



CP 413 : July : 1973

UDC 696:69.027.7

Code of Practice for

Ducts for building services

Amendments issues since publication

Amd. No.	Date of issue	Text affected
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1. (AMD 1473)	13 September 1974	as indicated by
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2. (AMD 3345)	31 October 1980	as indicated by
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This Code of Practice represents a standard of good practice and therefore takes the form of recommendations. Compliance with it does not confer immunity from relevant statutory and legal requirements.

Foreword

During the revision of CP 413, the information and recommendations have been expanded to take into account ducts within buildings and external ducts. Unless otherwise stated, all clauses refer to both situations.

When preparing the Section dealing with the precautions to be taken to reduce the risk of the spread of fire or the products of combustion within a building through ducts, consideration was also given to the related, though not identical, risks associated with ventilation ductwork and it was decided to include as an appendix to this Code recommendations for the precautions to be taken when installing ordinary air distribution systems. These precautions will not necessarily relate to ventilation ductwork installed for special purposes such as controlling the spread of fire or smoke by pressurizing escape routes or where other special circumstances apply such as a requirement that the ventilation ductwork may be used for smoke extraction.

Although 'heart units', 'packaged plumbing' and 'service walls' may be termed 'ducts', these are specifically excluded and it is intended that they should be the subject of separate Codes.

As part of BSI's programme of metrication, this Code is expressed in metric terms. The metric values are given in SI units: for further information, reference should be made to BS 3763, 'The International System units (SI)' and PD 5686, 'The use of SI units'.

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British Standard Code of Practice for

Ducts for building services

1. General

1.1 Scope

This Code deals with the design and construction of subways, crawlways, trenches, casings and chases for the accommodation of services. In addition to dealing with the precautions to be taken to reduce the fire risk from these ducts it also includes, as an appendix, similar precautions for ventilation ductwork.

NOTE 1. Where the expression compliance with 'the relevant Building Regulations' is used, it means compliance with:

- (1) The Building Regulations 1972 applicable in England and Wales except Inner London, or
- (2) The London Building Acts 1930 to 1939 and construction by-laws in force thereunder, or
- (3) The Building Standards (Scotland) (Consolidation) Regulations 1971,
- (4) Any revisions to the above currently in force.

NOTE 2. The titles of the British Standards referred to in this Code are listed on the inside back cover.

1.2 Definitions

For the purposes of this Code, the following definitions apply:

- (1) *Access*. Provision for entry to ducts to facilitate the installation, maintenance and renewal of the various services.
- (2) *Casing*. A cover to conceal pipes or other installations as defined in BS 3589.
- (3) *Chase*. A recess formed or cut to receive the services.
- (4) *Compartmentation*. A separation or division of a building into firetight compartments by fire-resisting elements of building construction in order to contain a fire within the compartment of origin.
- (5) *Conduit*. Tubing formed to enclose and protect electric cables and wires.
- (6) *Crawlway (crawl space)*. A space providing access to services hung or laid therein and of a height sufficient for crawling.
- (7) *Duct*. An enclosed space provided for the distribution of services in a building.
- (8) *Expansion bay*. A recess formed in the side of a duct to accommodate the loop in a hot water or steam pipe which takes up expansion and contraction in the pipe.
- (9) *False ceiling*. A ceiling fixed so as to give sufficient space above it for services or to change the proportions of a room as defined in BS 3589.
- (10) *Fire resistance*. A property of an element of structure as defined in BS 4422.
- (11) *Non-combustibility*. A property of a building material as defined in BS 476, Part 4.
- (12) *Pit*. A chamber below ground or floor level.
- (13) *Run*. The path taken by pipes, conduits and cables.
- (14) *Services*. Installations for the introduction into and distribution within a building or structure of water, air, gas, liquid fuel, electricity, telecommunications, heat or other sources of energy; for the disposal of waste from a building or structure; and for the fire protection within a building or structure.
- (15) *Shunt duct*. A branch duct that, instead of making a direct connection to the main duct, turns through an angle and runs parallel to the main duct for a specified distance before turning into and connecting with the main duct.

- (16) *Subway*. A passage or duct constructed large enough to accommodate the services required and for a man to walk through.
- (17) *Sump*. A receiver constructed at low level to collect liquid drained from adjoining surfaces.
- (18) *Tanking*. An impervious membrane used in the construction of a sump, subway or trench, to prevent the infiltration of sub-surface water.
- (19) *Thermal insulating material*. Material of low thermal conductivity applied to the outside of a pipe or other container.
- (20) *Trench*. A covered shallow horizontal service space, less than 1050 mm in depth, in the floor or ground with access from above.
- (21) *Ventilation ductwork*. A lightweight enclosure used for the conveyance of air.

1.3 Exchange of information

1.3.1 In the initial planning stages of a project, information should be exchanged between the developer or the client and his advisers regarding the various services and their adequate allotted spaces which will be required for the project.

1.3.2 Consultations with the fire and other appropriate authorities should follow to ascertain that main services are available, that connections to these can be made and to agree the sizes of the services required for the project. At this stage consideration should be given also to possible increased requirements which may be necessitated by future developments within or adjacent to the project. Lack of systematic advance planning of services can result in inconvenience and undesirable and expensive alterations.

1.3.3 Specifications for the work should be prepared and these, together with the drawings, should provide the information necessary for the contractor and the specialists to locate the routes of the services and the ducts required to accommodate them. Detailed drawings of the ducts and services should be provided to a sufficiently large scale to show the space required for bends, junctions and valves and the size and positions of openings into and out of the duct.

1.3.4 Upon completion of the work, drawings showing the actual position of the ducts and services including all isolating valves embodied in the project should be prepared for the client to retain.

1.4 Construction programme

A construction programme should be prepared to co-ordinate the various operations involved in the work taking into account the installation requirements of the services contractors.

External ducts that are to be positioned close to buildings should be formed at the same time as the foundations, so as to obviate undermining the foundations at a later date.

2. Materials and components

2.1 Combustible materials

Where the spread of fire would endanger the occupants or contents of a building or structure or where the spread of smoke would endanger or be likely to cause panic among the occupants of a building or structure, combustible material should either be selected for satisfactory performance in case of fire or be so contained that fire and smoke cannot spread. This applies particularly to acoustic or thermal insulating materials used for the lining or insulating of ducts and to services within ducts and to the lining or insulating of ventilation ductwork and to materials used for the fabrication of ventilation ductwork.

2.2 Watertightness

2.2.1 Where ducts are constructed in conditions where they may be subject to water pressure, it is

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essential that they should be watertight on completion (see CP 102).

2.2.2 For work in connection with thermally insulated mains on wet sites, reference should be made to CP 3009.

3. Design

3.1 General

3.1.1 At the design stage, the positions of entry into a building for services should be determined. Provision can then be made during the construction for these positions by means of pipe sleeves or the formation of a duct from the boundary giving access into or under the building in the appropriate positions. The point of entry should, wherever possible, be on that side of the building nearest to the street in which the mains are installed. The space between any sleeve and the service pipe or cable should be sealed at the point of entry with a non-hardening, plastic material to prevent the passage of water, gas and vermin. Consideration should be given also to the effects of possible settlement of the building and the resultant stresses on the services.

3.1.2 Where services are to be carried above a false ceiling, it may be more convenient to form the ceiling after these are in position and not complete the finishings until after the services have been fixed and tested. Access should be provided in the floor above or in the false ceiling except where the ceiling is required to be jointless (see CP 290).

3.1.3 Excavation, ducts and the like should be kept free from water to enable the installation of services to proceed. Provision should be made for the drainage of horizontal and vertical ducts by means of sumps and sump pumps or by connecting to surface water drains.

3.1.4 Horizontal and vertical ducts in large projects should be incorporated in the design of the building.

3.1.5 Services liable to movement not catered for outside the building should be anchored to the duct immediately before entry.

3.1.6 The provision of a warning system should be considered for leaks of liquids or gas (see also 4.4.2).

3.1.7 Ducts should be designed and the services laid out so as to permit, wherever reasonably practicable, the effective inspection and maintenance of the pipes and electrical services.



3.2 Arrangement of ducts

3.2.1 General Ducts are required to accommodate services from their points of entry to their respective controls and then to the various distribution points. They should not be placed in a position where they might weaken the structure without special precautions being taken.

The system of ducts will depend upon the size of the building and the extent of the services being accommodated. For example, pipes may be used as sleeves for single service supply entry but, in large buildings, crawlways or subways may be required.

In the latter case, the system of ducts falls into three main groups.

3.2.1.1 Main ducts: horizontal. These link the various entry points with the main controls and other ducts. They will be sited usually below ground floors, above corridors or at basement level and, where the number of services to be accommodated is large, should take the form of subways, crawlways or trenches. In such cases, it is important that adequate working space and space for crossovers should be allowed for the installation and also for future repair and maintenance.

3.2.1.2 Main ducts: vertical. These lead from the main horizontal ducts to the lateral ducts on the various floors. Their size will depend upon the number of services to be carried and they may be designed as part of the main structure. Vertical ducts may extend throughout the height of a building and their number

and spacing should be such as to allow for convenient lateral distribution of the various services to each floor. It is important to give consideration to means of access for repair and maintenance or the addition of future services. The means of access should be related to the length and dimensions of the pipes and fittings used.

3.2.1.3 Secondary ducts. These form the secondary distribution from the main ducts to the rooms or other points where services may be required. They may be included as a part of the main structure, e.g. as chases or cavities, or they may be preformed ducts. Wherever possible, a duct should serve the rooms on both sides.

3.3 Use of common ducts

3.3.1 A duct may be used for the accommodation of different services provided certain precautions are taken. Some services may be run adjacent to each other while others may not. One service can cause deterioration or affect the performance of an adjacent service (see Table 1).

3.3.2 Electrical services and pipes containing town gas (see table 1) should be spaced as far apart as is reasonably practicable. In all cases the separation should prevent fortuitous contact.



3.4 Position and dimensions

3.4.1 All ducts for services in the carcase of the building should be formed as far as practicable during the course of construction. Although minor modifications may be found desirable on the site which would facilitate the installation of services, their bends or thermal insulation, the desirability of agreeing the position and dimensions of the ducts, prior to the commencement of the work, cannot be stressed too highly.

3.4.2 The dimensions of the ducts should be adequate to accommodate the services including loops, controls, bends, thermal insulation etc.; to allow work space for installation and maintenance; to permit access to cleaning eyes, stop cocks and other controls for their operation and also for repairs, extensions and modifications. If necessary, it should be possible to remove one pipe from its supports without disturbing the remainder.

3.5 Subways, crawlways and trenches

3.5.1 It is essential that subways, crawlways and trenches should be constructed to withstand the imposed loads and pressures under working conditions, should be watertight and, within buildings, should have the appropriate fire resistance.

3.5.2 Notwithstanding the foregoing, subways, crawlways, and trenches should have drainage facilities to deal with possible leakages and should be ventilated to the open air (see 4.4).

3.5.3 Where access to crawlways or subways is by means of a duct cover, step irons should be provided on one wall of the duct, see CP 301.

3.6 Chases within buildings

Adjacent areas should be of solid construction if the chases are cut out. It is essential that they should not be cut to such depth or width, or in such a position, as to impair the stability, fire resistance or sound insulation of the construction.

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Table 1. Relation of various services to each other

Service	Hot water and steam	Ventilation and air-conditioning†	Cold, drinking and chilled waters	Electricity*	Telecom-munications	Town Gas §	Drainage	Oil‡	Flammable liquids and gases	Compressed air
Hot water and steam		space out and/or insulate	not adjacent to; space out and/or insulate	not adjacent to	not adjacent to	not critical	not exposed to leakage from	not exposed to leakage from	not in the same duct	not critical
Ventilation and air-conditioning†	space out and/or insulate		space out and/or insulate	not adjacent to	not adjacent to	not in the same duct	not exposed to leakage from	not exposed to leakage from†	not in the same duct†	not critical
Cold, drinking and chilled waters	space out and/or insulate	space out and/or insulate		not adjacent to	not adjacent to	not critical	not exposed to leakage from	not exposed to leakage from	not exposed to leakage from	not critical
Electricity*	not exposed to temperature or leakage from	not exposed to temperature from	not exposed to leakage from		not adjacent to without further precautions	space out and/or insulate (see 3.3.2)	not exposed to leakage from	not exposed to leakage from	not in the same duct	not critical
Telecommunications	not exposed to temperature or leakage from	not exposed to temperature from	not exposed to leakage from	not adjacent to without further precautions		space out and/or insulate	not exposed to leakage from	not exposed to leakage from	not in the same duct	not critical
Town gas §	not exposed to leakage from	not in the same duct	not exposed to leakage from	space out and/or insulate (see 3.3.2)	space out and/or insulate		not exposed to leakage from and not run adjacent to	not critical unless gas leakage occurs	not in the same duct	not to be run where gas leakage could be circulated
Drainage	not critical unless drain leakage occurs	not critical unless drain leakage occurs	not critical unless drain leakage occurs	not adjacent to	not adjacent to	not critical unless drain leakage occurs		not critical unless drain leakage occurs	not in the same duct	not critical unless drain leakage occurs
Oil‡	not exposed to temperature or leakage from	not exposed to temperature from	not exposed to leakage from	not adjacent to	not adjacent to	not critical unless gas leakage occurs	not exposed to leakage from	not critical	not critical	not critical
Flammable liquids and gases	not in the same duct	not in the same duct	not exposed to leakage from	not in the same duct	not in the same duct	not in the same duct	not in the same duct	not critical		not in the same duct
Compressed air	not critical	not critical	not critical	not critical	not adjacent to	not to be run where gas leakage could be circulated	not exposed to leakage from	not critical	not in the same duct	

NOTE 1. It is on occasion necessary to run different services to the same position to operate NOTE 4. Where possible, the main soil and surface water drainage should be situated below all equipment connected directly to a number of services. The above precautions should be taken in other services.

NOTE 2. Services should not be run within supply ventilation or air conditioning ductwork or within return air ductwork if recirculation is possible.

NOTE 3. Where practical, electric alarm or telecommunications should be run in a duct containing her services; if not possible to isolate, electric alarm and telecommunications should be placed.

*Refer to the current edition of the 'Regulations for the electrical equipment of buildings' published by the Institution of Electrical Engineers.

†Air intakes for ventilation should be free from risk of flammable vapours.

‡Oil indicates those liquids having a flash point above 23°C.

§Town gas is combustible gas normally supplied to the public by a utility undertaking in accordance with statutory requirements.

3.7 Access (see also 3.10.4)

3.7.1 Subways. Subways should be wide enough so that after all services have been installed there remains a clear working space of at least 700 mm in width, with a head room of not less than 2000 mm. Allowance should be made for thermal insulation material, where required.

The main access to a subway will be gained usually from the basement, plant room or control room but additional access should be provided at convenient points, especially at changes of direction and junctions. Removable access covers, minimum 450 mm wide x 600 mm long should be provided at these points. It is essential that covers should be strong enough to carry any loads or traffic which they may have to bear and have adequate lifting facilities.

It may be desirable for access openings to be long enough and suitably placed to enable lengths of pipe to be installed and removed with ease. Where discharge and ventilating pipes are accommodated in subways, access to cleaning eyes should be provided.

3.7.2 Crawlways. Crawlways should be wide enough so that after all services have been installed there remains a clear working space of at least 700 mm in width, with a head room of not less than 1000 mm. Allowance should be made for thermal insulation material, where required. Access openings should be provided at intervals by means of covers, minimum 450 mm wide x 600 mm long.

It may be desirable for access openings to be long enough and suitably placed to enable lengths of pipe to be installed and removed with ease. Where discharge and ventilating pipes are accommodated in crawlways, access to cleaning eyes should be provided.

3.7.3 Trenches. Trench covers, on account of their weight do not usually require fixing, but where timber covers are used, they should be fixed with brass cups and screws. It is essential that covers should be strong enough to carry any load or traffic which they may have to bear.

Each section of trench cover for continuous access should be light enough to be lifted by one man or by two at the most. Sockets for lifting handles or keys should be incorporated where necessary.

Where discharge and ventilating pipes are accommodated in trenches, access to cleaning eyes should be provided.

Continuous trench covers generally require individual adjustment during installation to ensure accurate alignment of the surfaces with adjacent floor surfaces and to eliminate any tendency to rock upon the bearing points. It is, therefore, important that individual sections of trench covers be numbered or marked to ensure that they are placed in correct sequence.

3.7.4 Vertical ducts. Vertical ducts should have similar means of access for removal of lengths of pipes as provided for subways, crawlways and trenches. Access for the passage of a man should not be less than 1400 mm x 600 mm wide (see 3.10.2.2).



Access to a large vertical duct is often obtained from a basement by means of a ladder extending inside the duct to its full height, see 3.10.7.1. Smaller vertical ducts and chases (through which a man cannot pass) should be provided with doors or detachable panels. The doors and panels should be secured to continuously rebated posts, any door heads or cross timbers being avoided as far as possible.

Where hot pipes are accommodated in the ducts, the back of the access panels should be protected by insulating material so as to avoid shrinkage and distortion. Such panels should fit with an airtight joint to avoid discoloration of adjoining surfaces by escaping warm air.

Access panels should have adequate fire resistance (see Section 4).

3.7.5 Chases. Chases may be provided with covers or filled in as required.

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3.8 Sound transmission

Ducts may form a ready transmission path for sound and the necessary precautions should be taken in design to provide adequate control of sound transmission between different parts of the building. Suitable planning of the duct position may minimize the effects of sound transmission. Structural precautions to reduce transmission include adequate weight of the duct walls, the sealing of gaps to avoid transmission via air paths, adequately designed access panels, which should be kept to a minimum both in size and number, and, if necessary, the introduction of barriers at floor levels in vertical ducts. See CP 3, Chapter III.

3.9 Transmission of heat

Ducts for hot pipes should not be placed within or in close proximity to spaces where transmission of heat would be likely to injure the fabric and contents of the building or cause discomfort to the occupants. Where necessary pipes or ducts where not already insulated should be insulated to prevent such effects.....

3.10 Safety precautions and control of hazards

3.10.1 General

3.10.1.1 The safety of the building and all occupants and maintenance personnel should be provided for during the design, construction and fitting out of ducts for services.

Special consideration should be given to the safety of personnel required to enter and work inside the ducts in the knowledge of the hazards likely to be encountered.

3.10.1.2 The nature of the operations to be carried out within the ducts should be assessed in detail, in order to determine the facilities operatives will need in order to work safely.

3.10.1.3 All ducts should be checked periodically as a planned maintenance routine to see that safety requirements are being observed.

3.10.2 Duct interiors

3.10.2.1 Where other requirements do not operate it is desirable to sub-divide the duct into compartments with fire resisting walls at intervals not exceeding 45 m.

3.10.2.2 Interiors of ducts should be simple and regular in shape and sudden changes in shape and floor levels should be avoided.

3.10.2.3 Pipelines or services within the ducts should be suitably insulated and protected to avoid endangering personnel. Step irons and handrails should not be in contact with hot pipes.

3.10.2.4 Unexpected obstructions or projections by the duct or by the services and equipment within should be limited by careful design and installation.

3.10.2.5 Services and equipment should be arranged neatly within ducts and should be readily accessible for maintenance.

3.10.2.6 Where an intricate system of ducts exists, the sections should be marked with clear identifying signs, see 3.13, and key plans should be mounted at all access positions showing the location of the access.