BS 5410-1:2014

BSI Standards Publication

Code of practice for oil firing

Part 1: Installations up to 45 kW output capacity for space heating and hot water supply purposes

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Publishing and copyright information

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Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 58, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 5410 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 December 2014. It was prepared by Technical Committee RHE/13, *Oil burning equipment*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 5410 supersedes BS 5410-1:1997 (incorporating Amendment No 1:2001, Amendment No 2:2001 and Amendment No 3:2006) which is withdrawn.

Relationship with other publications

BS 5410 is published in three parts:

- *Part 1: Installations up to 45 kW output capacity for space heating and hot water supply purposes*;
- *Part 2: Installations over 45 kW output capacity for space heating, hot water and steam supply services;*
- *Part 3: Installations for furnaces, kilns, ovens and other industrial purposes.*

Information about this document

This is a full revision of the standard, and introduces the following principle changes:

- condensing boilers are now included;
- boilers burning biofuels are now covered.

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Use of this document

As a code of practice, this part of BS 5410 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this part of BS 5410 is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this part of BS 5410 that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

In particular, attention is drawn to the following specific regulations.

- The Boiler (Efficiency) Regulations 1993 as amended by the Boiler (Efficiency) (Amendment) Regulations 1994 and the Boiler (Efficiency) (Amendment) Regulations 2006 [1];
- The Building Regulations [2], [3], [4];
- The Environmental Protection Act 1990 [5];
- The Control of Pollution (Special Waste) (Amendment) Regulations 1988 [6];
- The Control of Pollution (Oil Storage) (England) Regulations 2001 [7];
- The Control of Pollution (Oil Storage) (Amendment) Regulations (Northern Ireland) 2011 [8];
- The Water Environment (Oil Storage) (Scotland) Regulations 2006 [9];
- The Hazardous Waste (England and Wales) Regulations 2005 (as amended) [10];
- The Hazardous Waste Regulations (Northern Ireland) 2005 [11];
- The Special Waste (Amendment) (England and Wales) Regulations 2001 [12];
- The Special Waste Amendment (Scotland) Amendment Regulations 2004 [13];
- The Building (Approved Inspectors etc.) Regulations 2010 [14];
- The Building (Forms) (Scotland) Regulations 2005 (as amended) [15].

1 Scope

This part of BS 5410 gives recommendations and guidance on the design, installation, commissioning and maintenance of oil burning installations up to 45 kW output capacity for space heating and hot water supply purposes. It also gives recommendations and guidance on the selection and installation of oil tanks of capacity up to 3 500 L, when installed at buildings used primarily as dwellings. The standard is also applicable to oil fired cookers where these are connected to flues. This part of BS 5410 is not applicable to oil fired systems for marine and transportable installations, or for flueless heaters.

This part of BS 5410 is applicable to installations burning liquid fuel conforming to BS 2869:2010+A1, including biofuels conforming to BS EN 14214, and blends thereof.

This standard is intended for use by designers, specifiers, installers, and service and commissioning engineers.

NOTE 1 The types of appliances and burners covered by this part of BS 5410 are described in Annex A.

NOTE 2 Oil tank installations at buildings used primarily as dwelllings, with an oil storage capacity greater than 3 500 L are covered by BS 5410-2:2013.

NOTE 3 Oil tank installations at buildings other than dwellings, with oil storage capacity up to 3 500 L, are covered by BS 5410-2:2013, ***10.7****.*

2 Normative references

Standards publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 41:1973, *Specification for cast iron spigot and socket flue or smoke pipes and fittings*

BS 799-5, *Oil burning equipment – Part 5: Carbon steel oil storage tanks – Specification*

BS 2869:2010+A1:2011, *Fuel oils for agricultural, domestic and industrial engines and boilers – Specification*

BS 5410-2:2013, *Code of practice for oil firing – Part 2: Installations over 45 kW output capacity for space heating, hot water and steam supply services*

BS 6999:1989, *Specification for vitreous-enamelled low-carbon-steel fluepipes, other components and accessories for solid-fuel-burning appliances with a maximum rated output of 45 kW*

BS 7671, *Requirements for electrical installations – IEE Wiring Regulations – Seventeenth edition*

BS EN 1057:2006+A1;2010, *Copper and copper alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications*

BS EN 14125:2013, *Thermoplastic and flexible metal pipework for underground installation at petrol filling stations*

BS EN 1254-2:1998, *Copper and copper alloys – Plumbing fittings – Part 2: Fittings with compression ends for use with copper tubes*

BS EN 1856-1:2003, *Chimneys – Requirements for metal chimneys – Part 1: System chimney products*

BS EN 12285-1, *Workshop fabricated steel tanks – Part 1: Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids*

BS EN 13341, *Static thermoplastic tanks for above ground storage of domestic heating oils, kerosene and diesel fuels – Blow moulded and rotationally moulded polyethylene tanks and rotationally moulded tanks made of anionically polymerized polyamide 6 – Requirements and test methods*

BS EN 14214, *Liquid petroleum products – Fatty acid methyl esters (FAME) for use in diesel engines and heating applications – Requirements and test methods*

BS EN 50291, *Electrical apparatus for the detection of carbon monoxide in domestic premises – Test methods and performance requirements*

Other publications

[N1] CHARTERED INSTITUTION OF BUILDING SERVICES ENGINEERS. *Domestic heating – Design guide*. London: CIBSE, 2013.

[N2] OIL FIRING TECHNICAL ASSOCIATION. OFS T200 *Steel oil storage tanks and tank bunds for use with distillate fuels, bio-fuels, lubrication oils and waste oils. Construction standards and test procedures*. Issue 10. Ipswich: OFTEC, 2012.

[N3] OIL FIRING TECHNICAL ASSOCIATION. OFS T100 *Polyethylene oil storage tanks and tank bunds for distillate fuels. Construction standards and test procedures*. Issue 8. Ipswich: OFTEC, 2012.

[N4] OIL FIRING TECHNICAL ASSOCIATION. Technical Book 3, *Domestic and commercial requirements for oil storage and supply equipment: Serving fixed combustion appliances*. Ipswich: OFTEC, 2010.

[N5] ENVIRONMENT AGENCY. Pollution prevention guidance note PPG27 *Installation, decommissioning and removal of underground storage tanks.*

[N6] CONSTRUCTION INDUSTRY RESEARCH AND INFORMATION ASSOCIATION. Report 163 *Construction of Bunds for Oil Storage Tanks*. CIRIA, 1997

[N7] OIL FIRING TECHNICAL ASSOCIATION. Technical Book 2, *Domestic and light commercial service and commissioning: Requirements for oil fired systems (Pressure jet appliances)*. Ipswich: OFTEC, 2010.

[N8] OIL FIRING TECHNICAL ASSOCIATION. Technical Book 5, *Domestic servicing and commissioning: Requirements for oil fired systems (Vaporizing appliances)*. Ipswich: OFTEC, 2010.

3 Terms and definitions

For the purposes of this part of BS 5410 the following terms and definitions apply.

3.1 tank chamber
enclosure of a tank consisting of structural walls, floor and ceiling or roof

NOTE The main purpose of a tank chamber is to protect the contents of the tank from a fire originating outside the tank chamber.

3.2 bund
containment vessel to hold spillage from a primary tank or tanks caused by leakage or overfilling

NOTE 1 A bund provides secondary containment to a primary tank and is sometimes referred to as "secondary containment".

NOTE 2 A bund is designed to contain any leakage from the primary tank or any liquid escaping in an overfill situation and so prevent pollution and the risk of fire.

NOTE 3 A bund may be provided as an integral part of an oil storage tank.

3.3 chimney
construction to carry the products of combustion to the atmosphere having one or more passages

NOTE The passages are known as "flues".

3.4 primary tank
vessel used for the containment of liquid fuel

3.5 service tank
tank that isolates the main storage tank or tanks from the burner installation

4 Liquid fuels

4.1 Types of liquid fuel

Liquid fuel conforming to an appropriate class specified in BS 2869:2010+A1, and biofuels conforming to BS EN 14214, as specified by the equipment manufacturer, should be used with the equipment covered by this standard.

The specifier of the installation and the user should consult the local authority regarding any local controls which might limit the types of liquid fuel that may be used.

4.2 Liquid fuel characteristics

Users should obtain information on the typical characteristics of the fuel supplied, and advice on the safe storage and handling of this, from their fuel supplier.

A safety data sheet should also be obtained from the fuel supplier or from the fuel producer.

NOTE Attention is drawn to the Control of Substances Hazardous to Health Regulations [16] regarding the information that the safety data sheet is required to contain.

5 Installation of oil fired appliances

5.1 General

NOTE 1 The initial installation and replacement of oil fired appliances is work covered by the Building Regulations [2], [3], [4].

This type of work should be undertaken by competent technicians, subject to supervision by either a registration body or the local authority building control department.

NOTE 2 In England and Wales, Jersey, Guernsey and the Isle of Man, if a person registered with an approved scheme is used for such work then it is not required that application is made to the local authority building control department for approval prior to the work commencing and such firms can self-certify compliance of their work at completion.

NOTE 3 In England and Wales, Jersey, Guernsey and the Isle of Man, where documentation is required by the local authority to confirm competent installation work, form CD/10 [17] has been approved for use.

NOTE 4 Attention is drawn to the Building Regulations [2], [3], [4] with respect to structural alterations to buildings.

5.2 Selection of appliance

5.2.1 Factors affecting selection

NOTE The serviceability and safety of a heating appliance depend upon careful selection to enable it to match its working environment as well as the characteristics of the appliance itself.

The manner in which appliances are used varies from building to building and this should be taken into account when a heating appliance is selected. The operating factors listed in **5.2.2** should be ascertained and used in the selection of the appliance.

5.2.2 Operating factors

5.2.2.1 The required gross capacity of the heating appliance should be determined on the basis of the following factors:

a) the preferred room temperature;

b) the design winter temperature;

c) the structural and ventilation heat losses per °C;

d) the degree of continuity of heating required by the use;

e) the extent to which space and water heating are to be coupled;

f) the preferred form of user control or programming.

5.2.2.2 The rated output of the appliance should be able to meet the calculated space and water heating demand.

NOTE Correct selection of system controls can avoid the need for a margin of extra capacity.

5.2.2.3 The low load requirements of the heating system should also be taken into account, particularly when space and water heating are to be combined. If these requirements are likely to be exceeded at the lowest limit of the turn-down range of a continuously burning semi-automatic appliance, an automatic on/off appliance should be used.

NOTE Guidance on the design of space and water heating systems is given in BS EN 12828 and the CIBSE Domestic heating – Design guide [N1].

5.2.2.4 Heating systems served by fully automatic oil fired appliances should be of the fully pumped circulation type with their electrical controls arranged to prevent the burner short cycling.

NOTE Attention is drawn to the Building Regulations [2], [3], [4] with regard to heating system control.

5.3 Siting of appliance

5.3.1 General

The appliance should be sited so as to reduce risks, especially the risk of fire, to a minimum. If possible, the appliance should be installed at ground floor or basement level, preferably in a boiler room, utility area or kitchen. The appliance should be installed on a floor or above a surface which is impervious to oil. Any spillages from the burner or connections should be contained within the appliance or within a separate containment tray. The appliance should not be positioned where accidental spillage would be able to soak into combustible material such as wood or carpeting. Fuel pipework within the building should be kept to a minimum.

NOTE 1 Attention is drawn to the Building Regulations [2], [3], [4].

If an open-flued appliance is to be installed inside a building or within a restricted area externally, a carbon monoxide detector alarm conforming to BS EN 50291 should be installed in accordance with the manufacturer's instructions.

The need to avoid noise and vibration nuisance to building occupants and neighbours should be taken into account.

The following should also be taken into account:

a) any constraint imposed under **5.2.2**;

b) the manufacturer's installation instructions with respect to the provision of space around the appliance to allow:

   1) sufficient circulation of air for combustion and cooling and the operation of a draught diverter if required;

   2) sufficient access and clearance for maintenance and servicing (see also **5.6.10**);

c) environmental conditions, and need for combustion and ventilation air in accordance with **5.4**;

d) heat emission from the appliance casing and the manufacturer's instructions with respect to provision of protection of the floor or wall on which the appliance is to be mounted;

e) the recommendations given in Clause **10** regarding flues and chimneys;

f) the fact that open-flued appliances should not be installed in bathrooms, bedrooms or bedsitting rooms because of the possible increased risk of carbon monoxide poisoning.

NOTE 2 The physical size of the appliance might determine whether it can be accommodated in a habitable room or whether it needs to be separately housed.

If an appliance is intended to be built-in, so that it is adjacent to combustible material, an appliance classified as suitable for this purpose should be selected.

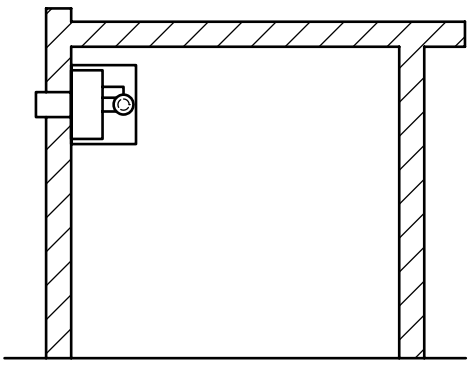
5.3.2 Room sealed appliances

In circumstances where it is necessary to avoid taking air for combustion or for draught control from within the habitable space, a room sealed appliance should be selected.

5.4 Provision of air for combustion and ventilation

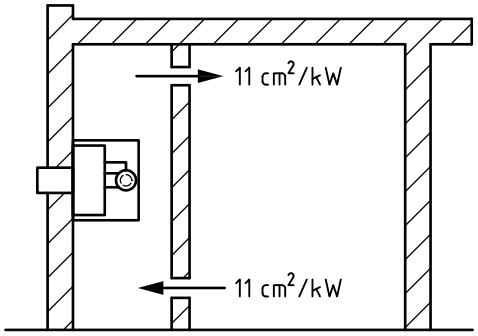
NOTE The recommendations given in this Clause for the provision of combustion and ventilation air supplies for different types of appliances are illustrated in Figure 1 and Figure 2.

Figure 1 **Combustion and ventilation air supply for room sealed balanced flue oil fired appliances**

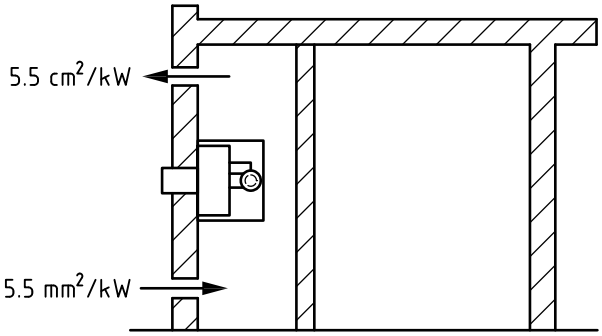


a) Room sealed balanced flue. No combustion air inlet required to room

Figure 1 **Combustion and ventilation air supply for room sealed balanced flue oil fired appliances**



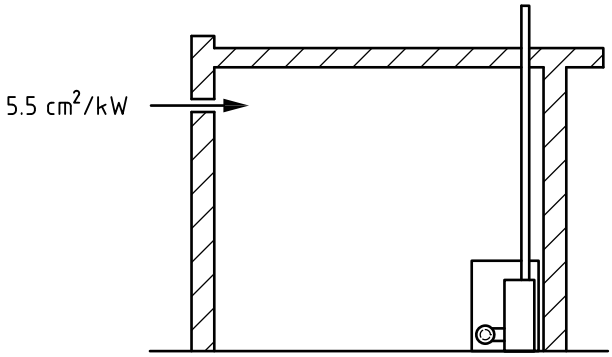
b) Room sealed balance flue. Compartment ventilated from room



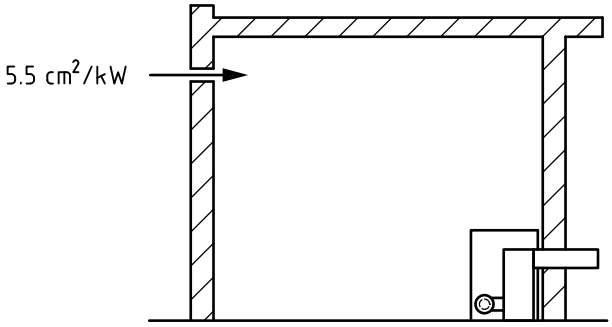
c) Room sealed balanced flue. Compartment ventilated from outside

NOTE The values in the drawings indicate free areas of grilles in relation to appliance output.

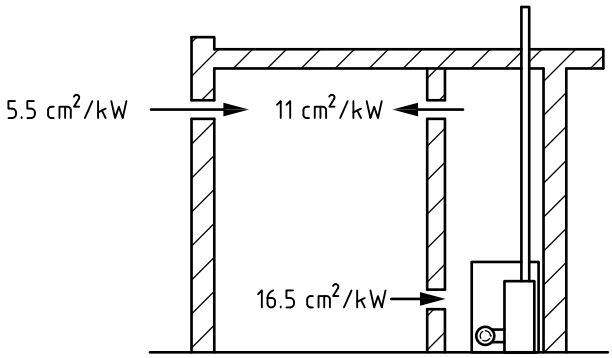
Figure 2 **Combustion and ventilation air supply for open flue oil fired appliances**



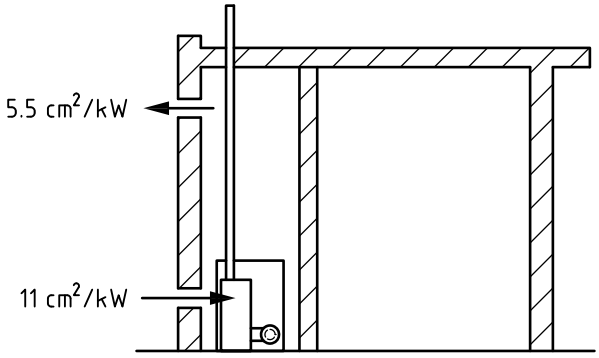
a) Conventional open flue appliance in room



b) Open flue low level discharge appliance in room



c) Open flue appliance in compartment ventilated from room



d) Open flue appliance in compartment ventilated from outside

NOTE 1 The values in the drawings indicate the free areas of grilles in relation to appliance output.

*NOTE 2 Recommendations for extract fans are given in **5.4.7**.*

5.4.1 General

A sufficient permanent air supply to an appliance should be provided:

a) for proper combustion of fuel and effective discharge of combustion products to the open air;

b) for the ventilation of any confined space in which an appliance is installed to prevent overheating of the appliance and any equipment in and near the appliance;

c) for the satisfactory operation of any draught break or stabilizer which might be fitted.

The designer and installer should ensure that the air required for these functions is introduced in such a way as to cause as little discomfort as possible to building occupants and thus to offer them the least temptation to obstruct ventilators.

5.4.2 Air for combustion for open flued appliances

The room or space in which the appliance is installed should have a purpose designed non-closeable opening or duct which is designed to allow the passage of air at all times, equivalent in total free area to 5.5 cm^2 for each kilowatt (kW) of appliance rated output.

NOTE 1 The recommended means of providing the minimum combustion/make up air for a vaporizing appliance is to fit a grille having a free area of at least 100 cm^2 to pass air directly from the outside into the room or space in which the appliance is fitted.

NOTE 2 Such provision is not necessary for a room sealed appliance designed to take air for combustion directly from outside.

5.4.3 Air for ventilation

For an appliance in a confined space, such as a boiler compartment, care should be taken to provide air for ventilation. The minimum free area of openings to be provided in addition to that for combustion air should be as follows:

a) where the air is taken from a heated space, 11 cm^2/kW at high level and 11 cm^2/kW at low level;

b) where the air is taken from outside, 5.5 cm^2/kW at high level and 5.5 cm^2/kW at low level.

This provision should be made for both open flued and room sealed appliances.

NOTE 1 Free area is the unobstructed opening allowing air to flow through the grille or air brick.

NOTE 2 A compartment is a room or space partitioned for the purpose of containing plant and equipment, or a room or space of insufficient volume to satisfactorily disperse the build-up of heat around the plant and equipment contained therein.

5.4.4 Air supply ducts and grilles

Grilles and other openings should be of the purpose designed non-closeable type.

They should be positioned so that they are not likely to be accidentally blocked, i.e. they should always be positioned in the vertical plane even if they supply air from an underfloor or similar area. Where more than two air vents are fitted in series across an air supply path, the free area of each vent should be increased by at least 50% over that required for a corresponding single vent. Ductwork should be properly supported and sealed, particularly where it crosses cavities. The cross-sectional area should be not less than the area of the opening required to accommodate the air vent it serves.

5.4.5 Draught breaks and stabilizers

An appliance fitted with a draught break or draught stabilizer should have adequate inlet air supply to allow efficient operation. Where ventilation openings are provided as recommended in **5.4.3** no separate allowance need be made, but where a combustion air supply opening only is provided an additional free area of 5.5 cm^2/kW should be provided.

5.4.6 Basement installations

When combustion air is supplied to an appliance in a basement, or similar below ground enclosed area, it should be ducted to low level.

5.4.7 Extract fans

5.4.7.1 General

If the building containing an open flued combustion appliance has an extract ventilation fan fitted that could affect appliance performance, the supply of air should be such that the operation of the appliance and flue is unaffected when the external windows and doors are closed, the internal doors are open and the extract fan is running. In these cases a flue draught interference test as described in **5.4.7.2** should be carried out. Extract fans should be fitted far enough away from open flued appliances to minimize the risk of interference with the flue. A separate air supply opening should be provided to supply air to the extract fan. This should be sized to allow the entry of sufficient air to ensure that the fan does not affect the operation of the flue to the oil fired appliance.

NOTE Guidance on air extract rates is given in OFTEC Technical Book 4 [18].

5.4.7.2 Testing for flue draught interference

To carry out a flue draught interference test when the appliance and the extract fan are in the same room, the doors and windows of the room should be closed. Any adjustable ventilation openings should also be closed. Where the extract fan is located elsewhere in the building, the external doors should be closed and the internal doors between the fan and the appliance should be left open.

When the doors and windows have been adjusted, the extract fan should be set in operation at its full capacity. After the fan has established its normal airflow pattern the oil fired appliance should be set in operation at maximum output. Combustion condition readings should then be taken with and without the extract fan running. The test should be carried out to check that there is no interference by the fan with the performance of the oil fired appliance under all operating conditions.

The effects of the operation of appliances using other fuels and of appliances such as tumble dryers which extract air to the outside should be taken into account.

5.5 Water circulating heating systems

Water circulating heating systems should be designed and installed in accordance with the recommendations given in the CIBSE *Domestic heating – Design guide* [N1].

5.6 Special installations

5.6.1 General

If it is not possible to install the appliance at ground floor or basement level in a kitchen or utility area or the boiler room, and an alternative installation is needed, the recommendations given in **5.6.2** to **5.6.11**, as applicable, should be followed. In these cases, the general safety recommendations for the siting of the appliance given in **5.3** should also be followed.

5.6.2 Heating appliance compartment installations

A heating appliance compartment should be in accordance with the following recommendations.

a) It should be a fixed rigid structure, the internal surfaces of which are protected in accordance with item f).

b) It should incorporate air vents for the provision of air for ventilation and, where necessary, for combustion in accordance with **5.4**.

c) It should permit access for inspection and servicing of the appliance and any ancillary equipment. It should be fitted with a door that will permit withdrawal of the appliance and any ancillary equipment. To discourage its use as a storage cupboard, a notice should be fixed in a prominent position to warn against such use.

d) Where the appliance compartment houses an open-flued appliance, the air vents should not communicate with a bathroom, bedroom or bedsitting room. Any draught diverter should be in the compartment.

e) Where the compartment houses an open-flued appliance and the door opens on to a garage, bathroom, bedroom, bedsitting room, then the door should have a warning notice attached stating: “This door must be kept closed at all times except when resetting the appliance controls”.

f) The internal surfaces of the compartment should be protected in accordance with the appliance manufacturer’s installation instructions. Where the appliance manufacturer’s installation instructions do not give specific instructions, any internal surface of the compartment which is of combustible material either should be at least 75 mm from any part of the appliance or should be lined with non-combustible material.

NOTE Information on determining whether a material may be described as combustible or non-combustible is given in BS 476-4.

5.6.3 Airing cupboard installations

The partitioned space of an airing cupboard adapted to house an appliance should be in accordance with **5.6.2**.

Additionally, the airing spaces should be separated from the appliance by a non-combustible partition which may be perforated, if required, by apertures the major dimension of which should not be greater than 13 mm.

The flue pipe should not pass through the airing space unless protected sufficiently to prevent damage to the airing space contents or injury to users.

NOTE 1 For double wall flue pipe, the external skin and air gap provide insulation to a standard where no extra precautions are necessary other than normal installation tolerances.

NOTE 2 Further information on double wall flue pipe is given in BS 6999.

For single wall flue pipe, protection should be provided by an air gap of at least 25 mm.

NOTE 3 This air gap may be provided by a non-combustible guard which forms an annular space around the flue pipe of not less than 25 mm.

Where the compartment partition is positioned next to a protected flue, the gap between the flue guard and compartment partition should not exceed 13 mm.

NOTE 4 Expanded metal or rigid wire mesh can be used for the partition and guard.

5.6.4 Understairs installations

An appliance should only be installed in an understairs location where no practicable alternative location is available. Whenever possible, an appliance in an understairs location should be of the room sealed type.

Understairs installations should be in accordance with the following recommendations.

a) The premises in which the appliance is to be located should be no more than two storeys.

b) Where the area is enclosed, the enclosure should be in accordance with **5.6.2**.

c) All internal surfaces around and above the appliance, including its base, should be non-combustible or lined with non-combustible material having a fire resistance of not less than 30 min.

NOTE Further information on determining fire resistance is given in BS 476-4.

d) The air vents should be direct to outside air.

5.6.5 Fireplace installations

Fireplace installations should be in accordance with the following recommendations.

a) An appliance which is purpose designed for location in a fireplace recess should be installed with space around it for air circulation and combustion air supply and with space for maintenance and servicing in accordance with the manufacturer's installation instructions.

b) The dimensions of the fireplace opening and the flue should be as given in the appliance manufacturer's instructions.

NOTE 1 It might be necessary to modify the fireplace opening or the flue to give the appropriate dimensions (however, see Note 3).

c) A hearth should be provided in accordance with **5.7**.

d) The appliance should be flued in accordance with Clause **10**. An existing brick chimney should be swept and lined with an appropriate rigid or flexible liner before use for this type of appliance.

Purpose designed enclosures and flues should be constructed of non-combustible material and sized in accordance with the appliance manufacturer's instructions.

NOTE 2 Proprietary items constructed of suitable material are available.

NOTE 3 Structural work to fireplace recesses requires Building Regulation [2], [3], [4] approval.

5.6.6 Bathroom installations

An appliance should only be installed in a bathroom if no practicable alternative location is available.

An appliance installed in a bathroom should be of the room sealed type.

The electrical connections to the appliance should be in accordance with BS 7671. Switches or controls in bathrooms should be enclosed by the appliance outer casing or compartment in such a way that they cannot be touched by a person using the bath or shower.

5.6.7 Bedroom and bedsitting room installations

An appliance should only be installed in a bedroom or bedsitting room if no practicable alternative location is available.

An appliance installed in a bedroom or bedsitting room should be of the room sealed type.

The need to avoid noise and vibration nuisance to building occupants and neighbours should be taken into account.

5.6.8 Garage installations

For garage installations only room sealed appliances should be used.

5.6.9 Roof space installations

An appliance should only be installed in a roof space if no practicable alternative location is available. The level of noise emitted by the appliance should be taken into account.

Roof space installations should be in accordance with the following recommendations.

a) Vertical clearances should be provided so that the static head requirement of the appliance is met.

b) A flooring area for normal use and servicing should be provided under and around the appliance. This should take the form of an oil-proof tray with impervious sides at least 75 mm high. The tray should be provided with an oil level detector valve that will shut off the oil supply and the appliance if the presence of oil is detected.

c) The appliance support should be capable of supporting the load of the water filled boiler, associated pipework and equipment, and the tray if it became filled with water or oil. It should also be capable of supporting maintenance personnel.

d) Where the floor is of combustible material and supports the appliance, a non-combustible insulating base of at least 12 mm thickness should be provided under the boiler.

e) The oil supply pipe should preferably be run up to the height required on the outside of the building and should have no joints in its internal section, other than within the area protected by the oil-proof tray (see item b).

f) A permanent means of access to the appliance installation should be provided, for example a permanently fixed retractable roof ladder leading to a loft access hatch. A hatch guard rail and a protected walkway from the hatch to the appliance should be provided.

g) A safety guard should be provided around the appliance.

h) A means should be provided to shut down the appliance and isolate the oil supply without entering the roof space.

i) The appliance should be flued in accordance with Clause **10**. Where an existing brick chimney is utilized, the unused lower portion should be blanked off by means of a plate inserted to form a void extending approximately 240 mm below the appliance connection to the chimney but ensuring that the other flues in the same chimney stack are not sealed off.

j) Access should be provided to the void immediately below the appliance connection to the chimney. Any openings into the lower portion of an internal flue, i.e. the sealed-off section, should be permanently closed off. For a flue with at least one external face, the sealed section should be ventilated to the external air at high and low level to prevent moisture accumulation.

5.6.10 External installations

External installations should be in accordance with the following recommendations.

a) An appliance installed in an external location should be either:

1) an appliance specifically designated in the manufacturer's literature as being suitable for external installation without the need for additional protection; or

2) installed in an enclosure capable of providing permanent weather protection.

b) Where an enclosure is required it should be in accordance with **5.6.2** and the following recommendations.

1) Within the enclosure an accessible, waterproof, fused double-pole switch should be provided to give complete electrical isolation of the appliance.

2) Air vents should be fitted in the enclosure connecting directly to the outside air, at both high and low level in accordance with **5.4**. The lowest part of the low level vent should be not less than 300 mm above ground level.

3) Any permanent openings to the enclosure, including those in the air vents, should have a minor dimension not greater than 16 mm to prevent the entry of birds or rodents. However, this dimension should not be less than 6 mm in order to minimize the risk of blockage.

c) Where an appliance is installed in an enclosure, the enclosure should be fitted with a means of preventing access by unauthorized persons.

d) Appliances installed in an external enclosure should be flued in accordance with Clause **10**.

e) The system should incorporate protection against corrosion, damage and freezing. Water-carrying pipework should be insulated against freezing.

NOTE Information on protection against freezing is given in BS 5422.

f) The appliance should be located such that it is accessible for maintenance without the use of ladders.

g) If maintenance work is likely to be required in wet weather or at night, weather protection and lighting should be provided.

h) Purpose built external appliances should be located on a free draining hard surface.

5.6.11 Other installations

An appliance installed in a location other than those covered in **5.6.2** to **5.6.10**. should be installed in accordance with the manufacturer's instructions.

NOTE Further information on the installation of appliances in leisure accommodation vehicles and transportable accommodation units is given in BS EN 722-1:2004.

5.7 Appliance temperature and its relation to surrounding building materials

*COMMENTARY ON **5.7***

The operational temperatures of parts of an appliance vary according to type and manufacture.

Appliance base temperature, side panel temperature and flue gas temperature should all be taken into account before installation.

NOTE 1 Of these, the first two are of most importance to the designer with respect to the siting of the appliance since the hearth temperature determines the nature of the supporting structure needed and the panel temperature governs the protection needed from any combustible fittings or finishes adjacent to the appliance. With respect to both of these, appliances are placed into two categories, those with surface temperatures up to and including 85 °C and those with surface temperatures above 85 °C.

For appliances with base temperatures up to and including 85 °C the structural base should be non-combustible and non-absorbent; for example, a sheet metal plate built into the appliance.

Appliances with base temperatures above 85 °C should be installed on a hearth of non-combustible material of sufficient thickness to ensure that the material below does not reach a temperature in excess of 85 °C.

NOTE 2 Attention is drawn to the Building Regulations [2], [3], [4] with respect to work on structural hearths.

Any combustible material adjacent to the appliance should be protected so that no part of the material reaches a temperature in excess of 85 °C.

If the whole appliance is enclosed in a purpose built compartment, the compartment should have a fire resistance of not less than 30 min and should be constructed so that it will contain a fire.

NOTE 3 Guidance on the reporting of base and side panel temperatures for oil fired appliances is given in BS EN 303-1 and BS EN 303-2 and OFS A100 [19].

6 Oil storage tanks and equipment

6.1 Oil tank construction

Oil storage equipment should be selected which has been manufactured to provide a 20 year expected working life.

Installers of oil storage equipment should obtain written confirmation that the equipment has a 20 year expected working life when correctly installed, used and maintained. This documentation should be retained by the owner for the lifetime of the installation. Records of installation (see Clause **8**) and maintenance (see Clause **16**) should be passed to the owner, and the installer should recommend to the owner that they retain these for the lifetime of the installation.

NOTE 1 Attention is drawn to the Contol of Pollution (Oil Storage) Regulations [6], [7], [8]. Attention is also drawn to the DEFRA Guidance note for the Control of Pollution (Oil Storage) (England) Regulations 2001 [20], which states: "It is recommended that you purchase a fixed container expected to last for a minimum of 20 years before it needs to be replaced."

Tanks should also conform to the relevant standard listed in Table 1.

Table 1 **Types of oil storage tank and locations for which they are suitable**

Standard	Type of tank	Location
BS 799-5	Steel fabricated primary tank	Above ground, internal or external
OFS T200 [N2]	Steel fabricated primary tank or integrally bunded tank	Above ground, internal or external
BS EN 13341	Thermoplastics primary tank	Above ground, internal or external
OFS T100 [N3]	Medium density polyethylene primary tank or integrally bunded tank	Above ground, internal or external
BS EN 12285-1	Steel fabricated double skinned primary tank	Below ground

NOTE 2 Attention is drawn to the Local Authority Building Control (LABC) Registered Detail Scheme. The scheme is for use by local authority building control departments in receipt of a Building Notice or Full Plans application under the Building Regulations [2], [3], [4]. It is intended to provide advice and guidance on acceptability of products and systems that may be considered by the authority to satisfy the requirements of the Building Regulations [2], [3], [4].

6.2 Capacity

6.2.1 The capacity of the oil tank should be in accordance with Table 2.

Table 2 **Recommended oil storage tank capacities**

Appliance rated output kW	**Nominal tank capacity** L
Up to and including 15	1 000 to 1 500
Over 15 up to and including 25	1 500 to 2 000
Over 25 up to and including 35	2 000 to 2 500
Over 35 up to and including 45	2 500 to 3 500

6.2.2 For bunded tanks, the capacity of the bund should be in accordance with **7.4**.

6.3 Provision for measurement of contents of oil storage tanks – tank contents display systems

6.3.1 General

A tank contents display system should be provided by the tank installer to make it possible to:

a) ascertain when a new delivery is necessary;

b) determine how much oil can be ordered;

c) determine if the new delivery can be accommodated.

The system should allow the person responsible for making the oil delivery to be able to establish the level of oil in the tank before commencing the delivery. The system should be suitable for use by the end user and by the oil delivery person.

A system incorporating one of the following types of gauge should be used:

1) electronic device;

2) sight tube gauge;

3) float operated dial gauge.

Sight tube gauges should not be connected to or installed with integrally bunded oil storage tanks.

For a float operated dial gauge, to reduce the likelihood of overfilling, the scale should indicate that the tank is full at a level equivalent to 95% of brimful/gross capacity.

The location of the display(s) should be one of the following:

i) local display, i.e. on the tank;

ii) remote display, i.e. at some convenient position away from the tank;

iii) both local and remote displays.

6.3.2 Local display

Where contents display is mounted on the tank, either it should be easily visible without the need to use steps or ladders or, if this is not possible, permanent secure means of access should be provided. Where local access is the only means of determining oil level the users should be advised to read the gauge at suitably frequent intervals. Where delivery is made directly into the tank, either the gauging on the tank should be visible from the point at which the delivery person stands to control the delivery, or a remote display should be used.

6.3.3 Remote display

If the tank mounted gauge is not visible from the point at which the delivery is controlled, remote display of tank contents should be provided. This should either be by means of a permanently installed gauge or by the use of a remote reading device which can sense the tank contents and which is held by the person controlling the delivery.

NOTE 1 Many remote gauging systems can accept signals from such devices, which can usually also provide an overfill warning alarm.

NOTE 2 Remote display has the advantage of enabling the tank contents to be read at a point which is convenient for the users of the oil fired system, i.e. inside the house.

NOTE 3 Remote systems can also permit the oil contents level to be read via a telephone link to the oil distribution depot from which the tank is serviced. This enables the automatic control of oil supply into the tank to be provided.

NOTE 4 Guidance on oil storage tank gauges is given in OFS E103 [21].

6.4 Overfilling alarm and signalling system

An overfilling alarm system should be installed on the tank.

NOTE 1 This is particularly important in the following situations:

a) where the filling point out of sight of tank;

b) where the vent termination out of sight of filling point.

The type of overfill alarm fitted should be indicated at the filling point.

NOTE 2 Guidance on overfilling alarms is given in OFS E105 [22].

6.5 Filling pipes and connection

Filling pipes should be in accordance with BS 799-5. Where more than one grade of oil is being stored there should be a separate filling pipe terminal point for each, indicating the grade for which it is to be used.

6.6 Vent pipes

Vent pipes should be in accordance with BS 799-5, OFS T100 [N3] or OFS T200 [N2], as appropriate. The diameter of the vent pipe should be not less than 50 mm or not less than the diameter of the fill pipe or the outlet, whichever is greater.

NOTE Attention is drawn to the the Control of Pollution (Oil Storage) (Amendment) Regulations (Northern Ireland) 2011 [8] and the Water Environment (Oil Storage) (Scotland) Regulations 2006 [9] which require vent pipes to be directed to discharge directly into the secondary containment.

The vent pipe should be free from sharp bends, should have a continuous rise and, while being as short as convenient, should terminate in the open air in a position where it cannot be tampered with. Wherever possible the vent pipe terminal should be visible from the filling point. The end of the vent pipe should be kept away from any zone in which the discharge of air and vapour might be dangerous or offensive. A separate vent pipe should be provided for each tank.

Where of necessity the vent pipe rises above the tank to a height exceeding that recommended for normal use by the tank manufacturer, excessive internal pressure on the tank might result if overfilling occurs, so where an extended vent pipe is to be fitted the manufacturer of the tank should be consulted before this is done. If a vent pipe unloading device is fitted to the vent pipe, any oil discharge should be directed into a bund. If an overfill alarm is fitted to the vent pipe, it should not restrict the oil flow should an overfill occur.

6.7 Filtration system

A filtration system should be provided in accordance with the requirements specified by the manufacturer of the oil burning appliance.

A filter having a filtration size of no more than 70 μm should be provided in the oil supply pipe, fitted close to the oil storage tank with sufficient clearance around and below it to allow maintenance to take place easily and without the risk of loss of oil.

NOTE 1 Oil burning appliance manufacturers might require a greater degree of filtration, i.e. as low as 15 μm.

When an oil strainer is also fitted, the filtration size of the strainer should be no greater than 150 μm.

NOTE 2 The positions of the filters are shown in Figure 3, Figure 4 and Figure 5.

NOTE 3 Guidance on oil filters is given in OFS E104 [23].

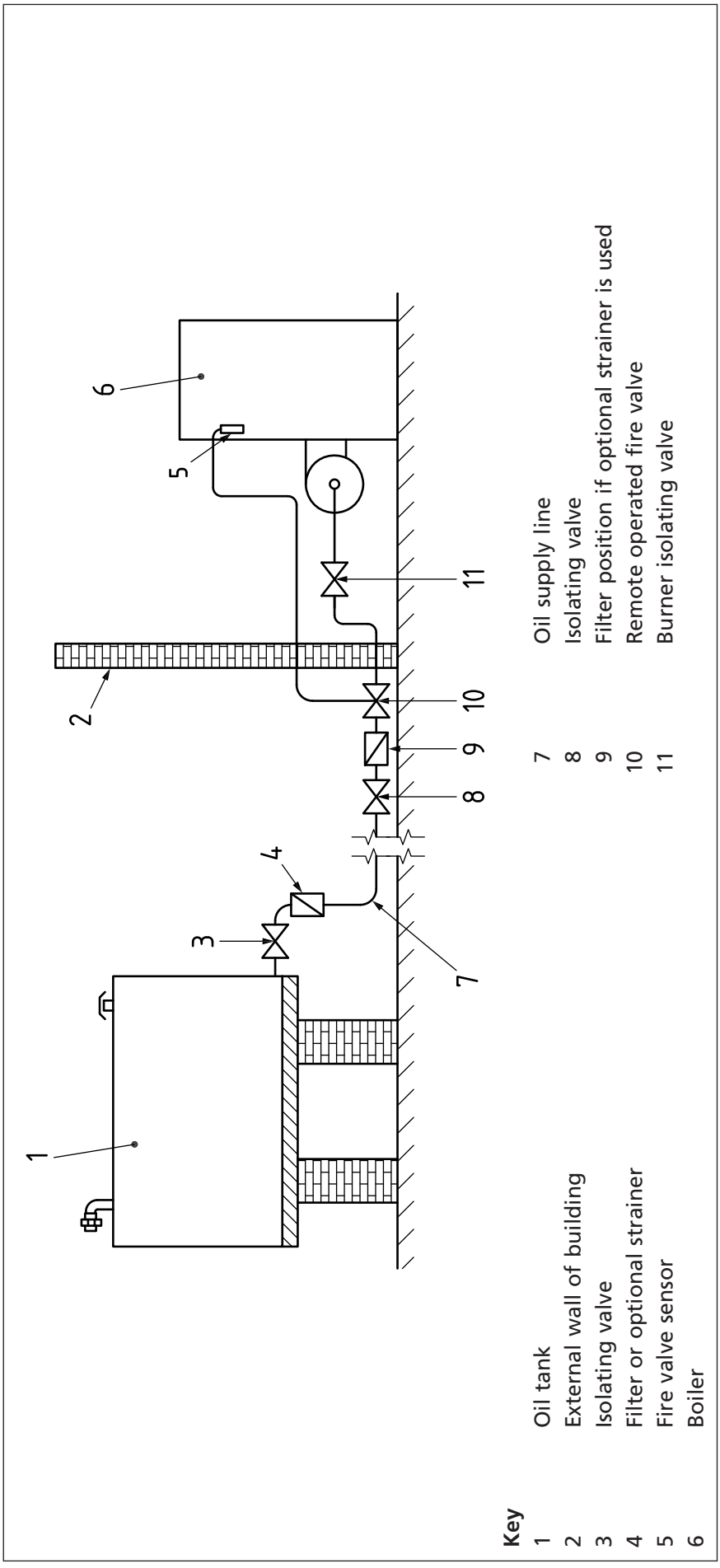


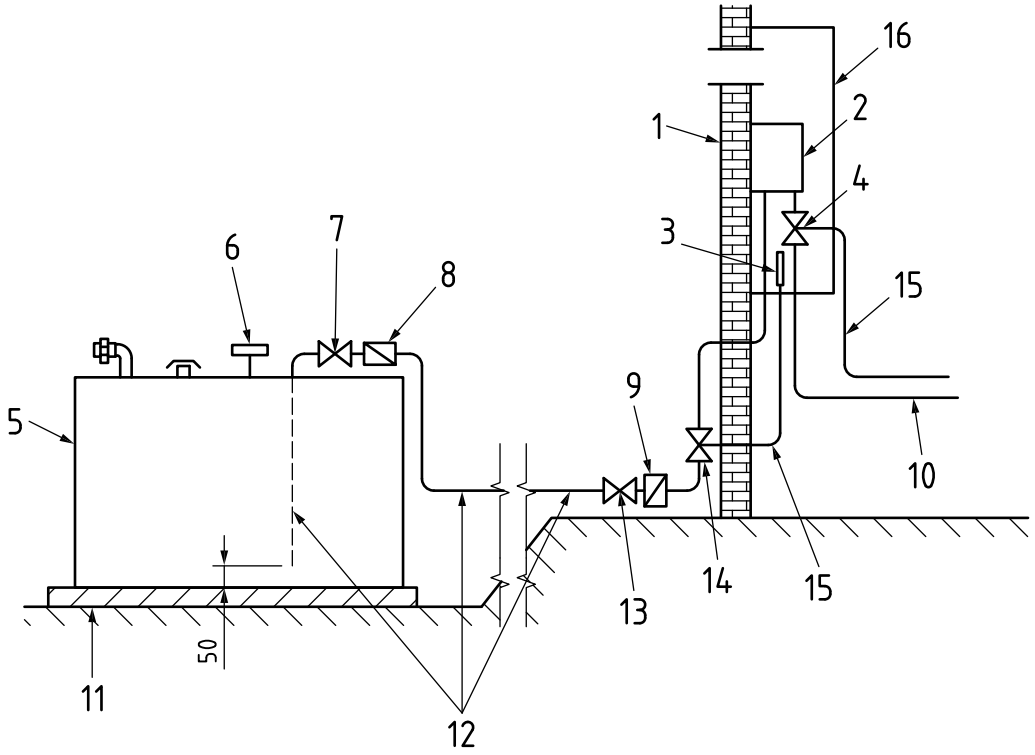
Figure 3 **Oil supply system with bottom of oil storage tank above burner – Single pipe supply**

Key

1	Oil tank	7	Oil supply line
2	External wall of building	8	Isolating valve
3	Isolating valve	9	Filter position if optional strainer is used
4	Filter or optional strainer	10	Remote operated fire valve
5	Fire valve sensor	11	Burner isolating valve
6	Boiler		

Figure 4 **Oil supply system with a single pipe connected through top of tank to an oil lifter**

Dimensions in millimetres

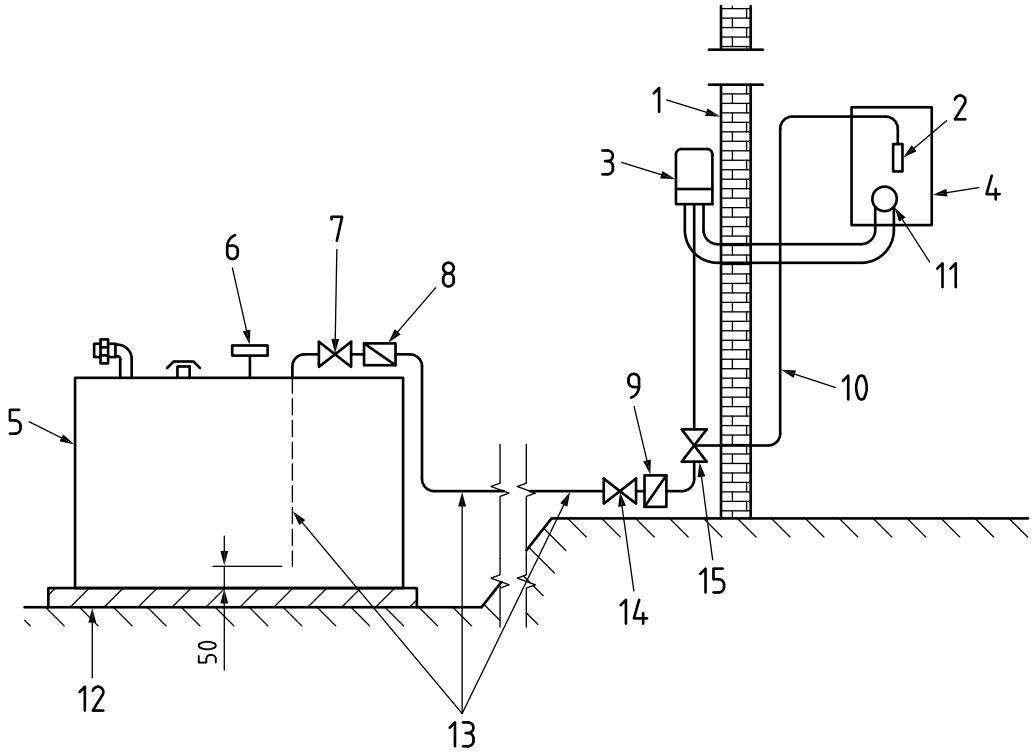


Key

1	External wall	9	Filter
2	Oil lifter incorporating a non return valve	10	Gravity flow supply line to appliance
3	Fire valve sensor at oil lifter, 65 °C type	11	Full base (for plastics tanks)
4	Remote operated fire valve with sensor at appliance	12	Suction line
5	Oil tank	13	Isolating valve
6	Tank contents gauging equipment	14	Remote operated fire valve
7	Isolating valve	15	Fire valve capillary
8	Anti-siphon valve	16	Fire resistant chamber ventilated to the outside

Figure 5 **Oil supply system with a single pipe connected through top of tank to a de-aeration device**

Dimensions in millimetres



Key

1	External wall	9	Filter
2	Fire valve sensor	10	Fire valve capillary
3	External de-aeraton device incorporating non-return valve	11	Burner oil pump set to two pipe operation
4	Oil fired appliance	12	Full base (for plastics tanks)
5	Oil tank	13	Suction line
6	Tank contents gauging equipment	14	Isolating valve
7	Isolating valve	15	Remote operated fire valve
8	Anti-siphon valve		

7 Accomodation for oil storage tanks

7.1 Siting of oil storage tanks

Tanks should be situated as follows:

a) external to the building in which the appliance is installed;

b) within a building, in a chamber with 60 min fire resistance, at the lowest possible level in the building.

Tanks should never be installed in a habitable area.

Tanks located in garages or in other internal spaces should be installed in a compartment with 60 min fire resistance in accordance with **7.4.2**f).

NOTE Attention is drawn to the Building Regulations [2], [3], [4] with respect to work on internal tank chambers.

7.2 Methods of tank protection

*COMMENTARY ON **7.2***

It is considered unlikely that a fire will originate in the stored oil and it is the purpose of the recommendations given in this Clause, including those in Table 3, to ensure that a fire originating in a building or from another external source is not transmitted to the tank contents or, if a fire occurred, its effects are limited.

The tank should be protected in one of the following ways:

a) isolating the tank, including any integral bund, by placing it at the distance from any building or other potential source of fire given in **7.3** and **7.4**;

b) protecting the tank, including any integral bund, by a physical barrier;

c) enclosing the tank, including any integral bund, with a non-combustible fire resisting construction as given in **7.3** and Table 3;

d) if a double skinned tank is used, burying the tank.

NOTE Attention is drawn to the Building Regulations [2], [3], [4] and the Control of Pollution (Special Waste) Regulations [6].

Table 3 **Protection of an oil storage tank located externally to a building**

Location of tank	Protection	
	Building without openings	Building with openings
Not more than 1.8 m from any part of any building	Non-combustible base and extending 300 mm beyond each side of the tank; and either: a) any part of the building not more than 1.8 m from the tank to have 30 min fire resistance for loadbearing capacity, integrity and insulation to internal fire; or b) a barrier	Non-combustible base and extending 300 mm beyond each side of the tank, and a barrier between the tank and any part of a building not more than 1.8 m from the tank that does not have 30 min fire resistance for loadbearing capacity, integrity and insulation to internal fire
More than 1.8 m from any building	Non-combustible base	
Not more than 760 mm from a boundary	Non-combustible base, and a barrier or boundary wall	
More than 760 mm from a boundary	Non-combustible base	
Externally and wholly below ground	No protection required	
Where an integrally bunded tank is used, the measurements should be taken from the outside of the complete containment system.		

NOTE 1 Underground tanks might not be acceptable in certain environmentally sensitive areas.

*NOTE 2 Recommendations for non-combustible bases are given in **7.3.1**.*

*NOTE 3 Recommendations for barriers are given in **7.3.4**.*

7.3 Tank accommodation

NOTE The recommendations for tank accommodation are also summarized in Table 3.

7.3.1 The tank should be installed on or over a non-combustible base that extends out at least 300 mm from all sides of the tank including any integral bund, except where the tank, including any integral bund, is closer than 300 mm

to a wall or boundary wall having a fire resistance of at least 30 min, in which case the base need only extend as far as the wall. One or more of the following types of base should be used:

a) concrete at least 100 mm thick;

b) paving stones at least 50 mm thick positioned close to each other on level ground;

c) stonework at least 50 mm thick;

d) a purpose designed steel stand.

NOTE Further advice on the provision of bases for oil storage tanks is given in OFTEC Technical Book 3 [N4].

7.3.2 Where tanks are to be installed at low level, sufficient height should be provided to allow full maintenance access to filters installed at any low level tank outlet.

7.3.3 If the tank is less than 1.8 m from a building, that part of the wall of the building within 1.8 m of the tank should be devoid of any openings and have a resistance to internal fire of not less than 30 min.

7.3.4 If there are any openings in the building wall closer than 1.8 m to the tank, the part of the tank adjacent to the opening should be protected by an imperforate non-combustible barrier with a resistance to fire of not less than 30 min constructed so as to prevent the passage of direct radiated heat from the opening to the tank. The wall and the barrier together should form a screen that completely interposes itself between the tank and any openings and extends at least 300 mm higher and wider than any part of the tank within 1.8 m of the opening. Small openings in the wall of the building such as air bricks or weepholes should not be considered as affecting the fire integrity of the wall.

7.3.5 If the wall of the building has a resistance to internal fire of less than 30 min, then a barrier should be built completely isolating the tank from the building. This barrier should protect any openings closer than 1.8 m to the tank in accordance with **7.3.3**. The barrier should be non-combustible, constructed so as to prevent the passage of direct radiated heat and should extend beyond the extremities of the tank by a height and width of not less than 300 mm.

7.3.6 Where barriers are fitted to protect metal tanks, the need for access for maintenance should be taken into account.

7.3.7 If the tank is less than 760 mm from a boundary then the boundary should have a wall with a resistance to fire of not less than 30 min which extends 300 mm higher and wider than the top and ends of the tank.

7.3.8 A tank chamber, where provided, should be constructed to meet the following recommendations.

a) The tank chamber should be a fully enclosed structure with non-combustible fire resisting construction of not less than 60 min fire resistance. The entrance to the chamber should have a 60 min fire resisting self-closing door, which should not form part of the secondary containment system. The door should open outwards, and be readily openable from the inside of the chamber without the aid of a key.

b) Unless an integrally bunded tank is used, the chamber should include a secondary containment system with a capacity at least 10% greater than the capacity of the tank in accordance with **7.4.2.**

c) The chamber should be ventilated to the open air sufficiently to prevent stagnation, independently of any other part of the premises and preferably by natural means.

d) Sufficient space should be provided within the tank chamber to provide access to all tank mountings and fittings, and to ensure it is possible to carry out maintenance to all parts of the installation.

e) Where electric lighting is provided within the tank chamber, fittings should be of the bulkhead or well glass type, and the light switches should be located outside the chamber.

NOTE Fire rating minimum durations are in terms of integrity, insulation and stability. For futher guidance see BS 476-20, BS 476-21 and/or BS 476-22.

7.3.9 Where tanks are installed below ground the following recommendations should be followed.

a) Tanks should be protected from damage during installation.

b) Tanks should be specially constructed for underground use. All underground tanks should be of the double skinned type with an interstitial monitoring system with an automatic alarm. Tank installations should conform to the Environment Agency Pollution prevention guidance note PPG27 [N5].

c) In areas with high water tables the possibility of problems caused by buoyancy should be taken into account.

d) Tanks should be fitted with overfill protection.

7.3.10 Tanks and bunds should be installed so that suitable inspection of their exposed surfaces can take place.

NOTE 1 Normally this would mean that the sides and top surfaces of the tank are kept at least 100 mm away from buildings, walls and any other structure.

Some plastic tanks may require a greater clearance and manufacturers' instructions should be referenced for this information.

*NOTE 2 For steel tanks, inspection of their bottom surface is also required. Recommendations regarding maintenance work on tanks are given in **16.3**.*

7.3.11 Where foliage, screening or other combustible matter is present which does not form part of a building or boundary, there should be a minimum separation distance of 600 mm between the foliage, or screening or other combustible matter and the tank.

7.4 Secondary containment (bunds)

7.4.1 General

All new and replacement oil storage tanks should be installed within secondary containment i.e. the tank should be located within a masonry or concrete bund constructed in accordance with **7.4.2**, or should be of the integrally bunded type (see Table 1).

7.4.2 Construction of secondary containment

Secondary containment should be constructed as follows.

a) The whole of the secondary containment system, including the base and the walls, should be constructed of materials with a minimum expected life of 20 years. The interior should be impervious to oil. Concrete or masonry bunds should conform to the constructional requirements of CIRIA Report 163 [N6].

b) The bottom of the secondary containment system should be laid to fall to an impervious undrained sump. No drain-off valve should be fitted to a secondary containment system.

NOTE Secondary containment systems can be emptied by the use of a hand pump.

c) Where the secondary containment system contains one oil tank the capacity should be 110% of the maximum capacity of the tank.

d) Where the secondary containment system contains more than one oil tank the bund capacity should be at least 110% of that of the largest tank or 25% of the total storage capacity, whichever is the greater.

e) Where metal tanks are fitted in secondary containment systems, sufficient space should be provided between the sides of the tank and the secondary containment system for maintenance access.

f) Wherever possible, valves, fittings, gauges, filters, etc. normally fitted to the tank should be located within the secondary containment system. Sufficient space for access and maintenance should be provided for all fittings within the secondary containment system.

8 Installation of tanks

8.1 General

The initial installation and replacement of oil storage tanks is work covered by the Building Regulations [2], [3], [4]. This type of work should be undertaken by competent technicians, subject to supervision by either a registration body or the local authority building control department.

In England and Wales, Jersey, Guernsey and the Isle of Man, if a person registered with an approved scheme is used for such work then it is not required that application is made to the local authority building control department for approval prior to the work commencing and such firms can self-certify compliance of their work at completion.

NOTE 1 In England and Wales, Jersey, Guernsey and the Isle of Man, where documentation is required by the local authority to confirm competent installation work, form CDI10 [17] has been approved for use.

NOTE 2 Attention is drawn to the Building Regulations [2], [3], [4] with respect to structural alterations to buildings.

Supports and foundations to carry the weight of the tank, contents and fittings should be completed before delivery of the oil storage tank. Supports for tanks should incorporate a base at ground level giving below tank fire protection at least as great as that recommended in **7.3.1**.

Where tanks are installed in close proximity to buildings and walls, space should be left for the inspection and maintenance of the tanks. Tanks and bunds should not be installed with their side surfaces closer than 100 mm to a building, wall or other structure.

Where tanks are to be accommodated inside buildings, openings should be left, or made, to receive them. If sectional tanks are to be used, openings should be left, or made, to receive the plates from which they are to be constructed. Sectional oil tanks should be erected by specialists.

Tanks should carry an Environment Agency/Scottish Environment Protection Agency label in a prominent position giving the emergency oil spill telephone number and noting the need for annual maintenance.

NOTE Further information on the installation of oil storage tanks is given in OFTEC Technical Book 3 [N4].

8.2 Supports for steel tanks

Steel tanks should be supported on masonry piers or purpose designed steel stands. These should maintain the tank at a sufficient height to feed the burner, if this is of the vaporizing type which does not incorporate an oil pump, or at a sufficient height to enable access to be gained for painting if a pressure jet burner is used.

Piers should be built on a concrete base of adequate strength and extent to suit the nature of the ground, and should be run across the shortest base dimension of the tank. They should be slightly wider than the tank in order to support the side plates.

With a normal height steel tank, i.e. 1.2 m, the maximum distance between the supports should be set so as to take account of the thickness of the tank's bottom plate in accordance with Table 4.

Table 4 **Distance between supports for steel oil storage tanks**

Bottom plate thickness mm	**Maximum unsupported length between supports** mm
2	450
2.5	550
3	600

Steel tanks that have integrated base supports should have a flat base capable of uniformly supporting the mass of the tank and its contents.

Bases for such tanks should consist of a poured concrete slab at least 100 mm thick or paving slabs at least 50 mm thick. In both cases the base should be constructed on top of a foundation designed to limit any ground movement affecting the base.

Where a tank is located in an area likely to be subjected to high winds or flood, tank strapping should be provided to prevent significant tank movement when the tanks contents are low. Manufacturers' requirements should be followed regarding the most suitable points on the tank for strapping to be applied.

NOTE 1 Further information on supports and strapping for oil tanks is given in OFTEC Technical Book 3 [N4].

The overhang at either end of the tank should not exceed half of the length between the supports.

Where masonry piers are used as supports for steel tanks, moisture should be prevented from accumulating between them and the bottom of the tank by building up a 25 mm thick layer of moist mortar beneath a damp-proof membrane on top of the piers before the tank is lowered on to them.

NOTE 2 The mortar sets to the profile of the tank base to avoid any openings being formed and the membrane prevents moisture in the masonry rising up to the steel.

8.3 Supports for plastics tanks

Plastics tanks should have a flat base capable of uniformly supporting the mass of the tank and its contents.

Bases for plastics tanks should consist of a poured concrete slab at least 100 mm thick or paving slabs at least 50 mm thick. In both cases the base should be constructed on top of a foundation designed to limit any ground movement affecting the base. Where oil tanks are to be elevated to provide a gravity oil supply, brick piers should be constructed on top of the tanks base. Concrete lintels or slabs should then be used to span the gaps between the piers so that the underside of the tank is fully supported.

Where a tank is located in an area likely to be subjected to high winds or flooding, tank strapping should be provided to prevent significant tank movement when the tanks contents are low. Manufacturers' requirements should be followed regarding the most suitable points on the tank for strapping to be applied.

NOTE Further information on supports and strapping for oil tanks is given in OFTEC Technical Book 3 [N4].

8.4 Painting and cleaning of steel tanks

The external surfaces of steel tanks should be thoroughly cleaned and made free from rust, oil or grease and protected with a suitable rust inhibiting primer followed by at least two coats of oil resistant paint.

Painting should first be carried out as soon as practicable after the delivery of the tanks to site and before installation.

NOTE Further information on tank painting and cleaning is given in BS 6150.

8.5 Multiple storage tank installations

8.5.1 General

In multiple tank installations, all tanks should be installed at an identical height. Wherever possible, each tank should have a clearly labelled fill point identifying the type of fuel contained in the tank.

NOTE Where this is not possible and where all of the tanks contain the same type of fuel, a common filling line may be used.

In each case, each tank should be provided with its own contents gauge, isolating valve, and overfill prevention device or overfill alarm. If a common oil supply pipe is used, non-return valves should be provided at each tank outlet to prevent oil transferring between the tanks.

In multiple tank installations, tanks should be separated from each other by a minimum 600 mm to provide access for inspection, maintenance and replacement.

8.5.2 Externally installed multiple storage tank installations

Externally installed multiple tank installations should be provided with a degree of fire protection appropriate to their location and the quantity of oil stored. If two or more tanks are located on a site under the sole control of the property owner and within 1.8 m of each other, the combined quantity of oil should be calculated, and fire protection provided as follows.

a) If the combined quantity of oil stored does not exceed 3 500 L, the installation should be in accordance with **7.3.1** to **7.3.6**.

b) If the total quantity of oil stored is in excess 3 500 L, fire protection should be provided by one of the following means:

   1) an installation should be provided in accordance with BS 5410-2:2013, **10.7**; or

2) the tanks should be moved so that they are separated from each other by a minimum distance of 1.8 m. Each tank installation should also be in accordance with **7.3.1** to **7.3.6**; or

3) an imperforate non-combustible barrier with a fire resistance of not less than 30 min should be provided between the tanks so as to prevent the passage of direct radiated heat. The barrier should extend beyond the extremity of the tanks in height and width by a minimum of 300 mm. The total amount of the oil stored which is protected by the barrier should not exceed 3 500 L and each tank installation should also be in accordance with **7.3.1** to **7.3.6**.

If two or more tanks are located on a site where access is granted to a number of property owners e.g. oil storage serving a number of individual properties or flats, the combined quantity of oil should be calculated and fire protection provided that is in accordance BS 5410-2:2013, **10.7.2**.

8.5.3 Internally installed multiple storage tank installations

Internally installed multiple tank installations should be provided with secondary containment in accordance with **7.4** and be protected from the effects of fire originating within the building by one of the following means.

a) If the combined quantity of oil stored does not exceed 3 500 L, the tanks should be contained within a chamber that is in accordance wih **7.3.8**.

b) If the total quantity of oil stored is in excess 3 500 L, the tanks should be contained within a chamber that is in accordance with BS 5410-2:2013, Table 11 or Table 12.

NOTE Further information on multiple tank installations is given in OFTEC Technical Book 3 [N4].

9 Oil system from storage tank to burner

9.1 Fuel supply systems

9.1.1 General

A hand operated isolating valve should be provided as close to the tank as possible (see Figure 3, Figure 4 and Figure 5).

A remote acting fire valve should be fitted in accordance with **9.3**.

A filter as specified by the appliance manufacturer should be fitted in the oil supply pipe between the isolating valve and the appliance (see Figure 3, Figure 4 and Figure 5). Filtration sizes should be in accordance with **6.7**.

An additional hand operated shut-off valve should be fitted in an accessible position in the oil supply pipe as close as possible to the appliance.

Oil pipes should be run so as to avoid the trapping of air which can restrict or stop the flow of fuel.

Owners of the installation should be made aware that oil supply pipes should be provided with mains equipotential bonding in accordance with BS 7671.

In extremely low temperature conditions, the flow properties of class D liquid fuel and biofuels might be affected. Proper siting and insulation of tanks, pipework and filters should be provided to ensure sufficient protection to maintain flow. In addition, where a steel tank is used, a tank immersion heater capable of maintaining the oil between 0 °C and 5 °C and pipeline trace heating capable of maintaining the oil between 0 °C and 5 °C can be fitted where continuity of service is essential. Oil pre-heating equipment should be in accordance with BS 799-5.

9.1.2 Gravity feed

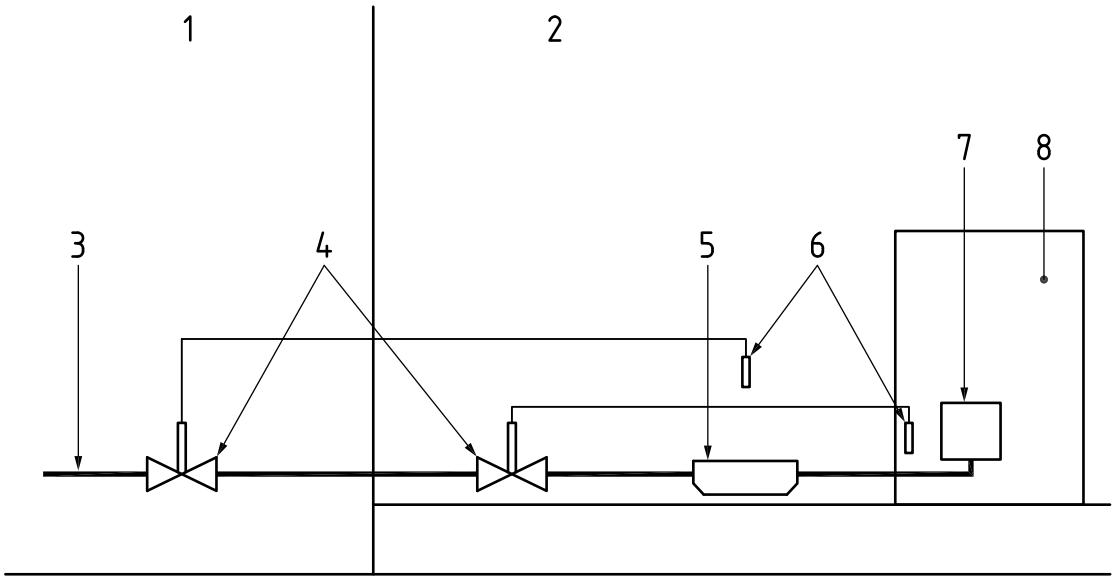
Appliances provided with gravity feed should not be subjected to a gravity head greater than that specified by the appliance manufacturer.

The minimum gravity head required by the appliance should be provided when the tank is almost empty (see Figure 3).

When high points cannot be avoided in oil supply pipes, these should not be above the level of the tank outlet and should be provided with a manual means of venting.

Where vaporising cookers are used, oil is supplied to a constant level oil valve located external to the cooker (see Figure 6). Both the constant level oil valve and cooker should be protected by remote acting fire valves in accordance with **9.3.11**.

Figure 6 **Oil supply system for a vaporising cooker installation with two remote acting fire valves**



Key

1 Outside
2 Inside
3 Oil supply line
4 Remote operated fire valve
5 Oil control valve
6 Fire valve sensor
7 Burner
8 Vaporising appliance

9.1.3 Suction feed

9.1.3.1 General

Provision of a non-gravity suction oil feed to a burner should be in accordance with **9.1.3.2** or **9.1.3.3**.

*NOTE Only the method given in **9.1.3.2** is suitable for appliances with vaporizing burners.*

9.1.3.2 A purpose made oil lifter

An oil lifter should be used to lift the fuel from the storage tank to a suitable level from which the appliance is supplied. The oil lifter normally incorporates a non-return valve and should be installed in accordance with the manufacturer's instructions. The gravity head imposed on the appliance by the oil lifter should be in accordance with **9.1.2**.

Oil lifters should be installed, preferably externally, in a weatherproof wall chamber, or internally in a fire resistant chamber of not less than 30 min fire resistance ventilated to the outside (see Figure 4).

9.1.3.3 One pipe suction lift

This system comprises a single pipe system with an anti-siphon device and two pipe de-aeration loops at the pressure jet burner (see Figure 5). Any air that might be drawn into the suction line from the oil supply at sub-atmospheric pressure should be discharged at the de-aerator. A flow and return loop should be created between the de-aerator and the burner pump. A non-return valve should not be used in the supply.

De-aerators should normally be fitted externally to the building. A de-aerator should not be fitted in close proximity to a flue terminal (see Figure 7).

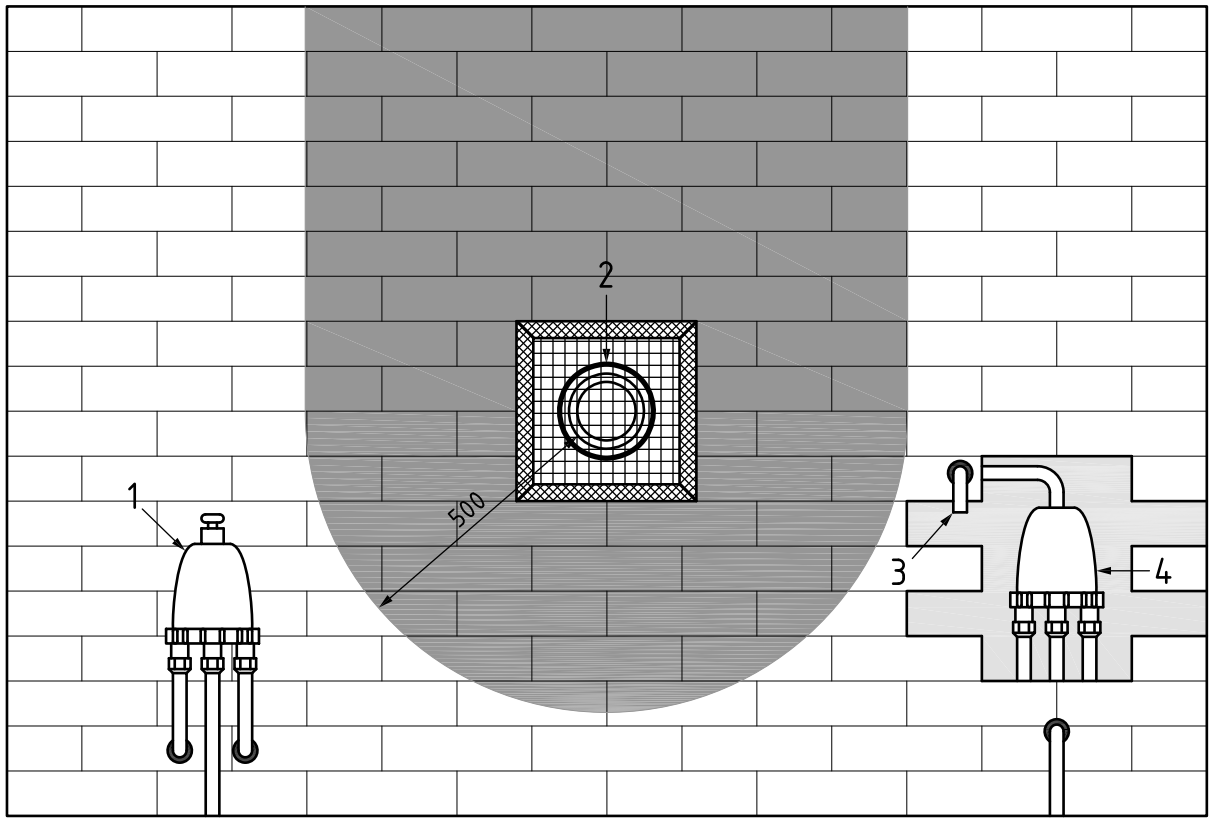
De-aerators installed inside buildings should be of fire resistant construction and should be provided with a means of taking vented air to the outside via a fireproof vent pipe.

The flow and return pipes from the de-aerator to the burner should be clearly marked.

NOTE Information on sizing single pipes for suction lift oil supply systems is given in OFTEC Technical Book 3 [N4].

Figure 7 **Positions of de-aerators in relation to a flue terminal**

Dimensions in millimetres



Key

1 Non-fire resistant/open de-aerator
2 Flue terminal
3 Vent from an internal open de-aerator
4 Internal de-aerator

9.1.4 Multiple appliance installations within a single occupancy dwelling

Where more than one appliance is fed from one gravity or sub-gravity storage or service tank, the relevant recommendations given in **9.1.1**, **9.1.2** or **9.1.3** should be followed in relation to each appliance connected to the fuel supply system.

9.1.5 Connection to multiple oil storage tanks

When more than one oil storage tank is installed and the tanks are hydraulically interlinked, non-return valves should be fitted in the linking pipes so that a leakage or overfill from one tank cannot affect the contents of any other tank.

Unless such devices are fitted the tanks should be classed as one combined tank for the purposes of this standard.

9.2 Fuel feed pipework

9.2.1 Sizing

Fuel feed pipework should be of suitable size to ensure that the pressure at the burner is within the limits specified by the appliance manufacturer or pump manufacturer, at the maximum flow rate. Where a fuel pump or an oil lifter is used, the manufacturer's advice regarding pipework should be followed.

9.2.2 Materials and jointing

Pipework carrying oil within a building or above ground externally should be constructed of steel or copper or other material with an equal degree of fire resistance, except where it is inside an appliance casing which is protected by a remote fire valve in accordance with **9.3.2**.

NOTE Plastics pipe may be used externally below ground.

Underground plastics oil pipelines should conform BS EN 14125.

Galvanized pipe and fittings should not be used. Copper tube conforming to BS EN 1057:2006+A1, R220 (soft copper tube) should be jointed with compression manipulative fittings conforming to BS EN 1254-2:1998, type A, or type B with insert. Copper tube conforming to BS EN 1057:2006+A1, R290 or R250.(hard or half hard copper tube, respectively) should be jointed with compression fittings conforming to BS EN 1254-2:1998, type B. Soft soldered joints should not be used.

If steel pipes and malleable fittings are used these should be inspected and cleaned before use. Taper threads should always be used. Running joints, long screws or connectors should not be used. Pipework and fittings should be oiltight. Hemp, red lead, boiled oil and hard setting jointing compounds should not be used. Petroleum resisting compounds and PTFE tapes which remain slightly plastic make the most satisfactory joints. However, when applying these materials, care should be taken to avoid excess materials breaking away and causing blockage. All pipework should be rigid and firmly fixed, and protected where necessary against damage.

9.2.3 Pipework

Pipework should be run so as to provide the most direct route possible from the tank to the burner. Joints should be kept to a minimum and the use of plastic coated malleable copper pipe is recommended. Inside buildings every effort should be made to avoid the use of joints between the entry point of the pipe and the boiler connection.

Where pipework is run above ground externally, care should be taken to locate it where it will be protected against damage.

All bends should be formed to reduce resistance to flow.

Where pipes pass through the walls of buildings they should be sleeved.

Pipes should be adequately supported to prevent sagging.

9.2.4 Buried pipework

Where fuel feed pipework is buried precautions should be taken to locate the pipe run where the chance of damage from digging or other such activities is minimal. Where this cannot be done the pipework should be protected, e.g. by covering with tiles. Pipework below ground should be jointless; where joints are unavoidable the pipework should be tested for leaks before backfilling. Steel tube should be protected against corrosion by suitable wrapping or by other means of at least the equivalent reliability. Copper tubing should be of the plastic coated type.

Where joints are buried these should always be provided with means of access for inspection.

NOTE Further information on installing oil supply lines underground is given in OFTEC Technical Book 3 [N4].

9.2.5 Leak detection

The complete supply pipework system should be subjected to a leak detection test in accordance with OFTEC Technical Book 3 [N4] after erection and before any paint primer, paint, trace heating or thermal insulation is applied.

Metallic fill pipes should be tested up to 1 bar pneumatic pressure for 30 min.

9.3 Fire valve types and installation

9.3.1 A fire valve system should be fitted so as to cut off the supply of oil remotely from the heating appliance in the event of an accidental fire occurring in or around the appliance. Each fire valve should be tested by the installer in accordance with OFTEC Technical Book 2 [N7] or Technical Book 5 [N8], as applicable, before fitting to check correct operaton. For appliances installed inside buildings, the oil supply should be shut off externally to the building. For existing installations where oil lines serving internally installed heating appliances are run so as to be built into the structure, the cut off point should be at the point where the line is first exposed internally. This type of layout should not be used for new oil supply pipework installations.

9.3.2 For externally located heating appliances, the oil supply should be cut off externally to the appliance casing.

9.3.3 The remote acting fire valve sensor activation temperature and phail position should be as required by the appliance manufacturer.

9.3.4 Fire valves are sometimes incorporated within core heating chambers and in such cases special attention should be given to the location of the sensing element. They should be designed to trip at a higher temperature to avoid nuisance lock outs.

9.3.5 Where more than one oil burning appliance is installed, each appliance should be provided with a sensitive element controlling a fire valve. Each oil pipe entering the building should be protected by a fire valve.

9.3.6 Fire valve systems either should be in accordance with the following recommendations or should comprise one of the systems recommended in **9.3.8**.

a) They should be able to sense a fire inside or close to a heating appliance and shut off the oil supply at a point that enables the recommendations in **9.3.1** to be met.

b) The system should be such that in the event of any part of a valve or any other component becoming damaged the oil supply is shut off.

c) Manual operation should be required in order for oil to be passed through to the burner after the system has been thermally activated.

d) The system should be provided with a means for testing for satisfactory operation and for resetting manually.

NOTE BS EN ISO 23553-1 covers the construction and testing of shut off valves. OFS E 101 [24] covers non-electrically operated remote acting fire safety valves.

9.3.7 The functions of a fire valve system can be provided by a single unit or by a number of separate components. In either case the system should be in accordance with the recommendations given in **9.3.1** to **9.3.6**.

9.3.8 If an alternative fire valve system to that recommended in **9.3.6** is to be used, one of the following systems should be fitted.

a) A system comprising an electrically operated valve coupled to thermal fuses located in accordance with **9.3.1** to **9.3.5**. The valve should self-closing on open circuiting of the thermal fuses, and should be installed so that the oil

pressure exerted by the head of oil in the tank assists closure. The thermal fuses should be of the type which remains open circuited after operation.

b) A system comprising a weight or spring loaded valve held open by a flexible cable with fusible links inserted in its length over each firing point. At all changes of direction, the flexible cable should pass over corrosion resistant metal pulleys with good quality bearings and a diameter of not less than 40 mm. The flexible cable should be made of corrosion resistant, inextensible multi-strand wire, suitable for use with these pulleys and which will not take a permanent set. This type of fire valve system should not be used where the run of the cable would be long or tortuous. Each fusible link should be at a sufficient distance from the pulleys, or other possible obstructions, to ensure that the metal fitting forming part of the fusible link has adequate free movement to permit complete closure of the fire valve when a link fuses.

c) A system comprising a spring loaded valve held open by a flexible cable enclosed within a flexible outer sheath, terminating in a fusible link. Excessive lengths of this type of cable or sharp bends can result in unreliable operation and should be avoided.

9.3.9 Where the sensitive element is positioned external to the appliance it should be located at a maximum height of 500 mm above the top of the burner.

9.3.10 Electrical circuits for fire valves should be independent of burner or other control circuits.

9.3.11 Where the oil supply system to the appliance involves the installation in an internal location of equipment such as constant level oil controls or oil lifters containing a reservoir of oil, they should be protected by remote acting fire valves positioned as specified by the appliance manufacturer. The fire valve system should be in accordance with the recommendations given in **9.3.6**.

10 Flues and chimneys

10.1 Chimneys and connecting flue pipes

*COMMENTARY ON **10.1***

Chimneys and connecting flue pipes, including chimney liners, for oil fired appliances are given a designation in accordance with the classification scheme specified in BS EN 1443:2003 (see Annex B).

The classification covers the maximum temperature that the flue is suitable for, its pressure class, i.e. suitability to cope with positive or negative pressure, its resistance to condensate, i.e. suitability to deal with wet or dry conditions, its corrosion resistance and its soot fire resistance. The European Standard to which the chimney or component is constructed can also be shown at the beginning of the designation.

NOTE 1 Annex A gives an example of a designation in accordance with the classification system given in BS EN 1443:2003.

Chimneys and connecting flue pipe components should have a minimum designation as given in Table 5. If the manufacturer's instructions specify a higher designation, components with that designation should be used.

Table 5 **Minimum performance designations for chimney and flue pipe components for use with oil fired appliances with a flue gas temperature of less than 250 °C**

Type of appliance	Minimum designation [A]	Liquid fuel class [B]
Boiler, including combination boiler – Pressure jet	T250 N4 D1 O	C2
Cooker – Pressure jet	T250 N4 D1 O	C2
Cooker – Pressure jet	T250 N4 D2 O	D
Cooker and roomheater – Vaporizing burner	T160 N4 D1 O	C2
Cooker and roomheater – Vaporizing burner	T250 N4 D2 O	D
Condensing pressure jet burner appliances	T120 N4 W1 O	C2
Condensing pressure jet burner appliances	T160 N4 W2 O	D
Condensing vaporizing burner appliance	T160 N4 W2 O	D

[A] Designations are given in BS EN 1443.
[B] As specified in BS 2869:2010+A1.

NOTE 2 Flue liners for condensing applicances in accordance with Table 5 are usually smoothbore which is a higher grade due to acid attacks (previously a Class 1 flue liner as for solid fuel with two layers of stainless steel interwoven to produce a stainless steel liner). It is very important that this type of liner is installed in the correct direction so that it allows any condensate to flow down the liner surface. Some flue liner manufacturers indicate the correct direction of flow of products of combustion through the liner with arrows.

10.2 Choice of materials

Materials for flue pipes should be as follows:

a) cast iron conforming to BS 41:1973;

b) vitreous enamelled low carbon steel conforming to BS 6999:1989;

c) stainless steel in accordance with BS EN 1856-1:2009.

The internal surfaces of chimneys should have a smooth finish and regular profile, and should be such as to not impede the flow of gaseous combustion products.

10.3 Construction of masonry or flueblock chimneys

NOTE 1 The construction of masonry chimneys is covered by the Building Regulations [2], [3], [4].

NOTE 2 The capacity of most lined masonry or flueblock chimneys is likely to exceed the requirements of an oil fired appliance.

The chimney diameter should not exceed that of the flue outlet on the appliance. Where it does so, the diameter of chimney available to carry the combustion gases should be reduced by fitting a flexible stainless steel liner. In cases where a high degree of heat loss from the chimney is likely, the space between the stainless steel liner and the original construction should be filled with insulating material. This should not be of the free running type in order to prevent possible blockage of the flue in the event of a liner failure. Insulation should only be applied where the installation instructions for the liner indicate that this is permitted.

Flexible chimney liners should only be used for lining or relining chimneys. They should not be used as a chimney on their own, as a connecting flue pipe or outside a masonry or flueblock chimney. Components used should be in accordance with Table 5.

Clay, ceramic or concrete flueblock flue systems can also be used, but, as with masonry chimneys, care should be taken to make sure that they are not oversized and that their thermal characteristics are suitable for oil fired appliances with low flue gas temperatures.

NOTE 3 Components of clay and ceramic flueblock chimneys are specified in BS EN 1457:1999, including amendment A1:2002, BS EN 1806:2006, BS EN 13502:2002, BS EN 13063-1, BS EN 13063-2, BS EN 13063-3 and BS EN 13069.

NOTE 4 Components of concrete flue block chimneys and liners are specified in BS EN 1857:2003, BS EN 1858:2003 and BS EN 12446:2003.

The inside of a previously used masonry chimney should be thoroughly cleaned to remove soot and similar deposits before a liner is inserted in order to prevent corrosion of the liner.

10.4 Factory made insulated chimneys (system chimneys)

NOTE 1 Factory made insulated chimney systems are covered by the Building Regulations [2], [3], [4].

Factory made insulated chimneys should be made of components with designations as given in Table 5.

NOTE 2 They are available in sections that can be fitted together to produce a complete chimney of the configuration required. Insulated sections can also be used as connecting flue pipes between appliances and masonry chimneys.

NOTE 3 A method of specifying the design criteria and installation method for factory made insulated metal chimneys is specified in BS EN 15287-1:2007 and components of these chimneys are specified in BS EN 1856-1.

Where factory made insulated chimneys are installed externally to the building, the outer casing should be fabricated from a material able to withstand rain penetration and atmospheric corrosion.

External runs of chimney should be securely supported so as to be capable of withstanding likely wind pressures.

10.5 Plastics chimney systems

Plastics chimney systems and components can be used with some appliances such as condensing boilers (see **13.1**). The system should be as specified by the appliance manufacturer.

NOTE Elastomeric seals for chimneys are specified in BS EN 14241-1 and requirements for system chimneys with plastics flue liners are specified in BS EN 14471.

10.6 Connecting flue pipes

Components for connecting flue pipes should have designations as given in Table 5. These should be made of a material listed in **10.2**.

10.7 Chimney terminals

Chimney terminals should be suitable for use with the type of oil being used, and should not place a restriction on the flow of combustion products.

Where proprietary or special terminals are used the contractor should obtain the manufacturer's recommendation on their durability.

NOTE Further information on clay chimney terminals is given in BS EN 13502.

Where a terminal is located less than 2 m from ground level, or in some other position where it could come into contact with people or be damaged, it should be protected by a terminal guard of a type approved by the appliance manufacturer.

10.8 Position of chimney terminals for open flued appliances (see Figure 8)

*COMMENTARY ON **10.8***

The height and position of a chimney terminal in relation to the roof has an important bearing on the proper functioning of the chimney. Wind pressures and suction effects causing turbulence depend not only on the pitch of the roof and the position of the chimney terminal but are influenced by the land contours and the proximity and height of adjacent buildings and trees.

Chimney terminals should be raised above the zone of turbulence. Where this is not possible for aesthetic reasons, the appliance should be resited to enable the chimney terminal to be placed in a more suitable position, or a balanced flue appliance should be used.

Some open flued appliances are designed for use with low level discharge flues. These are flues generally installed to discharge at a height of less than 2 m above the outside ground level. Such flues should be installed so as to discharge directly through the wall behind the boiler or be extended to discharge at some other point in an acceptable position.

NOTE 1 For open flued appliances with low level discharge flues, performance can be adversely affected by their disposition with respect to building corners, i.e. entrant and re-entrant angles.

NOTE 2 Specific terminals are provided for low level discharge flues and it is essential that the terminal and appliance are approved for use with each other.

An appliance designed to burn class D fuel should discharge its flue gases at a height of 2 m or greater from the outside ground level.

NOTE 3 There is no such limitation for an appliance designed to burn class C2 fuel.

If a terminal is so sited that there is a likelihood of accidental contact by persons or of damage to the terminal, the terminal should be fitted with a suitable guard in accordance with the appliance manufacturer's recommendations.

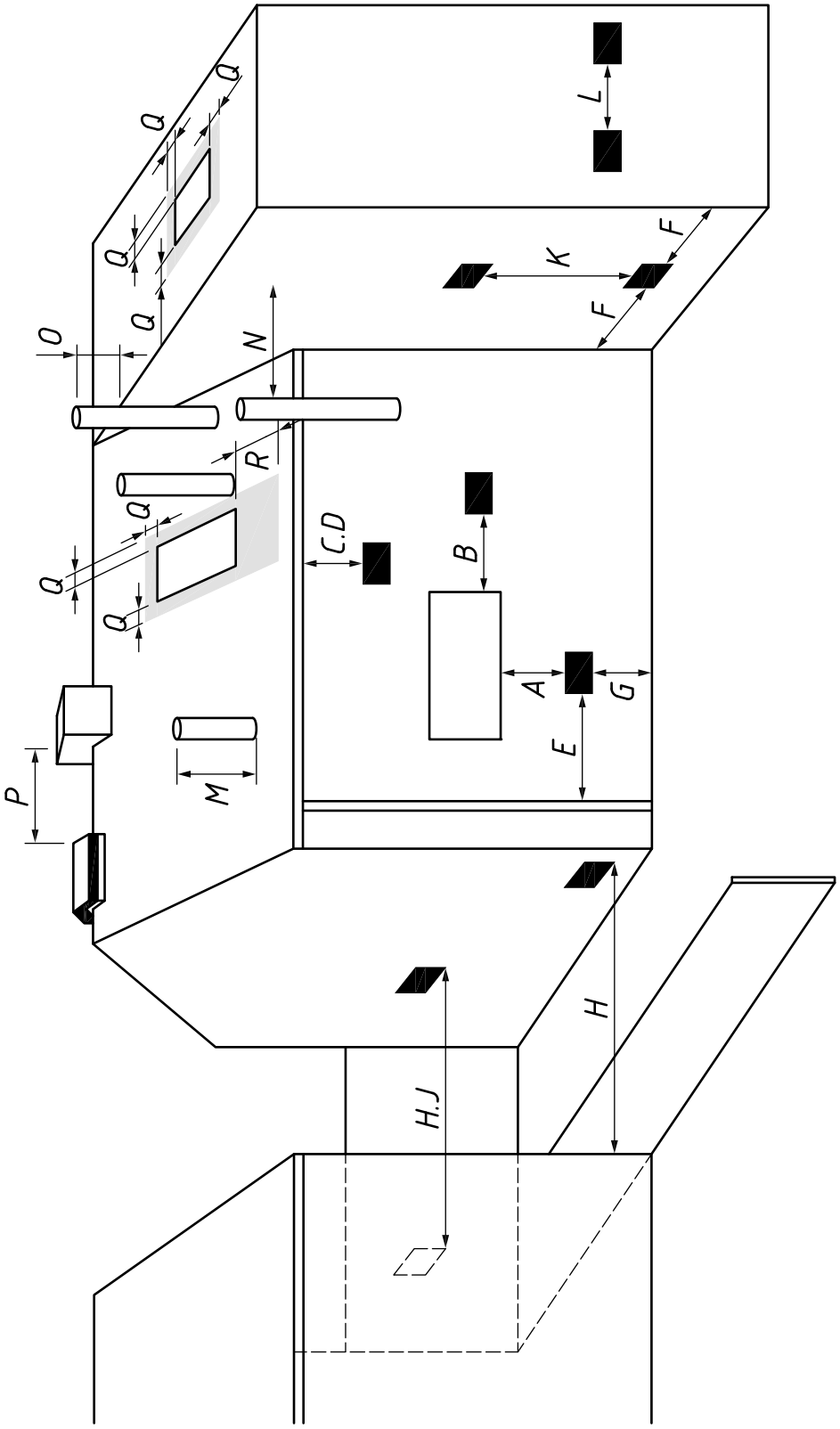
NOTE 4 Further information on oil fired appliances with low level discharge flues is given in BS EN 303-1, BS EN 303-2, OFS A100 [19] and OFS A101 [25].

Chimney terminals should be located as shown in Figure 8. Where the terminal of an oil fired appliance with a pressure jet burner discharges horizontally alongside a boundary, it should be located at least 300 mm away from the boundary.

10.9 Flue terminals for condensing boilers

Flue terminals for condensing boilers should be located in accordance with Figure 8.

Figure 8 **Flue terminal positions for oil fired appliances**



	Location	Appliance burner type		
		Pressure jet [A]	Vaporizing [A]	Condensing [A]
A	Directly below an opening, air brick opening, opening window, etc.	600	Not allowed	1 000
B	Horizontally to an opening, air brick opening, opening window, etc.	600	Not allowed	1 000
C	Below a gutter, eaves or balcony with protection	75	Not allowed	1 000
D	Below a gutter or a balcony without protection	600	Not allowed	1 000
E	From vertical sanitary pipework	300	Not allowed	–
F	From an internal or external corner	300	Not allowed	–

Figure 8 **Flue terminal positions for oil fired appliances**

G	Above ground or balcony level	300	Not allowed	–
H	From a surface or boundary facing the terminal	600	Not allowed	2 500
J	From a terminal facing the terminal	1 200	Not allowed	–
K	Vertically from a terminal on the same wall	1 500	Not allowed	–
L	Horizontally from a terminal on the same wall	750	Not allowed	–
M	Above the highest point of an intersection with the roof	600	1 000	–
N	From a vertical structure to the side of the terminal	750	2 300	–
O	Above a vertical structure less than 750 mm from the side of the terminal	600	1 000	–
P	From a ridge terminal to a vertical structure on the roof	1 500	Not allowed	–
Q	Above or to the side of any opening on a flat or sloping roof	300	300	–
R	Below any opening on a sloping roof	1000	1 000	–

Terminals should be positioned so as to avoid products of combustion accumulating in stagnant pockets around the building or entering into buildings.

*NOTE 1 Appliances burning class D fuel have additional restrictions, see **10.8** and **12.1**.*

NOTE 2 Vertical structure in N, O and P includes tank or lift rooms, parapets, dormers, etc.

NOTE 3 Terminating positionings A to L are only permitted for appliances that have been approved for low level flue discharge when tested in accordance with BS EN 303-1, OFS A100 [19] or OFS A101 [25].

Terminating positions should be at least 1.8 m from an oil storage tank unless a wall with at least 30 min fire resistance and extending 300 mm higher and wider than the tank is provided between the tank and the terminating position.

Where a flue is terminated less than 600 mm away from a projection above it and the projection consists of plastics or has a combustible or painted surface, then a heat shield of at least 750 mm wide should be fitted to protect these surfaces.

For terminals used with vaporizing burners, a horizontal distance of at least 2 300 mm should be between the terminal and the roof line.

If the lowest part of the terminal is less than 2 m above the ground, balcony, flat roof or other place to which any person has access, the terminal should be protected by a guard.

Notwithstanding the dimensions given above, a terminal should not be sited closer than 300 mm to combustible material. In the case of a thatched roof, double this separation distance should be provided. It is also advisable to treat the thatch with a fire retardant material and close wire in the immediate vicinity of the flue.

A flue or chimney should not pass through the roof within the shaded area delineated by dimensions Q and R.

Where protection is provided for plastics components, such as guttering, this should be to the standard specified by the manufacturer of the plastics components.

[A)] Minimum distances to terminals in millimetres as measured from top of the chimney or the outer edge of a low level discharge opening.

11 Design and installation of flues and chimneys

11.1 General

The initial installation, replacement and adaptation of flues and chimneys for oil fired appliances is work covered by the Building Regulations [2], [3], [4]. This type of work should be undertaken by competent technicians, subject to supervision either by a registration body or the local authority building control department.

NOTE 1 In England and Wales, Jersey, Guernsey and the Isle of Man, if a person registered with an approved scheme is used for such work then it is not required that application is made to the local authority building control department for approval prior to the work commencing and such firms can self-certify compliance of their work at completion.

NOTE 2 In England and Wales, Jersey, Guernsey and the Isle of Man, where documentation is required by the local authority to confirm competent installation work, form CD/10 [17] has been approved for use.

NOTE 3 Attention is drawn to the Building Regulations [2], [3], [4] with respect to structural alterations to buildings.

Existing chimneys might be suitable for oil fired appliances with adaptation work; alternatively, chimneys should be installed to suit the particular appliance chosen.

Wherever possible each appliance should be served by a dedicated flue.

NOTE 4 A factory made insulated chimney is an alternative to a conventional masonry chimney for both new and existing buildings. A further alternative might be a suitable form of insulated flue pipe normally positioned on a wall outside a building or, in the case of appliances where the flue gas temperature is less than 250 °C, on a wall inside a building.

NOTE 5 Further guidance on factory made insulated chimneys is given in BS EN 1856-1.

11.2 Size of flues

NOTE 1 The requirements for a chimney serving an oil fired appliance vary depending on the class of appliance and the rating of the appliance.

The appliance manufacturer's advice should be obtained to establish the size of the flue required. Flues should never be less than the size of the flue connection on the appliance. Flues larger than the appliance flue connection should only be used in exceptional circumstances and if recommended by the appliance manufacturer.

NOTE 2 Guidance on the design of chimneys serving one heating appliance is given in BS EN 13384-1:2002+A2.

11.3 Shared flues

If, in exceptional circumstances, one flue is to be used for two or more appliances this should only be done if they are in the same room and their combined rated output does not exceed 45 kW. In such instances the cross-sectional area of the common flue should equal the combined cross-sectional areas of the flues required for the individual appliances. Appliances with vaporizing burners should not share a flue with an appliance with a pressure jet burner.

NOTE Guidance on the design of chimneys serving more than one heating appliance is given in BS EN 13384-2:2003+A1.

11.4 Masonry chimneys

*COMMENTARY ON **11.4***

Masonry chimneys can be of many different types of construction. The type most commonly encountered, however, has inside cross-sectional dimensions of 228 mm × 228 mm, and is constructed of brick, lined or unlined, with a cement render.

Before a masonry chimney is used for an oil fired appliance it should be thoroughly cleaned to remove any traces of soot or debris.

Unlined chimneys or chimneys with oversized liners should not be used for oil fired appliances.

NOTE 1 Current practice is to line chimneys at the time of building. Such lined chimneys are not generally suitable for oil fired appliances, , because their cross-sectional area is normally too large and their thermal characteristics are poor (see Note 2). In general, the cross-sectional area of these liners is too large for oil fired appliances because of their low flue gas temperatures.

Where a chimney lined at the time of building is to be used a further liner should be inserted, e.g a flexible stainless steel liner, leaving a gap between the new and original liners. Depending on the degree of exposure and the practicability of the operation, this gap should be backfilled with insulating material. If this material is of the loose running type, it should be stabilized. Insulation infill should only be used where the liner manufacturer has stated that the product is suitable for use with their liner.

NOTE 2 The thermal resistance offered by a dense ceramic liner set in concrete is low and does not provide a significant improvement in performance over an unlined chimney. In addition, the thermal inertia of such a structure is high and in certain circumstances could cause flue problems such as undue condensation. Material damage to the structure and objectionable fabric staining can occur from flue gas condensation. This is most likely to occur if a solid fuel appliance has been previously connected and the chimney has not been swept clear of soot and other combustion deposits before connecting an oil fired appliance.

An existing chimney which has proved unsatisfactory for solid fuel should not be used for an oil fired appliance until it has been examined and any faults corrected (see also **16.2**).

11.5 Installation of flue pipes

11.5.1 General

Flue pipes should be sited or protected in such a way as to prevent them from being damaged.

Before erection, cast iron pipes and fittings should be examined to see that they are free of moulding sand and rough edges which, if left, encourage the collection of dust and soot deposits. The supports for a flue pipe, if fixed prior to the erection of the pipe, should be correctly positioned.

As modern oil fired appliances operate at very low flue gas temperatures because of the high efficiencies of their heat exchangers, a correctly sized warm flue should be used.

NOTE Oversized flues with poor insulation are not suitable.

11.5.2 Joints

Flue pipes with spigot-and-socket joints should be erected with the sockets pointing upwards.

Surplus and extruded jointing material should be removed from the internal surfaces to avoid constriction and roughness of the flue, and this should be done as construction progresses.

Joints should be made as follows.

a) *Cast iron pipes*. Joints should be made with fibre cord, well caulked and finished smooth with fire cement.

b) *Steel pipes*. Joints should be made by push fitting one end over the other. If there are any imperfections at the joint these should be sealed with jointing compound.

11.5.3 Stays and supports

Flue pipes should be stayed in accordance with manufacturer's instructions at intervals not exceeding 16 times the internal diameter. Preferably, staying or supporting should be carried out at each joint. Whenever possible, supports should be built in as work proceeds and should be strong enough to take the weight of each individual length of flue pipe.

11.5.4 Clearance from combustible materials

Flue pipes should be installed such that heat from a flue pipe cannot raise the temperature of any combustible material in its vicinity to more than 85 °C.

If the flue pipe passes through a wall or floor designed to prevent or restrict the spread of fire, it should be enclosed at that point in a casing able to provide the fire resistance required from each side of the wall or floor.

Flue pipes should have at least 25 mm separation from combustible material. Where the flue pipe passes through a combustible roof, floor, ceiling or partition, the pipe should be surrounded by a non-combustible sleeve. The diameter of the sleeve should be sufficient to provide an annular space of not less than 25 mm between the flue pipe and the sleeve when the pipe is in position.

NOTE With twin walled flue pipes this distance can be measured from the outside of the inner pipe.

This space should be filled with mineral fibre packing or similar non-combustible, insulating materials.

If a flue pipe passes through a room or enclosed space, other than that in which the appliance is situated, any part of the flue pipe which could reach temperatures exceeding 85 °C should be protected to prevent contact by persons using the room. Where a single skin flue pipe passes through a space subject to wide temperature variation, such as a roof space, it should be insulated with a non-combustible insulating material, or alternatively twin walled flue pipe should be used.

11.5.5 Materials for flue pipes and fittings

Flue pipes should be made of materials as listed in **10.2**.

NOTE 1 The material to be selected depends on the type of fuel to be used and on the flue gas temperature. Appliances are classed as having flue gas temperatures up to or above 250 °C.

NOTE 2 Further information on reporting flue gas temperatures is given in BS EN 303-1, BS EN 303-2, OFS A100 [19] and OFS A101 [25].

11.5.6 Bends in flue pipes and fittings

To minimize resistance to the flow of flue gases and to facilitate sweeping, there should be no more than two bends in the flue pipe and no more than two bends in the chimney. Any bends in flue pipes should not be more than 45° from the vertical.

11.6 Dampers

Unless specified by the appliance manufacturer, closeable dampers should not be fitted in any chimney or flue pipe serving oil fired appliances. Any existing dampers in a chimney or flue pipe should be removed.

11.7 Inspection and cleaning

Access points should be provided at those positions where any debris is likely to accumulate and cause obstructions in the chimney or flue pipe.

NOTE Sufficient access is provided in some appliances for this purpose.

Openings in flues and flue pipes made for inspection or cleaning should be fitted with a close fitting cover made of non-combustible material. No openings other than for this purpose should be made into any flue or flue pipe except as described in **5.4.5**.

11.8 Inspection on site

11.8.1 Structural chimneys

During the construction of a chimney frequent inspections should be carried out by a competent person to ensure that where bends, etc., occur no reduction of the flue area is made, and also that all details such as throatings, terminals, damp proof courses, flashings etc. are properly made.

The flue should be kept clear of mortar droppings, intrusions of jointing material and other obstructions. The flue should be proved clear prior to removal of scaffolding.

NOTE The flue can be cleared by lowering a coring ball through it.

Before the completion of constructional and decorative work an inspection should be made by a competent person to ensure that all recommendations relating to protecting the building from heat have been followed.

11.8.2 Factory made insulated chimneys

When the installation has been completed, an inspection by a competent person should be carried out to check that joints have been properly tightened and that all supports, fire stops and spacers are properly located and secured in accordance with the manufacturer's installation instructions. The fitting of the terminal and roof flashing should also be inspected.

11.8.3 Insulated flue pipes

When the installation is completed an inspection should be carried out by a competent person to check that joints have been properly tightened and that supports and clips are properly located and secured in accordance with the manufacturer's installation instructions.

12 Room sealed balanced flue appliances

12.1 General

*COMMENTARY ON **12.1***

A room sealed balanced flue appliance is an appliance with the flue gas exit terminal positioned on the outside of the building concentric with or adjacent to the combustion air inlet. This arrangement is designed to minimize the effect of wind on appliance combustion performance. Room sealed balanced flue appliances can discharge flue gases at high or low level.

An appliance designed to burn class D fuel should discharge its flue gases at a height of 2 m or greater from the outside ground level.

NOTE 1 There is no such limitation for an appliance designed to burn class C2 fuel.

NOTE 2 Further information on room sealed oil fired appliances is given in BS EN 303-1, BS EN 303-2, OFS A100 [19] and OFS A101 [25].

12.2 Mounting

The flue outlet terminal should be mounted so that it is separated from any combustible material forming part of the building.

If there is combustible cladding on the surface of a non-combustible wall through which the flue outlet passes, the cladding adjacent to the flue outlet should be replaced by non-combustible material extending not less than 50 mm beyond the outside dimensions of the flue outlet. If wall through which the flue outlet passes is itself made of combustible material, the flue outlet, where it passes through the wall, should be surrounded by non-combustible insulating material not less than 50 mm thick. The insulating material itself should be contained in a steel liner to provide the necessary structural rigidity and to prevent moisture reaching the insulating material.

12.3 Sizing

The flue size of a balanced flue appliance should be as specified by the manufacturer.

12.4 Terminal location

NOTE The terminal is part of the appliance and the design is the responsibility of the manufacturer.

The terminal should be installed on a plain surface of wall. The terminal location should be as shown in Figure 8. Positions where the discharge of combustion products could cause nuisance should be avoided.

Where a terminal is so sited that there is a likelihood of accidental contact by persons or of damage to the terminal, the terminal should be fitted with a guard in accordance with the appliance manufacturer's recommendations.

Where external boilers are used, the flue termination should be positioned to prevent flue gases stagnating in pockets created by the location of the boiler.

13 Special categories of flue system

13.1 Flue systems for use with condensing appliances

13.1.1 Flue materials

The flue should be constructed of materials suitable for use with condensed combustion products which are mildly acidic.

NOTE Materials such as copper, mild steel and certain grades of stainless steel are not suitable for this particular application.

Advice on suitable materials should be sought from the appliance manufacturer.

Plastics materials should only be used where the appliance manufacturer has approved them.

13.1.2 Condensate disposal

Where the appliance installation instructions specify that a condensate drain has to be provided for the appliance, provision should be made for the collection and/or disposal of condensate formed in the flue or the heat exchanger. The appliance manufacturer's instructions should be followed in respect of material selection, sizing and routing.

Unless stated otherwise in the manufacturer's instructions the condensate drain pipe should be made of corrosion resistant non-permeable pipe of at least 19 mm internal diameter. The pipework should be run with a sufficient fall to minimize the risk of ice accumulation in very cold weather conditions.

NOTE 1 A gradient of at least 5° would normally achieve this.

The condensate drain pipe should discharge into one of the following:

- an internal drain stack pipe;
- a waste pipe;
- an external drain or gully;
- a rainwater hopper that is part of a combined system i.e. a sewer that carries both rainwater and foul water;
- a purpose made soakaway.

Where possible connections should always be made to internal drain points (stack pipe or waste pipe) as external termination points are more likely to become blocked by, for example, freezing, leaves or general debris.

NOTE 2 Advice on condensate disposal is given in the Guide to the condensing boiler installation assessment procedure for dwellings *[26], and in OFTEC Technical Book 4 [18].*

The condensate pipe should be provided with a trap to prevent air from entering the flue or appliance or smells entering the building. The trap should be located internally where it will be protected from freezing.

13.2 Balanced compartment installations

*COMMENTARY ON **13.2***

A balanced compartment installation is an installation in which an open-flued appliance is installed in a sealed compartment with the ventilation inlet and flue termination close together in the same pressure zone situation, so that a balanced-flued effect is achieved.

13.2.1 General

A proprietary system should be used for a balanced compartment installation and should be installed in accordance with the appliance manufacturer's instructions. The compartment should be sealed in accordance with the system manufacturer's instructions.

13.2.2 Ventilation inlet and flue outlet

NOTE Proprietary systems include a ventilation inlet and a flue outlet designed by the manufacturer of the system.

There should be no ventilation openings into the compartment other than that supplied as part of the proprietary system.

13.2.3 Compartment access

The compartment should have a self-closing flush door which fits tightly in its frame with a draught sealing strip. The door should not open into a bathroom or a room containing a bath.

A notice should be attached to the door stating that it should be kept closed apart from when access is required.

The door should be fitted with an electrical isolator switch which shuts down the appliance when the door is opened.

13.2.4 Insulation

The flue pipe and any exposed hot water carrying pipework or air ducts within the compartment should be insulated to reduce heat transfer to the compartment.

NOTE Double-wall flue pipe or insulated metal chimney pipe are sufficiently insulated for this purpose.

13.2.5 Flue terminal location

Flue terminal locations for balanced compartment installations are not as critical as those for individual open flue installations; however, if positions other than those recommended in **10.8** are wanted, advice should be obtained from the appliance manufacturer or the flue system manufacturer.

13.2.6 Commissioning

NOTE In most applications, the compartment is sufficiently large to permit the engineer to remain in the compartment while commissioning tests on the appliance are being carried out.

Where the compartment is not sufficiently large for the engineer to remain in it while commissioning tests are being carried out, these tests should be carried out with the compartment door open. If during this time, the electrical isolator switch (see **13.2.3**) is bypassed it should be returned to operation when the work has been completed.

14 Electrical installation and system controls

The electrical installation should be designed and installed in accordance with BS 7671.

Appliances with high voltage ignition systems should be clearly marked "Danger – High Voltage".

System controls should be fixed in a position chosen to avoid temperature or vibration conditions which could adversely affect the functions of the system controls.

Means should be provided to isolate the main electricity supply from the appliance and system controls for maintenance purposes.

Radio remote control system packages should be selected to ensure compatibility with other components within the control system.

NOTE 1 In areas where television or radio reception is weak it might be necessary to enhance the equipment fitted as standard to the appliance to suppress electrical interference.

NOTE 2 Guidance on suppressing electrical interference is given in BS 9125.

Heat resisting cable or mineral insulated metal sheathed cable should be used where the wiring will be exposed to heat.

15 Commissioning

Appliance commissioning work should be carried out in accordance with the manufacturer's commissioning instructions by qualified and competent technicians, subject to supervision by a registration body.

NOTE 1 The installation of oil fired appliances and systems require the commissioning of both the oil fired appliance and any wet and control systems connected to the appliance. Installation work is controlled by the Building Regulations [2], [3], [4].

Appliances should be commissioned using the correct calibration equipment in accordance with the manufacturer's instructions. This should be the original appliance manufacturer for new equipment and the conversion equipment manufacturer for converted equipment.

The commissioning process should consist of the following steps:

a) establishing the appliance heat output rating via the heating system designer;

a) ensuring that the combustion equipment is capable of being fired safely;

b) checking that the appliance manufacturer's instructions and the recommendations given in this standard have been followed;

c) ensuring that, once ignited, the appliance performs safely and operates in accordance with the appliance manufacturer's combustion specification;

d) ensuring that the combustion and ventilation air supplies and the flue are operating in accordance with the appliance manufacturer's instructions. If an extract ventilation fan is fitted where it could affect the performance of the appliance, a flue draught interference test should be carried out as described in **5.4.7.2**;

e) ensuring that the appliance and system controls are operating correctly;

f) checking that the user has been provided with an operating manual for the appliance and has been properly instructed in the use of the appliance and in its maintenance and servicing requirements;

g) ensuring that the commissioning documentation is completed and provided to the installer.

NOTE 2 In England and Wales, Jersey, Guernsey and the Isle of Man where documentation is required by the local authority to confirm competent installation work, form CD/10 [17] and competent commissioning work, form CD/11 [27] have been approved for use.

16 Maintenance

16.1 General

For continuous satisfactory performance, appliances and installations should be regularly maintained by competent technicians, subject to supervision by a registration body.

Such maintenance should cover combustion equipment, including any safety aspects of its water connections, oil storage and supply. Special attention should be paid to the safety aspects of the operation of the installation such as combustion and ventilation air supply, flueing, emissions, fire and electrical safety. Checks should also be made of the condition of any combustible material located near oil fired appliances and flues.

16.2 Maintenance of combustion equipment

Combustion equipment should be thoroughly cleaned and checked for correct operation. Consumable items such as atomizing nozzles, flexible oil lines, filter elements and kindler wicks should be replaced at least annually, or not later than the expiry of the manufacturer's guarantee period.

NOTE The manufacturer's guarantee period can be taken as an indication of the expected life of the item.

A combustion efficiency test should be carried out with an electronic combustion analyser and a printout of the results left with the equipment user.

16.3 Maintenance of oil storage tanks

NOTE 1 Attention is drawn to the Control of Pollution Regulations [6], [7], [8].

Above ground oil storage tanks should be visually inspected externally at least every year or at the the time of the appliance service visit. Checks should be made for any signs of leakage or deterioration of the tank and its fittings. Any defects or areas of concern with regard to the condition of the tank identified at time of visual inspection should be reported to the owner of the tank.

Owners of underground oil storage tanks should be advised by the maintenance technician to have the integrity of the tank and its associated pipework verified at least every year by a specialist contractor.

The liquid fuel in the storage tank should be dipped using water-finding paste and a sample of fuel should also be visually inspected for signs of water in suspension. If evidence of water is found, the end user should be formally notified in writing and should be advised to seek specialist advice regarding remedial action.

If corrosion is noted on a steel tank the owner should be notified and advised that measures should be taken to ensure the integrity of the tank.

If any cracks are noted in a plastics tank, the owner should be advised that the tank should be decommissioned and replaced immediately.

The oil storage bund should be inspected for the presence of water and debris. If water or debris is found, the end user should be notified in writing and advised to arrange for its removal and disposal.

NOTE 2 Futher information on tank inspection is given in OFTEC Technical Book 3 [N4].

Owners should be advised that plants used for screening and any other combustible material should be kept at least 600 mm away from tanks.

NOTE 3 Where environmental and/or fire risk is identified at the time of inspection OFTEC Form TI/133D [28] may be used to record and advise the owner of the oil storage installation.

NOTE 4 The decommissioning and disposal of oil storage tanks can become necessary as part of the maintenance cycle of an oil fired system. It is a very hazardous procedure, and is only undertaken by specialist operatives who have the right equipment and expertise.

Building owners should never attempt to cut up old oil storage tanks themselves.

NOTE 5 Detailed guidance on decommissioning and disposal of oil storage tanks is given in OFTEC Technical Book 3 [N4].

16.4 Oil supply system

The oil supply pipework, valves, filters and fire valves should be inspected and checked for proper operation, including resetting, where appropriate, at least annually.

Where leakage is suspected from an oil supply line, pressure testing should be carried out.

NOTE 1 Field testing procedures for both mechanical and electrically operated remote acting fire valves are given in OFTEC Technical Books 2 [N7] and 5 [N8].

NOTE 2 Further advice on oil line testing procedures and replacing flexible oil lines is given in OFTEC Technical Books 2 [N7] and 5 [N8].

16.5 Burner and appliance safety controls

Burner and appliance safety controls should be inspected for correct operation at least annually.

16.6 System safety

The operation of heating and domestic hot water system safety and control thermostats, valves, pipework, expansion vessels and systems should be checked at least annually by a technician with specific competency for this type of work.

Where the operation of heating and domestic hot water system safety and control thermostats, valves, pipework, expansion vessels and systems is not included in the appliance service visit, the owner should be advised that this work should be carried out at least annually.

16.7 Maintenance records

A record of maintenance carried out, including the results of combustion tests and, in particular, notes of any replacement parts fitted, should provided to the owner. The owner should be advised to retain this information and make it available at future service visits.

NOTE A suitable form for recording maintenance carried out is the Service and Commissioning Report form CD/11 [27].

17 Conversion of appliances to oil firing

Conversion of appliances to oil firing should be undertaken in accordance with the appliance and burner manufacturers' instructions.

NOTE Attention is drawn to the Building Regulations [2], [3], [4].

18 Biofuels

*COMMENTARY ON CLAUSE **18***

Biofuels are blended into mineral heating oil, or some can be used as fuels on their own, to introduce a sustainable element into the oil, to reduce pollution and to reduce import dependency. The main type of biofuel is FAME (fatty acid methyl esters) which is specified in BS EN 14214. Other types of biofuel might be introduced in the future and it is important that their suitablility is checked before they are used. The base heating oils in the blend are oils conforming to BS 2869:2010+A1.

Biofuels have an affinity for water and can readily absorb it and also scour surfaces in an aggressive way removing debris and scale attached to the inside of an oil handling and storage system. This can result in filter blockage. Bacterial contamination is more likely to occur with biofuel blends than with straight mineral oil.

18.1 General

Careful handling and housekeeping should be ensured when biofuels are used.

Fuels with a biofuel content of up to 5% have been found to be relatively trouble free; however, for fuels with a biofuel content higher than this, equipment manufacturers should be consulted to find out whether the equipment installed is capable of handling the blended fuel.

NOTE Gas oil with a 7% biofuel content is likely to be widely available and fuels with higher biofuel contents are expected to come onto the market in the future. Kerosene with a 30% biofuel content is also expected to be made available in the future.

18.2 Oil burners

Where existing burners are to be used, the manufacturer should be contacted for advice.

NOTE The manufacturer might be able to supply a conversion kit to fit an existing model for biofuel use.

Where a new burner is to be installed, a biofuel compatible burner should be selected. Burner hydraulic components and flexible oil lines suitable for biofuel should be used.

Water absorbed into fuel adversely affects the operation of the burner and can damage its components so measures should be taken to keep water and oil separate, in accordance with **18.4** and **18.5**.

18.3 Oil supply system

All materials in the system from the storage tank to the burner should be compatible with the percentage of biofuel being used. Filtration is important and a biofuel compatible filter should be fitted at the tank with a similar secondary filter protecting the burner. Any seals incorporated in the system should also be biofuel compatible.

18.4 Oil storage

Where an existing oil storage tank is to be used for storing biofuel, enquiries should be made with the tank manufacturer as to the tank's suitability. Where any doubt exists the tank should be replaced.

Existing storage tanks should be inspected and checked for water contamination. All water should be removed. The tank should be cleaned and oil filters replaced before a biofuel delivery is made. Where a new tank is to be installed, a biofuel compatible tank should be selected.

18.5 Servicing and inspection

At least once a year, visual checks of seals, gaskets and hoses should be made, and filters replaced. The liquid fuel in the storage tank should be dipped using water-finding paste and a sample of fuel should also be visually inspected for signs of water in suspension. If evidence of water is found, the end user should be formally notified in writing and should be advised to seek specialist advice regarding remedial action.

Annex A (informative) Types of appliances and burners covered by this standard

A.1 Types of appliance

A.1.1 General

The oil fired appliances covered by this standard comprise heating boilers, of the freestanding, wall mounted and hearth type, combination boilers and oil fired cookers. They are intended to be used typically in single family dwellings and other buildings of similar scale.

These appliances are designed to be connected to a flue pipe, chimney or integral flue discharging flue gas into the open air.

A.1.2 Heating boilers

These are generally constructed of carbon steel plate or of cast iron sections. Condensing boilers use stainless steel or aluminium for those parts where condensate could be present. Boilers are designed, with the exception of those used with pressurized sealed systems, to operate with a vent to the atmosphere and to be capable of withstanding the static pressure of the heating system.

Boilers in this category are designed to operate over the range 50 °C to 95 °C and are suitable for the indirect heating of domestic hot water by means of a heat exchanger, such as an indirect cylinder. Some models take the form of combination boilers, which can provide instantaneous domestic hot water.

NOTE 1 Attention is drawn to the Boiler (Efficiency) Regulations 1993 (as amended) [1].

NOTE 2 See BS EN 303-1, BS EN 303-2, BS EN 15034 and OFS A100 [19] for further information on oil fired boilers.

A.1.3 Cookers

A.1.3.1 Oil fired domestic cookers in use at present comprise three basic types:

a) heat storage cookers with or without a domestic hot water facility;

b) a more direct form of heat application for cooking with or without a domestic hot water facility;

c) similar to b) but with a larger boiler output to give central heating capacity and a domestic hot water facility.

Heat storage cookers, type a), are generally constructed with large iron castings forming a heat reservoir surrounded by a thick insulated casing to retain the heat. The temperature of the heat reservoir is maintained by either thermostatic or manual methods using a comparatively small burner and the ovens and hot plates are heated mainly by conduction from this source.

The cookers of type b) are normally of lighter construction and employ a burner suitable for giving quick temperature response to the hot plates and ovens.

The cookers of type c) are similar to type b) and may employ one or more burners.

A.1.3.2 When a single burner is used, manually operated deflectors are sometimes fitted to direct the hot gases to either the boiler or to the hot plates and ovens depending upon user requirements.

NOTE See OFS A101 [25] for further information on oil fired cookers.

A.2 Types of burner

A.2.1 General

The types of burner most generally used for installations up to 45 kW capacity for space heating and hot water supply purposes are as described in **A.2.2**, **A.2.3** and **A.2.4**.

NOTE See BS EN 267, BS EN 293, OFS E100 [29], BS 799-2 and BS 799-8 for further information on oil fired burners.

A.2.2 Natural draught vaporizing burners

A.2.2.1 General

Natural draught vaporizing burners of the following classes are used on some types of cooker:

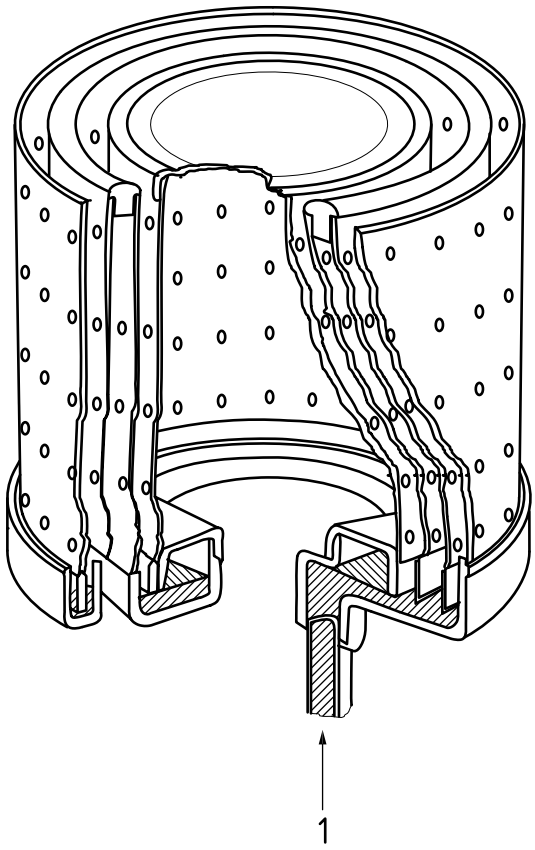
a) perforated sleeve burners (see **A.2.2.2**);

b) pot burners (see **A.2.2.3**).

A.2.2.2 Perforated sleeve burners

The perforated sleeve burner, as illustrated in Figure A.1, is constructed with a level cast iron base in which are formed one or two concentric troughs to distribute oil evenly round the base. Kindlers in the form of heat resistant tapes are placed in the troughs to assist oil distribution and to facilitate lighting. The troughs also accommodate metal sleeves of suitable diameters to fit the inner and outer perimeters of each trough. The sleeves are perforated with a regular pattern of air holes to allow a mixture of air with oil vapour which rises within the pair of sleeves when the base is heated by ignited kindlers. Generally a lighting port, covered by a moveable flap, is provided in the outer sleeve for lighting by match, but burners can have an electric element with a low voltage transformer to achieve ignition.

Figure A.1 **Schematic diagram of a natural draught perforated sleeve burner**



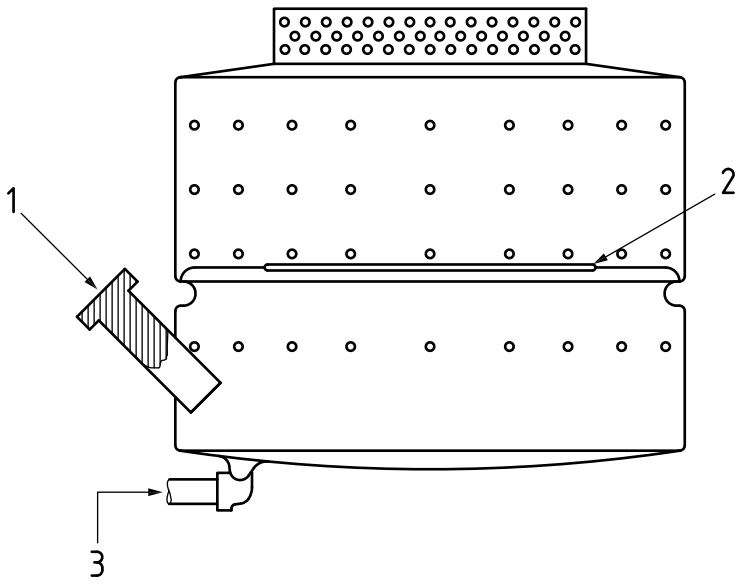
Key
1 Oil pipe from float control

The burner creates sufficient draught to induce the correct quantity of combustion air for efficient operation by virtue of the chimney effect created by the hot sleeves which can extend 250 mm above the base. In applications of this type of burner a draught break is usually provided to cut down the draught effect on the burner.

A.2.2.3 Pot burners

The pot burner, as illustrated in Figure A.2 is constructed of steel, and is generally circular in section although rectangular sections are also used to achieve a different flame distribution. The base of the pot is oiltight, having a small pipe welded in to admit oil to the base. Rows of air holes are provided in the sides of the pot in a systematic way to introduce air to the oil vapour generated within the pot. In many pot burners metal rings are sited in the lower part of the pot to stabilize the small flame obtained under controlled low fire conditions.

Figure A.2 **Schematic diagram of a natural draught pot burner**



Key

1 Lighting port
2 Low fire ring
3 Oil pipe from float control

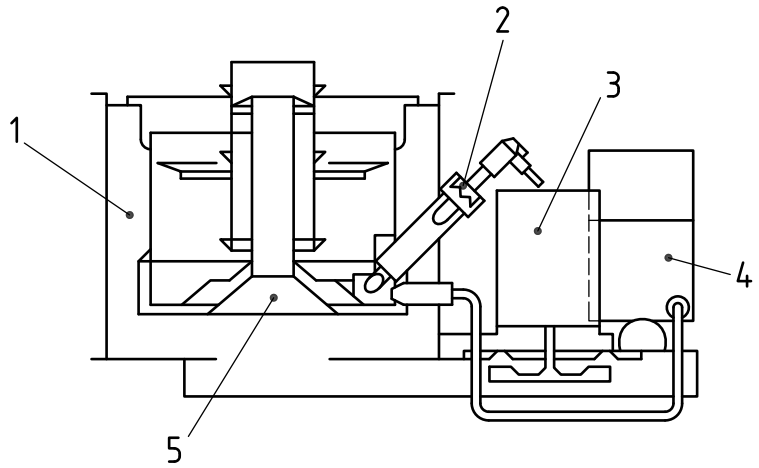
A.2.2.4 Control of perforated sleeve burners and pot burners

Both types of vaporizing burner can be controlled manually or thermostatically. The desired temperature of water or air produced by the appliance is achieved by altering the flow to the burner between a preset maximum and a minimum flow rate. This means that the burner once lit is always alight and therefore it is important that the minimum firing rate does not exceed the minimum heat requirement. Both types of burner are designed to use class C2 fuel (kerosene). Some pot burners can also use class D fuel (gas oil).

A.2.3 Fully automatic fan pressurised pot burners

This type of vaporizing burner operates in conjunction with an electrical control system and flame ignition device to give on/off operation so that when the heat demand is satisfied, the oil supply is turned off until further heat is required (see Figure A.3). Oil remaining in the burner at shutdown continues to burn until it is exhausted.

Figure A.3 **Schematic diagram of a mechanical draught pot burner with a central air diffuser**



Key

1 Wind box
2 Igniter
3 Motor and fan
4 Constant level oil control
5 Burner pot

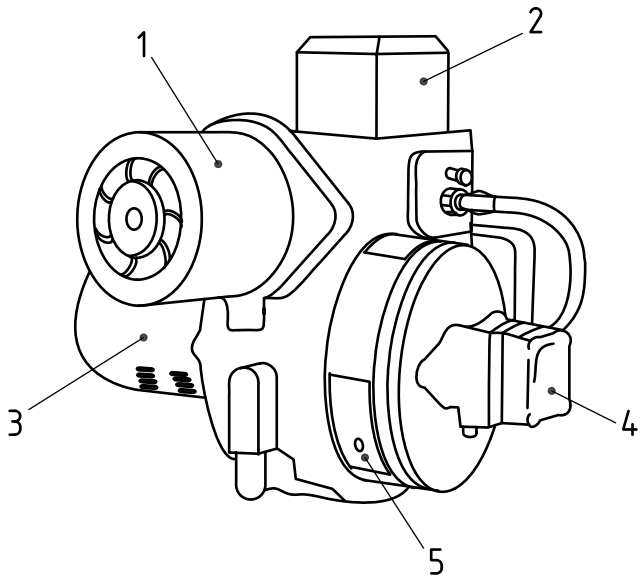
When further heat is required the control system will switch on the fan, energize the ignition and admit oil to the burner to supply heat again until the demand is satisfied. This arrangement enables the appliance to meet varying heat demands with greater flexibility than in the case of the burner types described in **A.2.2.2** and **A.2.2.3**.

This type of burner is designed to use class C2 fuel (kerosene).

A.2.4 On/off pressure jet burners

Pressure jet burners, as illustrated in Figure A.4, are the principal type of atomizing burners in use and, at ratings up to 45 kW, can be of the monobloc type, in which all components are fitted in a single burner unit, or utilize separate self-powered components, which can be located separately from each other.

Figure A.4 **Schematic diagram of a pressure jet burner**



Key
1 Draught tube
2 Ignition transformer
3 Electric motor
4 Oil pump
5 Air register

Atomization of the fuel is achieved by passing oil at high pressure through an orifice device to produce a spray pattern. A pump is used to achieve the necessarily high oil pressures and, in monobloc burners, the motor which drives it is also used to drive a fan giving air for combustion. This air is directed along a tube in which the atomizing jet is centrally placed. The atomized oil and air mixture is ignited by a high tension spark from electrodes and the flame is stabilized to burn away from the end of the draught tube.

The burners have electrical controls to give the correct sequence and timings for the various components of the burner which govern start up, shut down and safety precautions.

NOTE See BS EN 230 for further information on burner safety controls.

These burners are designed to use either class C2 fuel (kerosene), class D fuel (gas oil), biofuels conforming to BS EN 14214, or mineral/biofuel blends conforming to OFTEC Standard OPS24 [30].

Annex B (informative) Example of a chimney designation in accordance with BS EN 1443:2003

The following is an example of a chimney designation in accordance with BS EN 1443:2003.

Chimney designation: BS EN 1234 T 250 N 2 D 1 Oxx

Construction standard	BS EN 1234
Temperature class	T 250
Pressure class, N (negative) or P (positive) or H (high positive)	N 2

Resistance to condensate class, W (wet conditions) or D (dry conditions)	D
Corrosion resistance class	1
Sootfire resistance class, G (with sootfire resistance) or O (without sootfire resistance), followed by distance to combustible materials in millimetres (mm)	Oxx

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 476-4:1970, *Fire tests on building materials and structures – Part 4: Non-combustibility test for materials*

BS 799-2, *Oil burning equipment – Part 2: Specification for vaporizing burners*

BS 799-8, *Oil burning equipment – Part 8: Specification for connecting dimensions between atomizing oil burners and heat generators*

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