

Flues.

Michael Harrison

Aims

- The aims of this session are to provide you with the knowledge and understanding of the gas safety aspects of installation of flueing standards.

References.

- **BS 5440-1:2008 Installation & maintenance of flues and ventilation for gas appliances of rated input not exceeding 70kw net. (1st, 2nd, & 3rd family gases)**
 - Specification for installation and maintenance of flues.
- **BS 5871:2005 Parts 1-2-3-4 Space Heaters.**
- **BS 5440-2:2009 Installation & maintenance of flues and ventilation for gas appliances of rated input not exceeding 70kw net. (1st, 2nd, & 3rd family gases)**

Flues.

Regulation 32 states:

- (1) Any person who installs an automatic damper to serve a gas appliance shall:**
 - (a) Ensure that the damper is so interlocked with the gas supply to the burner that burner operation is prevented in the event of failure of the damper when not in the open position; and**

Flues.

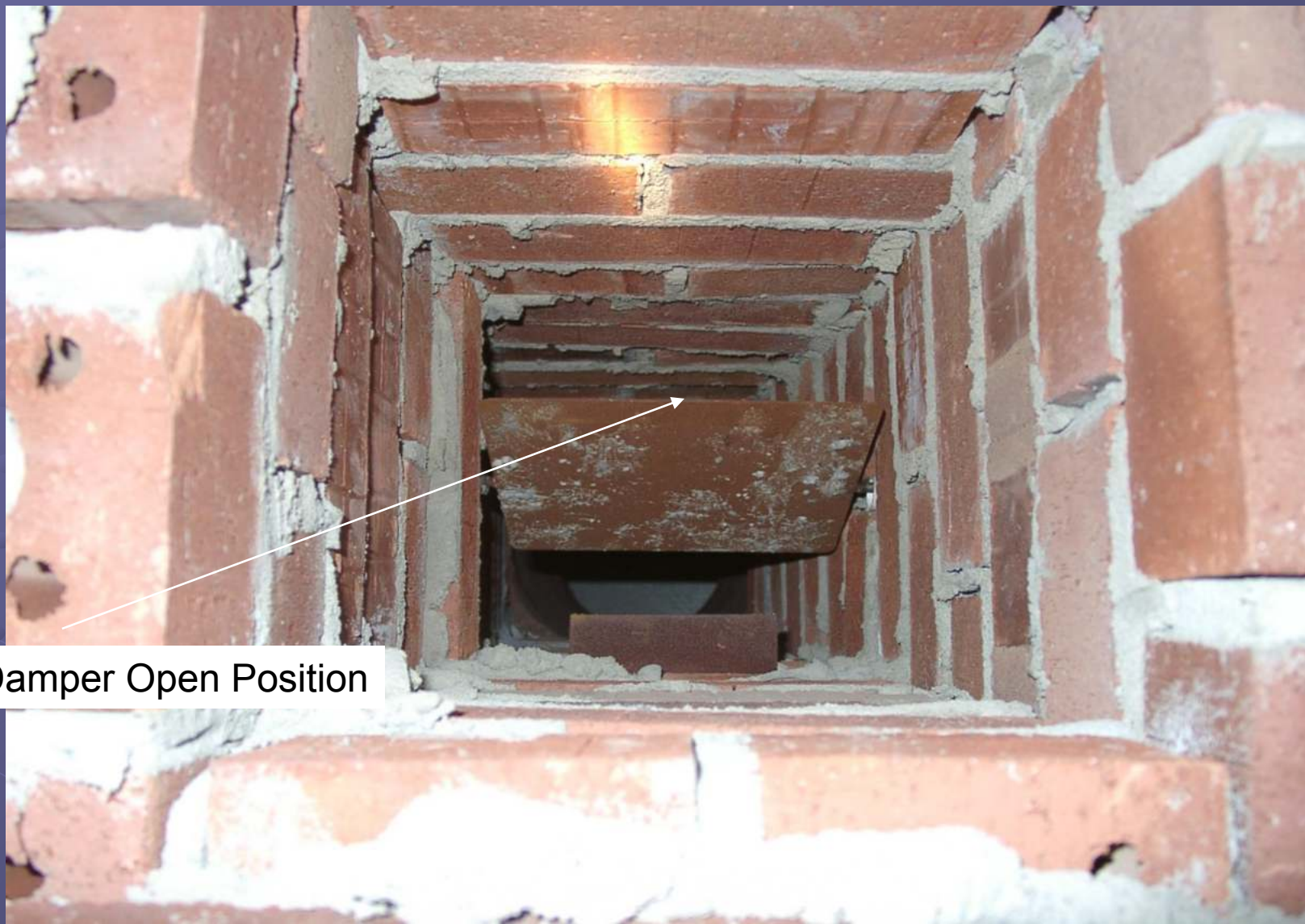
(b) Immediately after installation examine the appliance and the damper to verify that they can be used together safely without constituting a danger to any person.

Flues.

- (2) No person shall install a manually operated damper to serve a domestic gas appliance.**
- (3) No person shall install a domestic gas appliance to a flue, which incorporates a manually operated damper unless the damper is permanently fixed in the open position.**



Damper Closed



Damper Open Position

Flues.

- **After carrying out any work regulation '26(9)(a)' requires that the effectiveness of any flue be examined and any defects notified to the responsible person.**
- **Existing installations regulation '34(1) & 34(2)' require that an appliance shall not be allowed to continue to be used if the flue is not, and cannot be, used safely.**

Flueing Requirements

Factors that determine the need for a flue are:

- **Appliance heat input**
- **Continuous burning appliance**
- **Size of room the appliance are installed in**

Flue Construction

Materials used for flue construction vary from brick and ceramics to stainless steel.

All materials should be:

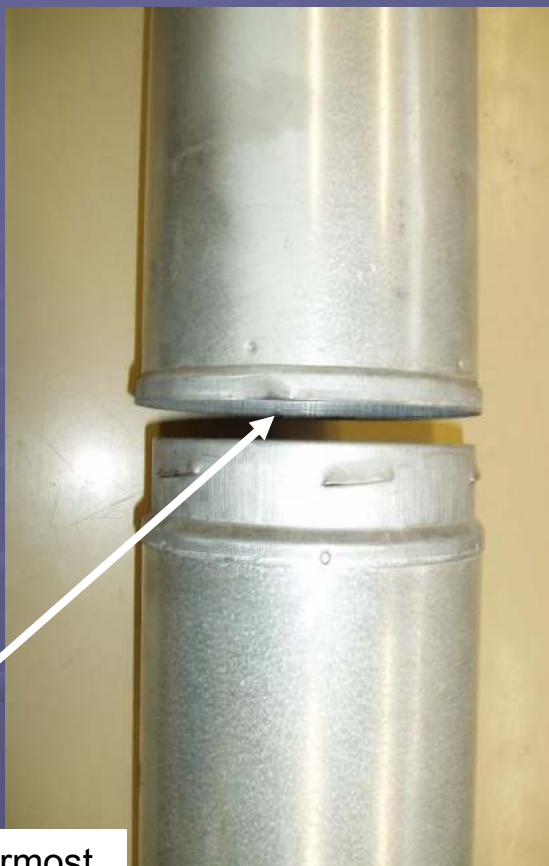
- **Adequately supported**
- **Mechanically robust**
- **Resistant to internal or external corrosion**
- **Non-combustible**
- **Durable under the conditions in which it is to be used**

Flue Construction

Materials most commonly used for open-flued installations in existing property are:

- **Double-wall (often known as twin-wall) metal.**
- **Vitreous enamelled steel, for internal flues only.**
- **Flexible stainless steel liner.**
- **Pre-cast concrete blocks for use in non bonded flues.**
- **Clay blocks for use in non-bonded flues.**

Double Wall (Twin Walled) Metal



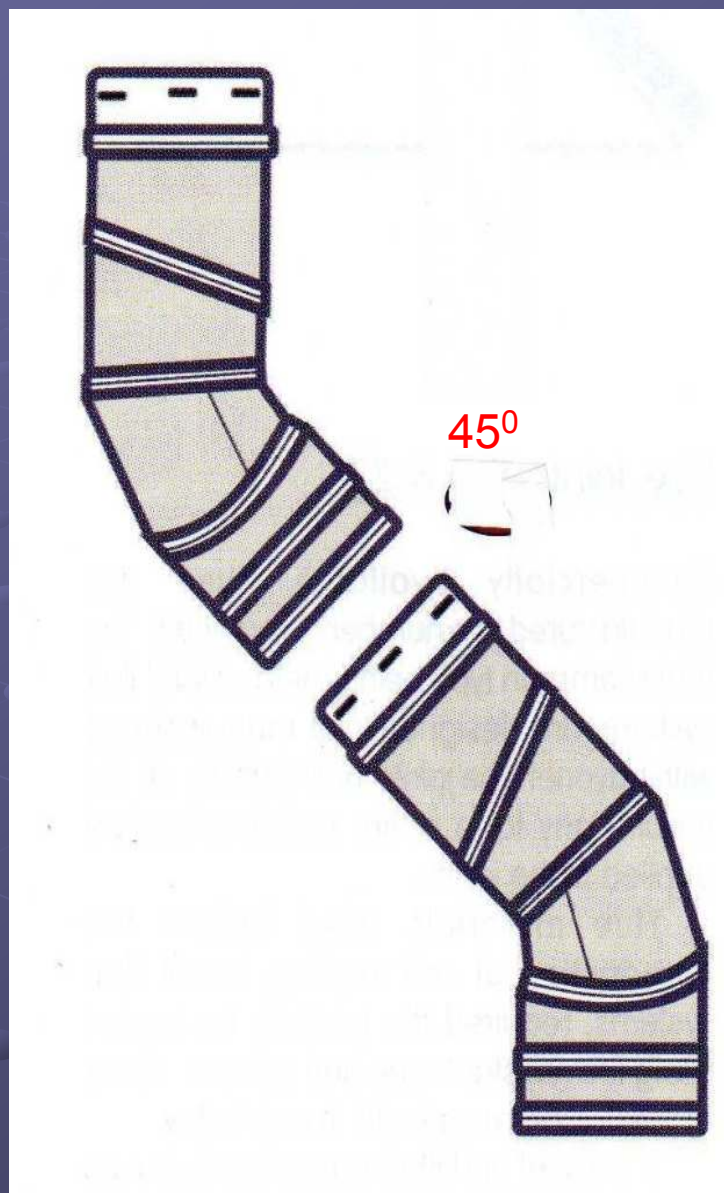
Socket Uppermost

Correct



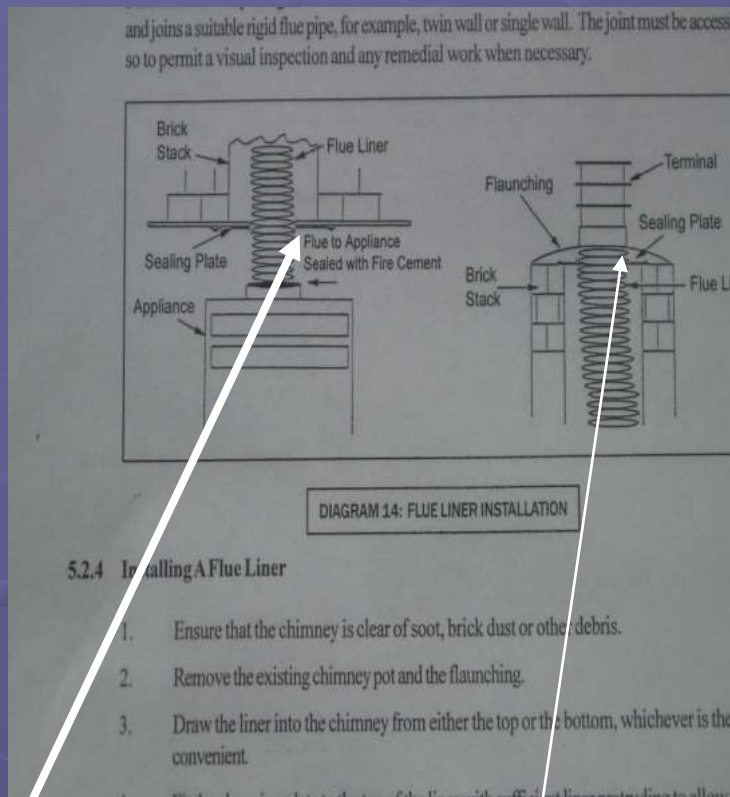
Condensation collect in air gap

Incorrect





Flexible Stainless Steel Flue Liner

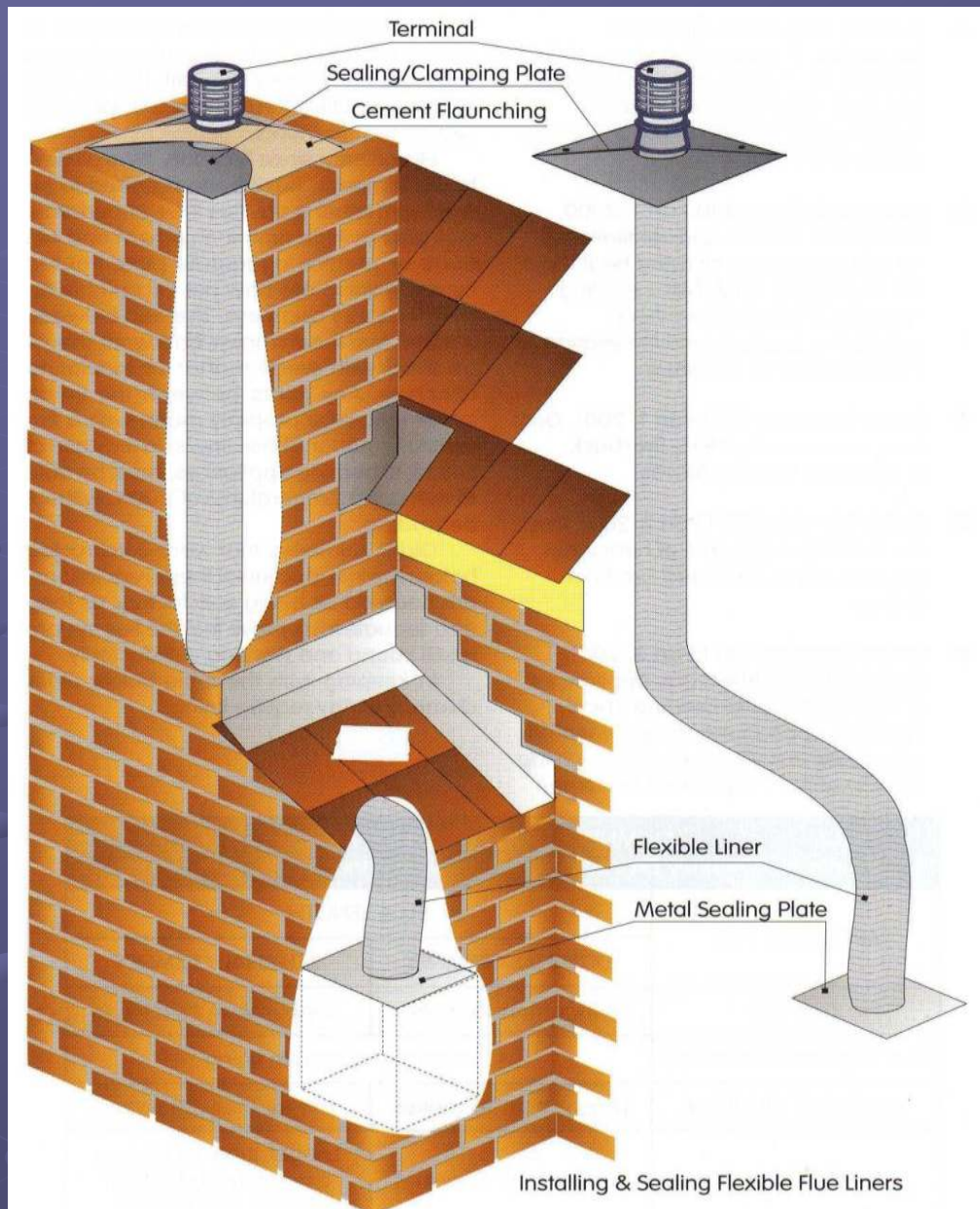


Annular Space Sealed
above boiler

Sealing plate
Flaunching



Stainless Steel Liner

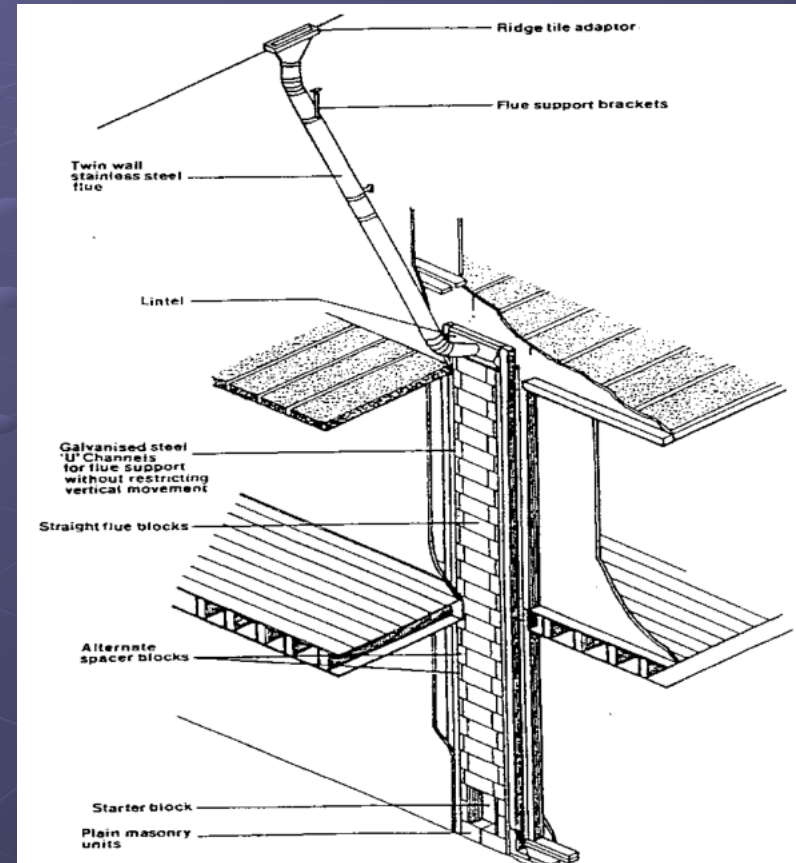


Pre-cast concrete Blocks



Raking Blocks

Adaptor Block
(Roof Space)

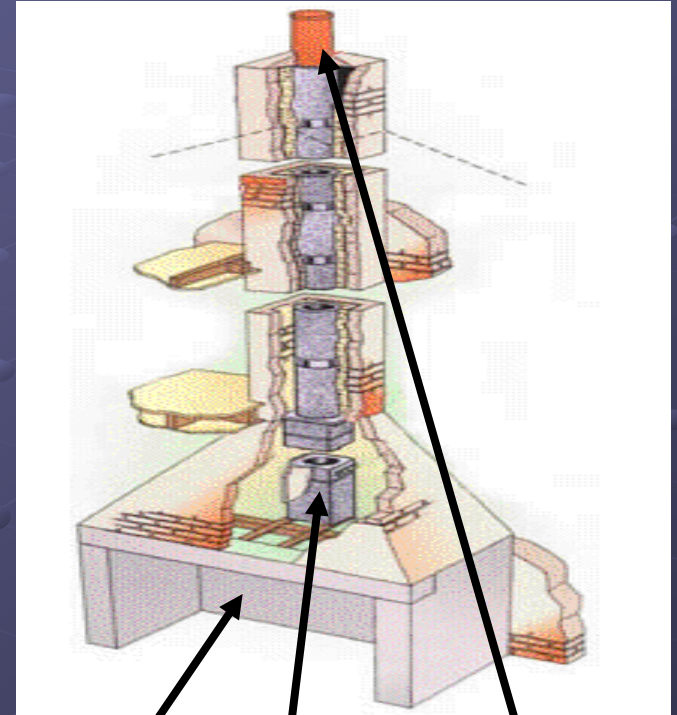


Clay Blocks



Clay Blocks

Adaptor Block



Catchment
Space

Adaptor
Block

Clay Blocks
to Terminal

Flue Categories

The flue draught will increase if:

- **Flue height is increased**
- **Flue gas temperature is increased**

The flue draught will decrease if:

- **The flue is cooled**
- **Excessive resistance, due for example, to horizontal fluepipe or 90o bends are present**

Flue Sizes

- **Generally a flue of a size equal to that of the appliance outlet will be adequate.**
- **A certain minimum height will be required**
- **Flues for new or replacement gas fires shall have a minimum cross-sectional area of 12000mm² unless the manufacturers instructions specifically permit otherwise.**

Flue Components

An open flued system has four component parts:

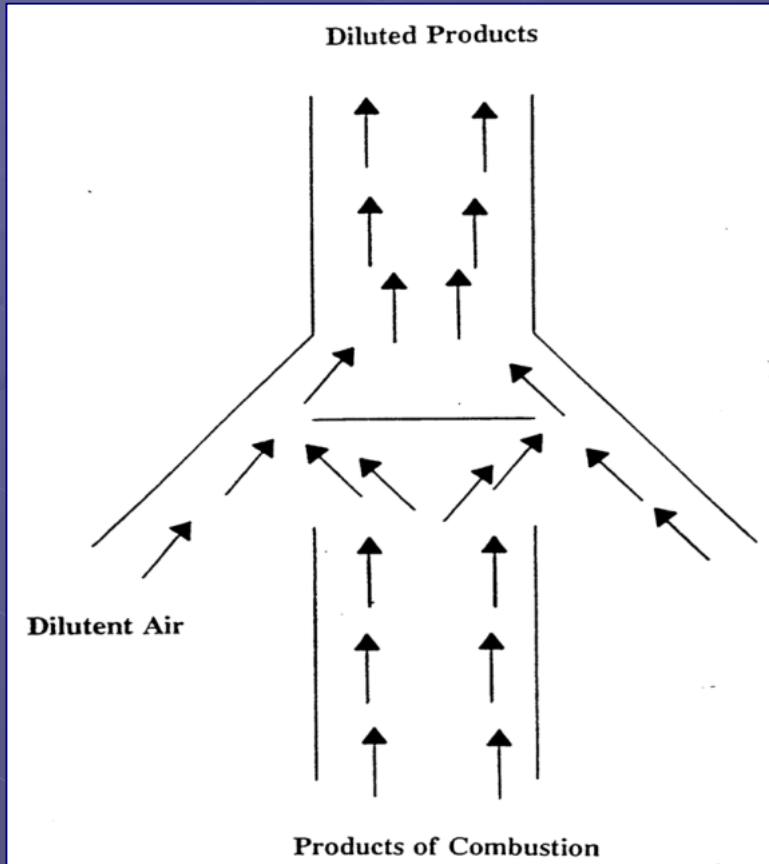
- **Primary Flue; forms part of the actual appliance and creates the initial flue draught required to exhaust all the POC from the appliance**
- **Draught Diverter; Normally part of the appliance, situated after the primary flue.**

Flue Components

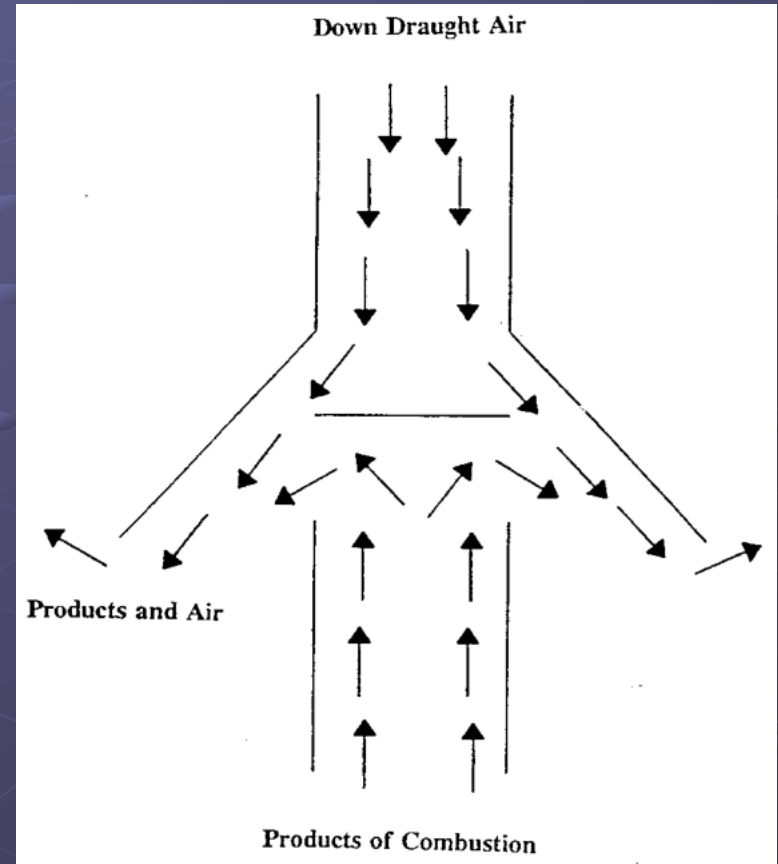
Draught Diverter does three things;

- **Diverts down-draught to prevent interference with combustion**
- **Allows flue products to dilute to minimise condensation**
- **Breaks the pull of the secondary flue**

Draught Diverter



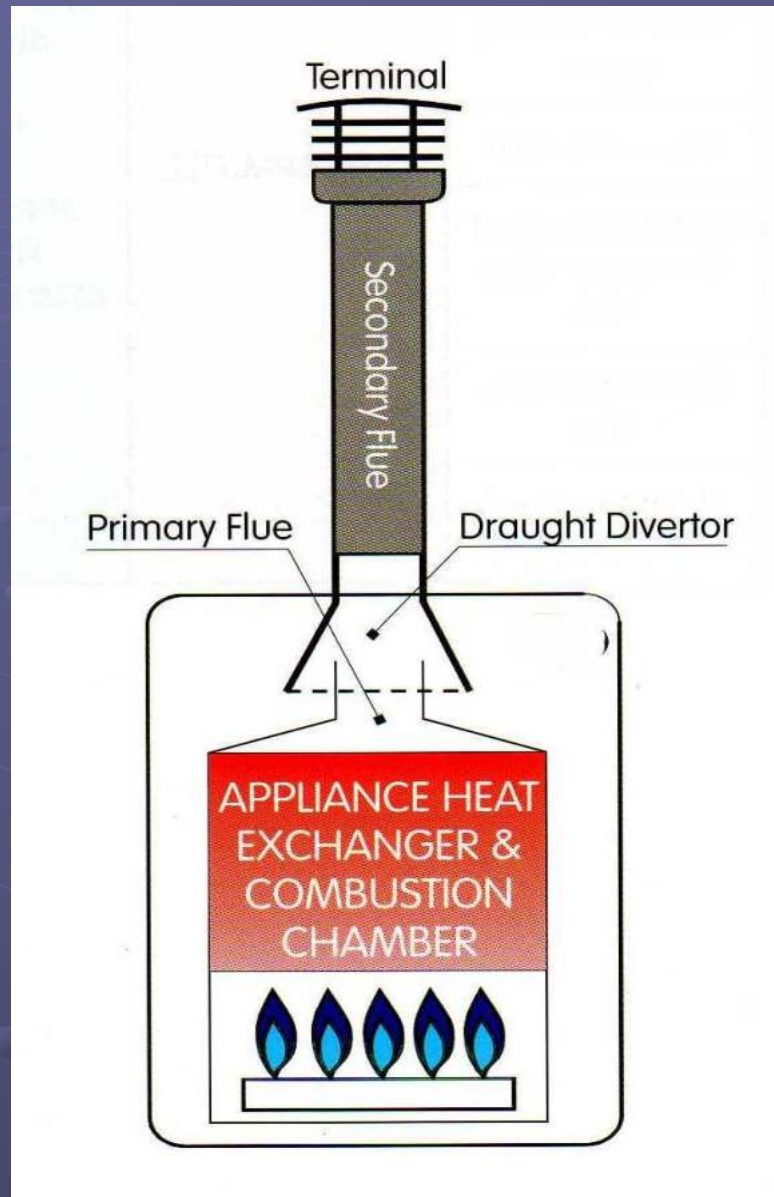
Normal Conditions



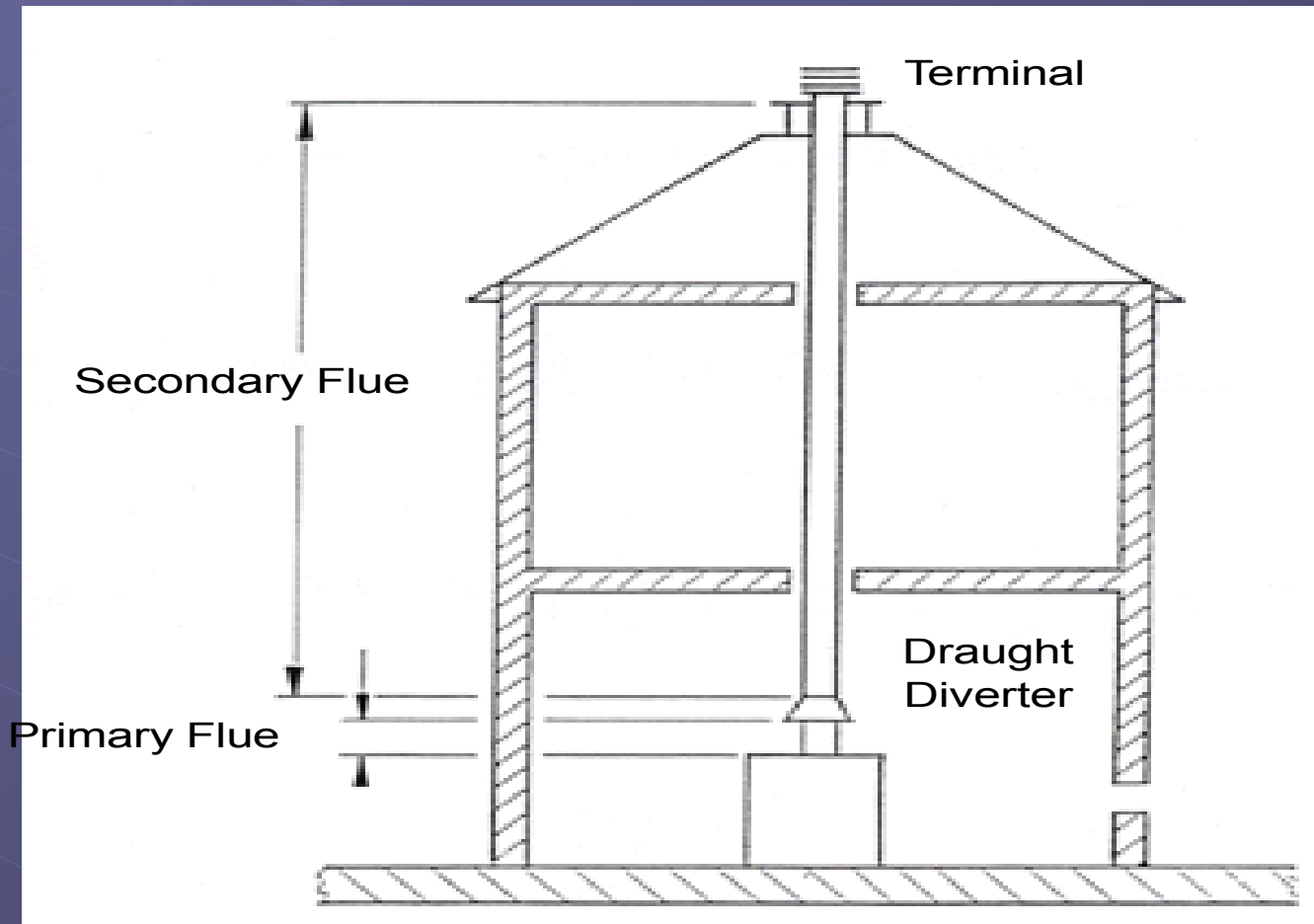
Abnormal Conditions

Flue Components

- Secondary flue is the long section between the draught diverter and terminal
- It channels combustion products from the primary flue to outside air via the terminal
- **Bends should be kept to a maximum of 45°.**



Flue Components



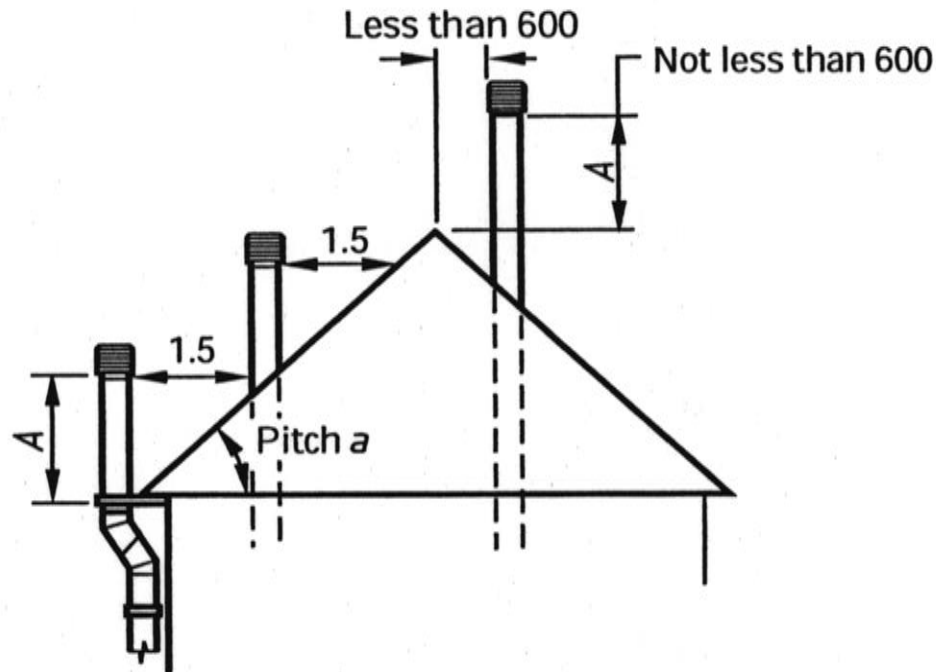
Flue Components

- Flue should be as near vertical as possible
- Minimum bends, shallow runs should be avoided
- Will effect resistance and encourage cooling
- Flue should be run inside the building as much of its length as possible
- **Minimum distance from DD to first bend, not less than 600mm**

Flue Termination

- **Flue terminals should comply with BS 5440/BS1289/BS715**
- **Fitted to the end of secondary flue to pass combustion products into atmosphere**
- **Assists exhaustion of POC from secondary flue and minimises down-draught**
- **Prevents entry of wind, rain, birds building nests in flue**

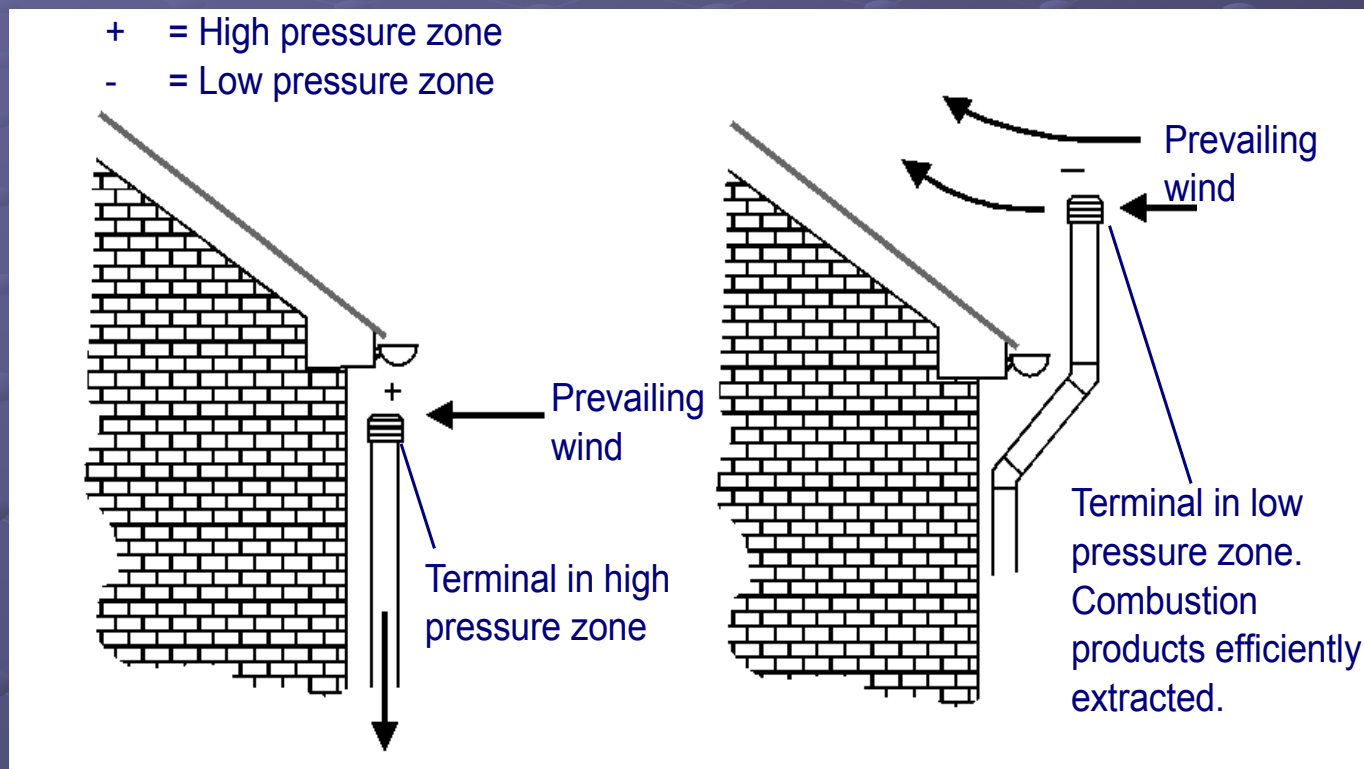
Flue Terminal Positions



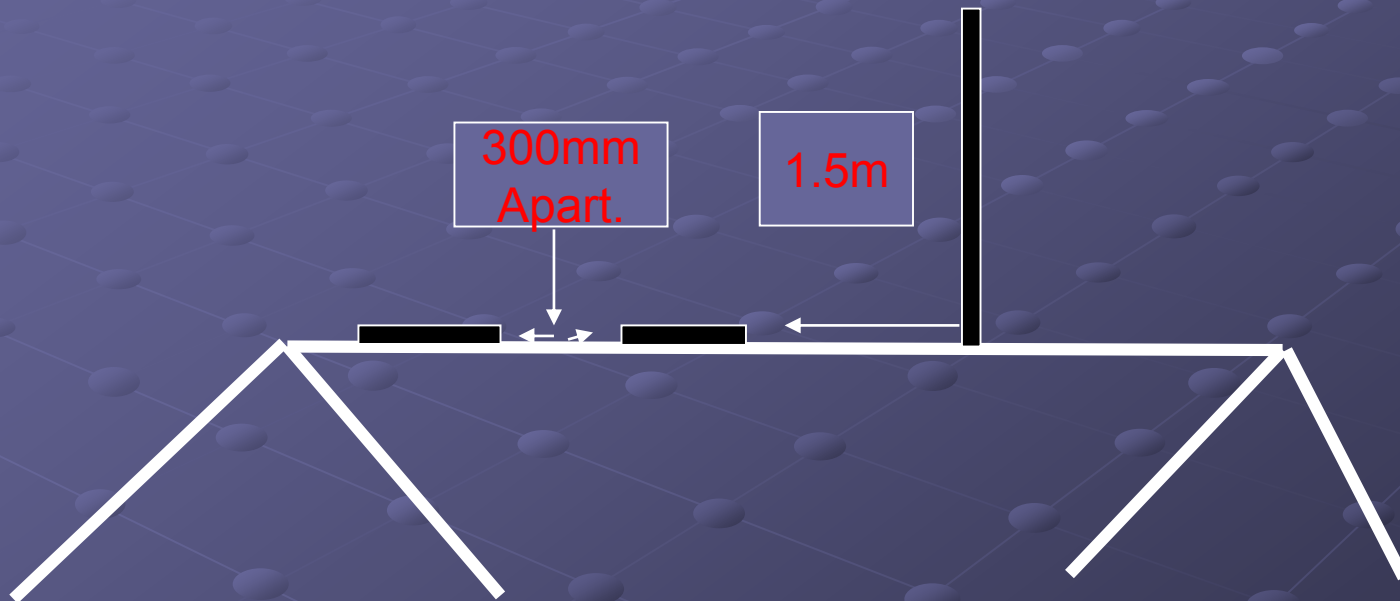
No part of the flue outlet shall be less than 1.5 m measured horizontally to the roof surface, or 600 mm above the ridge.

a) Terminal locations with respect to pitch

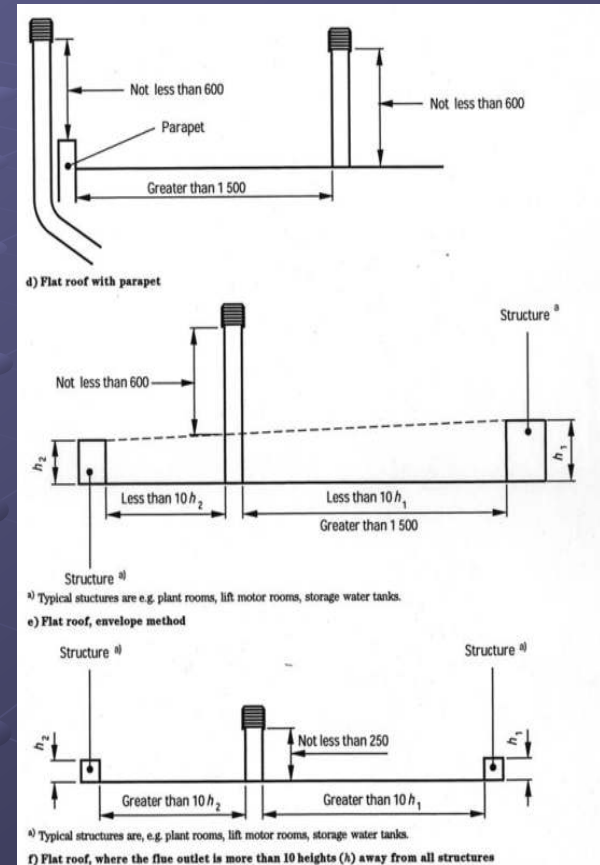
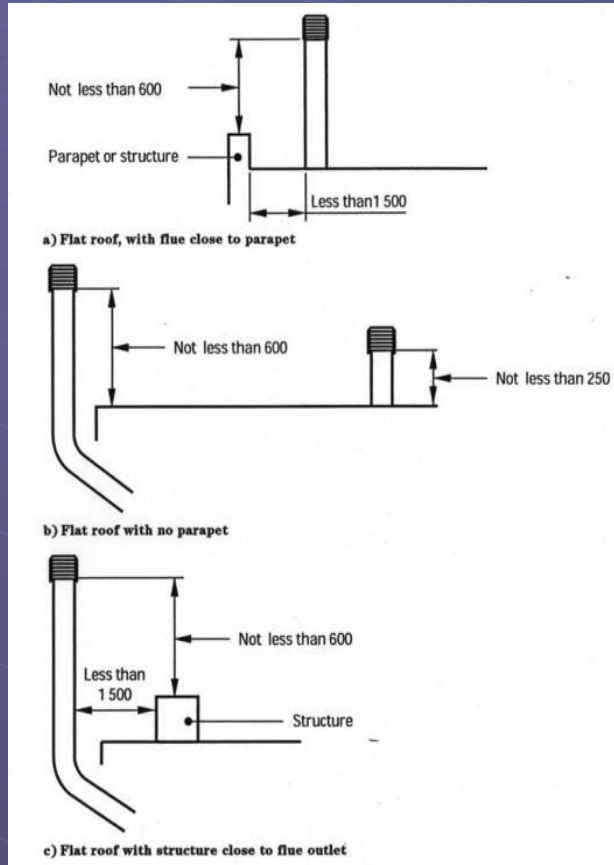
Flue Terminal Positions



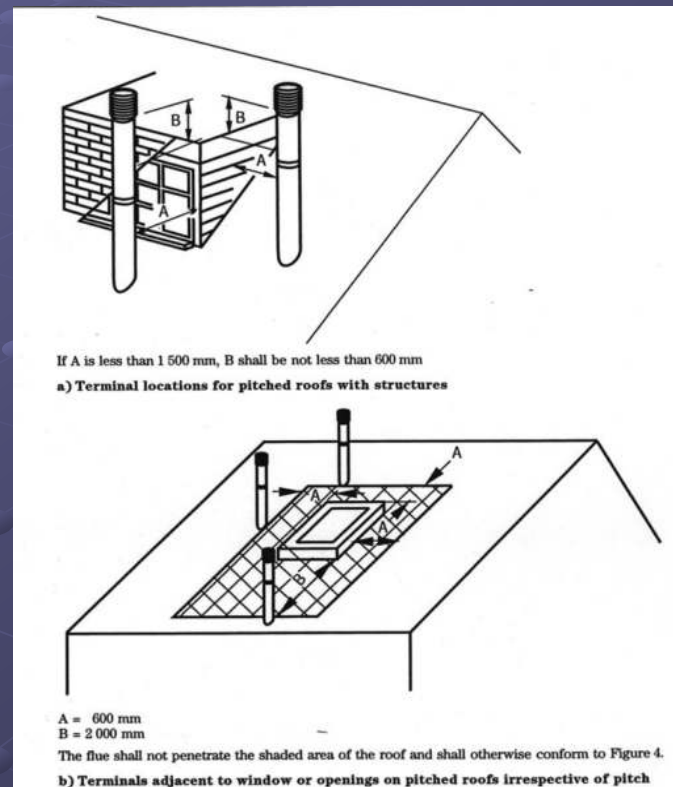
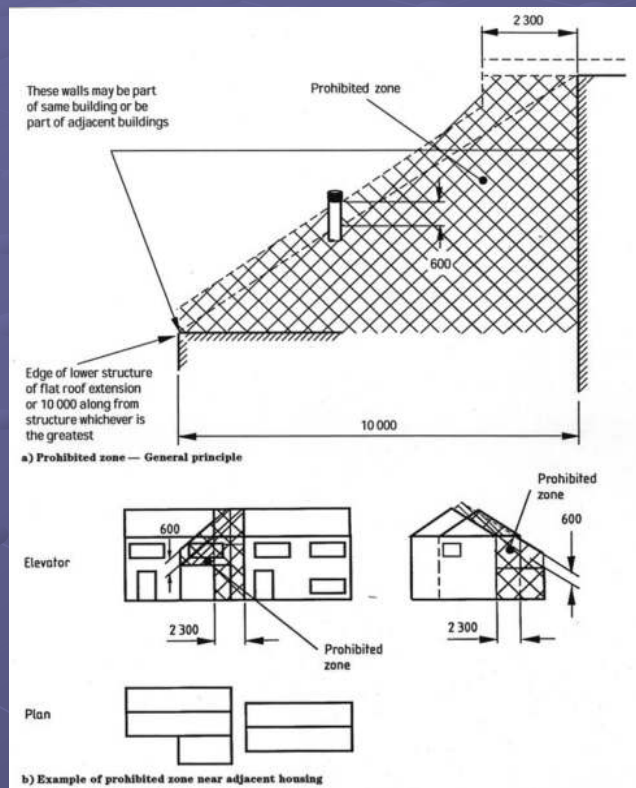
Multiple Terminations.



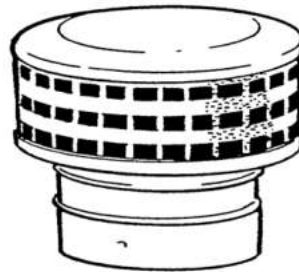
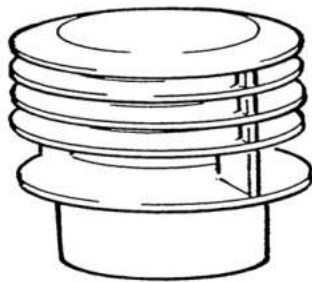
Flue Terminal Positions



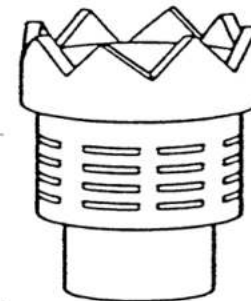
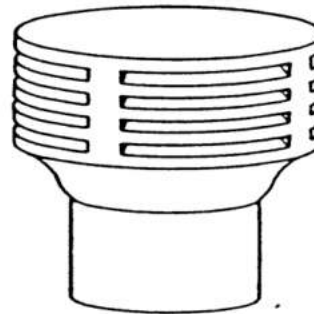
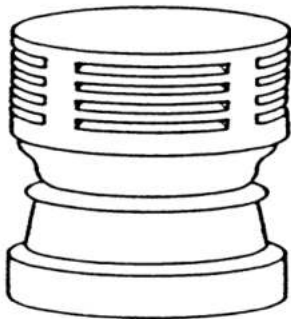
Flue Terminal Positions



Flue Terminals



Metal terminals



Clay terminals

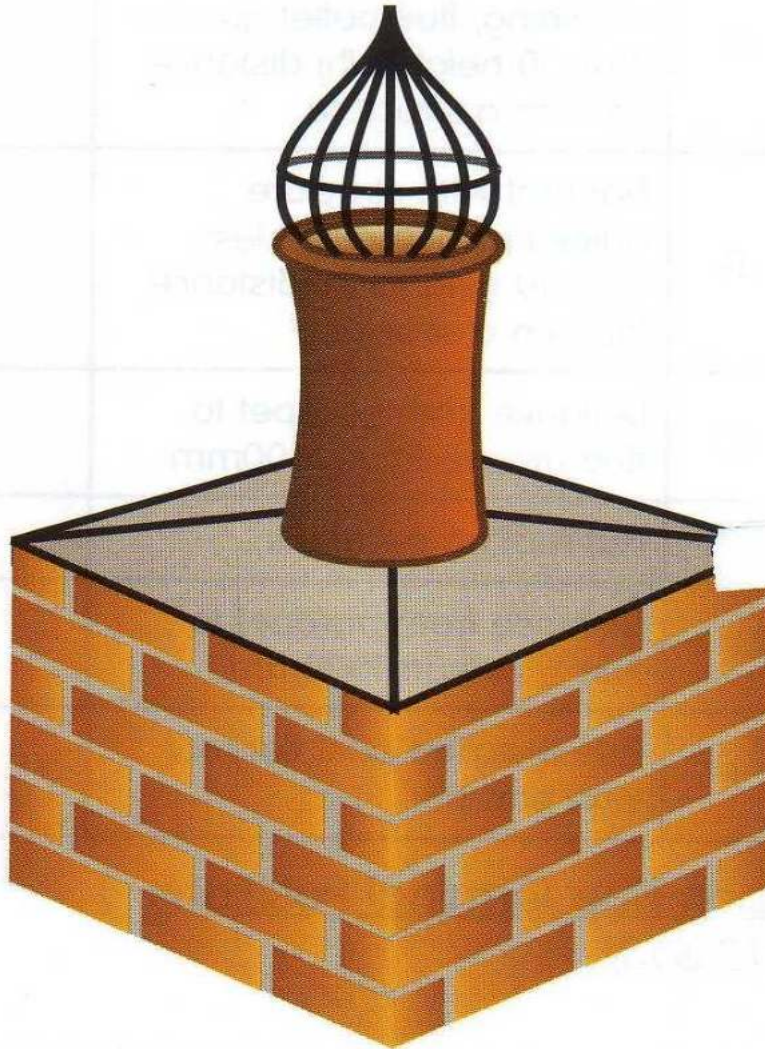
Flue Termination

- Sited to enable the POC to be dispersed freely at all times
- **Chimney systems with a flue dimension across the axis of the flue outlet of less than 175mm must be fitted with a terminal**

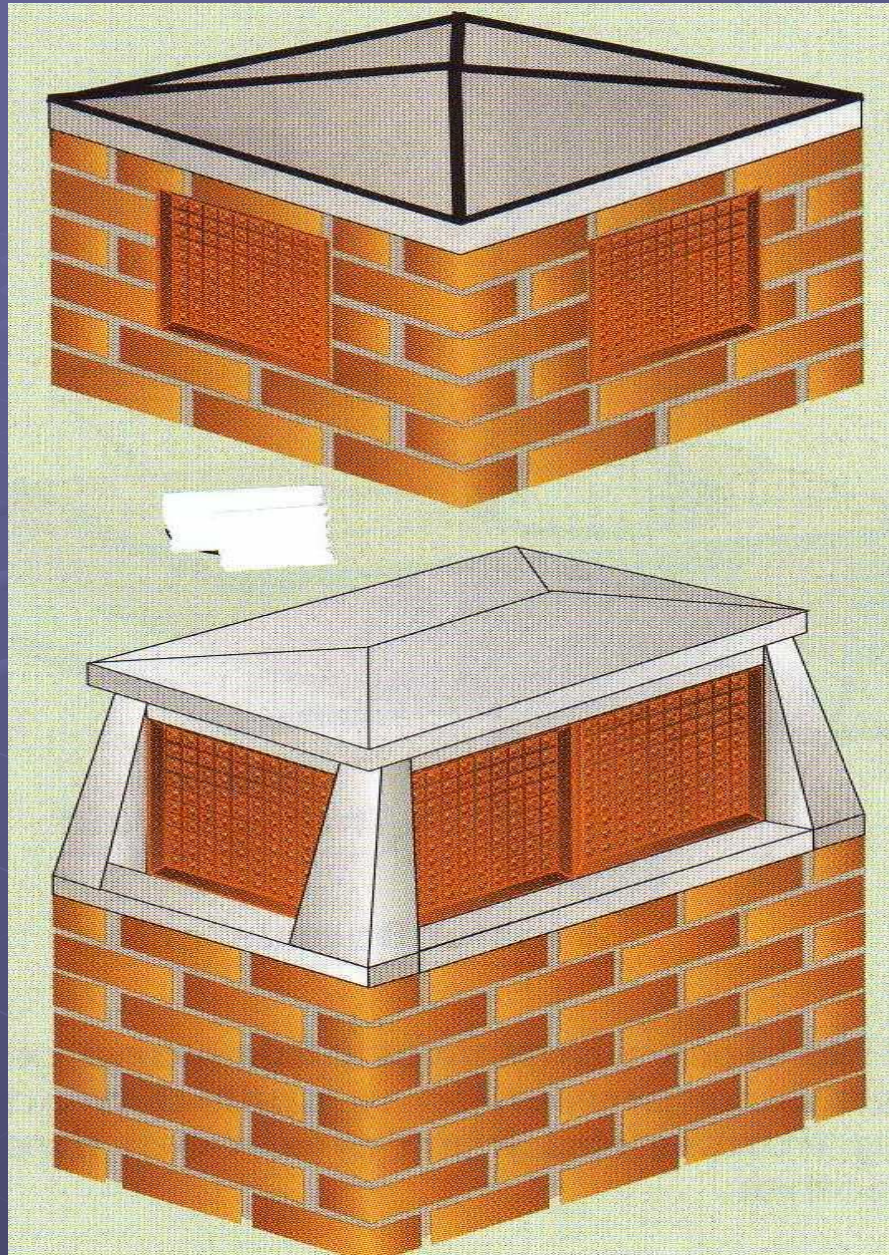
Flue Termination

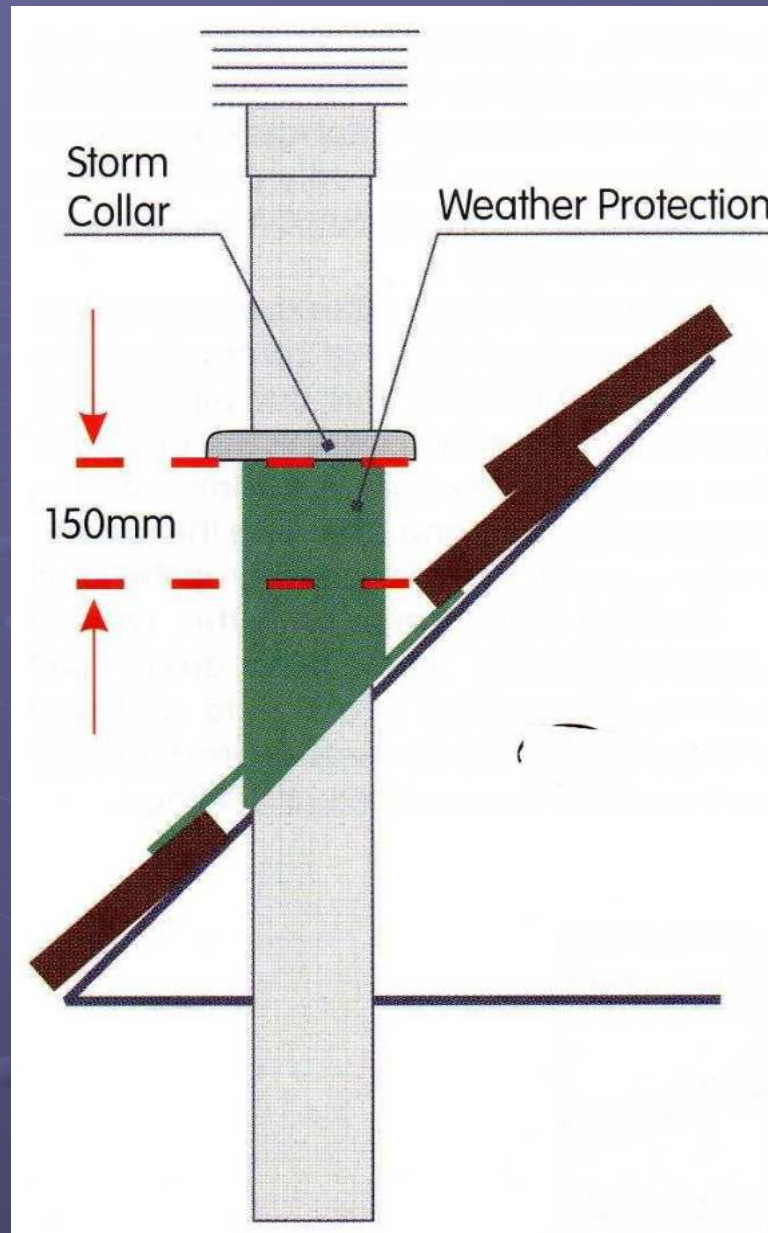
Points to consider:

- **Effect of any adjacent structures**
- **Type of appliance**
- **Type of termination**
- **Type and design of flue**



Terminal Fitted with Bird Protection





Flue Installation

- Do not mix with different manufacturers without correct adaptors
- **DD fitted immediately above appliance and in the same room**
- Modern appliances incorporate an integral DD
- **Single walled pipe must comply with BS715, a distance of 25mm from combustible material**

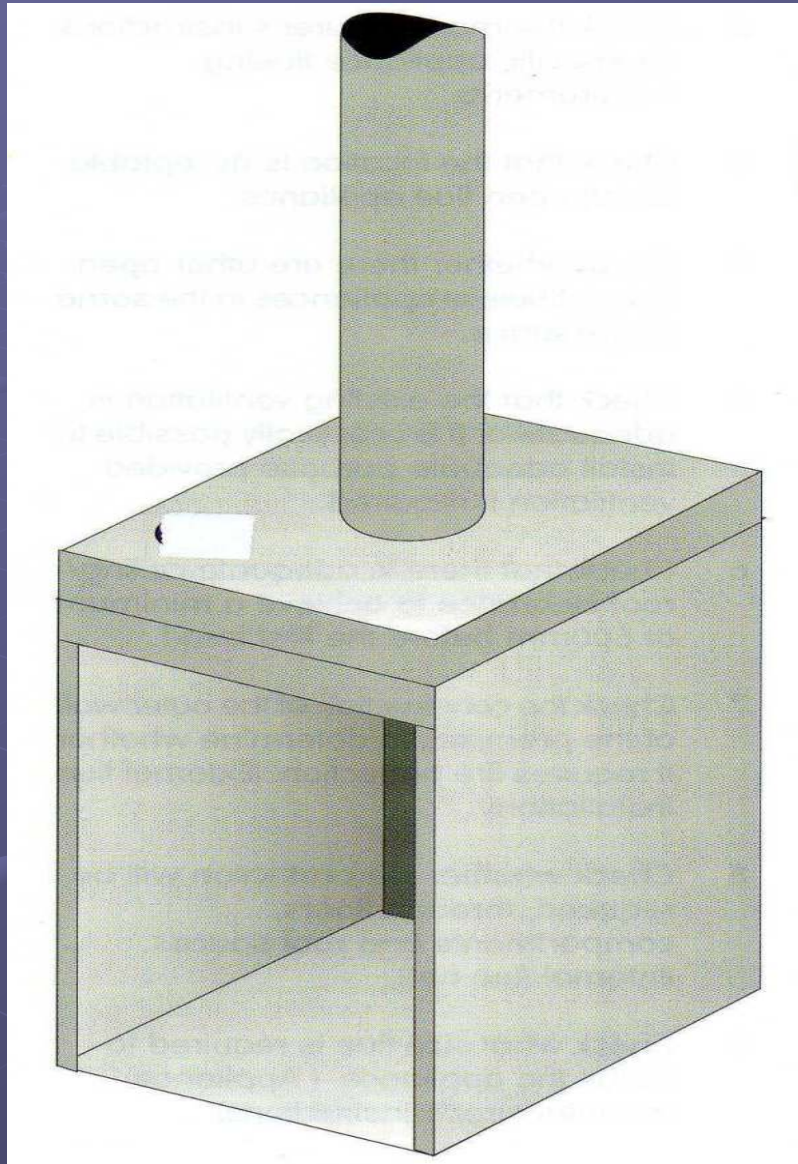
Flue Installation

- **Flue pipes and fittings must be supported at intervals of not more than 1.8m**
- Support fitted below the joint
- Flue pipe through an unheated space should be supported and insulated to prevent corrosion
- Flue should rise vertically as far as possible, minimum 600mm to first bend

Flue Installation

- Flue pipe connected to a ridge terminal must be properly secured to the terminal using appropriate fixings





Work On Open Flues

Checking the safe operation of an open flue system comprises three distinct groups of checks:

- 1. Preliminary Checks**
- 2. Flue flow and continuity checks**
- 3. Appliance and flue combination check (spillage test)**

Whenever a new appliance is installed or an existing appliance maintained, repaired or serviced. The three checks must be carried out.

Work On Open Flues

The only exceptions are:

- **When re-lighting an appliance or pilot lights following the temporary interruption to the gas supply (Tightness test)**
- **When carrying out non-gas component related work (Knobs, batteries)**

Preliminary Checks

- Remember any visual signs of an appliance malfunction should be thoroughly investigated

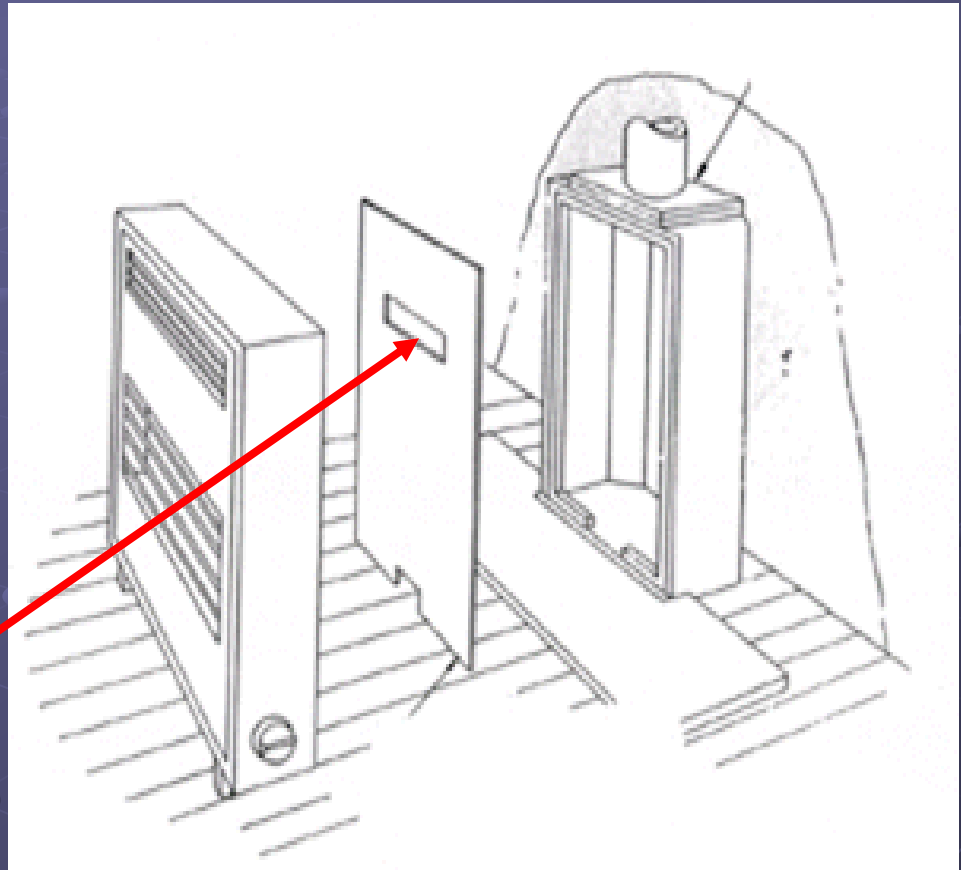


Signs of spillage

Flue Flow And Continuity Check

- **To ensure flue is continuous throughout its length.**
- **Free of damage and defects.**
- **Prelim checks satisfactory, then flue integrity must be demonstrated by the flue flow check.**

Flue Flow Check



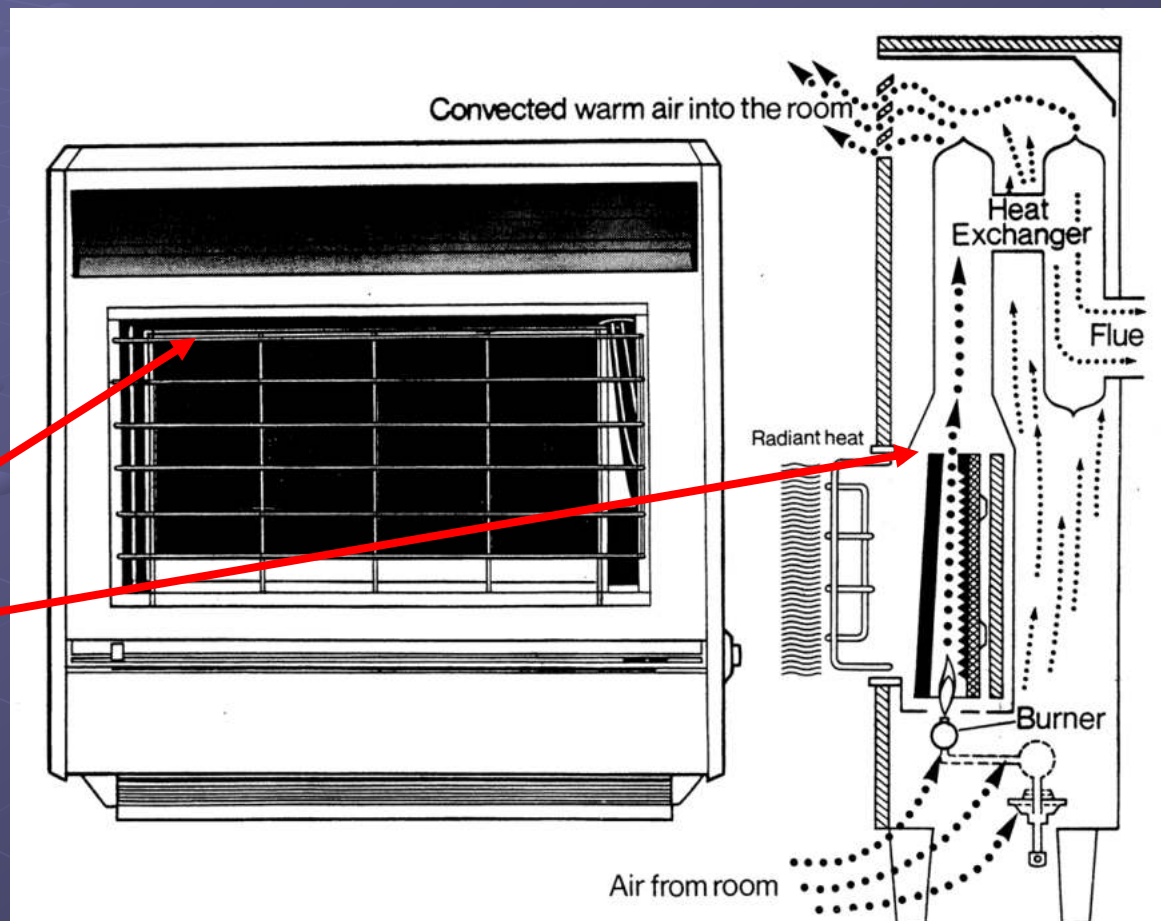
Apply smoke match through closure plate sealed to catchment opening

Spillage Test

- If prelim and flue flow checks are satisfactory then the appliance and flue combustion flue check (spillage test) should be carried out.
- All doors and windows in the room closed.
- Check appliance clears its products.
- Turn appliance on full rate.
- After 5mins check products are clearing using a smoke producing device (smoke match)

Spillage Test

Insert smoke match
under canopy



Spillage Test

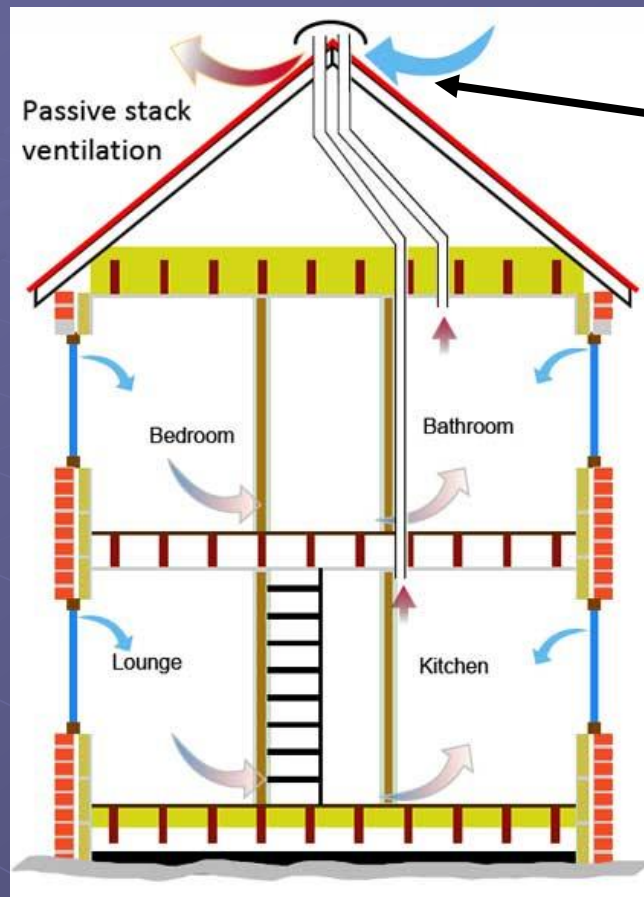
- If spillage occurs, continue to test at intervals up to a total of 15 mins, after lighting the appliance.
- If spillage still occurs then the appliance should be disconnected until the fault is rectified.
- If test satisfactory the test must be repeated with any extract/re-circulating fans in the room or adjacent rooms with the interconnecting door opened turned on.
- If tests fail, disconnect appliance.

Spillage Test

Example of fans than can effect flue operation:

- **Room extract fans**
- **Fans in flues for other open flued appliances**
- **Cooker hoods**
- **Warm air heating systems and tumble dryers vented to outside**
- **Decorative ceiling fans**
- **Other open flues**
- **Passive stack ventilation**
- **Radon gas extraction systems**

Passive Stack Ventilation.



Terminal should terminate above PSV outlets and in a positive zone

Passive Stack Ventilation.

- One option to provide domestic ventilation is the use of a passive stack ventilation (PSV) system.
- This uses a combination of the air flowing over the roof and the natural buoyancy of warm moist air to lift the moist, stale air from the kitchen bathroom, cloakroom etc up ducting to the roof ridge level where it escapes into the atmosphere.

Brick Chimneys

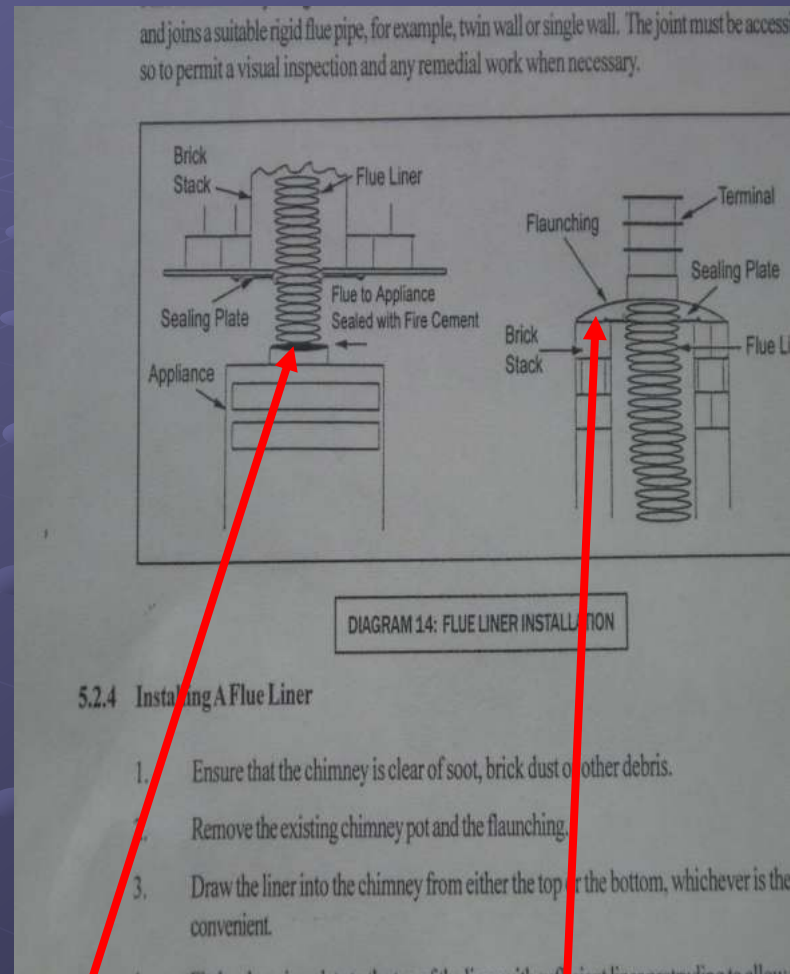
- Chimney should be visibly checked for defects and the catchment space should be correctly sized.
1. A new or used chimney: or one previously used only with gas appliance.
 2. Previously used with a solid fuel or oil burning appliance.

Table 1.

Debris catchment	Masonry chimneys		Block chimneys	
	Unlined	Lined (clay or cement)	New or unused ¹	Previously used ²
		New or unused ¹		
Minimum Void Volume dm ³				
2		●	●	
12	●		●	●
Depth mm				
75		●	●	
250	●		●	●
¹ A new or unused chimney, or one previously used only with a gas appliance. ² Previously used with a solid fuel or oil burning appliance. Note: A ● in the table indicates a requirement.				

Flexible Metal Flue Liners

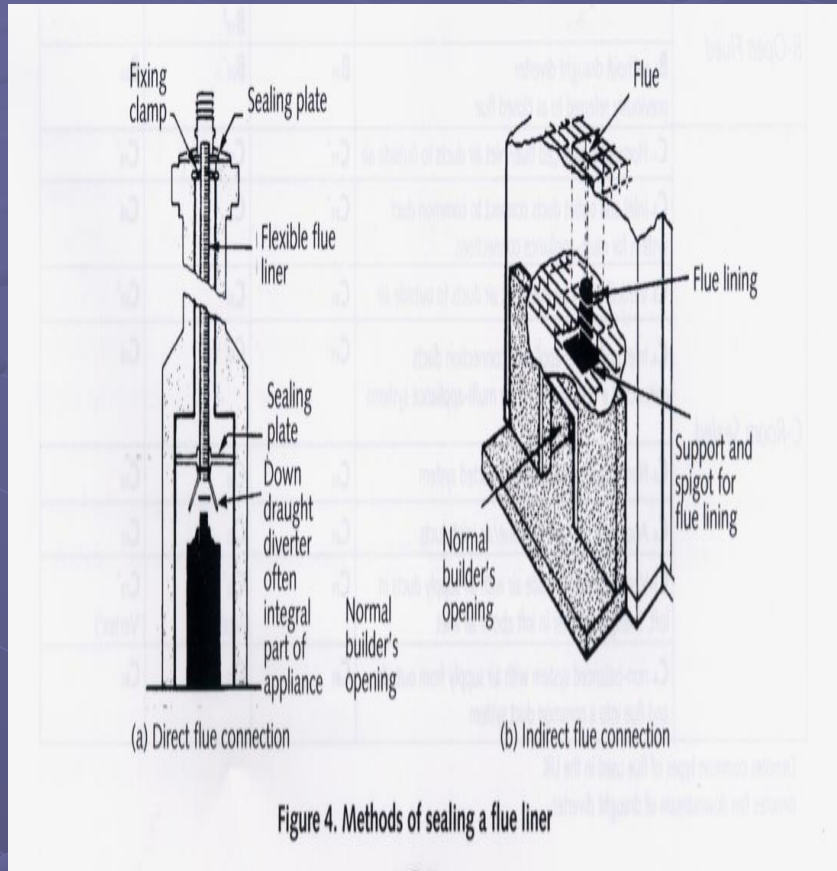
- Should be installed in a single length.
- Sealed at the top using a sealing plate secured and weatherproofed with sand/cement mix.
- Sealed at bottom using sealing plate or mineral wool to prevent debris falling into appliance.



Sealed at bottom

Sealed at top

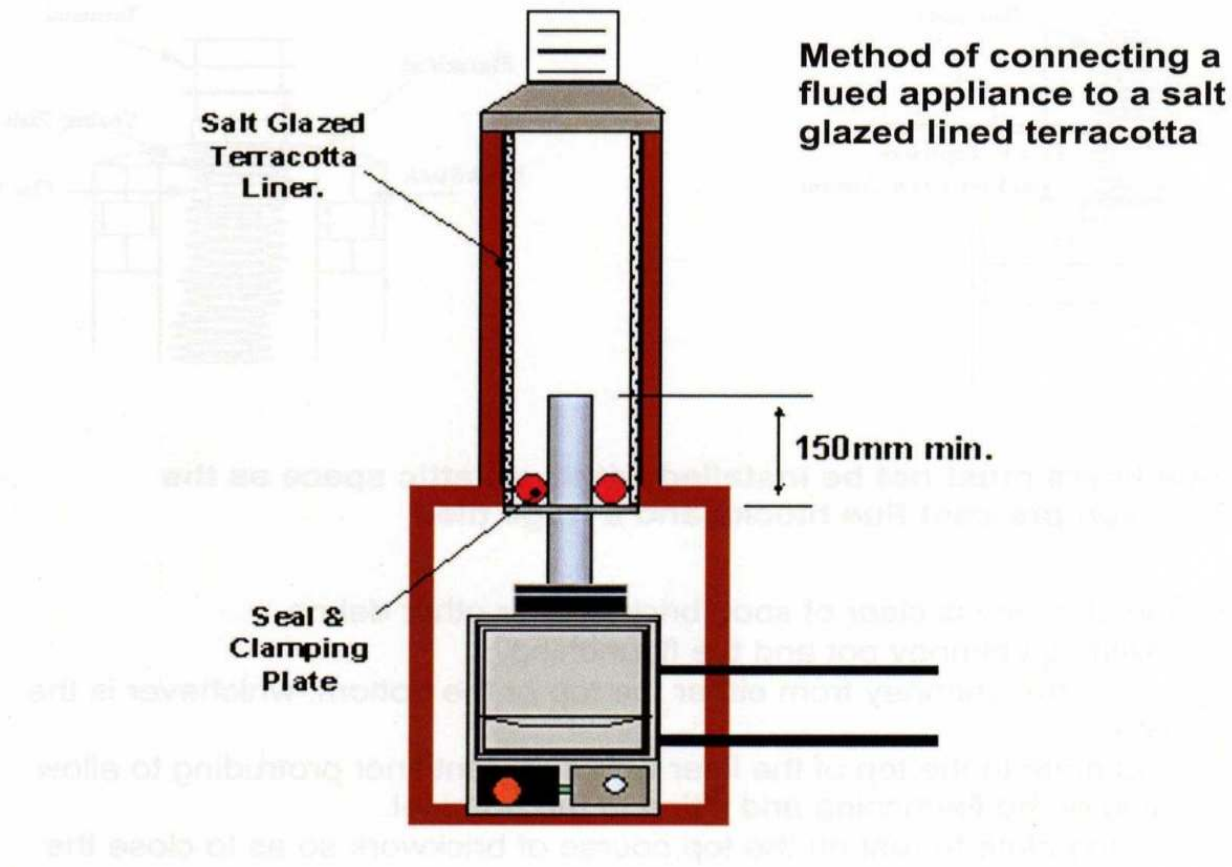
Installation of Flexible Flue Liners.



Poured Concrete Liners

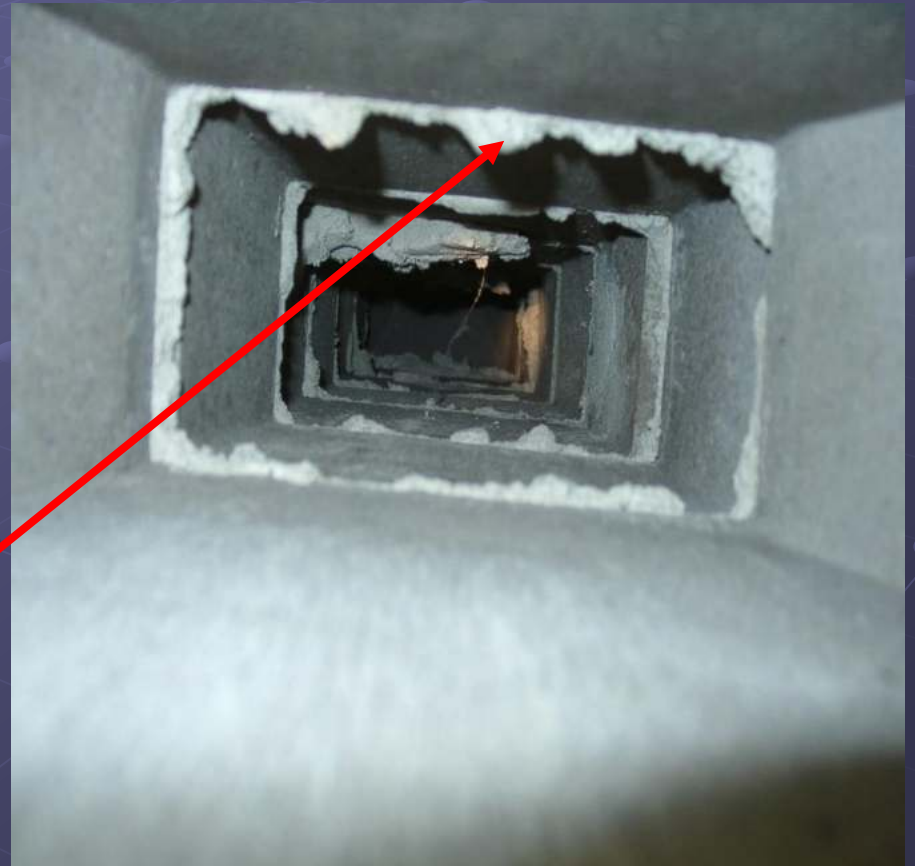
- Developed to overcome problems associated with brick constructions, which had become porous through age.
- An inflatable tube is inserted into the chimney and lightweight insulating concrete is cast in situ around the tube and allowed to set.
- Careful inspection is required of this type of liner.
- **If no BBA Certificate available, then a flexible liner must be fitted.**

Open flued boiler installed to a brick lined chimney.



Pre-cast Block System

- Any excess jointing material should be removed during construction.



Mortar Fangs

Room Sealed Natural Draught (Balanced Flue)

- On some appliances the outer case forms the combustion chamber seal.
- A sound seal will only be made if the seal components are intact and in good condition and outer case is fitted correctly.
- **Under no circumstances must a room sealed appliance be left operating if a seal is damaged or missing, or if outer case will not fit correctly.**

Checking Case Seals.

- **Industry guidance for the checking of case seals and the general integrity of room-sealed fan assisted positive pressure gas appliances.**
- **Historically, fanned draught room-sealed boilers were of the positive pressure type.**

Positive Pressure.

- **Fan located in cool air inlet duct.**
- **Drawing air for combustion from outside, putting the appliance under positive pressure.**

Negative Pressure.

- Fan located in the exhaust duct.
- Pushing out the products, so creating negative pressure.

Checking Case Seals.

- For a positive pressure appliance, it is essential to ensure that the combustion chamber casing is firmly secured to the boiler, as the manufacturer intended, with the correct seal in a good condition.
- If this is not achieved, there is a real risk that products of combustion may escape into the room and due to the poor combustion that is likely to occur, high levels of carbon monoxide (CO) could be produced creating a dangerous environment.

Checking Case Seals.

Before the case is put back on the appliance the following checks should be carried out:

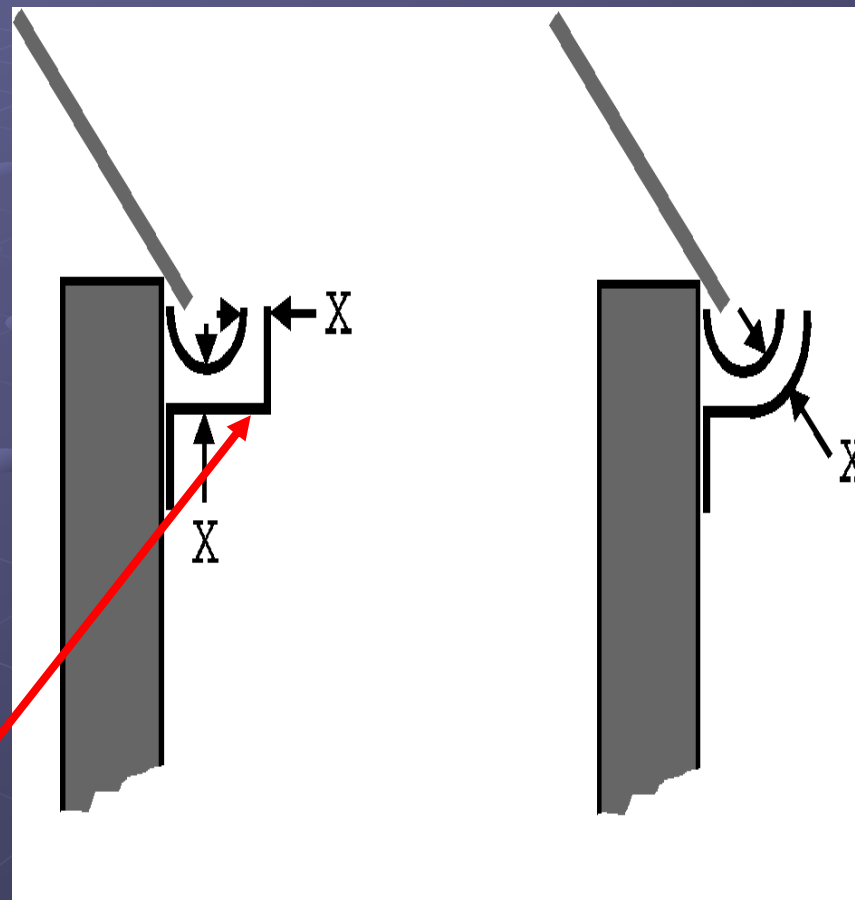
- **are any water leaks evident?**
- **is the backplate or case corroded?**
- **where corrosion is evident, is it likely to affect the integrity of the case, backplate, or seal?**

Damaged case
seal



Termination-Room Sealed Flues

- Fit a heat shield, at least **1m** long to the underside of the gutter, painted surface.
- At least **5mm** from the eaves of a gutter.



Heat Shield

X = 5mm gap

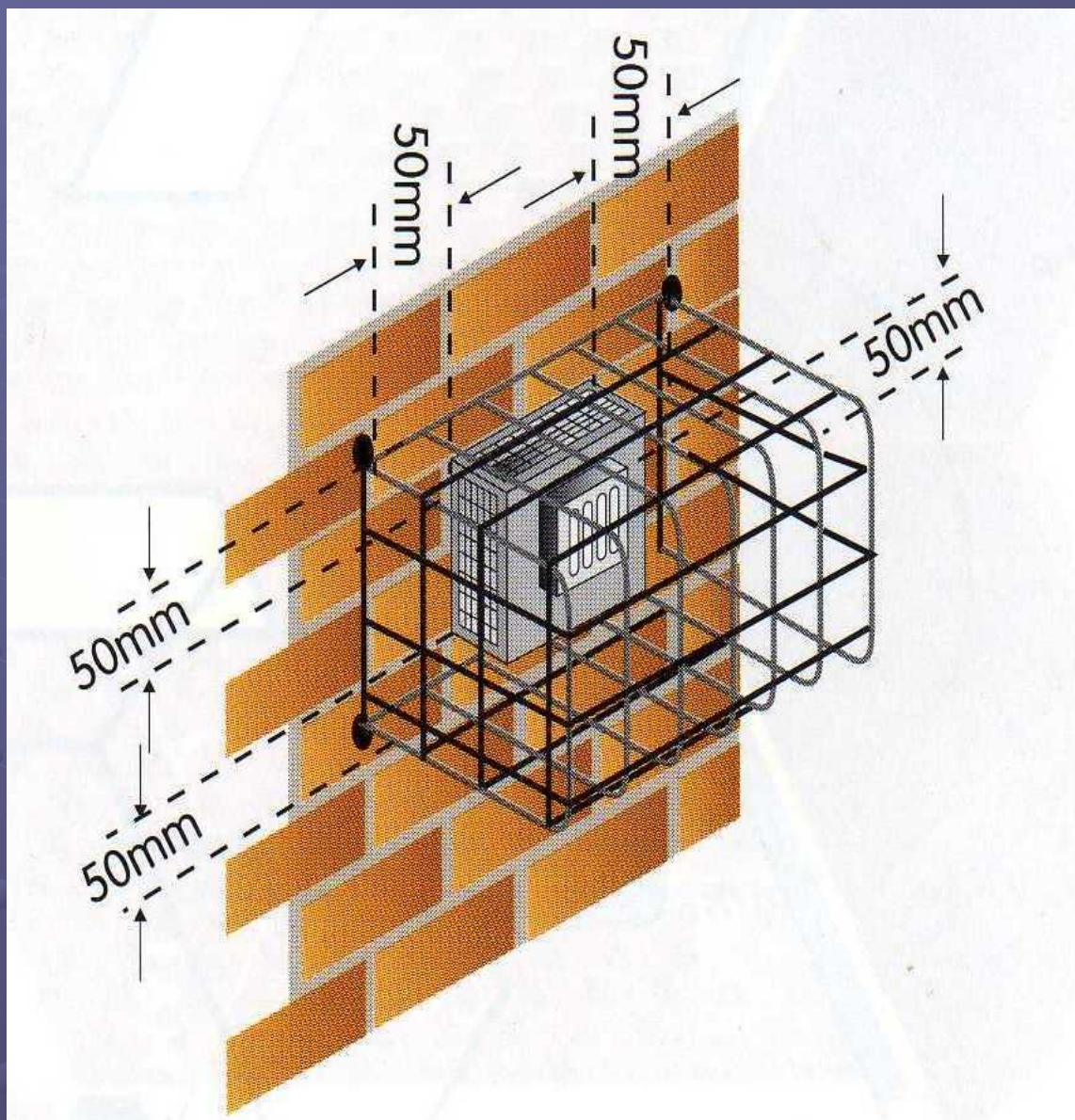


Table C.1 — Minimum dimensions of flue terminal positions (all types)(see Figure C.1)

Dimension	Terminal position (kW input expressed in net.)	Balanced flues room sealed		Open flues	
		Natural draught	Fanned draught	Natural draught	Fanned draught
A ^a	Directly below an opening, air brick, (0-7 kW)	300 mm	300 mm	Not allowed	300 mm
	opening windows, etc. (>7-14 kW)	600 mm			
	(>14-32 kW)	1 500 mm			
	(>32-70 kW)	2 000 mm			
B ^a	Above an opening, air brick, (0-7 kW)	300 mm	300 mm	Not allowed	300 mm
	opening window, etc. (>7-14 kW)	300 mm			
	(>14-32 kW)	300 mm			
	(>32-70 kW)	600 mm			
C ^a	Horizontally to an opening, air brick (0-7 kW)	300 mm	300 mm	Not allowed	300 mm
	opening window etc. (>7-14 kW)	400 mm			
	(>14-32 kW)	600 mm			
	(>32-70 kW)	600 mm			
D	Below gutters, soil pipes or drain pipes	300 mm	75 mm	Not allowed	75 mm
E	Below eaves	300 mm	200 mm	Not allowed	200 mm
F	Below balconies or car port roof	600 mm	200 mm	Not allowed	200 mm
G	From a vertical drain pipe or soil pipe	300 mm	150 mm ^b	Not allowed	150 mm
H	From an internal or external corner	600 mm	300 mm	Not allowed	200 mm
I	Above ground roof or balcony level	300 mm	300 mm	Not allowed	300 mm
J	From a surface facing the terminal (also see 6.1.2)	600 mm	600 mm	N/A	600 mm
K	From a terminal facing the terminal	600 mm	1 200 mm	N/A	1 200 mm
L	From an opening in the car port (e.g. door, window) into the dwelling	1 200 mm	1 200 mm	N/A	1 200 mm
M	Vertically from a terminal on the same wall	1 500 mm	1 500 mm	N/A	1 500 mm
N	Horizontally from a terminal on the same wall	300 mm	300 mm	N/A	300 mm
O	From the wall on which the terminal is mounted	N/A	N/A	N/A	50 mm
P	From a vertical structure on the roof	N/A	N/A	See Table 2 and Figure 6b	N/A
Q	Above intersection with roof	N/A	N/A	See Table 2 and Figure 4	150 mm

NOTE N/A = Not applicable.

^a In addition, the terminal should not be nearer than 150 mm (fanned draught) or 300 mm (natural draught) to an opening in the building fabric formed for the purpose of accommodating a built-in element such as a window frame, (see Figure C.2). Separation distances are linked to the rated heat inputs as shown.

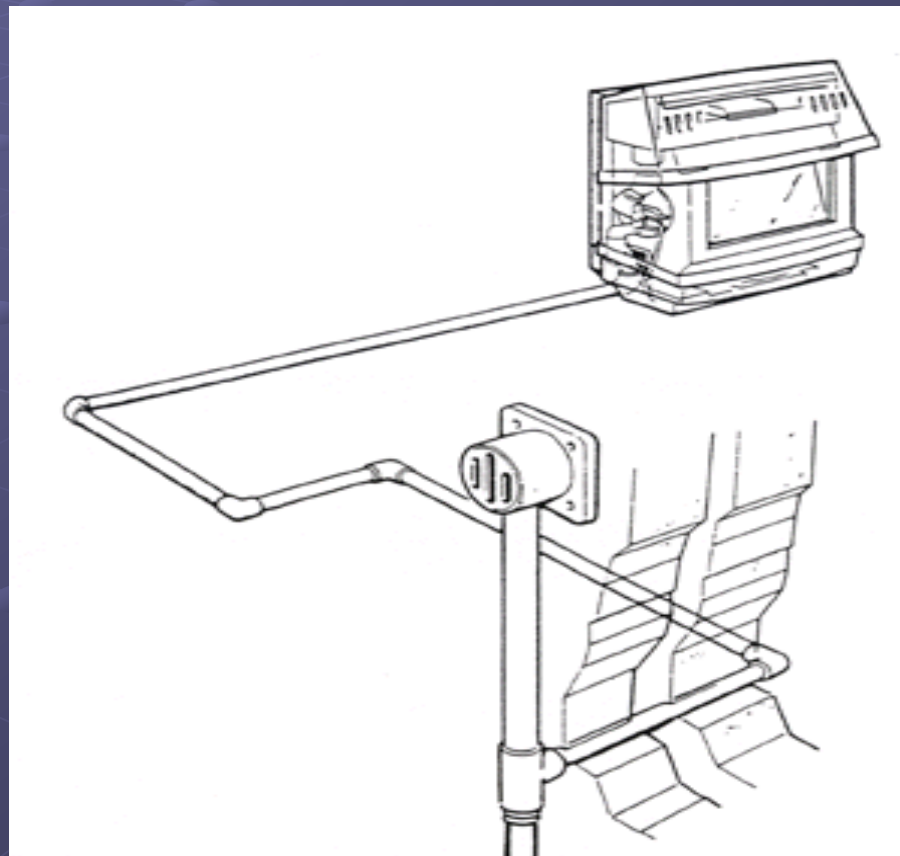
^b This dimension may be reduced to 75 mm for appliances of up to 5 kW heat input.

Closed Flues

- Is a flue system that is closed to the room, space or compartment.
- Does not incorporate a draught diverter, flue break or any other type of draught flue break on the appliance.
- **Manufacturers instructions must be followed regarding number of bends.**
- **Flue must be sealed with solvent glue.**

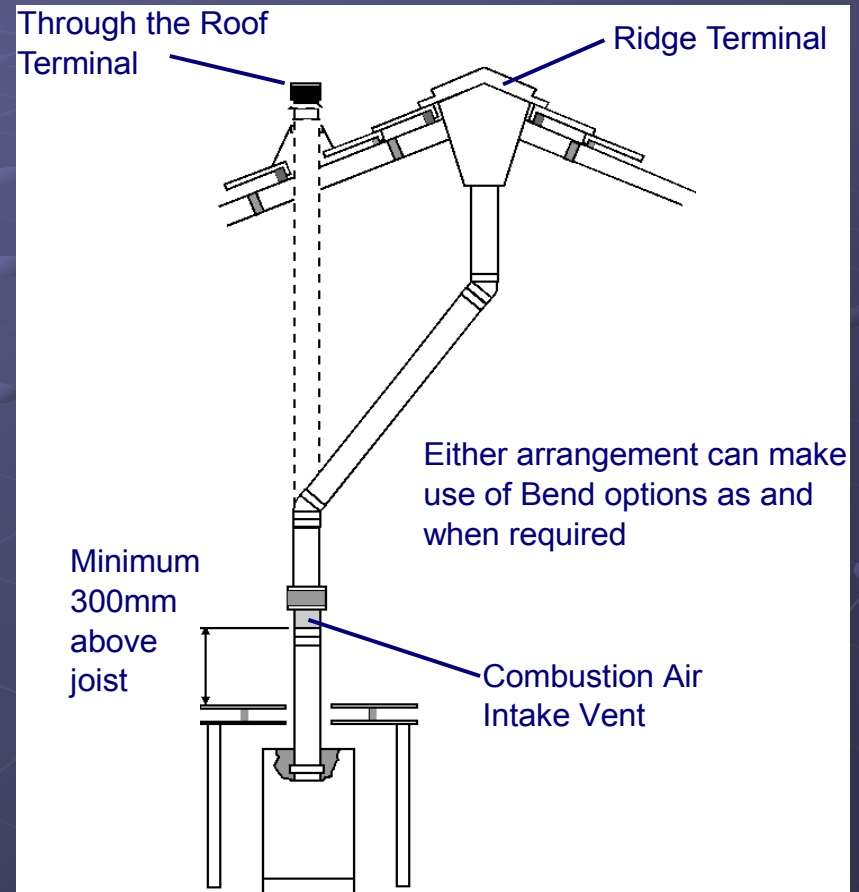
Closed Flues

- Typical example of a closed flue is the plastic flue system used with the Glow Worm plastic free flue fire.

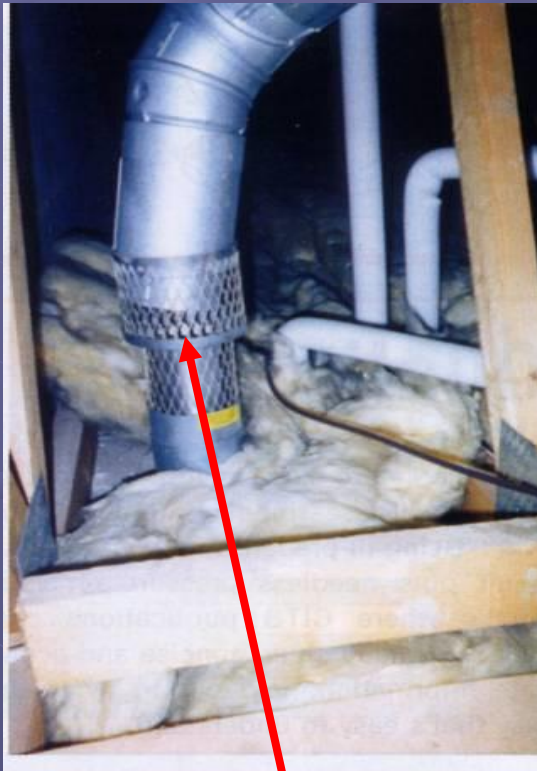


Vertex Flue

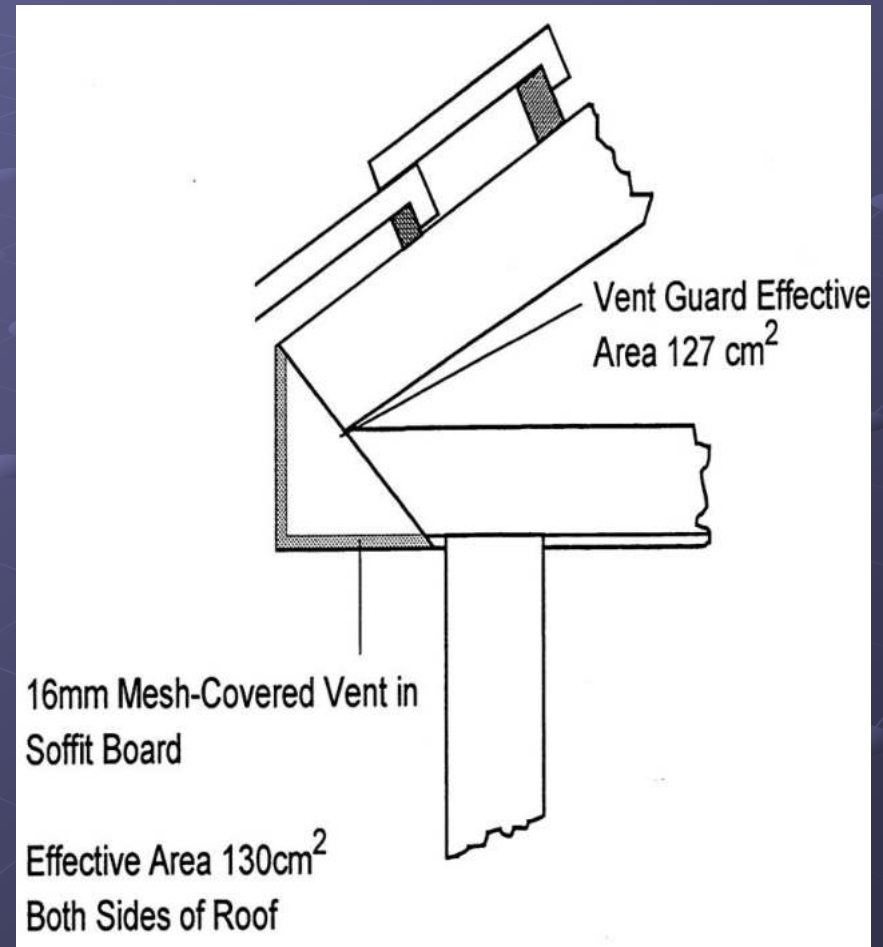
- Vertical fanned flue with a concentric air supply tube.
- Improves versatility of appliance installation.
- Roof space must be ventilated to provide combustion air.
- **300mm clearance above joists.**



Vertex Flue Air Requirements



300mm

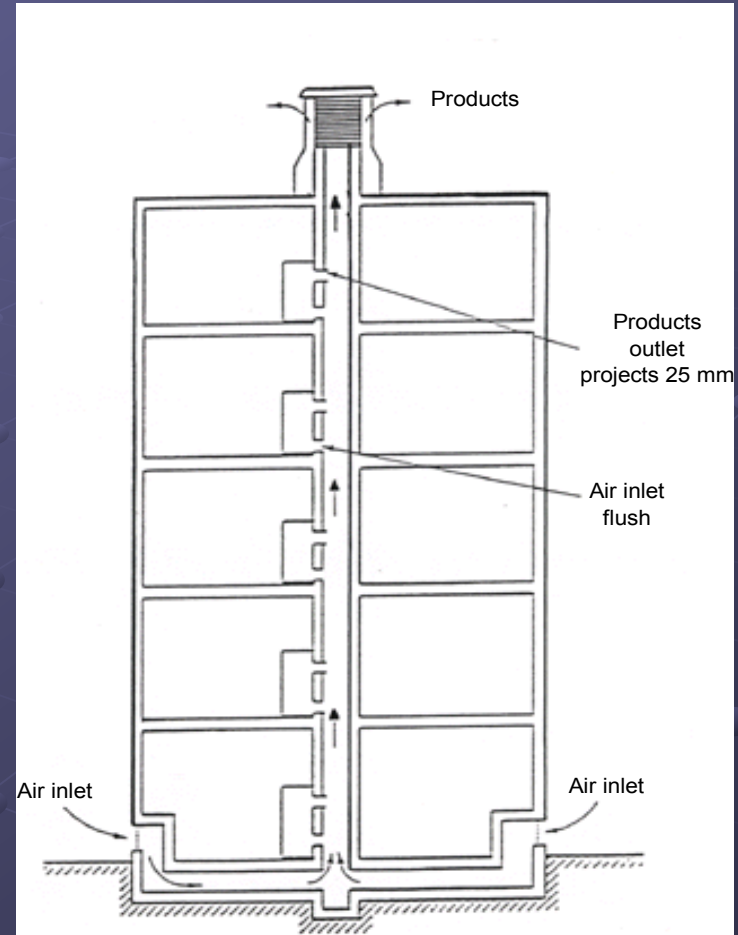


SE-Duct and U-Duct

- Only certified room sealed appliances are for use on these systems.
- They take air for combustion from within a duct.
- Products are discharged into the same duct.
- LPG appliances are not suitable.

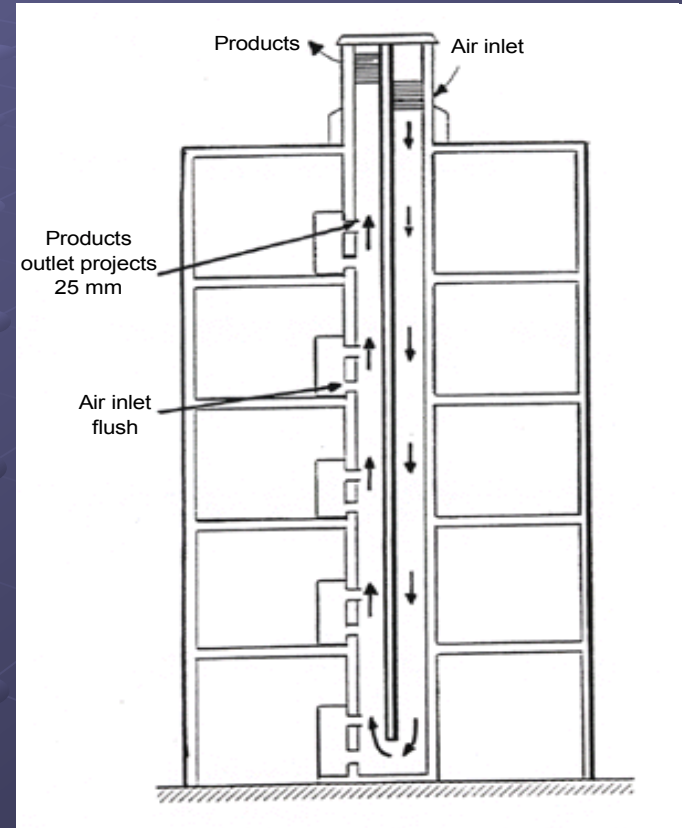
SE-Duct

- Take combustion air into a vertical duct via horizontal limbs at low level.



U-Duct

- **Have two vertical ducts which terminate adjacent to each other above roof level.**
- **Connected at the base in the form of a “U”.**
- **Appliances connected onto one duct, the exhaust, while the other acts as combustion air.**



SE-Duct and U-Ducts

- **The base of the terminal opening of both duct systems should be at least 250mm above roof level.**
- **Where there are other structures on the roof, the terminal should be at least 250mm above these.**
- **Or not less than 1.5m away from them.**

Hearth Plates.

- **Where a hearth, fireplace, flue or chimney is provided or extended.**
- **A durable notice containing relevant information regarding the performance/capabilities of the flue system/components should be fixed in a suitable location.**

Hearth Plates.

- **This information should provide sufficient data to enable a decision to be made on the suitability of a combustion appliance.**
- **If in doubt as to whether or not any renovation or repair work to a chimney/flue system is notifiable building work.**
- **Consult your local authority building control department.**

Hearth Notice.

CHIMNEY/HEARTH NOTICE PLATE

Property address:	
Chimney/hearth installed in the:	
Is suitable for:	
Chimney liner (type/diameter):	
Suitable for condensing mode:	
Installed date:	
Installers name/CORGI Reg. No.	

IMPORTANT SAFETY INFORMATION
THIS DATA PLATE MUST NOT BE REMOVED OR COVERED

Flues In Voids.

- Inspection panels must be installed by 31st December 2012.
- From 1st January 2013 any installations that have not been fitted with inspection panels will be deemed as **At Risk** and should not be used.
- The term “Concealed” primarily encompasses situation where the chimney/flue system passes through:

Flues In Voids.

- Ceiling voids.
- Floor voids.
- Behind false walls.
- But does NOT apply to chimney/flue systems incorporating:
 - Vertical condensing flexible room-sealed fan-draught systems, installed in enclosures, such as constructional chimneys.

Flues In Voids.

- Which are so sealed that any leakage of products of combustion cannot pass from the enclosure to any room or internal space.
- Short chimney/flue systems, which are connected directly from an appliance to outside air through an external wall.

Room Sealed Boilers.

Fan draught flue systems concealed within voids.

- **A risk assessment needs to be carried out to determine if any risks identified are adequately controlled.**
- **The route of the chimney should be ‘walked’ to ensure that there are inspection panels fitted.**

Room Sealed Boilers.

- **No stains, damp patches or discoloration to the material used to construct the enclosure below the chimney system.**
- **This may indicate that there is a break or defect in the chimney system.**
- **If the results of the risk assessment are satisfactory, i.e. inspection panels fitted no signs of distress.**
- **The installation should be deemed as being satisfactory.**

Room Sealed Boilers.

- Where there are any concerns with the installation following a risk assessment.
- No inspection panels fitted, no signs of distress.
- Installation deemed “At Risk”
- Advise the responsible person for the premise.

Room Sealed Boilers.

- Where there are any concerns with the installation following a risk assessment.
- No inspection panels fitted, or panels fitted and signs of distress.
- Installation deemed “Immediately Dangerous”
- Advise the responsible person for the premise.

Figure A1.1 Example of suitable positioning for inspection hatches for concealed horizontal chimney/flue systems

The diagram illustrates the required positioning of inspection hatches for concealed horizontal chimney or flue systems. It shows two vertical sections: one for an external wall and one for an internal wall. At the top, a horizontal flue terminal is shown passing through the external wall. Below this, the flue continues vertically and then horizontally, concealed within the wall. Inspection hatches are indicated by dashed squares with an 'X' inside. The distance between any two hatches, or between a hatch and the terminal, is marked as 'X'. A note specifies that 'X' represents the distance to the nearest intervening joint, which must be visible within 1.5m of the hatch. The diagram also shows a concealed flue connection between two boilers (Boiler 1 and Boiler 2) and an accessible flue connection. The internal wall section shows a similar setup with a vertical flue and a horizontal connection to another boiler.

Flue Terminal

External wall

Inspection hatch

X

X - Any Intervening joints to be visible within 1.5m of an inspection hatch

Inspection hatch

X

Inspection hatch

X

Accessible flue connection

Concealed flue connection

Boiler 1

Boiler 2

Internal wall

Inspection hatch

X

X - Any Intervening joints to be visible within 1.5m of an inspection hatch

Preferred Industry Options.

- The installation of appropriately specified and located inspection hatches, room monitoring carbon monoxide (CO) alarms and regular service/maintenance by a registered engineer.
- Inspection hatches are considered to be the most effective way of allowing the chimney/flue to be examined.
- CO alarms throughout the route of the flue will ensure system is safe.

Preferred Industry Options.

- The installation of a CO void monitoring safety shut-off system (COSSVM) and regular service/maintenance by a registered engineer.
- In exceptional circumstances the installation of inspection hatches may not always offer the best solution.
- A COSSVM may be considered.

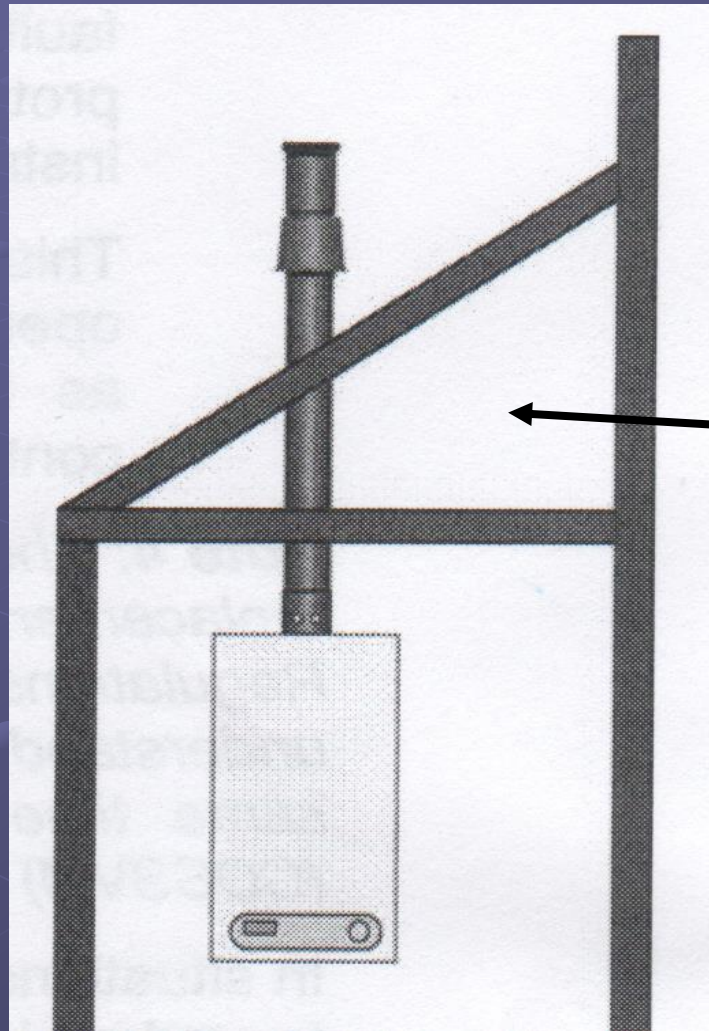
Exceptions.

- **Where it is identified that a short chimney/flue system is concealed within a void, a vertical chimney passing through a flat or pitched roof extension, with no means of access to allow inspection and the following factors confirmed the installation can be considered satisfactory.**

Exceptions.

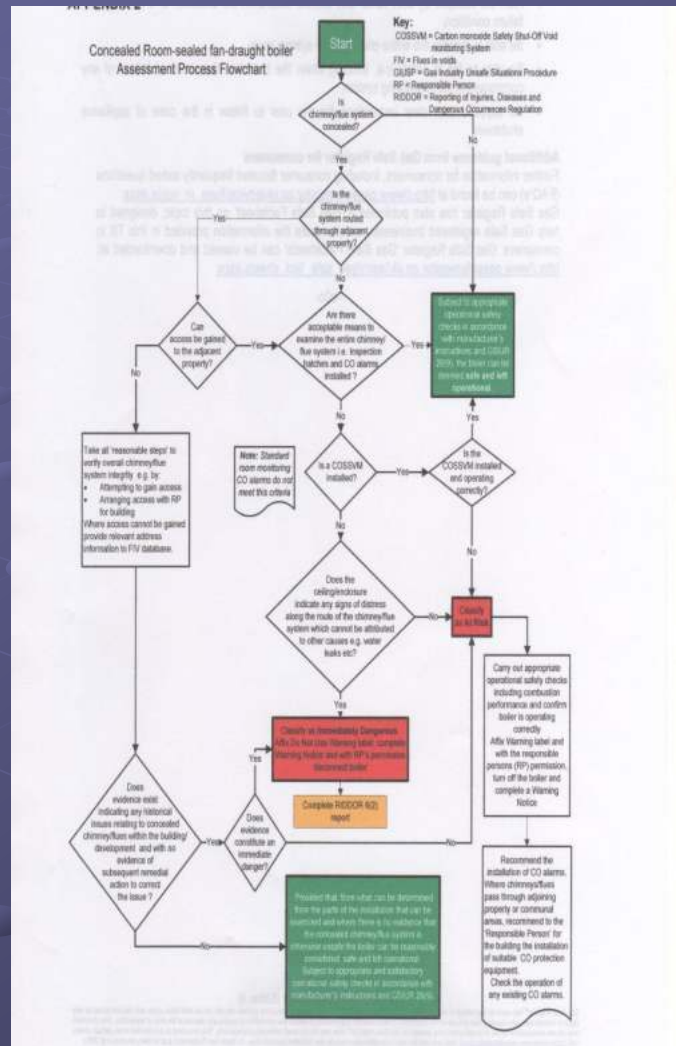
- There are no changes in the chimney/flue direction.
- There are no signs of distress likely to indicate a chimney/flue issue exists.
- The chimney/flue length does not exceed the maximum single length.
- Documented confirmation exists from the installation business stating that no chimney/flue joints are concealed.

Exceptions.



Inaccessible void

Flow Chart.



Commissioning of Gas Boilers.

- **With effect from April 2013, boiler manufacturers are recommending that engineers should measure the level of CO in the chimney/flue gases.**
- **The measured CO level and combustion ratio should then be recorded on the appropriate commissioning documentation i.e. Benchmark.**

Commissioning of Gas Boilers.

- HHIC boiler manufacturers already require engineers to correctly complete the Benchmark Commissioning Checklist as a condition of manufacturer warranty.
- The new requirement to record CO and combustion ratio will also form part of these warranty conditions.

Why the Changes.

- **These new measures have been agreed by HHIC and its members.**
- **They are designed to improve CO safety in relation to new installations of condensing boilers.**
- **The changes follow concerns of a very small number of incidents in recent years involving newly installed condensing boilers.**

Why the Changes.

- These boilers are fitted with air/gas ratio valves.
- Investigation of these incidents indicated that, due to a combination of different factors, high levels of CO were present in the combustion products.
- These incidents represent a tiny fraction of the 1.5 million boilers installed.
- From April 2014, this will become mandatory.

FLOWCHART FOR CO LEVEL AND COMBUSTION RATIO CHECK ON COMMISSIONING A CONDENSING BOILER

Important Preliminary Information on Checks

The air gas ratio valve is factory-set and must not be adjusted DURING COMMISSIONING unless this action is recommended following contact with the manufacturer.

If any such adjustment is recommended and further checking of the boiler is required the installer/service engineer must be competent to carry out this work and to use an electronic combustion gas analyser (ECGA) accordingly.

If the boiler requires conversion to operate with a different gas family (e.g. conversion from natural gas to LPG) separate guidance will be provided by the boiler manufacturer with any conversion kit supplied and this must be followed.

PRIOR TO CO LEVEL AND COMBUSTION RATIO CHECK

The boiler manufacturer's installation instructions must have been followed (where available), gas type verified and gas supply pressure / gas rate checked as required prior to commissioning.

As part of the installation process, **ESPECIALLY WHERE A FLUE HAS BEEN FITTED BY PERSONS OTHER THAN THE BOILER INSTALLER**, visually check the integrity of the whole flue system to confirm that all components are correctly assembled, fixed and supported. Check that manufacturer's maximum flue lengths have not been exceeded and all guidance has been followed (e.g. Gas Safe Register Technical Bulletin (TB) 008 where chimney/flues are in voids).

The ECGA should be of the correct type, as specified by BS 7967

Prior to its use, the ECGA should have been maintained and calibrated as specified by the manufacturer. The installer must have the relevant competence for use of the analyser.

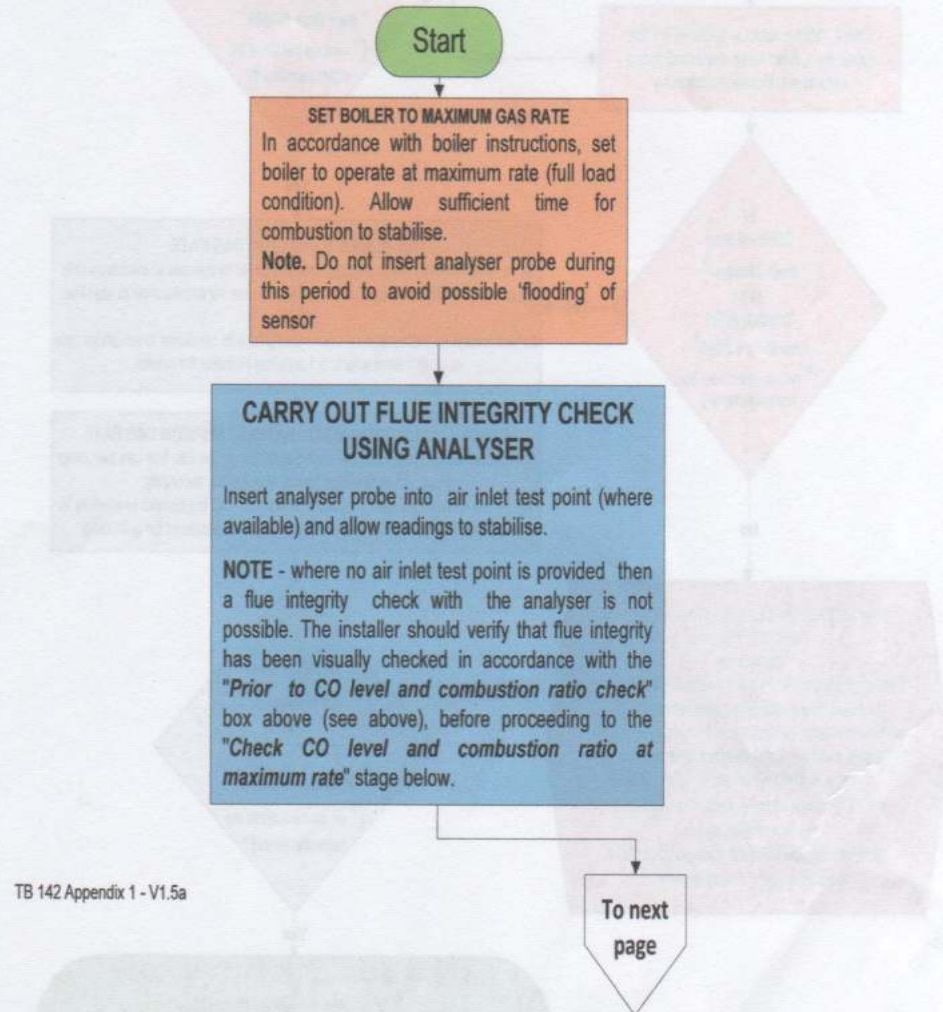
Check and zero the analyser IN FRESH AIR in accordance with the analyser manufacturer's instructions.

Key:

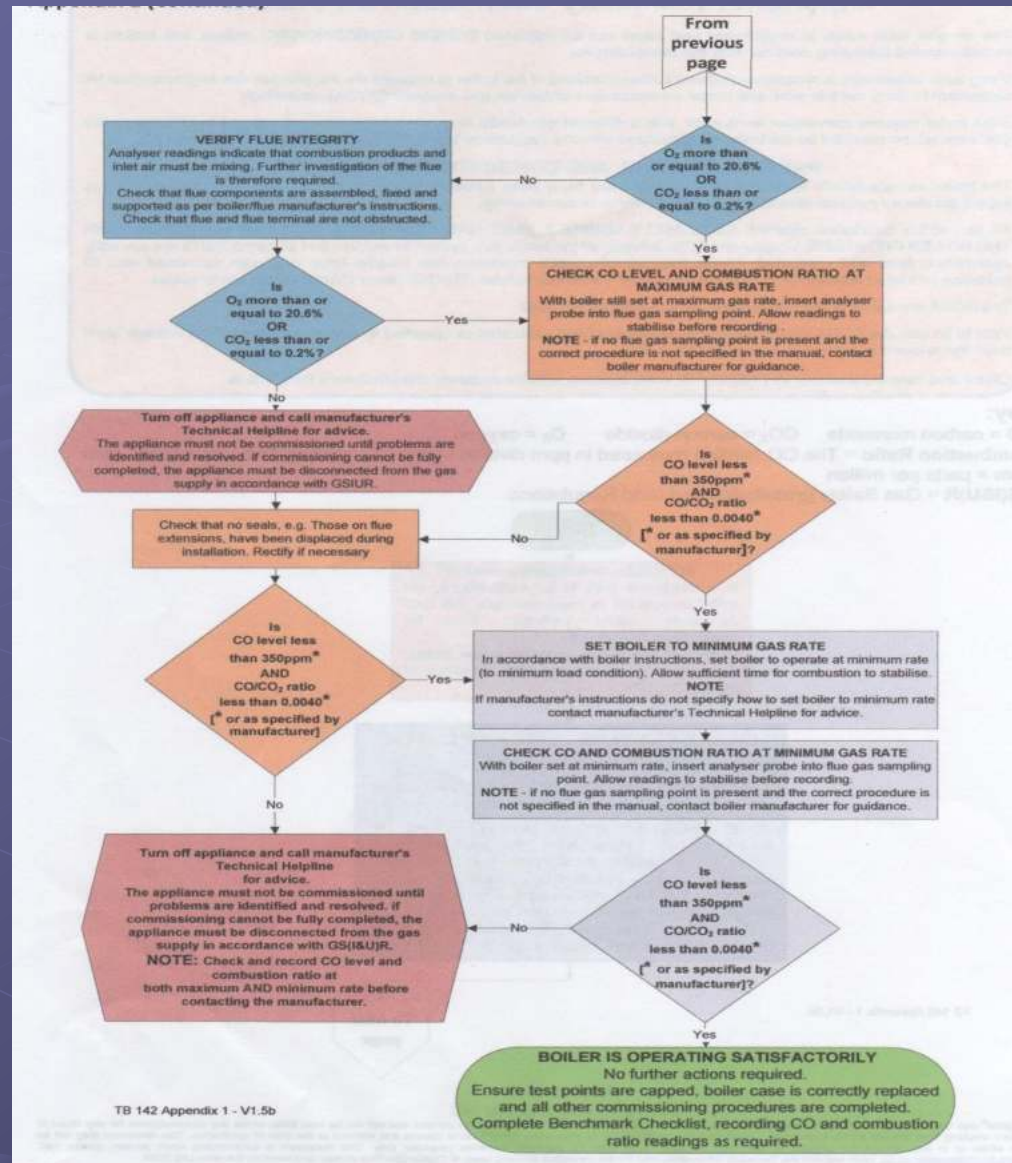
CO = carbon monoxide CO₂ = carbon dioxide O₂ = oxygen

Combustion Ratio = The CO reading measured in ppm divided by the CO₂ reading first converted to ppm
ppm = parts per million

GS(I&U)R = Gas Safety (Installation and Use) Regulations



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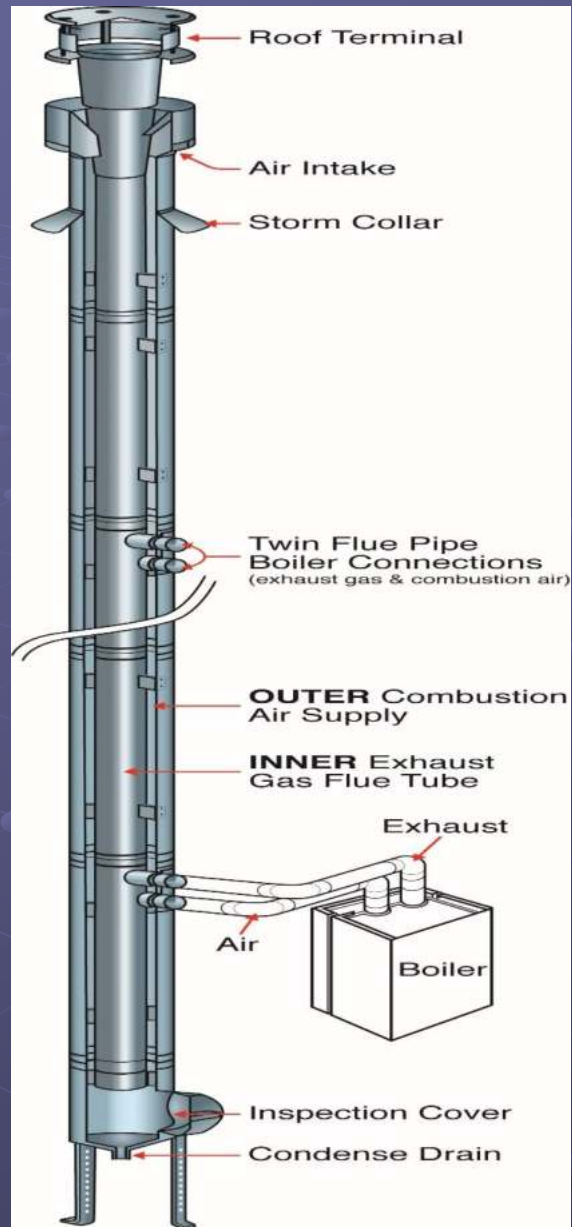
Combustion Products

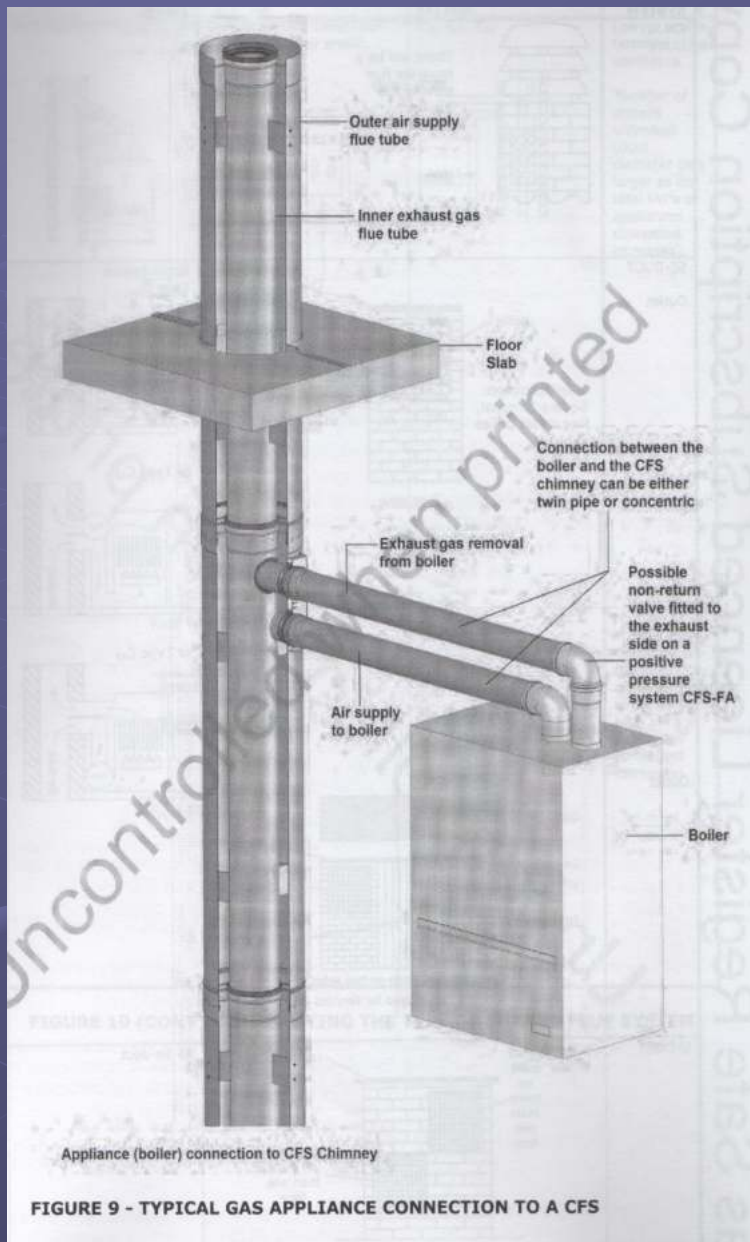
Air Products



Communal Flue Systems. (CFS)

- **Replacement appliances must be of the same type.**
- **Both condensing and non condensing appliances can be fitted to the same CFS providing the rating specification of the CFS is not exceeded.**
- **Where fan assisted appliances are connected to a CFS, a non-return valve (NRV) must be fitted on the exhaust duct.**







Note: In this application it is a simple rubber flap that is lifted via the appliance fan.

FIGURE 8 - TYPICAL POSITION FOR A NRV FITTED INTEGRAL WITHIN THE APPLIANCE











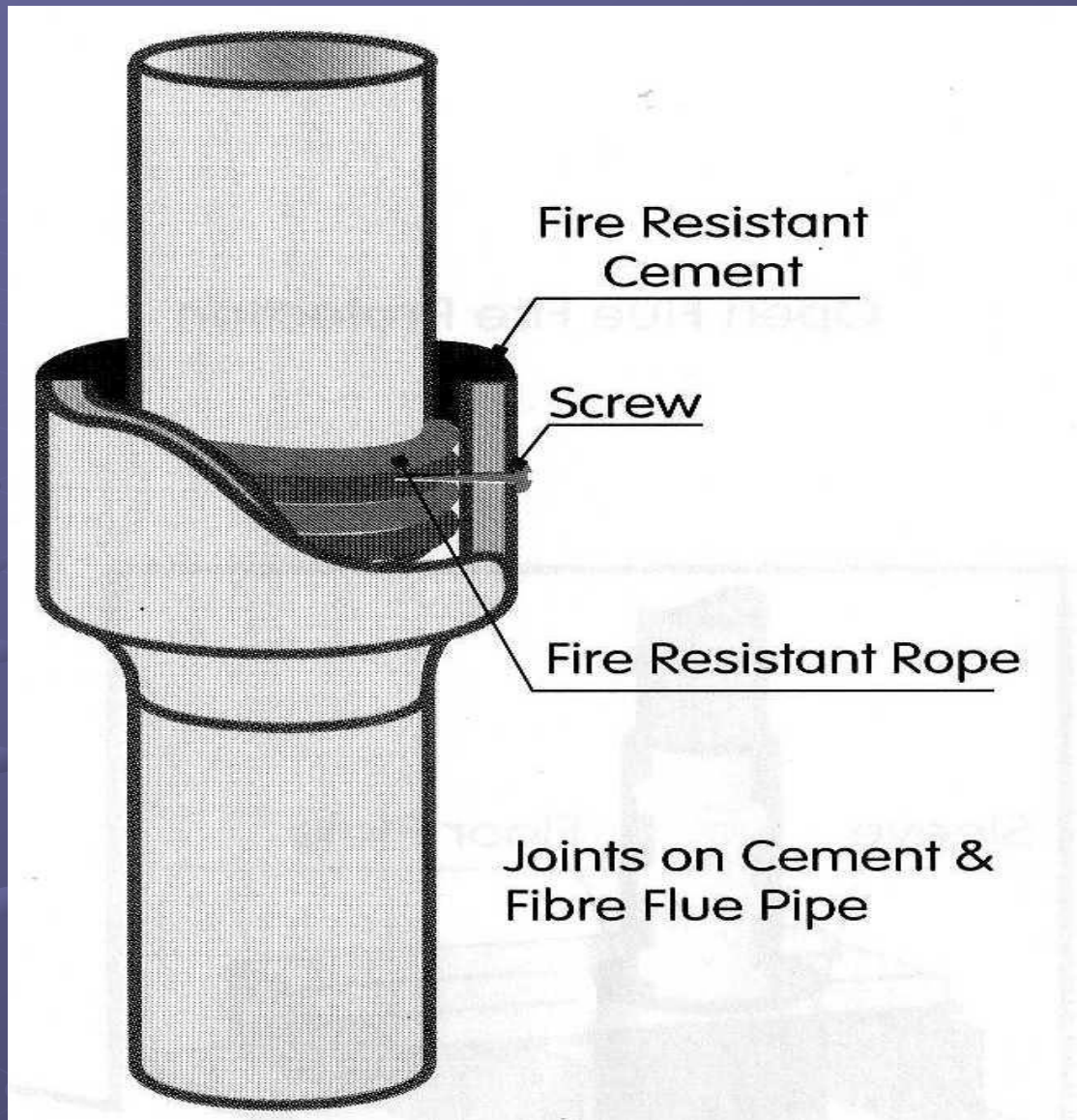


Acs Gas Training and Assessment
Centre Ltd























**Thank you for
your
attention.**