DE&S PROJECT: RAF CAM Relocation

COMMUNICATIONS AND INFORMATION SYSTEMS REQUIREMENTS SPECIFICATION

RAF CRANWELL

CENTRE FOR AVIATION MEDICINE

This Specification is approved, published and maintained by the command CIS specialists within Air A6 at:
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Record of Changes To CIS Specification
RAF Cranwell CENTRE FOR AVIATION MEDICINE (CAM)

Record of CIS Spec Change.xlsx

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SECTION 1 – INTRODUCTION AND SCOPE

INTRODUCTION

1. This document specifies the Communications and Information Systems (CIS) requirements for the new Centre for Aviation Medicine (CAM) building at RAF Cranwell. It defines the requirements for the provision of a flexible CIS Infrastructure providing voice and data services, within new and refurbished MOD buildings to meet the requirements of the building users. The CIS Infrastructure shall be compliant with the requirements for connection to the military network. Any deviation from the requirements detailed in this document shall be agreed with RAF Digital Delivery CIS Infra staff.

SCOPE

2. Part A covers the installation of compliant Structured Wiring Systems (SWS) within new and refurbished MOD buildings. Part B specifies site specific requirements relating to the project and includes any CIS which is not part of the SWS. Part B may also add to and/or modify the requirements of Part A. Part C defines the user CIS requirements in terms of User Presentations (UP) per room. This specification provides for the implementation of SECRET and OFFICIAL infrastructure.

REFERENCES

3. This specification complements the mandatory requirements in the references below which apply to all projects:

	Document	Title
A	JSP 604 Lflt 4800	Coordinating Installation Design Authority Codes of Practice (which references many British Standards). Regulations for the Installation of Information Communications Technology.
B	JSP 440	Defence Manual of Security
C	BS EN 50173, 50174 & 50346	Information Technology – Cabling Installation
D	SDIP-29	Facility Design Criteria & Installation of Equipment for the Processing of Classified Information

RESPONSIBILITIES

4. RAF Digital Delivery CIS Infra staff are responsible for overseeing all aspects of the CIS infrastructure and obtaining formal design and installation approval. The Technical Advisor (TA) assigned to the project is responsible for producing the site specific requirements (Part B) and user requirements (Part C) as well as signing off design compliance (Engineering Change Request (ECR) Part 3) and installation compliance (ECR Part 5).

DOCUMENTATION

5. In order to achieve installation design approval in accordance with Reference A, the M&E Contractor shall provide certification documents as follows:

a. The following installation design drawings are to be approved by CIS Infra staff prior to building construction and installation work:

(1) Wherever there is a dedicated NER, a dimensioned Room layout with floor plan and all 4 wall elevations.

(2) Containment routes for data and power.

(3) Method of traverse from tray work to Wall Mounted Dado Trunking (WMDT).

(4) Building floor plan showing number and locations of User Presentations (UP).

(5) CIS Power distribution indicating power filtering (if required).

(6) Proposed rack layouts.

(7) SWS topology if more than 1 point of presence included.

(8) External connectivity of CIS Infrastructure.

b. Confirmation that the SWS Installation M&E Contractor is an accredited data system installer.

c. Detailed technical specifications of the equipment that will be used for installation including cabinets, containment systems, patch panels, cables, etc. Data sheets and manufacturers' warranty details are required for all materials used within NERs and the SWS.

6. The following CIS documentation in support of the SWS installation shall be provided to CIS Infra staff prior to the handover of the building to the users. As a guide, the documentation pack shall include as a minimum, the following:

a. One hard copy and one soft copy (both PDF and CAD versions) of the as-fitted drawings that detail the installed position of the CIS infrastructure (cables, cable containment, LAN equipment and UPs).

b. Comprehensive test results for Copper (CAT 6 or other) and Fibre Optic installations, in accordance with the requirements of Reference A.

c. Certificate of Electrical Conformance indicating that the installation has been completed in accordance with Reference A. The testing of the cabinet supplies is to include PDU and earthing right up to the cabinet itself.

d. Detailed rack layouts showing installed equipment positions and wall elevations for wall mounted CIS furniture.

7. The issue of an installation conformance certificate is dependant upon the above documentation being provided.

PART A – SWS INSTALLATION REQUIREMENTS

SECTION 2 – STRUCTURED WIRING SYSTEM (SWS)

SWS TOPOLOGY

1. A SWS shall be implemented and any deviation shall be agreed with CIS Infra staff and captured in Part B. The SWS shall be a star-wired topology implemented from a central lockable CIS cabinet or room, housing LAN active equipment, voice distribution and patch panels, to the user presentation (UP) positions within the building. The composition of a UP is specified below. The primary distribution of cabling should be via high level 'backbone' trunking along corridors, spurred into rooms feeding multi-compartment dado trunking mounted around walls. Where raised floors are fitted, under-floor trunking and tray work linked to floor boxes may be utilised.

2. To achieve installation compliance, the OFFICIAL infrastructure shall be implemented in CAT6 copper cable from LAN active equipment to the UP. Where a specific TEMPEST, external EMC threat or vulnerability is identified, Fibre Optic cable shall be utilised (detailed in Part B, if required).

3. The number of UPs available within each room will generally be based on floor area. For M&E containment and CIS power calculation purposes, the criteria of one UP per 6m² of office space shall be used. Part C details the actual number of UPs to be fitted.

USER PRESENTATIONS

4. A standard UP shall provide all services (data, voice and power) to each user's working position. The number of UPs required within each room is defined in Part C and their locations will be agreed between CIS Infra staff and the M&E Contractor at an appropriate stage of the project.

5. In general, UPs are to be presented as follows:

a. **Copper UP (OFFICIAL/Black services)**. A copper UP shall be presented as 2 x Twin Switched Socket Outlets (TSSOs), a dual RJ45 socket, an RJ45/BT6L (PABX Master option) converter module – plus ISDN/PBX slave modules as specified within Part C.

b. **Fibre UP (SECRET & ABOVE SECRET/Red services)**. A fibre UP shall be presented as 2 x TSSOs and two pairs of STII sockets.

6. The faceplates shall be wired such that minimal cable is coiled immediately behind it. However, sufficient spare cable shall be provided to enable at least 3 re-terminations at the UP. Care must be exercised to ensure that cable bend limitations are not exceeded.

SECURE SERVICES

7. In the majority of buildings where there is a requirement to provide infrastructure for systems carrying information classified SECRET/Red, it is to be implemented exclusively using 50/125 OM3 fibre optic duplex pairs.

PERFORMANCE AND TESTING

8. The SWS is utilised to distribute both voice and data services. Data distribution shall be in the form of a star-wired Ethernet LAN. In particular, the cable infrastructure must support minimally current 100BaseTX (CAT 6) and 100Base FX cabling standards.

9. The SWS shall be tested and the results fully documented to demonstrate compliance with the standards defined within Reference A. The CIS TA is to witness minimally 10% of the testing.

SECTION 3 – CABLE CONTAINMENT SYSTEMS

GENERAL

10. The cable containment system provides the physical security and separation of secure and insecure circuits routed from the CIS cabinet to the UPs. The cable containment shall be a combination of fully enclosed or multi-compartment Wall Mounted Dado Trunking (WMDT); in voids it may be open basket or tray work. The system shall be sized such that the occupancy of the containment is no greater than 50% at any point, thereby providing for future expansion. Black and Red cables installed within containment systems inside a building shall be installed within physically separate trunking systems or within separate compartments of a multi-compartment containment system.

WALL MOUNTED DADO TRUNKING (WMDT)

11. The preferred method of containment within working areas is multi-compartment WMDT. This shall have permanent rigid section dividers to segregate power and signal cables. To meet the necessary separation requirements, the following arrangement is suggested:

TOP	**CIS Power**
MIDDLE	**Fibre Optic cables**
BOTTOM	**CAT 6 cables**

12. The WMDT solution shall be accessible to allow inspections and future expansion. It is to be permanent, unobtrusive in appearance and construction, and mounted with the bottom edge at 900mm AFFL unless building specific topology dictates otherwise and this is agreed by CIS Infra staff.

CONTAINMENT SYSTEMS

13. The suitability of CIS cable containment installed within voids for carrying restricted and secret signals shall take the following requirements into account:

14. **Black Systems (OFFICIAL or Official Sensitive)**. Within void spaces, the use of open containment is preferred for OS Cat 6 systems where the risk of inadvertent physical damage to cables is low. The containment used in such circumstances is to be installed in metal tray work, suitably earthed.

15. **Red Systems** (**SECRET/ABOVE SECRET**). If the containment is visible, then tamper seals shall be provided; these are sufficient for identification. If the containment is above a ceiling or below a floor, then it must have an appropriate red marking, which is visible when removing just one section of floor or ceiling. Where secure cables are routed within floor or ceiling voids, they shall use fully enclosed metal trunking (with a positive sealing mechanism) which can be readily inspected. Metal trunking shall be earthed in accordance with current earthing regulations.

16. All containment systems that follow fire escape routes shall comply with BS 7671 which states:

> "Wiring systems in escape routes shall be supported such that they will not be liable to premature collapse in the event of fire".
>
> Note 1. Non-metallic cable trunking or other non-metallic means of support can fail when subject to either direct flame or hot products of combustion. This may lead to wiring systems hanging across access or egress routes such that they hinder evacuation and firefighting activities.
>
> Note 2. This precludes the use of non-metallic cable clips, cable ties or cable trunking as the sole means of support. For example, where non-metallic cable trunking is used, a suitable fire-resistant means of support/retention must be provided to prevent cables falling out in the event of fire.

17. To comply with Reference A, in underground or windowless buildings or facilities, only steel Cable Management Sytems (CMS) are to be installed.

OPEN PLAN AREAS

18. Where large open plan areas require connectivity some distance from the walls, it may be necessary to use floor boxes or service columns as appropriate, fed from under-floor or above ceiling ducting/trunking. The use of raised computer flooring for large or CIS intensive offices may also be considered.

SECTION 4 – POWER AND EARTHING REQUIREMENTS

GENERAL

19. This section details the specific CIS-related Power and Earthing requirements to be provided as part of the CIS infrastructure.

20. When planning to install a cable or material into a particular type of room on the MOD estate, the cable or material shall comply with the Fire Hazard designations shown in Reference A Chapter 5. All cables and materials used for MOD installations must meet the stringent testing conditions for Flame-Retardance, Low Smoke emissions and Halogen Free emissions as shown in Reference A Chapter 5. Cables and other materials shall comply with current regulations, ie Construction Product Regulations (CPR); **cables shall be minimally Cca class.**

21. Prior to their installation, the M&E contractor must provide CIS Infra staff with full technical details of all materials to be used in the SWS and NERs, to ensure that materials comply with CPR, building and Fire regulations.

CATEGORIES OF SUPPLY

22. There are 3 categories of power that are required to service the building requirements:

a. **Domestic Supply**. The Domestic Supply is used for lighting, cooling, kitchen and other common equipment. It also feeds 13A outlets in offices and general areas. Domestic power must be sufficient to meet the building and end user needs and must be determined during the design phase of a project. As a guide for power calculations, it is expected that one 13A outlet is provided every ten metres in corridors and one 13A outlet minimum per room, depending on size and use.

b. CIS Supply. 18th Ed 7671:2018 411.3.3 requires RCD protection for socket outlets up to 32A. To negate the possibility of CIS equipment being adversely effected by spurious interference from other electrical equipment within the building, all CIS equipment is to be powered via a separate dedicated supply and Residual Current Devices (RCDs)/ Residual Current Circuit Breakers (RCBOs) from the building Mains Distribution Unit (MDU) and clearly marked “CIS Supply”. The CIS Power Supply feeds the CIS cabinets and all of the 13A twin switched socket outlets (TSSO) designated in Part C. The CIS Power Supply cables may share trays with the Domestic Power Supply cabling in corridors but must be contained separately in rooms. Domestic power must never be run in the CIS three compartment dado trunking. To avoid confusion with the Domestic Supply, any 13A TSSOs that are part of the CIS supply, whether in WMDT or elsewhere, shall be indelibly marked **“CIS Use Only”.**

c. **Filtered Supply**. Buildings that contain equipment classified above OFFICIAL and/or transmitter/receiver equipment may require that the power supplies to such

equipment be filtered in order to comply with TEMPEST and security requirements. Depending on local circumstances, this can result in either individual items of equipment being locally power filtered or the entire building CIS power being filtered. It is important to note that internal and external station factors will drive the requirement and these will be detailed in the Part B.

EARTHING REQUIREMENTS

23. The guidance and regulations that cover the earthing of electronic equipment are contained within Reference A. Particular attention should be made to the requirement for an earth bus bar within the CIS cabinets as detailed at Reference A, Chapter 7.

NETWORK EQUIPMENT ROOM (NER) POWER REQUIREMENTS

24. Each building NER shall be fed with a separate CIS Power supply. The NER shall be provided with a separate CIS Mains Distribution Board (MDB) from which power to all CIS equipment located within that room is taken. This MDB shall be:

a. Rated at a minimum of 40A switched with a suitable isolator.

b. Provided with sufficient Type B, 16A, MCBs, one for each of the CIS Equipment Cabinets and dedicated equipment in the room, plus 50% for expansion.

c. Provided with trunking for outgoing power cables from the MDB to the cable trays/trunking, which feeds CIS Power to the equipment cabinets and equipment within the room. Where power cables are installed on cable trays, they shall be neatly installed using tie-wraps or similar.

25. Each equipment cabinet shall be supplied with power via a suitably located and identified switching device. Each equipment cabinet shall be capable of being individually isolated in accordance with BS 7671, Clause 537.2 and shall utilise isolators (RCDs/RCBOs) with sufficient poles to enable the required isolation.

26. Emergency Power Off (EPO) controls in IT rooms generally shut down all equipment, although these are not a requirement of **BS 7671**. Where, through a risk assessment process, EPO controls are used, consideration shall be given to avoiding accidental operation.

27. Cabinet Certification, Inspection & Testing. A certificate of Electrical Conformance indicating that the installation has been completed in accordance with Reference A shall be included in the documentation hand over pack provided to CIS Infra staff in order for the ECR Part 5 to be completed. Equipment cabinets are deemed to be Fixed Installations in terms of BS7671 and as such testing shall include impedance testing of the cabinet protective earth and an Electrical Installation Certification for the power circuits directly to the distribution strip in the cabinet. If a plug /socket combination is used in the power feed to the cabinet the socket to power strip cable shall be supplied with Electrical Safety certification.

SECTION 5 – NER REQUIREMENTS

GENERAL

28. The NER provides the focal point for the CIS infrastructure and will contain the equipment cabinets for the patch panels and active equipment. It shall be a lockable room, sized to meet the requirements of the SWS as demanded by Part C of this specification. The size shall be no less than $20m^2$ (minimum wall length 3.4m) with dead space on 2 adjacent walls. Any deviation from this must have the prior approval of CIS Infra staff. The room should be located close to the Building Entry Point (BEP) for the CIS cabling (voice and data). The size of the SWS may not warrant the provision of full-size cabinets in a separate room therefore in these exceptional circumstances, an area should be identified and agreed with CIS Infra staff, close to the BEP for the installation of wall-mounted equipment cabinet(s).

SECRET/RED INSTALLATIONS

29. Any installation that includes Secret infrastructure will require either a secure NER or a secure container within a normal NER. To determine the exact requirements, an assessment matrix must be carried out by the relevant MoD security personnel in accordance with Reference B before the building design is finalised.

TEMPEST

30. The location of active network components within CIS cabinets must take into account TEMPEST and allow a minimum of 2m distance between Secret and any other equipment and signal lines.

31. On sites where the power supply is less than 100KVA, power to secret equipment cabinets shall be fed via filters and this will be identified in the Part B.

ENVIRONMENTAL CONTROL REQUIREMENTS

32. The M&E Contractor shall, iaw Reference A para 0629, provide normal office environmental controls (e.g. air conditioning or air cooling) necessary to maintain the limits defined below:

a. **Temperature.** The temperature should be maintained at 15 - 32°C with a maximum rate of change of 3°C/hour.

b. **Relative Humidity.** The relative humidity should be maintained in the range 20%-80% non-condensing with a maximum gradation of 10% per hour.

EQUIPMENT CABINETS

33. Separate cabinets shall be provided for SECRET/Red and OFFICIAL/Black infrastructure.

34. A standard 42U equipment cabinet is a floor mounted 19" 800mm x 1000mm deep cabinet, though larger cabinets are not unknown, and will be specified in Part B. At certain locations, with the agreement of CIS PM, a small 19” wall mounted cabinet, typically 21U,

may be more appropriate to the installation design. **Equipment cabinets and the appropriate number of patch panels and patch leads shall be provided by the M&E contractor.**

35. Cabinets provided for the use of SECRET & ABOVE SECRET equipment shall be Centre for the Protection of National Infrastructure (CPNI) approved or housed within an appropriate CPNI approved equipment room.

36. If wall-mounted equipment cabinets are required, they shall:

a. Be of multiple-section design. The front section shall be mounted to the rear by hinges to allow minimally 90° opening of the whole cabinet body. The front section shall have removable, lockable metal sides and a lockable glass front door.

b. Comprise of cable entry positions top and bottom in only the rear section.

c. Comprise of a single earth bus bar, mounted at the rear of the cabinet to allow earth connection of equipment.

d. Comprise of a single 13A power distribution strip comprising a minimum of 6 sockets mounted at the rear of the cabinet; the power distribution strip shall be individually switched and wired via the cabinet's power supply.

e. Powered by a dedicated feed via an adjacent rotary isolator. Cabinet electrical testing shall be up to and including the cabinet PDU, and include earth impedance testing to the cabinet earth point, which shall be directly wired to the room or building MET.

EQUIPMENT CABINET LAYOUT

37. The layout of active and passive components within the cabinet shall follow a standard format that is shown at Annex A. The layout is configured to prevent accidental cross patching.

38. Sufficient cable management or cable tidy devices shall be provided within the cabinets to ensure that the installed equipment and its interconnecting cables can be mounted in a neat and tidy manner. A 1U cable management module shall be provided between each adjacent patch panel and between Active Equipment.

39. M&E Contractors shall ensure that the mounting of patch panels are set back 100mm for wall mounted cabinets and at least 150mm for floor mounted cabinets, so that patch lead and fibre-optic bend radii are not exceeded when fitted. Additionally, the routing of cables entering wall-mounted cabinets should not constrain maintenance access.

40. M&E Contractors shall ensure that the installation of elements within the cabinet, such as power strips and earth bars, are installed in such a manner as to not to impede the subsequent installation of active equipment by others.

41. The patch cables shall be provided by the M&E contractor as specified in Part B. Patch lead colours should be as follows:

Blue	Analogue Voice
Grey	Data
Orange	Other
Green	ISDN
Red	Secure Speech

42. Where the SWS installation is small and a wall-mounted cabinet is used, the basic layout of the rack shall be the same as for a full size rack.

EQUIPMENT CABINET SITING

43. To enable personnel to work safely on Network Equipment Room (NER) cabinets, single cabinets and single rows of cabinets shall be installed such that all doors, where access is required, may be opened through a full 90 degrees and unobstructed access to the interior is provided or an unobstructed clearance of 1200mm is provided, whichever is the greater.

44. Multiple rows of cabinets shall be installed such that an unobstructed passageway, at least 1200 mm wide, is preserved between rows.

45. Wall mounting double hinged cabinets shall be installed such that the equipment containment portion of the cabinet may be opened through a full 90 degrees and are to be positioned such that they pose no Health and Safety hazard.

CROSS SITE CONNECTIVITY

46. The termination of cross site connectivity is shown at Annex A. Specifically; all cross site connectivity shall terminate in the NER which shall be as close as practicable to the building entry point (BEP). If included as a requirement in Part B to this Specification, sufficient wall space shall be made available immediately adjacent to the vertical containment from the BEP in the main NER for the mounting of fibre optic splice cabinets by others.

47. Analogue and digital voice circuit cross-site cables will terminate on a BT Insulation Displacement Connector (IDC) block (often referred to as 'Krone' block) within 2m of the BEP. The M&E contractor shall supply and install a single lockable IDC cabinet in which there will be dual IDC blocks, one for use by the voice service provider and the other for use by the RAF. This shall be located near the BEP. The BT cross site cables will terminate on the BT side and they will jumper across to the RAF side. The M&E contractor shall install a tie cable, suitably sized to accommodate voice, secure speech and ISDN services, as detailed in Part B. The tie cable will terminate in the voice patch panel in the CIS cabinet. The M&E contractor shall also make available adjacent to the IDC cabinet sufficient wall space for the mounting of voice filter cabinets by others.

EXTERNAL DUCTING

48. The M&E Contractor is responsible for the provision of any additional external CIS ducting. The minimum dimensions for pits are 1200mm by 600mm and any deviation from this must be agreed by CIS Infra staff. Other ducting requirements are as follows:

a. **External Data Ducting**. External data ducting shall normally comprise of 4 x 100mm bores and terminate at the defined BEP within the NER. Containment shall be provided to extend the pathway to join with the internal infrastructure. Additionally, an entry chamber is to be constructed within 5m of the building. All new ducts shall be provided with lockable pit covers in accordance with Reference B. The M&E Contractor shall ensure that the necessary Siting Boards have been completed and

that clearance has been granted for the duct work. **Note:** The external data cables will be installed by others.

b. **BT Ducting**. External BT (or other voice service provider) ducting shall comprise of 2 x 90mm or 2 x 100mm bores and terminate at the defined BEP within the NER. Additionally, an entry chamber shall be constructed within 5m of the building. All new ducts shall be provided in accordance with Reference A unless a separate specification is supplied by BT. The M&E Contractor shall ensure that the necessary Siting Boards have been completed and that clearance has been granted for the duct work.

Note: The M&E Contractor is to negotiate with the voice service provider for the provision of ducts as occasionally, they may provide the connection from the 5 m entry chamber to the existing duct. In some instances, access to the building may be via a combined access chamber; this will be detailed in Part B. In addition, it may be feasible to combine the final Data and BT chambers, particularly where there are space constraints. This shall be agreed with RAF Digital Delivery staff.

SECTION 6 – INSTALLATION REQUIREMENTS

SEGREGATION OF INFRASTRUCTURE

49. A pre-requisite of acceptance of the SWS into the military domain is the ability to prevent, physically and procedurally, the inadvertent inter-connection of standard and non-standard military infrastructure or equipment. To achieve this segregation the CIS cabinet(s) shall be configured such that segregation of various elements of the SWS can be achieved.

INSTALLATION OF SECRET AND ABOVE INFRASTRUCTURE

50. **SECRET & ABOVE Data Installations**. The installation of secure data infrastructure will necessitate the provision of a dedicated RED CIS cabinet and a dedicated RED NER where required. The 'back-bone' trunking of the secret must be segregated from OFFICIAL backbone.

51. **SECRET Voice Installations**. The SWS may be utilized to support the various types of secure voice systems. Any specific secure voice telephone installations would be detailed separately in Part B or installed under alternative arrangements.

CABLE INSTALLATION REQUIREMENTS

52. The installation of cables within the cable containment system and equipment cabinets shall be consistent with good commercial wiring standards in accordance with Reference A. In particular:

a. Cables shall be bundled together by type and data classification along their installed length and adequately secured to the cabinet frame within cabinets in such a manner as to not impede the installation of active equipment by others. The M&E Contractor shall ensure that any bend limitations for all cabling are never exceeded.

b. A 'management loop' of cables of sufficient length shall be left within the base of floor standing equipment cabinet sufficient for any future re-termination work. Within wall-mounted cabinets, particularly those which are of the hinged variety, the M&E Contractor shall ensure that sufficient spare cable is provided whilst ensuring that the operation of the cabinet is unimpeded.

c. All installed SWS cables shall be labelled at each end with a cable identification sleeve marked with a unique reference number, which is linked to the installed UP position. The UP reference number for each cable shall be labelled on the front face of each patch panel and at the UP faceplate. A connectivity schedule of the UP identification (Number/Room) and patch panel port number shall be provided within the installation documentation.

d. Cables that are not part of the SWS may use the same containment as SWS; however, they must uniquely identifiable and marked in compliance with Ref A para 0902.

SEPARATION OF CABLES

53. Section 6 of Part 2 of Reference C, *Information technology – Cabling Installation / Installation Planning and practices inside buildings*, provides the requirement for all electromagnetic separation requirements. The following parameters are to be used when calculating separation distances in rooms:

a. Table 3 – Classification of Information Technology Cables
Class a – Unrestricted

b. Table 4 – Minimum separation
WMDT without electromagnetic divider

c. Table 5 – Power cabling factor
Power factor 0.2 (1 to 3 circuits)

Notes:

1. The above would require a minimum separation of 60mm.
2. If more than 3 circuits are used then the power factor will change and the required separation distance will need to be re-calculated. Consideration may be given in these circumstances to the use of metal screening inserts. Should these be used, metal strip joints are to be overlapped by a minimum of 50mm, and double riveted perpendicular to the length of the strip to maintain the integrity of the RF screen.
3. These separation distances are typical for Cat 6 installations. Cable types and shielding of screened cables shall be considered in any calculations.

CAT 6 CABLING REQUIREMENTS

54. **Cable Termination**. The **T568B** wiring standard shall be used for all CAT 6 to maintain compatibility with existing installations.

55. The continuity of CAT 6 cable shall be maintained throughout a segment length (i.e. with no joints or splices) unless otherwise specified in the Part B; the segment length shall not exceed 90m from the equipment cabinet patch panel to the UP faceplate. Should the building layout make this difficult to achieve, CIS Infra staff are to be consulted. All cables shall comply with CPR, and are to be minimally Cca standard.

FIBRE OPTIC CABLING REQUIREMENTS

56. All Fibre Optic cable used from data cabinets to UP, unless specified elsewhere, shall be industry standard 50/125 micron OM3 multi-mode duplex pairs, the performance conforming to Reference A. The cable used shall be of the following types:

a. **Internal Use**. Connection between the equipment cabinet patch panels and the user UP shall use internal grade, tight buffered twin core cables. Should intermediate distribution points be utilised (i.e. Under-floor Distribution Boxes) multi-core, loose tube (non-gel filled) cables, of appropriate size, may be employed. A Fibre Optic cable segment length shall not exceed 2000m from equipment cabinet to UP faceplate; joint and splices shall be minimised as much as possible. All cables shall be minimally Class Cca and comply with Construction Product Regulations (CPR). Internal infrastructure Fibre Optic cable terminations shall be made from patch panels (STII type) to the final presentation faceplate fitted with two pairs of STII connectors.

b. **External Use**. Where there is a requirement to install cross-site connectivity, external or external/internal grade, multi-core, loose tube cables shall be used. These must be installed in ducts constructed in accordance with Reference A.

57. **Splice Housings & Enclosures**. If used, the Splice housing shall be lockable and contain suitable strain relief glands, splice cassettes and cable management fixings to enable the installation of the Fibre Optic cable to be implemented in a tidy and logical manner; any cable bend limitations shall not be exceeded.

58. **Cable Termination.** The internal cable shall be terminated and parked on the rear face of a suitable patch panel using LC connectors in the CIS equipment cabinet with the other end run into the splice enclosure, leaving a 5 metre management loop, ready for splicing onto the cross-site cable. Fibre-optic cable terminations at UP shall be ST II.

TELEPHONE SYSTEM

59. CIS Infra staff will direct the Station telecommunications staff to order the required voice communication services as defined within Part B.

60. The M&E Contractor shall note that the provision of cross-site telephone cables will be undertaken by BT or other provider; the junction of maintenance will be the BT IDC Frame, near the building entry point (see Annex A).

61. The M&E Contractor shall provide a BT compliant multi pair tie cable of sufficient size and terminate it on the RAF IDC Frame adjacent to the BT IDC Frame (see Annex A). For M&E calculation purposes, use the formula of 1 BT line for every UP.

62. The M&E Contractor shall also provide an IDC to RJ45 patch panel within the lower part of the CIS Equipment Cabinet on which the multi pair tie cable is to be terminated (see Annex A).

63. Each pair of the voice tie cables shall be terminated on a single pair on the voice patch panel (standard) and this will accommodate analogue services. Any requirements for digital voice/data services requiring 2 pairs will be captured in Part B of this specification.

64. The installation of ISDN within the CIS rack will be dependent on the ISDN configuration and implementation on a particular unit. The details of any ISDN requirements will be included in Part B. The M&E Contractor shall provide ISDN services to the patch panel if required.

LIFT TELEPHONES

65. Under existing legislation, all lifts are to have telephone or intercom connectivity provided for emergency communication. In some cases, automatic communication between the lift and the lift contractor may also be required.

66. Lift phone connectivity shall be installed separate to the SWS, and directly to the incoming side of the Insulation Displacement Container (IDC). Programming of auto-diallers will be agreed between CIS Infra staff and the Station representative. Any variation to this requirement is to be agreed between the contractor and CIS Infra staff.

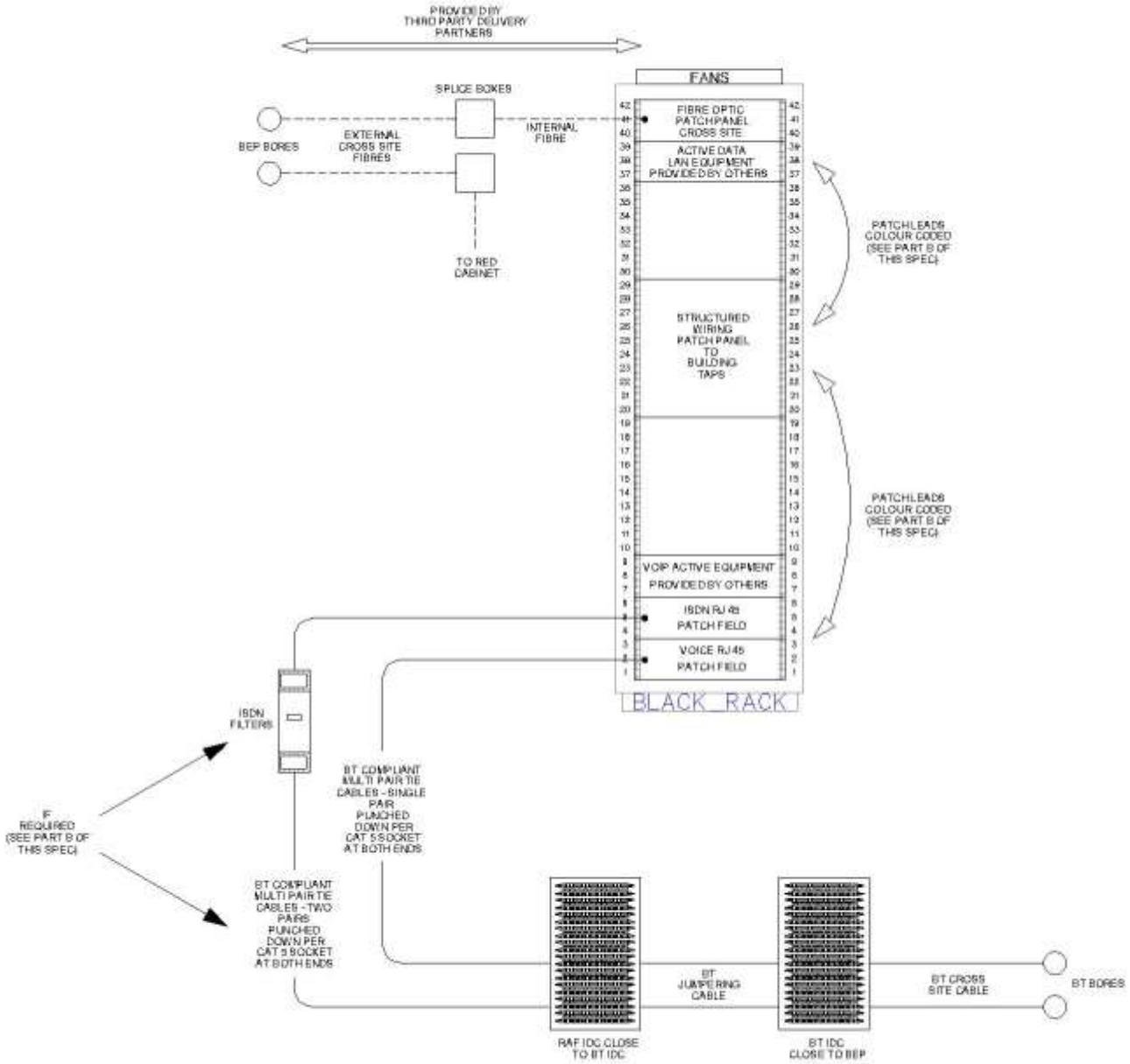
BUILDING SYSTEMS

67. Building systems such as PA, Intercoms, Fire Alarm and BEMS do not form part of the CIS specification and as such shall not be installed in SCIDA controlled environments such as Network Equipment Rooms (NER). If installation in the NER is unavoidable then it will be subject to the full requirements of Ref A and non-compliance will result in refusal of issue of an ECR Part 5 for the whole building. However, the contractor shall provide CIS Infra with details of how they intend to deliver these systems. In particular, any requirement for an external connection via BT or the MOD duct infrastructure should be co-ordinated through CIS Infra staff.

TESTING AND COMMISSIONING

68. All cable installations shall be tested in accordance with Reference A. The M&E Contractor is responsible for testing the end-to-end connectivity from UP to CIS cabinet patch panel and the end-to-end connectivity of any tie-cables that they have installed. In addition, the M&E Contractor is to test from the installed RAF IDC block to CIS cabinet patch panel for all voice and ISDN circuits.

TYPICAL LAYOUT OF CIS CABINET



The M&E Contractor should note the following with respect to CIS cabinets:

1. A Fan Tray shall be fitted at the top of the active cabinet.

2. It shall have a base plinth (for cable entry, if cabinet mounted directly onto solid floor) and be bolted to the floor.

3. It shall have 4 off 42U x 150mm vertical cable management trays, 2 on each side of the cabinet front and rear.

4. A full height earth bus bar (EBB) shall be mounted at the rear RHD side of the cabinet.

5. It shall have a 13A power distribution strip mounted vertically comprising of a minimum of 24 sockets, mounted at the rear LHD side of the cabinet, individually switched and wired via the cabinet's power supply to the MCB within the MDB. Alternatively, power may be fed to two 12 way PDU via a C19 divider unity. Power configuration shall be agreed with CIS Infra staff.

6. The patch panels shall be set back (a minimum of 100 mm, or minimum of 150 mm for 1000 mm deep cabinets) such that the patch leads and minimum bend radius are not exceeded when fitted.

7. If UPS equipment or other related equipment is to be fitted, it shall be installed at the bottom of the rack and the ISDN and Voice Patch Panels located directly above. Additional contactors shall be provided to isolation devices to ensure both input and output of any UPS are isolated in one action.

8. If Fibre Splice Boxes are required, they will be detailed within Part B to this CIS Spec.

PART B – SITE SPECIFIC CIS REQUIREMENTS

RAF CRANWELL – CAM FACILITY

SITE SPECIFIC CIS REQUIREMENTS

1. Part B of this specification details the site-specific CIS requirements for the new CAM Facility at RAF Cranwell. It identifies those requirements that are additional to, or vary from, the generic requirements detailed in the Part A. All the following works and materiel shall be contractor provided and installed, except where otherwise stated.

EXTERNAL WORKS

VOICE & DATA SERVICES

2. Contractor shall provide twin-bore 100 mm duct system to intersect with existing MOD data network infrastructure. (Intersection point to be determined later.) Duct system shall terminate at Building Entry Point (BEP), within the NER if feasible, with final chamber within 5 mtr of the new building. Final chamber shall have four 100 mm bores fed into BEP. Fibre-optic cables will be installed in this duct system and in to the building by other contractors. Building entry bores shall be situated flush with internal wall.

2. Contractor shall provide twin-bore 90 or 100 mm duct system to intersect with existing BT voice infrastructure. Note it is normal practice for BT Openreach to provide final connection into BT Chamber; this detail to be determined later. This duct system shall combine in the final chamber described above (TBC).

INTERNAL WORKS

DATA NETWORK

3. Contractor shall provide enclosed, galvanised containment to house fibre-optic cables (installed by others) from BEP to each data cabinet; incoming fibre-optic cables shall not to be exposed at any point. Notwithstanding Part A Para 43, no splice housing or fibre-optic tie cable is required; external/internal grade fibre optic will be fed directly to the data cabinets by other contractor.

4. Contractor shall provide a total of TBN x RJ45 outlets via a Structured Wiring System (SWS) on Cat 6 cabling for MODNet OS. Cables shall be tested as described in Part A. Required locations of data and voice outlets throughout the building shall be agreed between the end user, CIS Infra staff, and contractor.

5. Contractor shall provide, install & furnish one standard, lockable, full-height (42u) floor-mounted data cabinet for MODNet OS use, furnished and installed in accordance with JSP 604 leaflet 4800, and powered from a dedicated CIS supply MDB, via an adjacent lockable rotary emergency isolator. Cabinet shall be labelled “MODNET Cabinet”. Cabinet shall be electrically tested and certified as described in Part A. Patch panels shall be RJ45.

6. Contractor shall provide a total of TBN x ST II outlets via a Structured Wiring System (SWS) on OM 3 Fibre-Optic cabling duplex pairs for MODNet S. Cables shall be tested as described in Part A. Required locations of RED data outlets throughout the building shall be agreed between the end user, CIS Infra staff, and contractor.

7. Contractor shall provide, install & furnish one CPNI approved Class III secure full-height (42u) floor-mounted data cabinet for MODNet Secret use, furnished and installed in accordance with JSP 604 leaflet 4800, and powered from a dedicated CIS supply MDB, via an adjacent lockable rotary emergency isolator. Patch panels shall be LC connectors.

8. CIS MDB shall be located in the electrical plant room; supply shall also provide power to all UP power sockets, which shall be indelibly marked “CIS use”; identification of the supplying MDB/MCB shall also be marked on UP sockets and the data cabinet Note that cabinet shall be sized to house future WiFi switch/router, and cabling to WAPs in the building. Any contractor provided cabling will be detailed at a later stage.

8. CIS power to MODNet S cabinet, and all MODNet S data outlets, shall be fed by commercially available TEMPEST power filter.

9. Contractor shall provide a total of TBN x RJ45 outlets via a Structured Wiring System (SWS) on Cat 6 cabling for distribution of CAMNet data. Cables shall be tested as described in Part A. Required locations of CAMNet outlets throughout the building shall be agreed between the end user, CIS Infra staff, and contractor. Confirmation of use of copper or fibre cables TBC. CAMNet cables may share cable containment with other data systems, but CAMNet UP shall have unique identifying system such as differently coloured faceplates to prevent cross patching of other systems. (Confirm accreditation for containment share.)

10. Contractor shall provide, install and furnish one CPNI approved Class III secure, full height (42u) floor-mounted data cabinet for dedicated medical services internal network (CAMNet). This requirement, and cable distribution details, will be determined later.

11. Cable identification numbering system will be provided by RAF Cranwell C4I staff, and shall be used by the contractor to give a compliant numbering system. Cables shall have identification appended on cables behind cabinet patch panels, behind data outlet face plates, on the front of cabinet patch panels, and on the front of data outlet face plates. Cables that are NOT part of the SWS, shall comply fully with the requirements of JSP604 LEAFLET 4800. They shall be easily recognisable when sharing SWS containment (i.e. a different colour).

VOICE SERVICES

12. Contractor shall provide and install suitably sized, lockable Insulation Displacement Connector (IDC) as defined in Part A. Incoming voice cable will be provided and installed by other contractor, terminating on IDC.

13. Contractor shall provide and install BT-compliant XX pair tie cable from IDC to XX way voice patch panel in data cabinet. Telephone requirement is likely to be minimal as most OS voice services are through MODNet OS FVO. TBC later.

BUILDING SYSTEMS

14. Building systems such as fire alarms, BEMS and IDS do not form part of this specification; no cabling for any building system shall be routed via the SWS containment. Building Systems that require connectivity to BT must be wired directly to the BT IDC at the BEP. These cables shall be uniquely identifiable and marked in compliance with JSP604 LEAFLET 4800 Chapter 09.

AUDIO/VISUAL INTERFACES

13. A number of AV screens are required throughout the CAM building, as detailed in Part C. It is anticipated that the AV system will be installed by others; however, power for AV screens shall be provided by contractor, and shall be both visible and accessible to comply with current regulations (Electricity at Work Regulations 1989). Interface connections may be installed in data DADO trunking in rooms if required; details will be issued when known.

TELEVISION

14. Television access will be required in the TBN. The television must NOT be powered from CIS power. Antenna location and feeder cable locations/routes TBN.

WiFi

15. Distribution of and access to MODNet OS will be through DBI (Defence Based Internet), as well as through docking stations connected to the SWS. WiFi switches will be mounted in the CISMODNet OS data cabinet in the NER by other contractors. However, contractor may be required to provide enabling Cat 6 cables to WAP locations to provide power over ethernet (PoE); this work will be detailed when known.

LIFT TELEPHONE

19. To comply with DDA regulations, a lift will be installed in the building. Lift emergency telephone cabling is to be wired directly to the IDC defined at Para 10 above, and not be a part of the SWS; lift dialling details will be published at a later date when known.

MATERIEL

20. Contractor shall provide, in addition to other standard materiel such as cable containment, cables and User Presentations, etc:

a. Adequately sized data cabinets, furnished in accordance with JSP 604 lflt 4800 with cable management, power distribution, etc.

b. Voice patch panel suitable for at least XX voice circuits.

c. Building patch panel suitable for at least XX voice or data circuits.

d. XX x 1 mtr LSOH blue patch leads.

f.XX x 1 mtr LSOH grey patch leads.

g. XX x RJ45/BT6L PABX Master adaptors.

PART C – CIS USER REQUIREMENTS

USER REQUIREMENTS

The room-by-room requirements for the CAM facility are captured in the attached spreadsheet.

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