

Chapter 11 - ICT Outside Plant

Introduction

1. The importance of external information technology cabling infrastructure is the same as that of internal systems in terms of design, specification, implementation and operation, the requirements for which are covered in Chapter 08. Additional requirements, relating to underground and aerial cabling systems and infrastructure between buildings are specified in this chapter.
2. This JSP is not intended to undermine statutory instruments or legislation. If there is a confliction then statutory instruments or legislation will take precedence. Where there is a confliction between this document and an extant British standard or publication, then the most onerous or stringent requirement is normally to be applied. In cases of doubt please contact CIDA.

Direction

3. **All external cabling and plant used for the management of cables carrying MOD data is to be implemented in accordance with the specifications contained within, the current version of, JSP 375, JSP 440, SDIP 29, BS EN 124, BS EN 13101 and BS EN 50174.**
4. The MOD mandated policy for the preservation of data confidentiality, availability and integrity advocates the use of an underground rather than an aerial external cable infrastructure because of the inherent security, superior physical protection and flexibility towards future change afforded by a buried duct system. An aerial system for external cable infrastructure is therefore only to be considered under the most exceptional circumstances, and then, only with the agreement of the relevant SCIDA or CIDA.
5. In certain specialist cases, such as a Range or extended area where no future growth is envisaged, and in the absence of an existing pit and duct system, a directly buried cable system may be provided with the agreement of the relevant SCIDA or CIDA. Consideration should be taken of the physical and environmental conditions that exist to ensure that the necessary installation standards are met to achieve the integrity and resilience of the cabling system.
6. Security measures and TEMPEST countermeasures are to be applied to all cabling systems in accordance with the security classification of the Information and Communications Technology (ICT) for which it is provided. All segments, internal, external and the transition between building entry facilities are to be included. Applicable requirements are detailed in **JSP 440, SDIP 29/2 and NCSC GPG No14.**
7. Mandated safety processes and procedures applicable to all work on the MOD Estate or involving MOD personnel are detailed in **JSP 375.**
8. All access pits, maintenance/ hand holes or chambers are to be suitable for the load they are to support and the environment that they are installed.
9. In all instance's manufacturers installation guidance, instructions or requirements are to be adhered to in full. The change designer or installer or other party responsible for engaging with the SCIDA for the purposes of the ECR process is to ensure that these documents are provided to the SCIDA (normally at the design stage) so that inspection can be made against them.
10. Requirements associated with the installation of MOD ICT outside plant for which there are no extant International, European or British Standards are also shown in the next section.

Requirements

Duct Requirements

11. **Size of Duct.** The industry standard internal diameter dimension of underground duct is 90 mm. However, 50 mm, 100 mm and 150mm duct may be utilised to conform to local site practice. Sub-ducts have been frequently used in situations where both copper and fibre cables have been required to share the same duct. Sub-ducts are not to be utilised on new duct routes as separate bores are to be provided for fibre and copper. Similarly, separate ducting systems are to be provided for Data and Power cables in order to comply with both safety and EMC requirements.
12. **Linear Deviation.** Duct runs are, as far as is possible, to follow point-to-point straight lines with access pits provided along the route. Between any two access points including the premises boundary and the Building Entry Facility (BEF):
 - a) There shall not be more than one pre-formed bend of up to 90 degrees.
 - b) Deviations shall not exceed a total of 90 degrees.
 - c) Bends shall be a minimum of 600 mm radius.
 - d) Bends in the conduit shall not contain any kinks or other discontinuities that may have a detrimental effect on the cable sheath during cable pulling operations. However, long, slow curves are permitted providing the maximum pulling weight of the cables to be installed will not be exceeded.
13. **Depth of Bore.** Unless otherwise specified by national or local regulations the minimum planned depths of pathways shall be in accordance with Table 11-1. Bore depth must be sufficient to protect the duct from physical harm and is therefore dependent upon the ground material and surface fabric above the duct. The requirements of Bore depth is to follow the requirements of Table 11-1 which provides a minimum value for clearance between the ground surface and the upper part of the underground plant, dimension 'D' of Figure 11-1.
14. **Testing and Proving.** New ducts are to be tested and proved with a mandrel, a brush and a test length of cable connected together and pulled through the duct on a draw line:
 - a) The mandrel is to be at least 250 mm long with a diameter at least 90% of the duct bore.
 - b) The brush should be at least 200 mm long with a diameter at least 110% of the duct bore.
 - c) The test cable is to be at least 3000 mm long.
15. Each duct is to be left threaded with a 540 Newton minimum breaking strain nylon draw line, at least 4000 mm longer than the duct run.

Table 11-1 Depth of Bore - Requirements and Recommendations

Location of pathway ^a	Requirement	Recommendation
Footpath	0,5m	0,5m
Road - including parking areas	0,6	0,6m
Motorway	1,0m ^b	1,0m ^b
Railway	1,0m ^b	1,0m ^b
Agricultural land	0,9m	0,9m
Uncultivated or landscaped land	0,5m	0,9m

^a Increased depths may be required in accordance with agreements between the planner and the owners /operators of the land

^b The depth of dig may be significantly greater than that shown in table 11-1 in order to allow any protective layers to be installed below the conduits

Refer to BS 50174-3 for further details and other requirements

(C) BSI 2019 BS EN 50174 3:2013+A1:2017

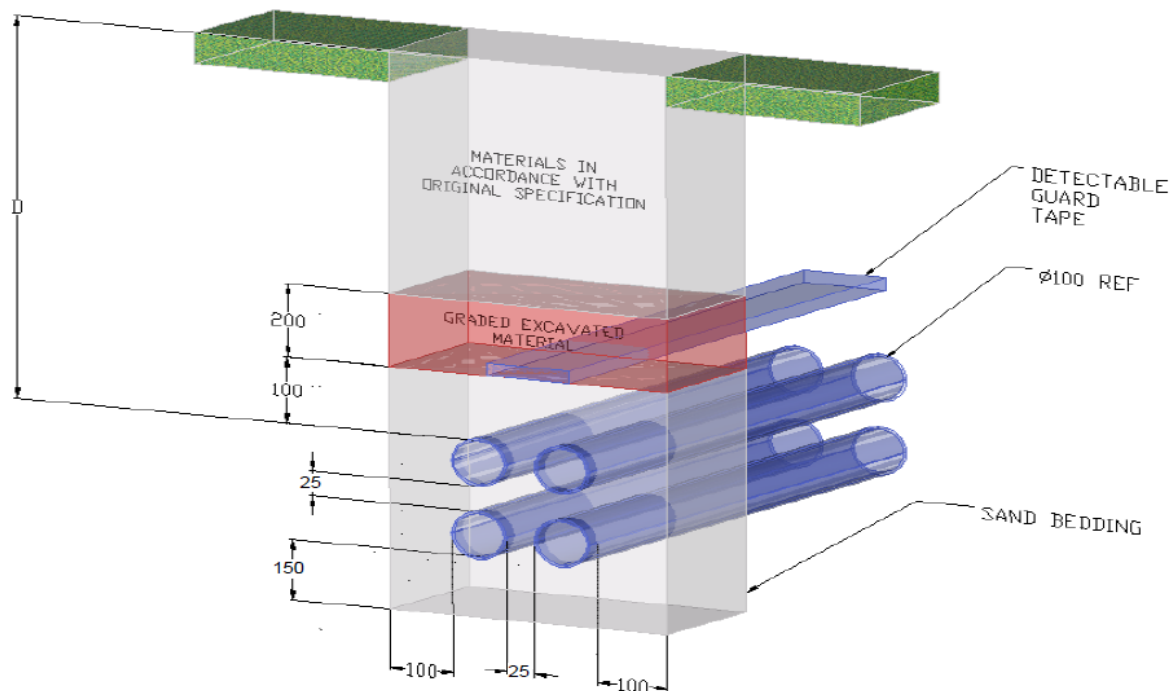


Figure 11-1 Section Through Typical Duct Run

16. **Pit Locations.** Cable access pits or 'maintenance holes' as they are described in BS EN 50174-3, shall be located to facilitate a safe and secure pathway system between buildings. They should be provided at both ends of a duct route, positioned as close as practicable (normally within 5 metres) to the external building walls and adjacent to the equipment room in which the cables terminate. Excepting in the case of directly buried cables, pits shall also be provided along a duct route at 100 metre intervals, either side of a road or rail crossing, and in accordance with the requirements of paragraph 12.
17. **Pit Dimensions.** All cable access pits/ maintenance holes are to be sized sufficient to allow unobstructed access for cable pulling; typical pit layout is illustrated at Figure 11-2. Actual size will depend on the number of duct entries the pit incorporates and its designated purpose:
 - a) Joining pits are to be sized sufficient to house the joint closure of the largest planned cable and provide adequate working space for cable jointing personnel and equipment.
 - b) Turning pits are to be sized sufficient to accommodate the minimum bend radii of all planned cables.
 - c) Through, in-line pits are to be sized sufficient to allow rodding.
18. **Construction.** Cable access pits/ maintenance holes may be either pre-fabricated from concrete or composite materials or built on site.

- a) **Prefabricated Cable access pits/ maintenance holes** must be installed and inspected to the **manufacturer's** installation guidance, instructions or requirements, the SCIDA must be provided with these as part of the ECR process and will inspect against them as part of that process.
- b) **Cable access pits/ maintenance holes built on site** are to be constructed of poured concrete, solid concrete block or Engineering Brick laid in English Bond. Breeze blocks or hollow concrete blocks are not acceptable materials for cable pit construction. Base thickness (of concrete) must be a minimum of 150 mm for pits up to 1800 mm deep, and 225 mm thick for pits between 1800 mm and 4500 mm deep. Concrete walls are to be a minimum of 225 mm thick. Walls built of Engineering Brick will be 215 mm thick. Strengthened, carriageway standard, pits are to be provided either side of a road crossing, train track etc.

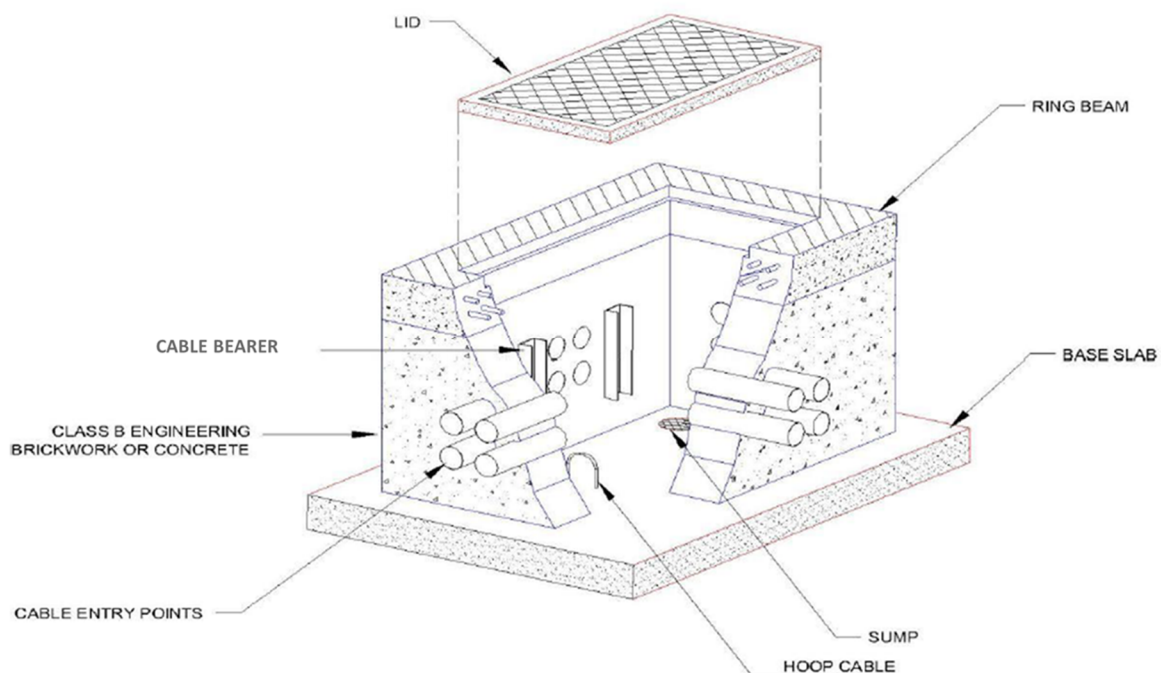


Figure 11-2

- 19. Pit Lids, gully tops and manhole covers.** Must be installed in accordance with the manufacturer's installation guidance, instructions or requirements, the SCIDA must be provided with these as part of the ECR process and will inspect against them as part of that process.

In addition to meeting the requirements of BS EN 124:

- a) Lids should require no more than 2 people to effect access to the pit.
 - b) Split lids are to interlock when closed to enable a single lock security mechanism.
 - c) Lids are to bear a permanent mark to denote pit ownership.
 - d) **All** pits are to be securable against intrusion.
 - e) Pits associated with Approved Circuits shall be secured in accordance with JSP 440.
- 20. Pit Furniture.** For safety and cable management, the following items, manufactured from corrosion resistant materials or with corrosion resistant finishes, should be fitted in all cable pits:
- a) **Cable bearers** are to be installed, on 0.5 metre centres, on all pit walls that exceed 0.9 metre in length, to allow optimal positioning of cable joints. Two sets of Cable bearers is the

minimum number to be installed, large pits with many duct entries may require more. Cable bearer brackets, for supporting the cable and joints, need only be fitted as required.

- b) **Ladders or Climbing Steps**, with non-slip treads, are to be fitted to all cable pits. The ladder option is to include a stable, non-slip mounting bar around the upper part of the pit to allow the ladder to be moved and secured as necessary. Where steps are employed, they are to meet the specification of BS EN 13101.
 - c) **Optional Cable Anchors** of 12 mm diameter round section steel are to be secured if required in the pit base to facilitate anchorage of cable pulleys etc.
21. **Drainage.** A 150 mm square or round soak away, excavated to at least 300 mm deep and filled with coarse gravel, is to be provided in one corner of the pit to allow water drainage. Alternatively, for areas with a high-water table, a 250 mm deep pumping sump may be substituted. Either option is to be finished with a flush fitting protective grating.
22. **Cable Duct Entries.** Entries into pits are to be spaced at least 25 mm apart, both vertically and horizontally, and at least 100 mm from adjacent side walls and 150 mm from the base. Eight-way ducts are to be arranged in two horizontal rows of four, four way ducts arranged in a square formation and two way ducts in a horizontal formation. Ducts are to be cleanly cut, flush with the inside wall so there are no protrusions into the pit. To prevent water ingress, all unused duct entries are to be fitted with a short length of duct which has been sealed, with duct caps, at both ends.
23. **Soft ground.** To protect our assets, pits/ maintenances holes, gully tops and manhole covers installed within soft ground should be selected to include a protective surround or 'ring beam'. These elements should be constructed and installed in accordance with the manufacturer's installation instructions and Annex F of BS EN 124-1:2015. The manufacturers installation instructions should be provided to the SCIDA as part of the ECR process for the SCIDA to inspect against.

Building Entry Specification

24. Duct entries into buildings either shall be through the ground floor slab (Figure 11-3) or shall be via a Stainless-Steel Pipe (SSP) through the external wall (Figure 11-4). The BEF should enter the same place as other utilities. Other BEF options can be considered, subject to the change approval process.
25. The BEF shall not exceed a total area of 300mm square and should be located in an area that will least affect the structural specifications of the building. All penetrations into buildings shall conform to the Building Regulations.
26. Installation of Entry/Exit ducts should enable the fitting of metal enclosures that are internally hinged, key lockable, earth bonded, and fitted covering each 100mm entry bore. They shall be of sufficient size to allow maximum cable capacity of the entry bore width and enable the manufacturer's specified bend radii of the cables.
27. Each SSP used for building entries shall be earthed at the BEF with an approved earth. The SSPs shall penetrate the inner surface finished wall with a clearance of 15mm from the end face of the pipe to the finished wall surface and have a minimum bend radius of 140 – 160mm. They shall be securely fixed to the wall by brackets at intervals not exceeding 1.6 metres. Where SSPs are unable to fully penetrate the building due to depth of wall, the contractor shall build a brick or concrete pier around the pipes externally.
28. Each entry duct shall provide 50% spare capacity, or approximately 12 cables and shall be sealed at both the BEF and the cable chamber pit.

29. All underground building entry ducts shall have minimum bend radius of 600mm from the external chamber to the penetration point in the floor slab (Figure 11-3). The entry/exit point shall finish flush with the floor surface to enable the fitting of a cable entry/exit enclosure with unhindered access to vertical and horizontal trunking.

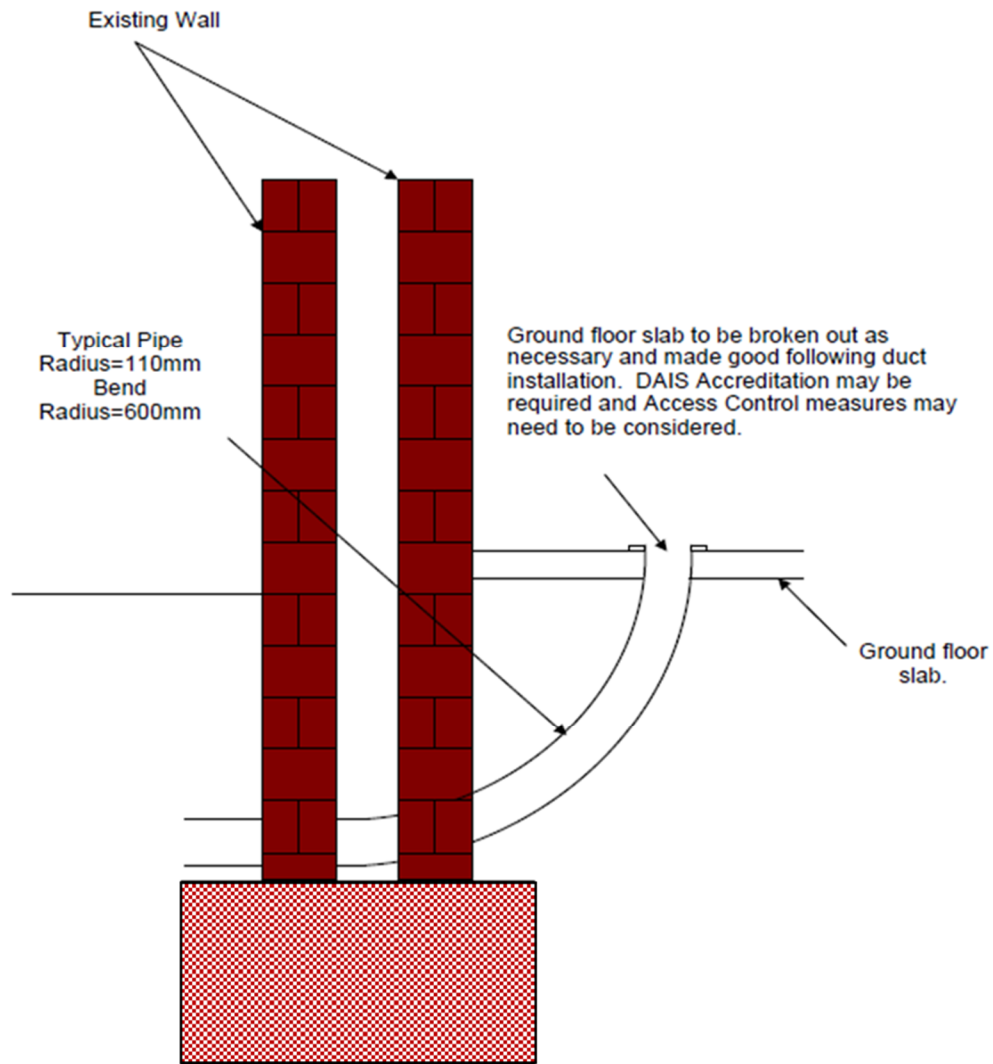


Figure 11-3 - Underground Building Entry Elevation

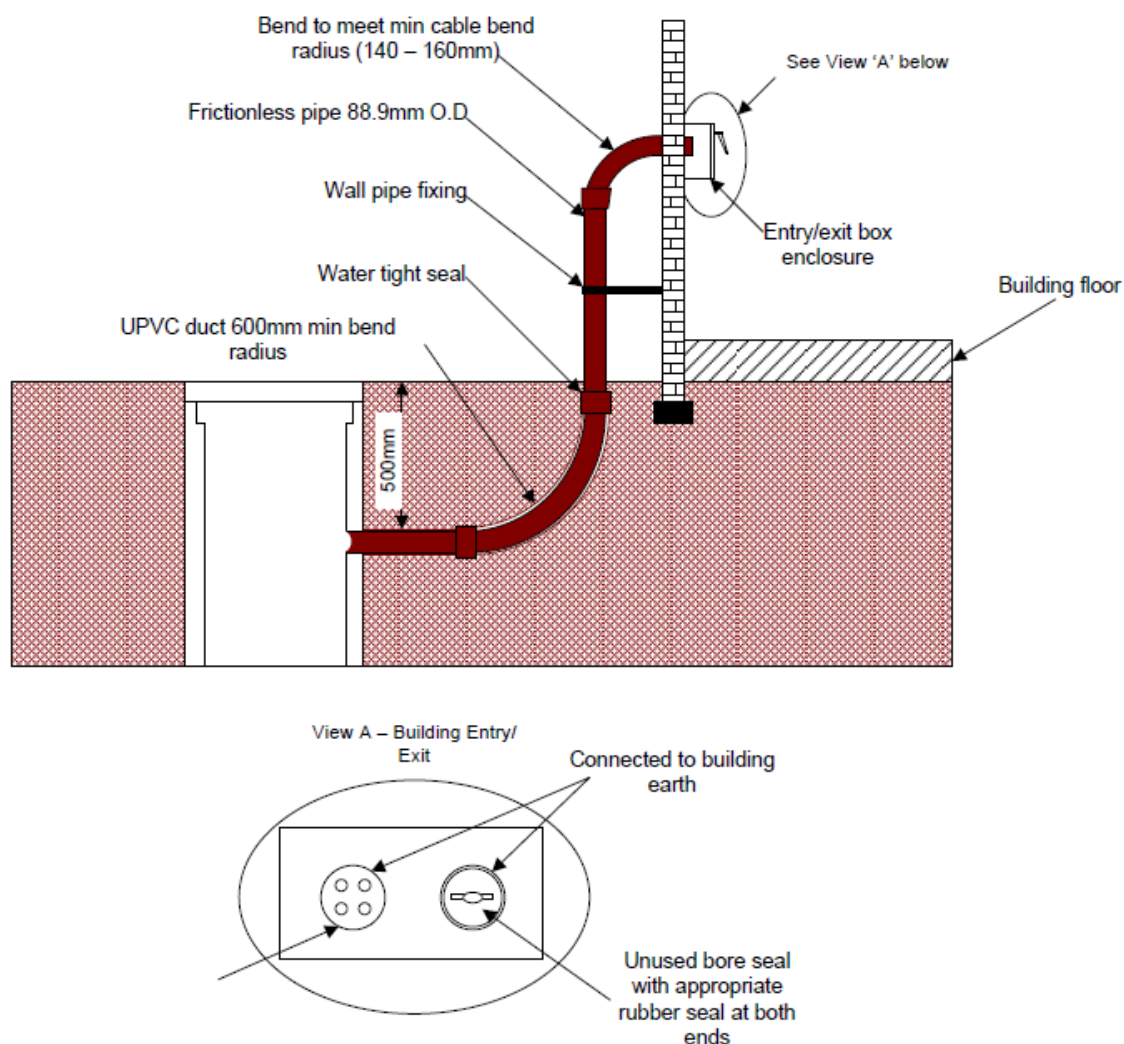


Figure 11-4 Building Entry Through Wall

Standards and Publications

30. BS EN 50174-3 'Information technology ~ Cabling installation, Installation planning and practices outside buildings'. This British Standard provides the detailed requirements and guidance relating to the installation planning and practices of outside cabling and plant by defining a planning strategy and guidance, design and installation rules for metallic and optical fibre cabling, requirements for satisfactory operation and the practices and procedures to be adopted to ensure that outside cabling and plant is installed in accordance with the specification.
31. BS EN 124 'Gully tops and manhole tops for vehicular and pedestrian areas Design requirements, type testing, marking, quality control'. This British Standard details the specification for pit lids (correctly termed manhole tops) for installation within areas subjected to pedestrian and/or

vehicular traffic, in terms of definitions, classes, materials, design and testing requirements, marking and quality control. A recent update to part 1 is Annex F (informative)
Recommendations for installation.

32. BS EN 13101 'Steps for underground man entry chambers, Requirements, marking, testing and evaluation of conformity'. This British Standard details the specification for access steps for installation into cable pits.
33. SDIP 29 'Facility Design Criteria and Installation of Equipment for Processing of Classified Information'.
34. NCSC GPG No14 'Electromagnetic Security'.
35. JSP 375 'MOD Health & Safety Handbook', Volume 2:

Chapter 27, 'Working at Heights'.

Chapter 28, 'Work in Confined Spaces'.

Chapter 33, 'Safety in Excavation'.

Chapter 9 – Dangerous Substances and Explosive Atmospheres (DSEAR)

Chapter 24 – Lifting Operations & Lifting Equipment (LoLER)