



**NUIG Campus Network - Structured Cabling System Standards
Information's Solutions & Services (ISS)**

Revision date – 28th January 2014

The purpose of this document is to assist Building Refurbishment and planning

Table of Contents

Contents

Introduction	3
Refurbishments of a Building / Office / Laboratory	3
Data Outlet requirements and specifications and room layout	3
Wireless Network specifications	3
The labeling of the Data points on the face plates	4
Active Equipment Specification	4
PC Suites	5
Post Installation Documentation Required	5
Campus Network Infrastructure specifications	5
Fibre Optic Links	5
Structured Cabling System	6
Telecommunications cable	6
Wiring Closet and Cabinet Requirements	6
Power Requirements and Earthing Bonding	8
Trunking and cableways in Buildings	8
Appendix A	10
Terminology	10
Appendix B	11

Introduction

This document is intended to be supplied by the Buildings Office, NUI Galway to data/network contractors who could be or will be undertaking data cabling work at NUI Galway, so that work can be carried out in accordance with Information Solutions and Services (ISS) specifications. ISS are responsible for the management and integrity of the campus network at NUI Galway

The Structured Cabling Specification is constantly changing due to the implementation of new technologies. As such this Structured Cabling Specifications is available on our website at and should be checked frequently for updates.

Please note that the Buildings Office is responsible for the specification, management and maintenance of duct ways and access to same must be provisioned by Buildings.

Refurbishments of a Building / Office / Laboratory

- Consolidation of all Services is the desired end result.
- Consultation with ISS is needed to archive this.
- A Supplier own solution may not be acceptable to NUI Galway
- All standards in this document still apply.

Data Outlet requirements and specifications and room layout

- Staff member – 3 x data points should be allocated to each staff desk position alongside four double power sockets, for ease of connection, data points should be at desk height. Drawings indicating furniture layout are required by ISS to facilitate appropriate data point installation.
 1. 2 data points – desktop
 2. 1 data point – phone
- Teaching and Research Facilities: Teaching and research facilities may have less / more dependent on the user specification – typically No. of Voice/Data Points
 1. 2 data points should be allocated to each postgraduate position

Wireless Network specifications

1. Wireless data points

In general terms a double data points at high level (or ceiling level) are sufficient to service a wireless access point. The access point will receive power via the data cable and therefore no power supply is required. Wireless in a building covers two use cases:

a. Overlay network- When the primary network connection is wired and a wireless connection is required to support ad-hoc office meetings. Located around offices, labs etc.

b. High density environment- When wireless access is required to serve a number of users located in close proximity such as the library, reading and study spaces.

The general requirements are:

- A double high level data point every 25 metres or a double high level data point for each 20 potential users of the wireless system
- At least one double high level data point is required for every meeting room
- Meeting rooms\ Seminar rooms with capacity for more than 20 users should have sufficient high level data points to accommodate every user and these data points must be distributed evenly around the working space.
- In a high density environment, data points must be distributed directly above the user group in the ceiling and must be easily accessible.
 - In a less dense environment, data points must be centrally located.
- Access points can be mounted on suspended ceilings, walls and plasterboard
- 2 data point to serve each wireless access point should be allocated per 20 users or 1 per 20 metres whichever is appropriate

The labeling of the Data points on the face plates

- Cabinet: Each block or Communications cabinet should be identified by using an agreed name (a, b, c, d , etc) or as on Services drawing.
- Patch Panel: Each data patch panel should be identified by a, b, c, and d from the top of the cabinet.
- Socket: The number on the patch panel should be used, on a 1 to 24 way panel the max number should be 24, on a 1 to 48 way panel the max number should be 48,

E.g. BA-A-01 this is Block A Patch panel A point number 1

E.g. BC-B-15 this is Block C Patch panel B point number 15

Active Equipment Specification

Cabling alone will not allow active connections to be made to the campus network for the installed data points. Active network equipment (switches) must be installed for this purpose. To support the initial connection of the building to the network core a switch and associated connector equipment is needed, at a current cost of €10,000 including VAT @23%. A possibility may arise where the core network equipment is at capacity and cannot support the addition of an additional building, in this instance an additional switch or module may need to be purchased to support the core switch. The cost that should be budgeted here is a minimum of €10k include VAT @23%. Within each new building each communication room requires a switch to support connections from the building switch to the user switches, at an approximate cost of €k per 48 end user connections including VAT @23%. For smaller buildings or areas, this switch will also suffice as the user switch.

For larger buildings, additional user switches will be required at a cost which will depend on the size of the building. Budgetary provision needs to be from building project funds made in this regard.

Contractors should request switch specifications and supplier details from ISS

Additional points in public areas of buildings may need to be cabled to support wireless access points. Again, budgetary provision needs to be made.

PC Suites

Where a new building contains a PC suite(s), CAT 6 UTP cabling should run locally to a cabinet located in each suite, unless the communications room is very close by. The cabinet in that suite must have a minimum of four power and two data points within it, with both front and rear cabinet access required.

Only one data point is required per PC in a suite. An extra data point for every ten PCs is required to support printer connections, with an additional two points on each of the two walls within the suite (i.e. four additional points), location to be agreed.

The suite should be connected to the network communications room by means of a fibre run. OM3 8 core Multimode cable should be used.

(This also applies to laboratories or any location where benching is installed) A cable management system must be supplied to facilitate neat cabling.

Post Installation Documentation Required

The cabling contractor shall provide the following directly to ISS in paper and electronic format

Test results, and drawings of fibre routes if relevant, must be provided to ISS on completion of a cabling contract

Contractors must complete work in a tidy fashion

Cat 6 UTP data and fibre specification and test results.

Map: End user points, location and label indicated on a map. A spreadsheet is an alternative to a map in situations where an electronic map is unavailable.

Warranty: The system must be provided with an end-to-end 'Link Performance' to comply with the ISO specification for at least five years for all of the current applications described in ISO/IEC IS 11801:2000. Full details of support arrangements during the warranty period must be included in the documentation.

Commissioning Report: The contractor shall provide a commissioning report comprising of the above.

Campus Network Infrastructure specifications

Fibre Optic Links

Throughout the University campus ISS specify the use of fibre optic cabling as follows:

1. To interlink Buildings
 - a. 32 core Singlemode Fibre 1.5dB per Km
2. To interlink communications rooms or cabinets within a building where the distance is >90m

- a. 16 core Multimode OM3 cable to be installed internally within a building only
- b. 16 core Singlemode fibre

Internal fibre runs should employ indoor/outdoor rodent resistant grade cable. Outdoor fibre runs must be layed in ducts and must be of rodent proof armoured grade and gel filled. All fibre termination should end in a 19" fibre splice drawer in the communications rack in the building in question the type of connectors used must be standard LC and all jointing must be done using fusing technology.

Structured Cabling System

- ISO/IEC 11801:2000 Generic Cabling for Customer Premises
- EN50173:2000 Generic Cabling Systems
- TIA/EIA 568B Commercial Building Telecommunications Cabling Standard

Any deviation from these specifications must be approved by ISS

- Cable Twists: To maintain transmission performance of the cabling system the twists in the cabling must be maintained as close to the point of termination with a maximum untwist of 13mm from the point of termination. The Contractor should also ensure that if introducing twists back into the wiring then only one twist may be performed.
- Stripping Cable Sheath: The stripping of the cable sheath will be limited to the minimum amount required for a successful termination.
- Allow for Re-termination: Contractors shall design the system such that sufficient slack remains to enable re-termination of the outlets a minimum of twice.
- Allow for Cabinet Movement: and a limited scope for movement of the cabinets.
- Excess Cables: Coils of excess cables underneath the cabinets are unacceptable.
- Unbroken Cables: All data cables will be installed with no form of joint on the cable run between the patch panel and the outlet (or Consolidation box). If cables are damaged along the run of cable then they must be removed and replaced with new cable.
- Patch Panel Labeling: Each patch panel and outlet will be labeled according to Infrastructure Services, ISS labeling system See 4 above.
- Cable Testing: All cables must be tested using a Fluke DSP4000 Digital Cable Analyser or an equivalent cable analyser. All test results must be recorded and supplied to the ISS directly by the cabling contractor.

Telecommunications cable

To facilitate analogue telephone requirements a copper cable must be run to each new building and possibly between communications rooms within buildings.

The NUIG cable specification is **(CW1308B)** complete specification Appendix B

Wiring Closet and Cabinet Requirements

The requirements for a wiring closet are as follows:

1. Location, Security:
 - Wiring closets should be located in secure restricted areas (not accessible to the wider University community or the public) to which ISS technical personnel

have 24 hour 7 day access. The closet must be fitted with swipe card access in conjunction with our security department

2. Size of Wiring Closets:
 - In a large installation (> 300 cables) the wiring closet should be a "walk in" design, i.e. capable of containing multiple 42u 800 x 800 cabinets. Room should be allowed for front, rear and side working access to the Cabinet. The size of the wiring closet is determined by the number cabinets required. A minimum of one meter access space should be available to the front, rear and at least one side of the cabinet(s).
3. The number of wiring closets:
 - The number of wiring closets in any one building must be kept to one if possible, located centrally in the building. In situations where cable distances deem it necessary to have more than one closet, then the closets must be inter-linked via a 16 core OM3 multimode and 16 core singlemode fibre optic cable via resilient paths where practical.
4. Wiring Cabinets:
 - In installations less than or equal to 200 data points, one 42u 800 x 800mm full height good quality 19in (e.g. APC) cabinet may be used. In installations greater than 300 data points, additional cabinets must be used. There should be no more than 300 points in an 800 x 800mm cabinet. In smaller installations a wall mounted or floor standing lockable 15 u 19"rack cabinet located in a suitable closet is acceptable. Each cabinet should contain a 48-way to 48-way patch panel to the cabinet containing, the fibre for the closet. A power disruption unit, rack mountable system should be installed with one 3 pin outlet per 24 UTP user points.
5. Connecting Wiring Closets to the University Backbone Network Infrastructure:
 - The wiring closet should be connected to the University Backbone Network Infrastructure via a 32 core single mode fibre optic cable routed to be specified uplink point nominated by ISS. Where these fibre requirements are not adhered to, it will be necessary to get the written permission of ISS before network services can be provided to the closet. The connection to the University backbone network will normally be via resiliently routed fibre to two separate locations.
6. Using the Approved University Infrastructure Ducting:
 - All fibre cables between University buildings must be installed in ducting that complies with or is part of the approved Campus Infrastructure plan. Access to these ducts by qualified cabling companies is subject to the approval of the Buildings Office. Undertakings must be given to cover the full cost of replacing all cables already in the ducts that are damaged during the installation of additional cables and/or draw wires. Existing draw wires must be replaced if used.
7. Category 6:
 - The cable, connection components and installation techniques must adhere to Category 6 UTP cabling standards. The type of cable used must be Low Smoke Zero Halogen.
8. Terminating Cables in Patch Panels:
 - Cables should be terminated in RJ45 19" Patch panels. Panels and terminations should adhere to ISO/IEC 11801:2000 and should be 48 way unless specified by ISS. A cable management system is required for every 24 port patch panel inserted. This will ensure correct installation of patch panel cable. Samples are available from ISS on request. All rising cables should be on a tray outside the 19 inch rack space and a shelf should be installed to protect the cables in the bottom of the cabinet in the case of floor standing cabinet.
9. Patch Cables:

- Patch cables should also adhere to ISO/IEC 11801:2000. Two patch cables should be supplied for each point installed. This is a requirement for all new buildings.
10. Ventilation:
 - Adequate ventilation should be provided by means of electric extractor fans and air inlets into the closet, via air vents where deemed necessary. In the larger installations (> 300 cables) the minimum requirement for air conditioning is a Heat Pump Air Conditioning System rated at 5.2Kw. Each cabinet should be equipped with a roof mounted 4 fan cooling fan tray. In smaller installations electric A.C. fans should be placed in the cabinet to keep the active components cool. The recommended temperatures for wiring closets is **Cooling to a maximum temperature of 29 degrees celcius is required, and a maximum temperature of 24 degrees is preferred. The temperature should not get colder than 10 degrees. Relative humidity should be maintained in the range from 30 to 80%.**
 11. Control of Dust:
 - The floor and walls of the wiring closet should be sealed to inhibit dust ingress into the cabinets. The room should be thoroughly cleaned before handover.
 12. Telephone Patch Panels: The telephone-to-telephone patch must be manufactured by Krone unless stated otherwise by the PABX System Co-coordinator.

Power Requirements and Earthing Bonding

- Minimum Power Requirement per Cabinet: The minimum power requirements are as follows; one separate 25A supply with earth leakage protection for every 150 points connected. The power should not be interruptible except at distribution boards or inside the closet.
- General Purpose Requirement in Closet: Two general purpose 13A outlets should be provided in the wiring closet for every 300 points served.
- Approval of Buildings Office: No electrical power installations are permitted without the prior consent of the Buildings Office at NUI Galway

Trunking and cableways in Buildings

1. Cable Length:
 - The cable length from patch panel to faceplate outlet must not exceed 90m.
2. Bend Radius:
 - The bend radius of a cable must not be greater than 4 times the cable diameter.
3. Cableway Size:
 - Trunkings and cableways must be sized to 2.5 times the requirement of the current installation, i.e. if current installation is 2 cables then cableways must be sized for 5 cables.
4. Separation from Electrical Power:
 - It is preferred to use cableways completely separate from electrical power installations; however in certain situations this may not be aesthetically possible. Data must not be allowed to run side by side with electrical cables unless separated by a distance of 50 mm plus an earthed metal fillet.
5. Cable Looms:
 - Cables must not be loomed in numbers > 25.
Enclosing Cables: Cables should be enclosed within conduit or trunking where exposed.
6. Metal Conduit:

- Metal conduit or trunking is necessary only in construction/mechanical laboratories, or where it is deemed to be aesthetically necessary.
7. Reinstatement of environment:
- The Contractor will be responsible for the removal, and reinstatement to the original condition of any fixtures, fittings and structures, disturbed during the installation unless otherwise agreed with the Buildings Officer.
Access must be provided to all trunking and cableways in Buildings for future refits and expansion.

Appendix A

Terminology

Cableways: Trunking, cabletray, conduiting, etc

ISO International Organisation of Standardisation

IEC International Electro technical Commission

CENELEC European Committee for Electro technical Standardisation

TIA Telecommunications Industry Standard

EIA Electronic Industries Association

IEE Institute of Electrical Engineers

ISO/IEC 11801:2000 ISO standard for Category 5e cabling systems

EN 50173 (2000) CENELEC standard for Category 5e cabling systems

TIA/EIA 568B TIA/EIA standard for Category 5e cabling systems

Appendix B



General Cable CelCat, Energia e Telecomunicações, S.A.

TECHNICAL DATA SHEET

Internal/External Telephone Cable (CW1308B)

CABLE DESCRIPTION

CONSTRUCTION

- Conductor	: Solid annealed copper conductors 0.5mmØ
- Insulation	: PVC
- Earth Conductor	: Solid annealed copper conductors 1.35mmØ
- Insulation Earth Conductor	: PVC
- Core	: 20Pr Unit Type
- Wrapping tape(s)	: 1 polyester
- Ripcord	: 1 longitudinal ripcord
- Screen	: W/PE 150/40µm tape
- Sheath	: LSF

COLOUR CODE

Pair Number	Insulation Colour *	
	A wire	B wire
1	WHITE-Blue	BLUE-White
2	WHITE-Orange	ORANGE-White
3	WHITE-Green	GREEN-White
4	WHITE-Brown	BROWN-White
5	WHITE-Grey	GREY-White
6	RED-Blue	BLUE-Red
7	RED-Orange	ORANGE-Red
8	RED-Green	GREEN-Red
9	RED-Brown	BROWN-Red
10	RED-Grey	GREY-Red

Pair Number	Insulation Colour *	
	A wire	B wire
11	BLACK-Blue	BLUE-Black
12	BLACK-Orange	ORANGE-Black
13	BLACK-Green	GREEN-Black
14	BLACK-Brown	BROWN-Black
15	BLACK-Grey	GREY-Black
16	YELLOW-Blue	BLUE-Yellow
17	YELLOW-Orange	ORANGE-Yellow
18	YELLOW-Green	GREEN-Yellow
19	YELLOW-Brown	BROWN-Yellow
20	YELLOW-Grey	GREY-Yellow
21	VIOLET-Blue	BLUE-Violet
22	VIOLET-Orange	ORANGE-Violet
23	VIOLET-Green	GREEN-Violet
24	VIOLET-Brown	BROWN-Violet
25	VIOLET-Grey	GREY-Violet

* Ring markings. Base colours in capital letters.

1 / 2

