ceilings should be sealed with resin or other suitable sealant to aid cleaning and reduce the amount of dust and flaking of building material.

12.0 Equipment Room (Main Comms Room) – detail

12.1.1 Due to recent developments, more and more equipment is becoming IP based, e.g. VoIP telephony, security equipment, CCTV, A/V kit, etc.

12.1.2 As Network Services, Audiovisual Technology and Telephones are all part of the same division (IT-Infrastructure), and as pressure on building space increases, we should be looking at housing ALL network connected infrastructure devices in a shared location, i.e. an Equipment Room.

12.1.3 Other equipment may also be housed in Equipments Rooms, e.g. Door Controllers, CCTV recording equipment, etc. The housing of such equipment must first be agreed with the Network Installation Project Manager.

12.1.4 In addition to the Telecommunications Room requirements, mentioned above, new building and refurbishment projects should take into account the following minimum requirements for Equipment Rooms:

12.2 Number of Communications Cabinets

Calculation of floor space and number of Communications Cabinets is dependant on many factors and will differ for each installation. Where the requirements are not known the following guideline should be used:

- 2 x 42U Communications Cabinets required for Network Services core equipment - PLUS any Communications Cabinets required for FDs.
- 2 x 42U Communications Cabinets required for Audiovisual Technology.
- 1 x 42U Communications Cabinet required for Telephones.
- 1 x 42U Communications Cabinet required for Security, CCTV etc.
- 1 x 42U Communications Cabinet required for future.

12.3 Please Note: Once a suitable location for the Equipment Room has been identified, the position of the Communications Cabinets should be carefully planned and agreed with the Network Installation Project Manager.

12.4 Appendix 2 gives an example of the Number of Communications Cabinets required in an Equipment Room.
12.5 Power

12.5.1 A distributing board dedicated to, and housed in, the Equipment Room should be considered vital. This distributing board should be fed from the nearest essential services distributing board.

12.5.2 To protect equipment from disturbances associated with the mains power supply an Uninterruptible Power Supply (UPS) and/or back-up generator may also be installed in certain circumstances.

12.5.3 Appendix 6 gives an example of Typical UPS requirements.

12.5.4 UPS units may give rise to radio-frequency interference effecting other equipment in the vicinity; it is advised that the UPS not be positioned next to devices, which, by their nature, are sensitive to such interference. I.S. advises a minimum separation distance of 150cm between the UPS and Structured Cabling components or active equipment.

12.6 Ventilation/Air Conditioning/Cooling

12.6.1 As new equipment is introduced, with increasingly more powerful processors, resulting in a rise in heat output, it is essential measures be taken to carefully control the temperature and relative humidity. At the early stages of a project an assessment of current and possible future ventilation, air condition and/or cooling requirements must be addressed by the architect, consultant, main contractor or sub-contractor.

12.6.2 The following should be used as a general guide.
Potential heat dissipation per Communications Cabinet:

- Approx 3500 watts maximum
- Approx 12000 BTU/hour maximum

12.7 Lighting

Emergency lighting should be considered essential in an Equipment Room.

12.8 Raised Floor

A raised access floor should be considered essential in an Equipment Room and shall provide a void of a minimum height of 600mm.

12.9 Security

12.9.1 The location of Communications Cabinets should be carefully planned and agreed with the Network Installation Project Manager.

12.9.2 Doors to the Equipment Room should be self closing.

12.9.3 Swipe Card Access should be considered essential in an Equipment Room.
12.10 Surface Finishes

Air-borne dust levels must be carefully controlled. Where clean room standards are required, finishes should be in accordance with BS EN ISO 14644-4

12.11 Back up (analogue) Phones

Each Equipment Room shall have a double data outlet installed for back up telephony. The outlets shall be positioned central to the Communications Cabinets on the wall facing the front of the patch panels and active equipment.

13.0 Backbone Cabling - Campus/ Building Distribution

13.1 The Backbone Distribution is split into two areas, namely the Campus and the Building Distribution, which are interconnected to form a basic hierarchical topology, as described in Clause 4, BS EN 50173-1.

13.2 It is critical the Backbone Distribution is designed correctly, with consideration given to:

- Current and foreseeable application requirements
- ICT media choice
- Cable routing
- Cable management
- Communications Cabinet layouts
- Raised floor
- Ceiling void

13.3 Backbone cables are routed using pathways. A variety of cable management systems can be used to support the cables within the pathways including ducts, conduits, tray and basket. Requirements for the pathways and the cable management systems within them are provided in the BS EN 50174 series of standards.

13.4 Where backbone cabling serves multiple buildings, the use of optical fibre cabling is essential to avoid transmission problems associated with earth potential differences between buildings, lightning strikes, power surges, etc. Unless otherwise stated all fibre installations shall use Bloduct products.

13.5 Power and signal lines including fibre-optics in metallic protection may need protection against lightning-induced surges and rises in earth potential. Where this is the case, voltage limiting devices may need to be employed together with disconnection or protective devices such as barrier boxes. Where possible, overhead cables between buildings should be avoided. Separation of different types of cables entering the building will significantly reduce coupling effects. BS EN 62305 gives guidance on the protection of power and data cables.

13.6 Where the locations of CDs, BDs and FDs require backbone channel lengths less than 300m, the cabling shall comprise:

- 8 x OM3 multimode optical fibre.
50 pair CW1308 from BD to local DP

13.7 Where the locations of CDs, BDs and FDs require backbone channel lengths more than 300m, the cabling shall comprise:

- 8 x OM3 multimode optical fibre, and
- 8 x OS1 singlemode optical fibre.

50 pair CW1308 from BD to local DP

13.8 All fibre cores shall be terminated with LC duplex pigtails by fusion splicing. It is not acceptable to use mechanical splicing techniques.

13.9 In addition to the above, when the backbone cabling is in the same building, the following copper links shall be installed:

- 4 x CAT6a from BD to FD
- 20 pair CW1308 from BD to FD

13.10 See Appendix 2; Typical Schematic

14.0 Floor Distribution - general

14.1 The horizontal cabling subsystem extends from FD to the TO(s). The subsystem includes:

- Horizontal cables.
- TO(s).
- Mechanical termination of the horizontal cables at the FD and TO, together with associated equipment cords at the FD.

14.2 The horizontal cabling subsystem should be designed to support the broadest set of existing and emerging applications within the environmental conditions defined in Clause 5, BS EN 50173-2, and therefore provide the longest operational life. This will minimize disruption and the high cost of re-cabling in the work area.

14.3 The horizontal cabling subsystem shall be continuous from the FD to the TO and shall conform to the Interconnect - TO Model, as specified in fig. 11a, BS EN 50173-2.

14.4 The total length of the horizontal cabling subsystem must not exceed 90m and the total length of the patch cordage must not exceed 10m. The total combined end-to-end length must not exceed 100m and must contain no more than two connectors. I.S. forbids the use of Consolidation Points (CPs) or any form of joint.

14.5 Where a potential work area is not adjacent to a wall, facilities for under floor or above ceiling distribution (e.g. floor boxes or power poles) that provide cable protection shall be installed to enable TOs to be deployed at every potential work area.

14.6 All TOs shall be easily accessible
14.7 The design should ensure that the lengths of equipment cords and work area cords are minimised:

   Equipment cords should not exceed 5m.
   Work area cords should not exceed 3m, although 5m can be used in exceptional circumstances.

14.8 Furniture with 'plumbed-in' data wiring should not be used. They are unreliable and prone to faults. I.S. will not support this!

14.9 FDs should be located such that the resulting cable lengths are consistent with the channel performance requirements of Clause 5, BS EN 50173-2.

14.10 Each TO require two power points.

14.11 Appendix 5 provides a list of suitable cable and components to be used on premises belonging to the University of Edinburgh.

14.12 User Outlet Concentration

14.12.1 An important consideration is the number of potential work areas in a workplace requiring ICT facilities. This will have a direct effect on the number of Communications Cabinets required and, as a result, the size and design of the Telecommunications Rooms. A high density of TOs, i.e. flood wiring, will enhance the ability of the user community to accommodate changes.

14.12.2 The design of horizontal cabling subsystem should provide for a minimum of two TOs per work area, as outlined in Clause 4.7.6, BS EN 50173-2. However, each user type will demand different requirements from the Structured Cabling infrastructure. The main user types and number of TOs per person/desk have been defined below as the minimum requirements for outlet concentration.

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<td>General</td>
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<tr>
<td>Computing Officer</td>
<td>4</td>
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14.12.3 Other TO requirements include:

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<tr>
<td>Photocopier</td>
<td>1</td>
</tr>
<tr>
<td>FAX</td>
<td>1</td>
</tr>
<tr>
<td>Back-up telephone</td>
<td>2</td>
</tr>
<tr>
<td>Door Controller (i-star)</td>
<td>2</td>
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<tr>
<td>A/V Web Cam</td>
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<tr>
<td>A/V Information Screen</td>
<td>1</td>
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<tr>
<td>A/V Lectern</td>
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<td>Study Space</td>
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</tr>
<tr>
<td>CCTV</td>
<td>2</td>
</tr>
<tr>
<td>Metering</td>
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<tr>
<td>BEMS</td>
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</tbody>
</table>
14.14 Communications Cabinets

14.14.1 In general, the Structured Cabling infrastructure and the active electronics are housed in separate Communications Cabinets. However, where there is a small concentration of TOs, the Structured Cabling infrastructure and the active electronics may be housed in the same Communications Cabinet. The number of Communications Cabinets required is largely dependant on the number of TOs being installed.

14.14.2 In the absence of detailed information the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the design of the Structured Cabling infrastructure should allow the following:

- 001 to 050 TOs, requires one 15u Communications Cabinet.
- 051 to 100 TOs, requires one 42U Communications Cabinet.
- 101 to 300 TOs, requires two 42u Communications Cabinets.
- 301 to 600 TOs, requires four 42u Communications Cabinets.
- 601 to 900 TOs, requires six 42u Communications Cabinets.

14.14.3 Appendix 4 gives an example of a Typical Communications Cabinet Layout.

14.15 Wireless Access Points

14.15.1 Wireless networking may be provided in addition to generic telecommunications cabling.

14.15.2 Please Note: Wireless networking is not functionally equivalent to hard-wired cabling, generally offering inferior reliability, security and data throughput. In situations where users regularly locate mobile equipment, e.g. a laptop, at a desk or meeting table, generic telecommunications cabling should be used.

14.15.3 Where the ICT facilities and services will be accessed only occasionally, e.g. cafe, using mobile terminal equipment, wireless networking may be used instead of generic telecommunications cabling.

14.15.4 During the design phase of a contract the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the design of the Structured Cabling infrastructure, should perform a site/wireless survey (or use a planning tool) to determine the best location to site the Wireless Access Points (WAPs), taking into account the users current and future requirements.

14.15.5 If a school or college wants ‘complete’ wireless coverage then the data installer should carry out a thorough wireless survey and report its findings back to the Network Installation Project Manager for any knock-on effects or considerations.

14.15.6 Appendix 7 provides further information regarding Wireless Access Points, installation guide, etc.

14.15.7 It is possible DECT Wireless telephony may also be used. For further
information contact Telephones and Security.

14.15.8 Where wireless is required I.S. recommend the installation of a dual TO.

14.15.9 The number of dual TOs required largely depends on the wireless coverage, the building fabric and the user requirements. As a rule of thumb, one WAP can accommodate up to eight users. This rule also applies to DECT Wireless Phones.

14.15.10 In the absence of detailed information or wireless survey the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the design of the Structured Cabling infrastructure should allow at least one dual TO for every 100m$^2$ of floor space.

14.15.11 The TOs and WAPs should be easily accessible, mounted vertically below ceilings and no higher than 2.4m from ground level, making sure the WAP bracket is mounted alongside the TO, and is the correct way up.

14.15.12 In some locations, e.g. Library, it is permissible to install the TO above the ceiling and mount the WAP horizontally below the ceiling. Where this is the case the installer shall drill or cut a cable access hole in the ceiling tile large enough for the equipment cord to pass through. If the ceiling tile is metal a suitable grommet shall be used. The equipment cord shall pass through the access hole leaving approximately 30cm of cable at the WAP. The equipment cord shall not exceed 3m.

14.16 Telephones Distribution

14.16.1 With a few exceptions, all new telephony shall be VoIP, and as such shall be carried over the Structured Cabling infrastructure.

14.16.2 I.S. policy is to daisy-chain the Workstation from the VoIP handset.

14.16.3 Back-up phones and FAX machines shall also form part of the Structured Cabling infrastructure but shall not be IP based. Back-up phones and FAX machines shall patch to the analogue telephone distribution.

14.16.4 Emergency phones, e.g. lift phones, shall NOT form part of the Structured Cabling infrastructure and shall be wired in CW1308 cable from the local DP.

14.16.5 Each BD shall have a single 50 pair CW1308 feed from the local DP.

14.16.6 Each FD shall have a single 20 pair CW1308 feed from the BD.

14.16.7 A dedicated Telephones Communications Cabinet shall house the analogue telephone distribution. This cabinet will usually be located in the Equipment Room.

14.16.8 The following links shall be installed from BD to Telephones Cabinet:

- 24 x CAT6a.
- 20 pair CW1308
14.16.9 See Appendix 2; Typical Schematic

14.16.10 For further information about telephones, please contact Telephones and Security.

14.17 Door Controllers

14.17.1 Many sites within University of Edinburgh require Swipe Card, Door Entry Systems. To this end Door Controllers (i-star) may be housed in the Equipment Room. The location of the Door Controllers (i-star) must first be agreed with the Network Installation Project Manager. They shall be wall mounted and will require a dual TO.

14.17.2 For further information about door control, please contact Telephones and Security.

14.18 Audio Visual Distribution

14.18.1 Audio Visual technology is increasingly becoming IP based. As such, much of the A/V equipment installed at University of Edinburgh shall form part of the Structured Cabling infrastructure.

14.18.2 Teaching areas will require TOs for web cameras, information screens, lecterns etc. TOs will also be required at study spaces.

14.18.3 In the absence of detailed information the architect, electrical/data consultant, main contractor, sub-contractor, supplier, installer, or anyone responsible for the design of the Structured Cabling infrastructure should allow TOs as per above (see 14.12 User Outlet Concentration).

14.18.4 A dedicated A/V Communications Cabinet shall house specialized A/V equipment, e.g. OneLAN. This cabinet will usually be located in the Equipment Room.

14.18.5 Four CAT6a links shall be installed from BD to FD.

14.18.6 Forty-eight CAT6a links shall be installed from BD to A/V Communications Cabinet.

14.18.7 See Appendix 2; Typical Schematic

14.18.8 For further information and detailed requirements for the Audio Visual Distribution, please contact Learning and Teaching Spaces Technology Section (LTSTS).

14.19 CCTV

14.19.1 CCTV is increasingly becoming IP based. As such, much of the CCTV equipment installed at University of Edinburgh shall form part of the Structured Cabling infrastructure.
14.19.2 CCTV normally requires two TOs per location.

14.19.3 TOs shall be installed at locations specified by the Security Section of the Support Services Division within the Estates and Buildings.

14.19.4 A dedicated CCTV Communications Cabinet shall house the CCTV recording and other security equipment. This cabinet may be located in the Equipment Room. The location of the CCTV Communications Cabinet must first be agreed with the Network Installation Project Manager.

14.19.5 The following links shall be installed from BD to CCTV Communications Cabinet:

- 24 x CAT6a.
- 8 x OM3 multimode optical fibre.
- 8 x OS1 singlemode optical fibre.

14.19.6 See Appendix 2; Typical Schematic

14.19.7 For further information about CCTV, please contact the Security Section of the Support Services Division within Estates and Buildings.

14.20 Metering and Building Energy Management System

14.20.1 Both Metering and Building Energy Management System (BEMS) normally requires two TOs per location.

14.20.2 TOs shall be installed at locations specified by Estates and Buildings.

14.20.3 For further information contact Estates and Buildings.

15.0 Horizontal Cabling – Installation Guidelines

15.1 The following information covers the implementation techniques required for a successful installation of a Structured Cabling System for University of Edinburgh.

15.2 Cabling

Unless otherwise stated, the Cable used shall be **ADC Krone TrueNet CAT6**, 100 ohm, 4 pair unshielded twisted pair (UTP) cable.

15.3 Installation of Cable

15.3.1 The installation of system components has a tremendous effect on the final performance level of the network; therefore, it is essential to ensure that the performance of the entire network is not diminished through improper installation.

In particular:
15.3.2 Care must be taken not to stretch or abrade cables during installation; i.e. the pulling tension for cables must not be exceeded.

15.3.3 Cables that pass through the infrastructure of the building shall be suitably protected against damage. Through walls and floors this shall involve an appropriate type of sleeve; through any form of metalwork or stiff plastic then a rubber grommet shall be used.

15.3.4 To ensure cable management and also strain relief, cables shall be properly dressed using Velcro cable ties. However, cables ties should never be over tightened.

15.3.5 On vertical runs, the cables shall be dressed and tied from the bottom up, thus putting minimum strain on the cables.

15.3.6 Staple guns must never be used, as this damages the cable

15.3.7 Cables shall not run behind radiators

15.3.8 In order that the system may be easily re-routed, or damaged sections quickly replaced, free access to the cable, where possible, is important

15.3.9 Draw cords shall be left in ducting, piping etc. for future use

15.3.10 Because of the nature of modern offices, I.S. insist dust sheets be used at all times.

15.3.11 The Contractor shall be responsible for the removal, and reinstatement to the original condition, of any tiles and panels required to carry out the installation.

15.4 Special care shall be taken to avoid contact with dangerous materials e.g. asbestos

15.5 Minimum Bending Radius

Sharp bends in the cable will damage the insulating material thus causing unacceptable losses in the transmission medium. Therefore, the internal radius of every bend in a cable shall be such as not to cause damage to the cable, nor impair the characteristics of the cable.

15.6 Cable Slack at Outlet Points and Patch Panels

Contractors shall install the system such that sufficient slack remains to enable re-termination of the outlets a minimum of twice and a limited scope for movement of the cabinets. Excess coils of cables underneath the cabinets are unacceptable.

15.7 Patch Panels and Cable Management

15.7.1 Where possible, patch panels shall be installed within the Communications
Units from the top, continuing downwards. Should this not be possible, advice should be sought from the Network Installation Project Manager.

15.7.2 I.S. forbids the use of PCB Patch Panels.

15.7.3 Patch panels must be fully populated.

15.7.4 Cable management systems shall not be filled beyond their designed capacity.

15.9 Labelling

The cable shall be clearly labelled at both ends, as outlined in the documentation and/or drawing.

15.10 Electromagnetic Compatibility (EMC)

As a passive medium, Structured Cabling need not comply with the European EMC directive, EMC standards and UK legislation. The Contractor has no legal EMC responsibility. However, Contractors should be aware that cabling, when connected to transmission equipment, could radiate, receive and conduct electromagnetic disturbances.

15.11 Minimum Distance from EMI Sources

15.11.1 High power electrical plant may produce switching transients and radio frequency emissions that may induce interference on the UTP cable. Therefore in addition to the rules imposed by the IEE Regulations, data cables shall not run parallel to power cables, especially where these cables may carry heavy switching loads. If, however, this is unavoidable it is advisable to keep cables as far apart as possible.

15.11.2 For 'standard' loads, the following separation distances shall be used as a guide:

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<th>Distance (cm)</th>
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<td>MICC</td>
<td>2</td>
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<tr>
<td>Earthed Conduit</td>
<td>3</td>
</tr>
<tr>
<td>Earthed Trunking</td>
<td>3</td>
</tr>
<tr>
<td>Twin and Earth</td>
<td>7</td>
</tr>
<tr>
<td>Fluorescent Lighting</td>
<td>30</td>
</tr>
<tr>
<td>Electric Motors</td>
<td>100</td>
</tr>
<tr>
<td>Transformers</td>
<td>100</td>
</tr>
</tbody>
</table>

15.11.3 When crossing mains cables this shall be done at right angles.

15.12 Cable Routes

Cable shall not be routed over pipes, conduits, other cabling, ceiling tiles, etc., but shall rest directly on the supporting surface so as to minimize the potential for sharp bends, kinks etc. Every cable used shall be supported in such a way that it is not
exposed to undue mechanical strain and so there is no appreciable mechanical strain on the terminations.

**15.13 Cable Supports**

For cables which are not continuously supported, the maximum distance between supports shall not exceed 50cm (horizontal or vertical).

**15.14 Future Expansion**

Unless otherwise stated, all newly installed containment must provide for at least 50% future expansion and be capable of supporting CAT6a cabling.

**15.15 Wire Basket**

Where a multiple of cables are installed wire basket is preferred to other types of containment. When exiting the wire basket, cables shall be installed in 25 mm conduit mated to the wire basket using appropriate gland plates. No more 2 x CAT6 cables shall be installed in a 25 mm conduit.

**15.16 Conduit/Mini-duct**

Where individual of cables are exposed, they shall be enclosed within plastic conduit or mini-duct.

**15.17 Trunking Lid**

Trunking shall be installed such that the lid of the trunking does not form the lower surface.

**15.18 Earth Bonding**

Each section of metal trunking, tray work and wire basket shall be bonded to the adjoining sections using a suitable earth braid to meet the current edition of the I.E.E. Regulations.

**16.0 Terminating**

**16.1 'LIVE' Units**

Contractors shall not work in Communications Cabinets which already house active equipment. However, in certain circumstances where this cannot be avoided, the Network Installation Project Manager must first give permission.

**16.2 Pin-outs**

All terminations shall be made using an IDC punch tool fit for purpose. The incoming cables shall have all 4-Pairs terminated at both patch panel and TO on ADC Krone modular RJ45, 8 pin sockets, as follows (568B):
<table>
<thead>
<tr>
<th>Pair 1</th>
<th>WHITE/blue</th>
<th>Pin 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BLUE/white</td>
<td>Pin 4</td>
</tr>
<tr>
<td>Pair 2</td>
<td>WHITE/orange</td>
<td>Pin 1</td>
</tr>
<tr>
<td></td>
<td>ORANGE/white</td>
<td>Pin 2</td>
</tr>
<tr>
<td>Pair 3</td>
<td>WHITE/green</td>
<td>Pin 3</td>
</tr>
<tr>
<td></td>
<td>GREEN/white</td>
<td>Pin 6</td>
</tr>
<tr>
<td>Pair 4</td>
<td>WHITE/brown</td>
<td>Pin 7</td>
</tr>
<tr>
<td></td>
<td>BROWN/white</td>
<td>Pin 8</td>
</tr>
</tbody>
</table>

### 17.0 Labelling

Each RJ45 socket must be individually labelled. The label shall contain a unique identification, as outlined in the documentation and/or drawing, and must be indelible and placed behind a transparent cover. At the patch panels, each socket shall be labelled according to its corresponding TO.

### 18.0 Testing UTP Cables

#### 18.1 Notice of Testing

The Contractor shall give adequate notice to I.S. of the dates for testing the system so that, if necessary, the Network Installation Project Manager may be present to witness the testing.

#### 18.2 Cable Tester

Testing shall be performed using a Fluke Field Tester or similar. The Field Tester shall be in good working order, with the latest software update and shall be calibrated in keeping with the manufacturers guidelines, with a copy of the certificate provided in the documentation.

#### 18.3 Testing Method

18.3.1 To many people, testing structured cabling is simply a case of pressing the test button and waiting for the result to appear. Although testing has been simplified to this level, there are some fundamental steps that should be adhered to and some that must be avoided at all costs:

18.3.2 As electronic equipment is sensitive to temperature fluctuations it is advisable to allow the testers to reach ambient temperature. The time for the testers to reach ambient temperature will vary between sites, although 30 minutes from powering on the testers is usually adequate.
18.3.3 Visually inspect the test leads and any test leads that are worn or damaged should be discarded.

18.3.4 Ensure the calibration is up-to-date. A yearly calibration to National and International Standards should be conducted by the manufacturers. Any tester that is not up-to-date should not be used.

18.3.5 Check the NVP (Nominal Velocity of Propagation) and if incorrect, change the figure. The figure will vary between cable manufacturers so it must be changed to suit the cable being tested. To check this figure is correct, test a known length of cable from the cable manufacturer and check that the tester can measure the length within its tolerance.

18.3.6 When testing an installation, it is essential that walkie-talkies, mobile phones or other means of radio link communications are not used during the testing.

18.4 Minimum Test

At present, I.S. requires only the Permanent Link be tested, i.e. from the patch panel to the TO. New installations, refurbishments, etc. shall meet the requirements of BS EN 50346 and BS EN 61935-1.

18.5 Marginal Passes

I.S. forbids the use of CPs. Because of this, and the fact the I.S. use only high quality components, marginal passes shall not be accepted, as per Clause 4.6.3c, BS EN 50346.

18.6 Saving the Test Results

The installer shall save the results under the labelling scheme as specified by the Network Installation Project Manager.

18.7 Quality Assurance

To ensure confidence in the installed components, I.S. shall test 10% of the installation.

19.0 Documentation

19.1 Prior to commissioning by I.S., the contractor shall, on completion of the works and at least 15 working days before users occupy the site, submit copies of the following to the Network Installation Project Manager:

   19.1.1 Floor Plans, both hard copy and AutoCAD, suitably marked up to show location and I.D. of each and every data point, and detailing any deviation from the original plan.

   19.1.2 Full Structured Cabling Test Results in .flw format, via email or compact disc.
19.1.3 Tester Calibration Certificate.

19.1.4 ADC Krone Warranty Certificate.

20.0 Commissioning

20.1 Prior to commissioning by I.S., the contractor shall supply the following ADC KRONE Cat6 equipment cords, and leave them in the relevant Telecommunications or Equipment Room:

1 x 2 metres (approx) equipment cord for every Cat6 cable terminated in the Communications Cabinets, i.e. one equipment cord per TO

20.2 In general, and unless otherwise stated, the contractor shall provide the following ADC KRONE Cat6 work area cords, and leave them in the relevant Telecommunications or Equipment Room:

1 x work area cord for every TO; one-third of which shall be 1 metre (approx) in length; one-third shall be 3 metres (approx) in length; one-third shall be 5 metres (approx) in length.

20.3 The data contractor shall be responsible for providing specialist cleaners to provide a final clean of the Telecommunications Rooms and Equipment Rooms, Communications Cabinets and other ICT equipment. This should also include beneath raised floor and above false ceilings.

20.4 Please Note: Telecommunications Rooms and Equipment Rooms need to be clean, well lit and lockable before commissioning can commence.

20.5 The I.S. Commissioning Team's job is to install the electronics required to make the network active and to check that what has been installed performs to specification.

20.6 In order to avoid unnecessary delays and to ensure smooth transition from a passive to an active network, the Network Installation Project Manager should receive adequate notice (i.e. 20 working days or more) of users’ entry dates.

20.7 The Network Installation Project Manager shall notify the Commissioning Team of critical dates, who, in turn, shall schedule the work accordingly.

20.8 Any slippage on the contract will have a large knock-on effect. In these cases the Commissioning Team shall agree a target commissioning date with the Network Installation Project Manager, subject to the contractor being complete, and will inform the user of that date.

20.9 Normally, the commissioning is completed within three weeks of the Network Installation Project Manager receiving the relevant documentation. However, this can be delayed because of having to recall the contractor to correct things and also if network faults occur. If such delays occur, the Commissioning Team shall inform the user and the Network Installation Project Manager of the revised schedule.
Appendix 1.
List of Relevant British Standards

Data installers should have a thorough working knowledge of the following Standards associated with data cabling:

- **BS 6701**: Telecommunications equipment and telecommunications cabling - Specification for installation, operation and maintenance.
- **BS EN 50173-1**: Information technology – Generic cabling – General requirements.
- **BS EN 50173-2**: Information technology – Generic cabling – Office premises.
- **BS EN 50173-3**: Information technology – Generic cabling – Industrial premises.
- **BS EN 50173-4**: Information technology – Generic cabling – Homes premises.
- **BS EN 50173-5**: Information technology – Generic cabling – Data centres premises.
- **BS EN 50174-1**: Information technology – Cabling installations – Specification and quality assurance.
- **BS EN 50174-2**: Information technology – Cabling installations – Installation and planning and practices inside buildings.
- **BS EN 50174-3**: Information technology – Cabling installations – Installation and planning and practices outside buildings.
- **BS EN 50310**: Application of equipotential bonding and earthing in buildings.
- **BS EN 50346**: Information technology – Cabling installations – Testing of installed cabling.
- **BS EN 61935-1**: Specification for the testing of balanced and coaxial information technology cabling. Installed balanced cabling as specified in the standards series EN 50173.
- **PD CLC/TR 50173-99-1**: Cabling guidelines in support of 10 GBASE-T.

Other standards relevant to data cabling installation may include:

- **BS 6266**: Code of practice for fire protection for electronic equipment installations.
- **BS 6396**: Electrical systems in office furniture and educational furniture - Specification.
- **BS 7083**: The accommodation and operating environment for Information Technology (IT) equipment.
- **BS 7671**: Requirements for electrical installations. IEE Wiring Regulations.
- **BS 7799-1**: Information technology - Security techniques - Code of practice for information security management. [aka BS ISO/IEC 27002]
- **BS 7799-2**: Information technology - Security techniques - Information security management systems - Requirements. [aka BS ISO/IEC 27001]
- **BS 7799-3**: Information security management systems - Part 3: Guidelines for information security risk management.
- **BS 8492**: Telecommunications equipment and telecommunications cabling. Code of practice for fire performance and protection.
BS EN 12464-1: Light and lighting - Lighting of work places - Part 1: Indoor work places.
BS EN 12825: Raised Floor Access.
BS ISO/IEC 14763-2: Information technology - Implementation and operation of customer premises cabling - Planning and Installation.
BS EN 50098-1: Customer premises cabling for Information Technology - ISDN basic access.
BS EN 50098-2: Customer premises cabling for information technology - 2048 kbit/s ISDN primary access and leased line network interface.
BS EN 50288-1: Multi-element metallic cables used in analogue and digital communication and control. Generic specification.
BS EN 50288-6-1: Multi-element metallic cables used in analogue and digital communication and control. Sectional specification for unscreened cables characterised up to 250 MHz. Horizontal and building backbone cables.
BS EN 50468: Resistibility requirements to overvoltages and overcurrents due to lightning for equipment having telecommunication ports.
BS EN 60603-7 Series: Connectors for electronic equipment. Detail specification for 8-way, unshielded, free and fixed connectors.
BS IEC 61000-5-2: Electromagnetic Compatibility (EMC) - Installation and mitigation guidelines - Earthing and cabling.
BS EN 61000-6-3: Electromagnetic compatibility (EMC) - Generic standards - Emission standard for residential, commercial and light-industrial environments.
BS EN 61000-6-4: Electromagnetic compatibility (EMC) - Generic standards - Emission standard for industrial environments.
BS EN 61935-2: Testing of balanced communication cabling in accordance with series EN 50173. Patch cords and work area cords. Blank detail specification for class D applications.
BS EN 62305-1: Protection against lightning — Part 1: General principles.
BS EN 62305-2: Protection against lightning — Part 2: Risk management.
BS EN 62305-3: Protection against lightning — Part 3: Physical damage to structures and life hazard.
BS EN 62305-4: Protection against lightning — Part 4: Electrical and electronic systems within structures.
Schematic relationship between the BS EN 50173 series and other relevant standards

BS EN 50173-1: Information technology – Generic cabling – General requirements. [International cross reference: ISO/IEC 11801]

BS EN 50173-2: Information technology – Generic cabling – Office premises

BS EN 50173-3: Information technology – Generic cabling – Industrial premises

BS EN 50173-4: Information technology – Generic cabling – Homes premises

BS EN 50173-5: Information technology – Generic cabling – Data centres premises

PD CIC/IFR 50173-96-1: Cabling guidelines in support of 10GBase-T

BS 6701: Telecommunications equipment and telecommunications cabling – Specification for installation, operation and maintenance

BS EN 50174-1: Information technology – Cabling installations – Specification and quality assurance

BS EN 50310: Application of equipotential bonding and earthing in buildings

BS EN 50346: Information technology – Cabling installations – Testing of installed cabling

BS 7671: Requirements for electrical installations. IEE Wiring Regulations.

BS EN 61935-1: Testing of balanced communication cabling in accordance with standard series EN 50173 – Installed cabling

BS EN 50174-2: Information technology – Cabling installations – Installation and planning and practices inside buildings

BS EN 50174-3: Information technology – Cabling installations – Installation and planning and practices outside buildings
Appendix 2.
Typical Schematic
Appendix 3.
Typical Room Layout, showing minimum requirements for FD Telecommunications Room
# Appendix 4.
## Typical FD Passive Cabinet Layout for 2 x 42u Communications Cabinet scenario, housing up to approx 300 TOs

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<td>1u</td>
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</tbody>
</table>

### Vertical Cable Management

- **Slot 1**: Spare
- **Slot 2**: Voice Patch Panel
- **Slot 3**: Cable Management
- **Slot 4**: Spare
- **Slot 5**: Fibre BD-FD Link
- **Slot 6**: Fibre BD-FD Link
- **Slot 7**: Cable Management
- **Slot 8**: Spare
- **Slot 9**: Link 1
  - **Slot 10**: Cat6a BD-FD Links
  - **Slot 11**: Link 24
- **Slot 12**: Cable Management
- **Slot 13**: Spare
- **Slot 14**: Data Patch Panel
- **Slot 15**: 24
- **Slot 16**: Data Patch Panel
- **Slot 17**: 48
- **Slot 18**: Cable Management
- **Slot 19**: Data Patch Panel
- **Slot 20**: 72
- **Slot 21**: Data Patch Panel
- **Slot 22**: 96
- **Slot 23**: Cable Management
- **Slot 24**: Data Patch Panel
- **Slot 25**: 120
- **Slot 26**: Data Patch Panel
- **Slot 27**: 144
- **Slot 28**: Cable Management
- **Slot 29**: Data Patch Panel
- **Slot 30**: 168
- **Slot 31**: Data Patch Panel
- **Slot 32**: 192
- **Slot 33**: Cable Management
- **Slot 34**: Data Patch Panel
- **Slot 35**: 216
- **Slot 36**: Data Patch Panel
- **Slot 37**: 240
- **Slot 38**: Cable Management
- **Slot 39**: Data Patch Panel
- **Slot 40**: 264
- **Slot 41**: Data Patch Panel
- **Slot 42**: 288
- **Slot 42**: Cable Management
- **Slot 43**: Data Patch Panel
- **Slot 44**: 312
- **Slot 45**: Data Patch Panel
- **Slot 46**: 336

**800mm x 800mm**
Appendix 5.
List of Structured Cabling and Ancillary Components

The data contractor shall supply and install the following:

More details to follow

oOo

ADC Krone TrueNet Cable
ADC Krone TrueNet Connectors

Free standing racks - Prism, AP
Wall mounted racks - Cooper B-Line

Olson 10 way vertical sequential start PDU strips
See - [http://www.olson.co.uk/seq_vert_13a.htm](http://www.olson.co.uk/seq_vert_13a.htm)

Fibre/bloduct
Appendix 6.
Typical UPS Requirements for Essential Active Equipment

More details to follow
Appendix 7.
Wireless Information

I.S. has chosen the Cisco Aironet 1140 Series as its standard Wireless Access unit. This 802.11n access point has been chosen for its simple deployment, high-performance and energy efficiency from standard 802.3af Power over Ethernet (PoE).

An installation guide can be found at: