

Chapter 06 - The ICT Physical Environment - Leaflet 4800

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Rule ownership

1* area responsible for Chapter 06 - The ICT Physical Environment - Leaflet 4800 is **Ops Co-ordinating Installation Design Authority**.

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Introduction

It is desirable that the installation of any ICT into any area will have a net zero impact on the environment of the immediate area. To this end, the environmental impact, particularly in terms of space, heat and noise output, of the addition of ICT is to be fully explored and measures put in place to negate any deleterious effect.

Rationale

CIDA Governance adopt a Standards based approach to all ICT installations that hold and process MOD data. Some Standards underpin the requirements of SI's. As well as industry recognised standards the installation must meet MOD requirements as promulgated in various JSP. Standards, SI's and JSP's are referenced in L4800 Chapter 6 are listed in Associated Standards.

Benefits and risks

Meeting the requirements of this Chapter 6, ensures that the ICT installation meets Statutory Requirements and industry recognised installation Standards. Compliance also ensures that, in terms of space, heat and noise output, the ICT change will have minimal effect on its surrounding environment. A non compliant installation will not be accredited for processing and storing MOD information.

Technical controls

Network Equipment Rooms or Computer Rooms

6.1.1 New buildings containing ICT infrastructure require a dedicated NER, to house the NEC's in the building. Existing rooms may require modification to make it a suitable Computer Room. ^[1]

In both cases the following requirements ^[2] shall be addressed to determine the compliance of the room for housing the NEC's

1. The cabinet(s) dimensions. ^[3]
2. What is housed inside the cabinet, either cabling components only ^[4] or cabling components and active equipment. ^[5]
3. Sufficient space in the room to allow for the installation and maintenance in compliance with Leaflet 4800. ^[6]
4. If overhead pathways are to be utilised, is the room of sufficient height? ^[7]
5. The room door to be of sufficient size to allow the cabinet into the room without dismantling. ^[8]
6. The room is secured to the appropriate classification level of the information being processed. ^[9]

ICT Cabinets and Enclosures

Space and Accessibility

6.2.1.1 On new installations, cabinet faces that require access should be confirmed by the change proposer and future requirements should be considered by the SCIDA.

6.2.1.2 All cabinets require adequate working space and adequate access ^[10], ensuring that equipment can be inserted or withdrawn without obstruction. A minimum clearance of 1200 mm is required ^[11] on all faces that require access. Particularly heavy or bulky equipment may require these clearances to be increased.

6.2.1.3 The doors of the main engineering face, usually the front of the cabinet, must also open beyond 90°. Any other accessible cabinet face with doors, requires them to open beyond 90°.

6.2.1.4 If a cabinet rear face has a double wardrobe door arrangement where both doors can be fully opened beyond 90° and not introduce an obstruction the rear 1200 mm may be reduced to a minimum of 900 mm.

6.2.1.5 Multiple rows of adjacent cabinets are to be installed such that an unobstructed passageway of at least 1200 mm is maintained between bayed suites ^[12].

6.2.1.6 Cabinets situated on a raised access floor, require to be positioned so that the floor tiles immediately at the front and rear of a cabinet, or suite of cabinets, can be removed ^[13]. As well as front and rear floor access, the floor tiles in the space between cabinet suites must be removable.

6.2.1.7 Wall mounted double hinged cabinets are to be installed so that the equipment containment portion of the cabinet may be opened through a full 90° while maintaining unobstructed access.

6.2.1.8 Wall mounted cabinets that are not double hinged must have suitable unobstructed engineering access to the front and at least one side (removable panel or door).

Siting and Location

6.2.2.1 The location of ICT cabinets or enclosures must be agreed with the SCIDA and not have a negative impact on intended or existing building structure, functionality, or staff environments. During the concept stage of a change, consideration must be given to the proposed location of ICT cabinets and the enduring engineering, operation, flexibility, and expansion of the completed installation. For new cabinet installations, floor loading and wall loading is a consideration for the change proposer and not the SCIDA.

6.2.2.2 ICT cabinets, frames, racks, or other enclosures shall NOT be installed in the following locations: ^[14]

- Toilet facilities or kitchens.
- Emergency escapeways.
- Ceiling or sub-floor spaces.
- Dedicated firefighting equipment storage rooms (fire hose reels, fire extinguishing equipment etc).

6.2.2.3 Wall mounted cabinets should be installed at a suitable working height above finished floor level and not introduce a health and safety hazard.

6.2.2.4 The location of a cabinet or enclosure should not have a negative impact on the proposed or existing natural or artificial light levels.

6.2.2.5 Guidance on physical security measures required for the various levels of classification must be adhered to. ^[15]

Size, types, and furniture

6.2.3.1 In the proposal stages the SCIDA should take a holistic approach to design proposals and ensure the relevant size and type of cabinet or enclosure is to be installed. ICT cabinets and enclosures are to be of sufficient size to support the immediate design requirement and provide capability for future expansion.

6.2.3.2 For floor mounted cabinet installations, within a purpose built NER the minimum requirement for cabinet size is 800 mm wide x 800 mm deep x 42 U, however deeper cabinets may be required to facilitate larger equipment and increased cabling requirements.

6.2.3.3 For floor mounted cabinets outside an NER, such as utilising an existing room, the cabinet width and depth remain 800 mm, but the U height must be agreed with SCIDA.

6.2.3.4 For new wall mounted cabinet installations, the cabinet should be of sufficient size to correctly support all housed equipment including furniture.

6.2.3.5 ICT cabinet door sets are available in various forms. Solid panel metal doors and doors with metal frames incorporating safety glass panels are common on several existing installations across the MOD Estate. Other installations may have single or double perforated metal doors which provides better air flow in forced air or non-forced air environments. For new installations, the selection of door set type should be relevant to the application for the immediate and future requirements whilst considering the other physical environment elements covered in this chapter.

6.2.3.6 Installation of new equipment and cabling must not prevent the intended function of an enclosure, i.e., the doors from closing. To prevent unauthorised entry, removable side panels and door sets should incorporate locking provisions. Best practice is for a single cabinet or enclosure to have suited locking mechanisms that can be secured with a common key. ^[16]

6.2.3.7 All ICT cabinets are to be fitted with:

- A PDU of sufficient current capacity and number of ways, with an external earth terminal (earth stud). For connection of equipment within the cabinet the PDU presentation is typically a UK 3 pin plug ^[17], however other certified connections may be used. Within the cabinet, PDU's should not directly feed another PDU unless specifically designed to do so.
- A cabinet bonding busbar. ^[18]
- Internal rails to support equipment.
- Cable management system to ensure that cables cannot be damaged by doors and internal equipment. Ultimately this assists in the protection of the patched live circuits
- All cabinets whether individual or suited are to retain all side panels and doors. Open 19" solutions such as patching frames or racks are not included in this requirement.

6.2.3.8 Requirements for floor cabinets:

- A full height vertical cabinet bonding busbar.
- A suitable cabinet bus-bar, as a minimum, is to provide equal conductive properties to that of the cabinet bonding conductor. ^[19] Cabinet bonding bus-bars are typically constructed of solid hard drawn copper, approximately 6 mm thick and 16 mm wide with intermediate holes spaced at equal distances to provide component bonding connections.
- Typically have 2 vertical powder coated cable trays (1 either side) to separate power and communications cables.
- Four full height vertical equipment mounting rails, two front and two rear. To support heavy or deep equipment or the installation of full depth cantilever shelves.
- Recommended cable bend radii must be maintained when the cabinet doors are closed.
- Internal cable management system must be able to support immediate cabling requirements and any future requirements, whilst providing an enduring ability to maintain EMC separation distances and where required TEMPEST separation distances.
- Vertical cable management provisions (rings or equivalent) at either side of the front and rear vertical mounting rails.
- Horizontal cable management panels to provide patch cables a transition to the horizontal cable management provisions whilst maintaining cable bend radii.



Floor Cabinet



Raised floor frame

4.2.3.9 For cable access, cabinets should be mounted on a supplied metal plinth or in raised access floor areas a purpose manufactured metal frame solution.

4.2.3.10 High level cable entry in the cabinet roof with direct access to the cabinet vertical CMS should be considered for all new installations as this will enable cables to be top fed. Some cabinet manufacturers provide integral solutions that fit to supplied cabinets and this is the recommended option. For high level cable access, a suitable cable management system of sufficient size should be installed above the cabinet. To prevent dust ingress and assist with cabinet air flow all cable entries are to be fitted with a brush strip cover or similar.



Cabinet on raised access floor

6.2.3.11 On new installations, cabinet side panels should not have any cable entry capability. This should be from top or bottom entry provisions.

6.2.3.12 Cabinet side entries are not to be used as a distribution method for any installation cables or patch cabling. If specific circumstances that require cabinet side entry because this the only viable solution, for example, a flight cased equipment cannot be dismounted into a cabinet for warranty or contractual reasons, the change proposer should specify this in the proposal.

6.2.3.13 Requirements for wall cabinets:

- Wall cabinets may adopt either a full height vertical bonding busbar or a 19" horizontal solution.
- Wall mounted cabinets are supplied as standard with 2 front rails, however, larger wall cabinets may require additional rear rails. These rails are to be positioned so the cabinet doors can be fully closed while not making contact with any installed equipment or foul any power cabling, earth cabling or communications cabling/patch cords.
- At least 1 full cabinet height powder coated cable tray that can maintain EMC separation distances between power cables and communications cables
- Horizontal 19" cable management panels. These are to be optimally positioned to provide direct patching between active equipment and patch panels.



High level raceway



Hinged wall cabinet

6.2.3.14 In addition to the above, it should be noted that some installations may require specialist cabinets or enclosures ^[20] In these cases all relevant documentation, including risk mitigation(s) arising from non-compliance must be passed to SCIDA.

6.2.3.15 Purpose made mobile 19" cabinets are to conform with the installation requirements of transportable cabinets. ^[21]

6.2.3.16 In both cases all relevant documentation, including risk mitigation(s) should be included in ECR documentation.

6.2.3.17 Further advice can be sought from CIDA Governance.

Stability

6.2.4.1 There is a requirement to ensure that all cabinets are installed to prevent movement or topple hazard. ^[22] Both floor mounted cabinets ^[23], wall and ceiling mounted cabinets ^[24] have specific requirements.

6.2.4.2 Floor mounted cabinets are to have transit castors removed and are to be fixed in place on a supplied metal plinth. The fixings are to be of suitable mechanical properties to prevent movement or a topple hazard. This can be achieved by fixing the cabinet directly to the building structural elements or by using a manufacturer recommended safe method of support (struts etc).

6.2.4.3 Timber plinths should not be used, however existing timber plinths do not require replacement.

6.2.4.4 In raised access floor installations, ICT cabinets are to be secured against movement using a purpose designed metal frame that is secured to the floor pedestals and forms part of the 600 mm² flooring grid.

6.2.4.5 Direct fixing of cabinets to the sub floor slab through the local floor is not permitted in a raised access floor installation as this fixes the local floor tiles in place which restricts underfloor access.

6.2.4.6 To increase stability, suited cabinets are to be fixed to adjacent cabinets using prescribed baying methods detailed by the specific cabinet manufacturer.

6.2.4.7 Wall mounted cabinets or wall enclosures are to be fixed to the building structural elements, in accordance with manufacturers instructions,

6.2.4.8 Cabinet and enclosure manufacturers maximum safe working loads should be observed and not exceeded.

6.2.4.9 Wall mounted cabinets require a significant amount of support, so the suitability of the proposed wall for installation should be considered at the design stages. The wall should provide independent support to the weight of the populated cabinet without affecting the integrity of the building structure.

6.2.4.10 Suitable fixtures with appropriate drill and fix methods for the application are to be used.

6.2.4.11 For masonry structures, expanding bolts, sleeve anchor bolts, projection bolts or similar are a common practice however manufacturers mounting recommendations should be followed.

6.2.4.12 Partition/stud walls or prefabricated structures will require specialist fixings and additional support may be required from the opposing side of the wall that the cabinet is to be mounted on.

4.2.4.13 The installation of a wall cabinet should not introduce a Health & Safety issue.

Bonding

6.2.5.1 All cabinet powder coated metallic panels and other exposed metallic structural parts are to be individually connected to the cabinet bonding busbar with 4mm² copper stranded earth cable with yellow and green insulation.

6.2.5.2 The individual connection is to be by the shortest route without coiling and the earth cables are not to restrict access to equipment mounting area or impede on the cabinet function.

6.2.5.3 'Daisy chained' earth connections are not permitted, individual connections must be removable by means of a tool. Spade, bullet, or other quick connection types are not to be used. ^[25]

6.2.5.4 For cabinets with welded panels ^[26] only a single panel bonding connection is required as the remaining panels are bonded through the welds. All other metallic internal parts of the cabinet are to be individually bonded to the cabinet bonding busbar.

6.2.5.5 For active equipment with an external earth stud, if there is earth continuity provided by the CPC ^[27] in the main power feed from the Distribution Board through the PDU there is no requirement to additionally bond the equipment to the cabinet bonding busbar.

6.2.5.6 Active equipment bonding is only required if there is no earth continuity provided by the CPC. This may be more common in overseas locations. During the change process, the change proposer is to ensure active equipment bonding arrangements are included in the design documentation.

6.2.5.7 Some copper patch panels, particularly Voice Application Patch Panels, may require an earth connection to drain any nuisance frequencies. Patch panels provided with an integral earth terminal are to be connected to the cabinet bonding busbar. Metallic patch panels without an integral earth terminal and metallic 19" blanking panels do not require to be connected to the cabinet bonding busbar.

6.2.5.8 Equipment with Functional Earthing requirements are to be connected to the cabinet bonding busbar.

6.2.5.9 All cabinet PDU's are to be supplementary bonded to the cabinet bonding busbar from a dedicated earth terminal (earth stud) on the PDU.

Labelling

6.2.6.1 All ICT cabinets and enclosures are to be individually identifiable with a durable, clearly legible label affixed in a visible location on the exterior of the cabinet or enclosure.

6.2.6.2 Change agents should note that cabinets that deliver Defence Digital services require a unique identifier from DD Service Provision. This unique identifier must be provided as part of the design documentation and must be provided to ensure compliance. The appointed SCIDA can provide further details.

6.2.6.3 For Cabinets that deliver non - Defence Digital services, the change agent should liaise with the system owner.

6.2.6.4 Processing classification of the cabinet or enclosure should also be labelled, or the classification must be clearly distinguishable from differing classifications i.e. Red labels = a Red cabinet or enclosure.

6.2.6.5 Cabinets or enclosures containing fiber optics or equipment with laser sources must be labelled with laser hazard warnings. Other required display information are included in Leaflet 4800 Chapter 7.

Equipment within enclosures

6.2.7.1 Unless manufacturers' installation design standards specifically allow, all equipment, active or passive, installed within an ICT cabinet or enclosure is to be independently supported and secured against movement using supplied brackets or lugs, shelving, slides or runner assemblies.



Non hinged wall cabinet



6.2.7.2 Considering the size, weight and design of individual equipment, the amount of mechanical support afforded to the equipment should be sufficient to provide an enduring installation without any strain on the equipment casing or enclosure vertical posts. Small items that do not have a recognised fixing accessory must be secured on dedicated 19" shelves with Velcro straps or ties.

6.2.7.3 Equipment, patch panels, shelves and horizontal cable management should be distributed in complete U intervals in the most efficient layout whilst ensuring optimum airflow and good cable management. Equipment selection and equipment placing within a cabinet or enclosure is a key element to be considered in the change proposal stage.

6.2.7.4 To assist with air flow, individual active equipment fitted within 1 U of each other should be avoided where possible. Unused U space(s) can be covered with Blanking plates.

6.2.7.5 For new cabinet installations with non-perforated doors and vented roofs, consideration should be taken for roof mounted or rack mounted fan units.

Room Main Earth Terminal

6.2.8.1 Room MET is the term for the primary connection point to the main building earth or subsequent earth points.

6.2.8.2 A room MET provides a dedicated earth connection for cabinet bonding conductors to the cabinet earth busbar. This MET is to be local to the cabinet(s), accessible and ideally visible. If the MET is not visible a clear label near the location of the MET should provide details to the location.

6.2.8.3 A typical MET is fabricated of solid hard drawn copper, approximately 6 mm thick, 32 mm wide and 300 mm long or of sufficient length for immediate requirements and a 20% future capacity requirement.

6.2.8.4 It is recommended that a room MET incorporates a disconnection link from the main safety earth which provides a means for future testing of individual earth connections. The MET main safety earth connection and the cabinet bonding conductor connected to the cabinet earthing busbar are to be clearly labelled.

6.2.8.5 Cabinet bonding conductor detail are covered Leaflet 4800 Chapter 7.



Room MET

Cooling provision

6.2.9.1 The change agent is to address and confirm cooling requirements at the design stage. There are various forms of room cooling provisions with the majority on the MOD estate being dedicated indoor/outdoor Air Conditioning condensing units or the cooling is provided from the overall building HVAC.

6.2.9.2 Data centres with raised access floors usually incorporate a forced air solution with in-row or in-aisle cooling from chillers with the heat exchange being managed by local air handlers. With all housed equipment in operation internal cabinet temperatures should not exceed 40°C. If the SCIDA has any concerns with the temperature inside equipment rooms they should raise these concerns with local site facilities management.

6.2.9.3 Cabinets installed in a staff working environment, should not significantly increase ambient room temperature to an uncomfortable level. If a change involves adding equipment to an existing installation, the additional heat loading is to be considered and, if required, mitigated by the change agent.

Luminaire provision

6.2.10.1 There is a requirement that lighting levels should be sufficient to allow people to work without experiencing eyestrain and safely move from place to place. ^[28]

6.2.10.2 Change agents should consider the effect of cabinet colour and finish ^[29] can have on the lighting ^[30], which should be sufficient to allow any engineering task to be carried out in the network room. If the SCIDA has any concerns with the lighting levels inside equipment rooms they should raise these concerns with local site facilities management.

Manufacturers' installation standards

6.2.11.1 Whenever possible, manufacturers' specifications are to be provided to the SCIDA at the design proposal stage. These should identify aspects such as cooling requirements, power draw, ventilation space requirements or EMC issues that may require safeguarding by SCIDA throughout the in-service life of the equipment. The SCIDA should retain this information in the relevant CMDB area.

Related Pages

Parent Page

- CIDA installation regulations (Leaflet 4800)

Sibling Pages

- Chapter 05 - Fire hazard designation of cables materials - Leaflet 4800
- Chapter 05 - Fire hazard designation of cables materials - Leaflet 4800
- Chapter 06 - The ICT Physical Environment - Leaflet 4800
- Demarcation Diagram

Signature block

Author to sign off: Richardsond505

Author signed by: Not signed (talk)

Author signed date: Not signed

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Associated standards

Associated documents with Chapter 06 - The ICT Physical Environment - Leaflet 4800

- JSP 440 (https://modgovuk.sharepoint.com/sites/defnet/DINSJSPS/DINSJSPS/20170203.1/JSP440_Leaflet4.pdf)
- RAL Organisation (<https://www.ral.de/en>)
- BS7671: 2018+A1-2020 (<https://bsol.bsigroup.com>)
- BS EN 60297-3-100 (<https://bsol.bsigroup.com>)
- BS EN 62368-1:2014 (<https://bsol.bsigroup.com>)
- BS EN 60529 (<https://bsol.bsigroup.com>)
- BS EN 12825 (<https://bsol.bsigroup.com>)
- BS EN 50174 (<https://bsol.bsigroup.com>)
- SI 1998 No 2306 (<https://www.legislation.gov.uk/uksi/1998/2306>)

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References

1. BS EN 50174-2:2018 Chp 11.3.8.2.4
2. based on BS EN 50174-2 2018
3. BS EN 60297-3-100:2009
4. BS EN 50174-2:2018 – 8.3.8.1.4
5. BS EN 50174-2:2018 – 8.3.8.1.5
6. Reference to 1200mm requirement in Leaflet 4800
7. BS EN 50174-2:2018 – 8.3.8.1.3
8. BS EN 50174-2:2018 – 8.3.8.2.4
9. Link to JSP 440 Part 2 Leaflet 4
10. SI 1989 No 635 Regulation 15
11. BS EN 50174-1:2018+A1:2020 Chp 4.2.5.1
12. BS EN 50174-2:2018 11.3.8.1.3
13. BS EN 50174-2:2018 11.3.8.2.4
14. BS EN 50174-1:2018 4.2.5.1
15. JSP 440 Part 2 Leaflet 4
16. BS EN 50174-2:2018 4.9.1.3
17. BS1363-5:2016
18. Previously referred to as the cabinet MET for component bonding connections
19. The cabinet bonding conductor is the earth cable that connects the cabinet bonding busbar to the room main earth terminal
20. Examples such as simulated training environments with transportable enclosures or flight cased equipment that cannot meet all of the requirements of this chapter.
21. BS EN IEC 62368-1:2020+A11:2020
22. SI 1998 No 2306 Regulation 20
23. BS EN IEC 62368-1:2020+A11:2020 Clause 8.6
24. BS EN IEC 62368-1:2020+A11:2020 Clause 8.7
25. BS 7671-2018 Chp 542.4.2 & 543.1
26. Example is a Secure cabinet
27. BS 7671-2018+A1-2020 Part 2
28. Workplace (Health, Safety and Welfare) Regulations 1992
29. RAL , European colour matching system
30. Dark colours absorb light, while lighter colours reflect light

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