- Place a smoke pellet at the front of any grate and ignite it. For the first 30 seconds watch the smoke and note whether all the smoke enters the fire opening and chimney and that none of the smoke enters the room. Next, open a window and observe if the smoke travels quicker up the chimney than previously.

- If either of the above occurs there is insufficient ventilation for the efficient operation of the flue. Additional ventilation must be provided, noting the requirements of ADJ Table 1.

Module 13 Commissioning

A smoke test as detailed in Appendix E: Approved Document J in the Building Regulations should be carried out. The purpose of smoke testing is to check that the flue gasses will rise freely through the flue. The test should also identify any leaking joints that could cause the escape of flue gases.

On completion, a flue flow test should be carried out in accordance with BS EN 15287 Part 1:2007.

Briefly:

1. Carry out visual and physical check of all components, especially joints.
2. Ensure adequate ventilation is available for the combustion appliance in accordance with ADJ, Table 1.
3. Close doors and windows in room where appliance is installed.
4. If another ventilation device is present in the same room (such as a cooker hood) this should be activated during the duration of the test to simulate a 'worst case scenario'.
5. Warm the internal surface of the chimney system chimney using a blow torch or similar device. This may take between 10 and 30 minutes depending of the size and length of the flue.
6. Position suitable smoke pellets into the firebox and light them.
7. Check the appliance for spillage of smoke.
8. Check the joints in the chimney system for leakage of smoke.
9. Check all smoke is discharged from the chimney terminal.
10. Whilst the internal chimney is warm, use a draught gauge to confirm there is adequate draught to satisfy the appliance manufacturer's installation instructions.
11. If the chimney fails any of the above, fully investigate the cause and rectify as appropriate.
12. If any rectification work cannot be carried out on the same day, the home owner must be advised not to use the appliance until such time as the work has been completed.

Risk Assessments

The Management of Health and Safety at Work Regulations 1999, sets out what is required of employers under the terms of the Act and applies to every work activity. The main requirement on employers is to carry out a risk assessment. Employers with five or more staff need to record any significant risk identified. The law does not expect all risks to be eliminated, but employers are required to protect people as far as is reasonably practicable.

In a wood heating project, the risk assessment should normally be completed as part of the project planning process and relevant information should be collected during the site survey.

The five key steps to risk assessment are:

- Step 1 – Identify the hazards
- Step 2 – Decide who might be harmed and how
- Step 3 – Evaluate the risk and decide on precautions
- Step 4 – Record your findings and implement them
- Step 5 – Review your assessment and update if necessary

Definitive information can be obtained from the Health & Safety Executive on www.hse.gov.uk

Handling

A chimney system can be heavy. Adequate facilities must be provided for loading, unloading and handling before and whilst installing.

Asbestos

These chimney systems do not contain asbestos. However, if there is any possibility of disturbing any asbestos in the course of installation, seek specialist advice. As a precaution, wear the appropriate mask and gloves to avoid exposure. Never disturb asbestos and follow the guidance provided by the HSE.

Metal Parts

Take care when installing or servicing the system chimney to avoid personal injury. Operatives should take suitable precautions such as gloves, safety glasses and boots to avoid injury on sharp exposed edges. You can find the HSE guidelines for protective equipment on their website (see link above).

Access

Ensure suitable and safe access is available when working at a height and on roof areas. Installers should acquaint themselves with and follow HSE guidelines (available via the link above).

Lightning

In areas where lightning strikes are common, consideration should be given to providing lightning conductors to metal flue systems to prevent potential damage to the property and its occupants.

Sweeping Access

It is essential that the chimney connected to the appliance can be swept throughout its length and any deposits can be removed from the flue. This operation should be carried out without needing to detach the appliance from the chimney. In some cases, you can use a detachable maintenance collar or an adjustable length to disconnect the stove .

Duty of Care

Some home owners may ask for registered engineers to carry out work which is in breach of Building Regulations or manufacturer's instructions. Such work may be deemed illegal or dangerous. All HETAS Registered installers are considered 'experts' and should never contemplate such actions. To do so would be a breach of Health and Safety at Work legislation.

General note: **The removal of the appliance is to be made possible without the need to remove the completed flue system.**

Module 2 Health & Safety at Work Act

The installation / construction of stainless steel chimney systems will require the installer to carry out a risk assessment. Other areas of consideration are covered by:

The Health and Safety at Work Act 1974

The Act states that 'it shall be the duty of every employer to ensure, as far as is reasonably practicable, the health, safety and welfare at work of his employees'. This duty of care extends to protecting the safety of the homeowner and any persons likely to be in the proximity of work being carried out.

The Work at Height Regulations 2010

This regulation provides guidance on safe practice to minimise risk. The Regulations apply to all work at height where there is a risk of a fall liable to cause personal injury.

The assembly and construction of and system chimney involves a greater risk of injury than appliance installation due to the risks associated with working at height.

Due to the size and weight of the chimney components this means that scaffolding or 'cherry pickers' are commonly employed for ease of access to the roof area. Moreover, it would be unsafe to work on a ladder for long periods of time, especially when assembling sections of the flue. Health and safety regulations from 2010 state a maximum use of a ladder as 20 minutes before a break is required. It also states that 3 points of contact are required to help ensure the safety of the worker. Details of Health and Safety requirements are detailed in Module 3 of the H003 Training Manual.

Control of Substances Hazardous to Health (COSHH)

COSHH is the law that requires employers to control substances that are hazardous to health. There is a guide to COSHH available on the HSE website (www.hse.gov.uk). You can prevent or reduce exposure to hazardous substances by:

- Identifying what the health hazards are
- Deciding how to prevent harm to health (risk assessment)
- Providing control measures to reduce harm to health
- Making sure control measures are implemented
- Keeping all control measures in good working order
- Planning for emergencies

Whilst installing any system chimney, you could be exposed to a variety of hazardous substances including asbestos and other dust particles as well as fire cement and sealants. Consideration should also be given to the sharp edges of metal components (e.g. flue pipes).

Module 3 Carbon Monoxide Safety

Carbon monoxide (CO) is a colourless and tasteless gas which is the product of incomplete combustion of carbon based fuels such as coal, wood, gas and oil. It is harmful if breathed in and may result in death if present in sufficient quantities or if a person is exposed for a sufficient length of time. This gas is always present in large quantities in the smoke/fumes from any solid fuel/wood burning appliance while under fire. Any escape of flue gasses into the property must be treated as a serious incident. If a system chimney is used where the size and height is insufficient, there is a potential danger of carbon monoxide spillage from the appliance. Ensure that the correct diameter and height of chimney is used, if unsure ask the appliance and chimney manufacturer for advice.

Full details on carbon monoxide are covered in the H003 Training Manual.

Carbon Monoxide Alarms

Since October 2010, ADJ requires that CO Alarms are fitted to all new or replacement solid fuel/wood burning appliances installed in dwellings. Paragraphs 2.34 to 2.36 detail the requirement.

Alarms should comply with BS EN 50291:2001 and may be battery or mains powered. Battery powered units should last the lifetime of the sensor.

Module 4 Building Regulations & Standards - *advice for a prefabricated system chimney*

Building Regulations Approved Document J 2010 Edition paragraphs 1.42 to 1.47 and ADJ diagram 13 refers to the current requirements for the installation of -

Factory-made Metal Chimneys

1.42 Ways of meeting the requirements when proposing *factory-made metal chimneys* include:

a. Using component systems appropriately designated in accordance with BS EN 1856-1:2009 to suit the appliance and types of fuels to be burnt and installing them in accordance with the relevant recommendations of BS EN 15287-1:2007 and manufacturers installation instructions;

b. For gas and oil appliances where flue temperatures will not normally exceed 250°C using twin-walled component systems etc…

c. Using any other chimney system that is suitable for the intended purpose and installed in accordance with the relevant recommendations in BS EN 15287-1:2007 or BS 5440-1:2008, as appropriate to the type of appliance being installed.

1.43 Where a *factory-made metal chimney* passes through a wall, sleeves should be provided to prevent damage to the *flue* or building through thermal expansion. To facilitate the checking of gas-tightness, joints between *chimney* sections should not be concealed within ceiling joist spaces or within the thickness of walls without proper access being provided. (see para 1.47)

1.44 When providing a *factory-made metal chimney*, provision should be made to withdraw the appliance without the need to dismantle the chimney.

1.45 *Factory-made metal chimneys* should be kept a suitable distance away from combustible materials. Ways of meeting the requirement for *chimneys* designated to BS EN 1856-1:2009 comprise:

a. Locating the *chimney* not less than distance 'xx' from combustible material, where 'xx' is defined in BS EN 1856-1:2009 as shown in figure 7.1

b. Where a *chimney* passes through a cupboard, storage space or roof space, providing a guard placed no closer to the outer wall of the chimney than the distance Gxx is required. Refer to module 7 for information regarding ventilation.

1.46 Where a *factory-made metal chimney* penetrates a *fire compartment* wall or floor, it must not breach the fire separation requirements of Part B. See Approved Document B for more guidance (or see appendices part c.) but the requirements may be met by:

a. Using a *factory-made metal chimney* of the appropriate level of *fire resistance* installed in accordance with BS EN 1856-1:2009 Annex NA; or

b. Casing the chimney in *non-combustible material* giving at least half the *fire resistance* recommended for the *fire compartment* wall or floor.

Notice Plates

Building Regulations ADJ states that any new chimney or appliance installation will need to have a Notice Plate fixed in a visible position. Possible location is by the electricity or gas meter. This Notice Plate will indicate the information essential to the correct application and use of the chimney (see clause 1.56 to 1.59 on page 23 of appendix ADJ). Diagram 1 below shows an example of a notice plate.

Figure 4.1
Chimney notice plate

HETAS www.hetas.co.uk	**IMPORTANT SAFETY INFORMATION** This notice plate must be fixed in position. Do not remove
Property address	
Appliance	
The hearth / chimney installed in the	
Is suitable for	
Chimney type & internal diameter	
Installation date	
Other information	
Installers name & address Competent persons Reg No	

In addition, the chimney system must meet the standards recommended in BS EN 15287-1:2007.

The HETAS Official Guide to approved products and services Part 3 Section C - Factory-made metal chimneys, states in its introduction:

Types — Made in interlocking sections with a suitable external metal outer casing surrounding high performance insulation and a flue liner made of stainless steel. Some systems have a ceramic flue liner that may offer a longer resistance to corrosion. This depends upon the fuel being burnt and subject to proper maintenance.

Approvals — These systems must conform to BS EN 1856-1:2009 with a minimum or equivalent designation of T400 N1 D V3 L40040 Gxx.

NOTE: Products meeting the requirements of the 2010 Edition of Approved Document J should have an equivalent designation according to BS EN 1856-1 of T400 N1 D Vm L40040 Gxx where L40040 is the minimum material specification in the national Annex to BS EN 1856-1 and xx is the necessary separation from combustible materials, when the product is tested in the fully enclosed arrangement specified in BS EN 1859:2009 including fire-stops. Such products will carry a CE mark. Alternatively, products may have the designation T400 N1 D V3 L40040 Gxx having been independently tested for their corrosion resistance according to Annex A3 of BS EN 1856-1 2009. A product designation of T400 N1 W V2 L40040 Gxx is acceptable as being equivalent to a chimney designation of T400 N1 D3 Gxx. The fire-stops must meet the default requirements of the UK Annex to BS EN 1856-1 or be tested to BS 476-20 for fire retarding properties, meeting a minimum delay time of 30 minutes. All HETAS listed products have been verified to meet these requirements.

Special Notes — The metal lined systems should give a normal life of 10 to 15 years or more when correctly installed, operated and maintained. However, prolonged periods of slow burning particularly using solid fuels, combined with inadequate cleaning of the flue-ways can cause corrosion damage which may reduce the expected life of the system chimney and invalidate the manufacturer's warranty.

Building Regulations ADJ 2010 specifies that chimneys built using products meeting the requirements of European product standards should result in a chimney whose performance equals the designation T400 N1 D Vm L40040 Gxx in accordance with BS EN 1856-1, as below, (where xx is the necessary separation from combustible material). HETAS considers all chimneys serving appliances burning solid fuel should have the corrosion resistance designation 3. All HETAS listed chimney products in the Guide have been verified to meet these standards.

BS EN 1443 – European Chimney Grading for Solid Fuel

Performance Characteristics

When selecting a chimney suitable for a given appliance, any chimney with performance characteristics equal to or higher than those appropriate for the appliance may be used.

T400 – Mean operating temperature up to 400°C

N2 – Pressure test criteria – cubic metres per hour per square metre of flue surface area (N1, P2, P1 are also acceptable)

D – Suitable for dry operating conditions, W means suitable for wet operating conditions.

Vm – Minimum material specification for corrosion resistance in accordance with BS EN 1856-1 and BS EN 1856-2. An alternative approach is to apply three corrosion resistance tests - 3 is suitable for solid mineral fuel and heavy oil, 1 is for gas & kerosene and 2 for wood and light oil. BS EN 1856-1 states 'the installed chimney shall be designated 1, 2, or 3 according to national regulations prevailing for the material comprising the flue liner'.

G – Soot fire resistance. The letter G, followed by distance in mm to any combustible materials, such as G50. This means there must be no combustible material within 50mm of the outside surface of the chimney. O means it will not withstand a soot-fire.

A System Chimney with only an Oxx designation is not suitable for solid fuel appliances, its clearance to combustible is based on a safe distance at maximum operating temperature, (that is it is the safe distance that is measured when the flue gas is 100 degree C above the operating temperature T), and because the appliances do not produce soot and therefore there is no danger of a soot fire occurring

All system chimneys are tested at 100°C above the T operating temperature then for soot fire (Gxx) they are tested at 1000°C and it is at this higher temperature that the soot fire clearance to combustible dimension is measured as being the distance that the temperature is below 100°C. (wood can combust at 200°C), without adequate ventilation around the system chimney, this temperature will rises rapidly and potentially cause local combustibles to ignite, by explaining this the installer will have a better understanding of the risk involved if a chimney is not installed correctly with the correct ventilated enclosure.

In 1992 the UK signed up to a European Directive aimed at removing barriers to trade across Europe. It is implemented in UK Law by the Construction Products Regulations.

Under the EU Construction Products Directive, products should have a CE mark and those which have the mark will satisfy the UK Construction Products Regulations.

Chimneys bearing a CE mark will also now have an identification label attached, which identifies its capability by way of a designation. Figure 4.2 shows an example of CE marking for an insulated stainless steel flue system.

See next page for example indentification plate for a chimney fitting

CE

01234

AnyCo Ltd, PO Box 21, B1-050

00

01234-CPD-00234

EN 1856-1

Metal system chimney fitting

Single-wall T Piece G soot Fire proof

T400 - NI - D - VM - L50040 - G(50) quality + thickness of liner

Compressive Strength

Maximum load: 30m of chimney sections

Flow resistance

Coefficient of friction: 0,3 for 90° change of direction

Thermal resistance

0,22 w/m^{2}K at designation temperature

Thermal shock resistance: NPD

Flexural strength

Tensile Strength: 2m

Non-vertical installations: NPD

Wind load: Free standing height: NPD

Freeze thaw resistance: Yes

CE conformity marking, consisting of the "CE" symbol given in directive 93/68/EEC.

Identification number of the notified body.

Name or identifying mark and registered address of the manufacturer.

Last two digits of the year in which the marking was affixed.

Certficate number. This number identifies the manufacturer and the approval body (i.e. LNE). A CE mark without a valid CPD number is not a valid CE mark.

Number of European Standard.

Definition of the product

And appropriate designation according to clause 9

Information on mandated characteristics not included in the designation or threshold values to be given (see Table ZA.1)

Figure 4.2 Identification plate

Module 5 Chimneys - *How They Function*

The up-draught or 'pull' in a flue results from a combination of factors. The higher into the atmosphere you travel, the lower is the air pressure. Therefore atmospheric pressure will always be greater at the base of the flue. As air will always move from high pressure at ground level to low pressure at the chimney terminal, 'natural up-draught' will always be present in a flue of a chimney.

In addition, the difference in temperature between the flue gases and the outside air will add to this effect. Very simply, a column of hot gases in a flue is lighter in weight than an equivalent column of cold air outside, so decreasing further the pressure inside a warm flue, which is less than the air pressure outside. Thus, it is these small differences in air pressure which creates up-draught. Therefore the taller a chimney and the warmer the flue gases are, the greater the up-draught force in the chimney. Reduce the Height and reduce the temperature and the smaller the up-draught force in the chimney.

Uneven surfaces and sharp bends or shallow angles in a flue create a resistance to the flow of flue gases and reduce the draught. Therefore these factors should be eliminated as far as possible when designing a chimney system. Similarly, air leakage into a flue has the effect of cooling the flue gases, thereby reducing draught. A correctly designed and installed twin wall flue system should help avoid some of the problems common with old masonry chimneys.

In some circumstances it may be desirable to reduce an excessive draught by introducing 'dilution' air into a flue, but this should only be done in a controlled way by the use of a correctly set draught stabilizer, and not by accidental air leakage.

Wind at the top of a chimney may have a good or bad effect on draught, depending on the surroundings and the position of the chimney top in relation to the roof.

Poor chimney draught may show itself either in a sluggish fire and general poor performance of the appliance, or in the escape of smoke and fumes into the room. A fire will burn sluggishly when the draught is inadequate to supply sufficient air to the fire for efficient combustion.

Flue Draught Testing

Most appliance manufacturers recommend minimum flue draught requirements in their installation instructions. The capability of the chimney to provide the required draught level should be ascertained prior to installation. Where flue draught requirements are not stated by the appliance manufacturer, 10pa (1mm wg) is considered the minimum draught for safe operation. A typical installation with 4.5m high chimney and less than 20% of its total length in an offset should produce more than 1mm wg of draught.

Module 6 Design Considerations

Building Regulations ADJ Diagram 17 provides guidance on flue outlet positions, however it should be recognised that those locations which terminate below the roof ridge may be affected by local weather conditions. Do not assume that compliance with ADJ will guarantee the chimney will work efficiently under all atmospheric and weather conditions. Terminals below the ridge may suffer 'down-draught' or air pressure issues if they are in the lee of the wind. See common problems illustrated in Chapter 10 of The H003 Training Manual or the SFA Booklet 'The Guide to Curing Chimney Problems'.

Be aware that in some areas of the UK Local Authority Planning Departments may require home owners to obtain planning consent if a new metal flue is to be erected, especially external flue systems which are clearly visible to neighbours. Many manufacturers provide coloured outer finishes for exposed top sections to dull the appearance. In addition they supply 'dummy' brick chimney-stacks which can be used to disguise the sight of a stainless steel flue in locations where neighbours may complain.

Additionally, in some areas there are restrictions placed upon the height of flue terminals on roofs of barn conversions which often are required to be of twin wall stainless steel construction and not visible from the front of the building. Clients should always check with their Local Authority Planning Dept. before work commences.

Listed Buildings can also provide a challenge as the local authority may impose severe restrictions on what work is permitted.

Consider location, neighbourhood and environmental impact as a one of the most important design aspects of an installation.

Care must be taken when making an assessment as to the location of a system chimney. Although system chimneys are available in many colours and sizes and provide a convenient solution for an installation that requires a retrospective chimney, there are many important factors that need to be assessed prior to installation.

An installation that is completed without considering the local environment could cause a nuisance to adjoining property owners this could be detrimental to the installation and may cause neighbour disputes because of its proximity and visual impact to adjoining properties. These systems are expensive and involve care and attention as to the method of installation. Therefore, great care must be taken to avoid any potential and unwanted nuisance from a neighbour dispute or environmental problem.

Smoke nuisance is another important factor in the design and an assessment should be made to local wind patterns and dispersion zones. Providing a suitable height system chimney could mitigate the effects of smoke nuisance.

The following table *(p.16)* provides a checklist for the installation of a system chimney and may be used in conjunction with the drawings that follow after it. The list is not exhaustive but could prove effective for the major part of the system design and any irregularity in the installation.

System Chimney Component Checklist	Notes	✔
Location	Neighbours	
	Wind Patterns	
	Smoke dispersion	
	Smokeless zones	
Bends	450 Bend = 1 Bend.	
	900 = 2 Bends	
Connecting flue pipe from appliance	No more than 1.8 m from appliance outlet	
System Chimney flue diameter	In accordance with AD J or manufactures instructions whichever is more stringent and no less than the appliance outlet diameter	
System Chimney Flue length (no less than 4.5 meters)	Number of vertical lengths. Number of diagonal lengths (no greater than 20% of the system. Flue outlet position in accordance with AD J Diagram 17	
System Chimney	Must protrude through the ceiling so that the flue pipe is a minimum of 3 x OD of appliance flue pipe from combustible surfaces	
System chimney inspection access	Provision for sweeping and cleaning access.	
Passage through the house	Ceilings	
	Voids, Cupboards, enclosures	
	Floors – Trimming floor joist	
	Roof spaces – trimming ceiling and roof rafters	
Proximity to combustibles (Gxx distance)	Floor and ceiling Joists, timber frames and panelling.	
	Enclosures.	
	Combustible material.	
Internal support: Ventilated fire stops / support	Can be supportive and also used to provide a fire stop	
Rafter support	Adjustable gimbal plates to allow chimney support on roof joists, trussed rafters.	
Sleeve	Used to sleeve between the internal and external walls leaves.	
Wall support	Positioning – spacing between fixings. (manufactures instructions)	
System support	Ventilated fire stop	
Joist / base support	Used to take the vertical load of the chimney when supported from a wall or foundation pad	
Roof penetration		
Weathering / Flashing	Angle of the roof?	
	Flat roof?	
Terminals: Top stub tapered section. Rain Cap	Location? Effect on dispersion of combustion products?	

The following diagrams provide examples of a system chimney that pass through the various elements of a building. The boxes in the diagrams can be used for recording measurements from a site survey.

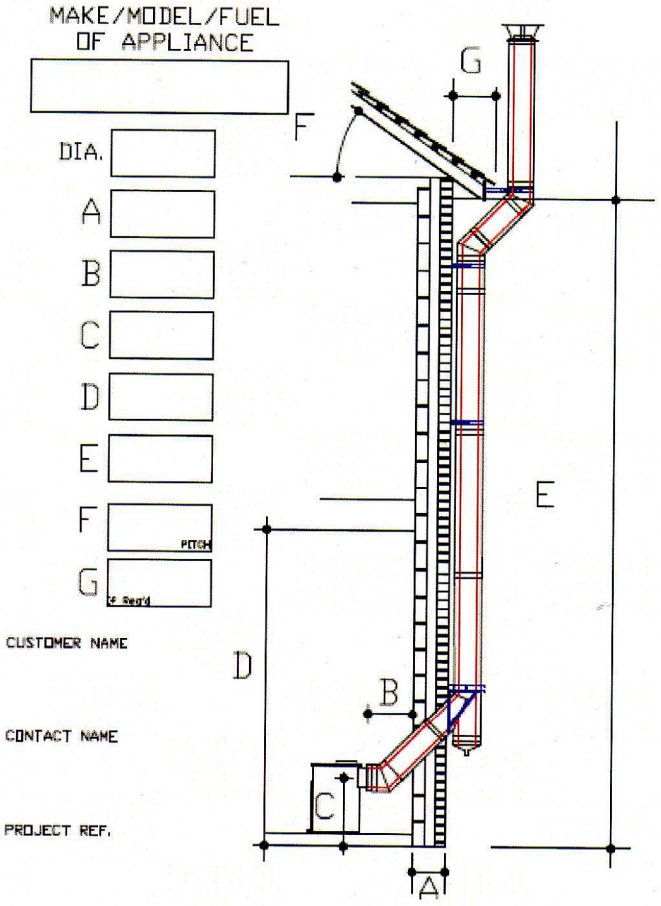
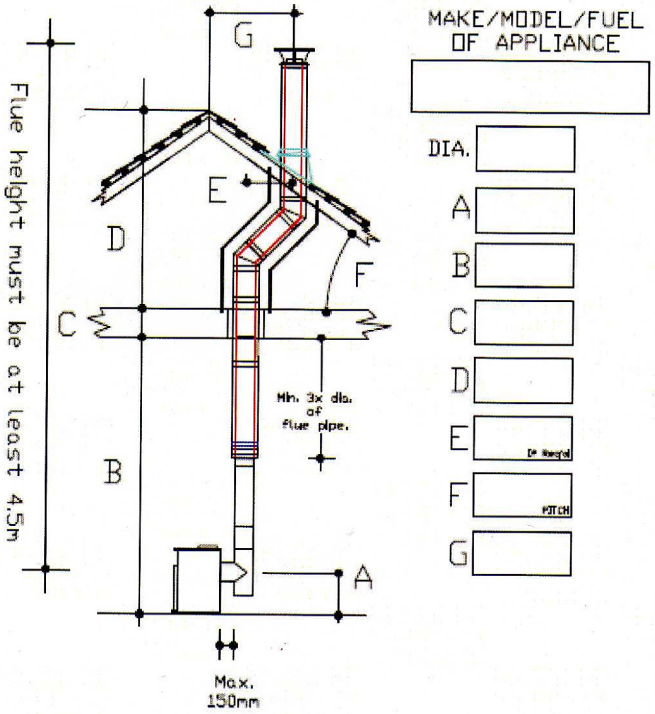


Figure 6.1 Two storey building (external system)

Figure 6.2 Single storey building (internal system)



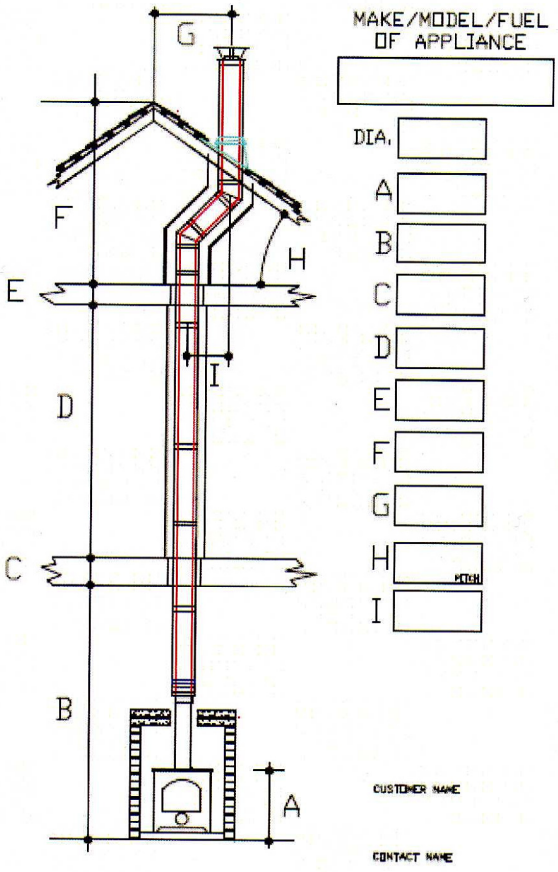


Figure 6.3 Two storey building (internal system)

Module 7 Chimney Specification

In general, system chimneys fall into two main types –prefabricated stainless steel system chimneys and masonry chimneys.

- Importantly for this Course, there are a number of manufacturers and importers offering twin-wall insulated stainless steel systems into the UK market suitable for use with solid fuel and wood burning appliances as well as oil and gas.
- New masonry chimneys are traditionally of brick, medium weight concrete block or stone construction and are lined with clay or concrete lining materials to comply with Approved Document J and BS EN 1443:2003, and installed in accordance with manufacturer's instructions.
- In addition, chimneys may be constructed of factory made flue blocks with a performance equal to that laid down in BS EN 1443:2003.
- The exact installation requirements of metal system can and usually does change from one manufacturer to another, it is critical that the installer is fully acquainted with the specific manufactures installation instructions of the system he uses and how they can be applied. Always follow manufacturer's instructions.

CE marking requires system chimney manufacturers to provide comprehensive literature and installation instructions itemising all of the various components available from them. Sketches to illustrate how to install the items correctly, detailing the loading requirements and showing the correct arrangement that matches the way the chimney was tested to BSEN 1859 should be provided also. These arrangements vary from one manufacturer type of chimney to another and each manufacturers installation instructions are specific to that product and are not transferable to a different product.

Each project site will, of course differ, and care must be taken to ensure the correct arrangement of the chimney and its support components, angled sections and fire stops are fitted in the correct way.Instructions will also detail how the enclosure must be installed to the specific to the manufacturers instructions and Building Regulations.

Components from different system manufacturers should never be mixed as joint integrity cannot be guaranteed.

A number of manufacturers supply stainless steel system chimneys to cater for a variety of applications. In particular there is a clear separation between those designed for use with gas and oil fired appliances only and those intended to include solid mineral fuels and wood, (as well as gas and oil). The latter type of chimney system is made from a more corrosion resistant specification of stainless steel able to withstand the aggressive nature of some flue gasses and higher operating temperatures. Note that some system chimneys carry more than one designation that means they are suitable for different fuel types.

Gas and oil flues are generally designed to operate at lower flue gas temperatures (200°C, T200) compatible with high efficiency and condensing (w) boiler operations, condensate disposal and a positive operating pressure (P1).

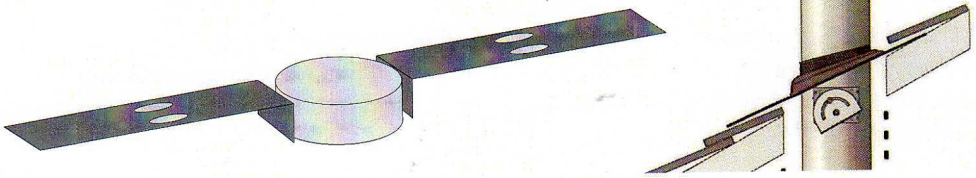
The multi-fuel chimneys are required to withstand normal operating temperatures of between 400° C to 500°C and a maximum temperature of 1000°C. In addition, most solid fuel burning appliances operate with negative pressure within the flue in order to create natural draught.

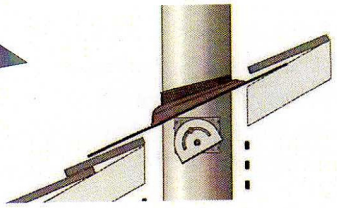
Pre-fabricated flues are supplied in various sections up to 1.5 metre in length and a variety of internal diameters to suit the intended application. Building Regulations ADJ and appliance manufacturer's installations instructions will determine the most appropriate internal flue size, which should never be smaller than the flue spigot from the appliance.

Connection to the heating appliance is normally made by a suitable size and length of metal flue pipe and the appropriate adaptor/connector piece, ensuring that the joint between the adaptor and the appliance is securely caulked to prevent leakage of flue gasses. This type of pipe is commonly referred to as "connecting flue pipe". Any flue pipe connection must be made in the same room as the appliance.

The weight of the flue system shall not be borne by the appliance. Manufacturer's support brackets should be used to take the weight of the chimney system.

A





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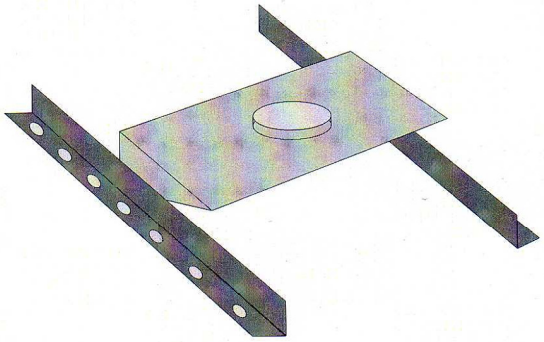

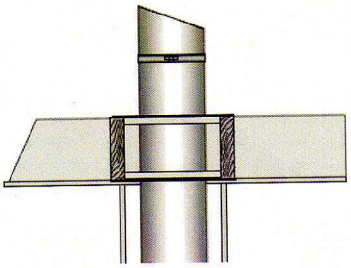

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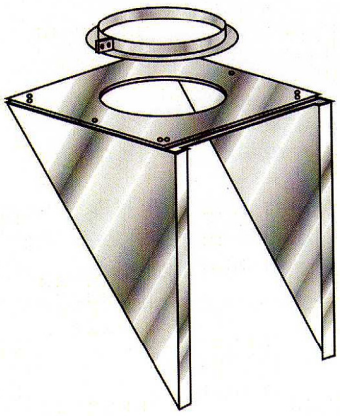


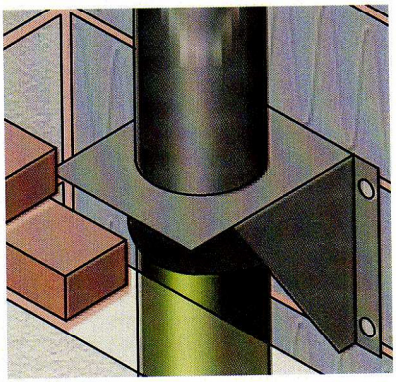


Figure 7.1 Support brackets

A. Rafter support with example

B. Joist / Floor support with example

C. Intermediate Wall support with example

Pre fabricated chimney sections are either push fit or employ a simple twist lock device. Locking bands are supplied to ensure a gas tight joint is achieved. Some systems do not require locking bands to create a gas tight system. The male end is always positioned uppermost pointing in the direction of the terminal. Both are effective methods of joining the chimney sections together. The push fit joint provides a chimney that is designated wet (W) plus the joint itself is insulated. The twist lock provides a dry (D) joint. However there are makes that are both twist and push lock combined. These are usually designated wet (W).

Push fit joints allow sections ie elbows to be rotated once joined together this is not normally possible with twist lock joints, although some manufacturers leave the barbs on elbow sections off to facilitate rotation. These must be held together with a locking band. Locking bands can be either bolted or the snap push type. With the latter it is normal to add a security clip to ensure that they cannot work loose and come undone.

External system chimneys should always be installed with locking bands. However some manufacturers allow internal systems to be installed without locking bands.

Wherever possible, chimneys should be straight and vertical. 15°, 30° and 45° insulated elbows are available. Where a change of direction is unavoidable, the chimney shall have no more than 4 bends in total of no greater an angle than 45° from the vertical. Any diagonal offset shall not exceed 20% of the total system chimney length (including flue pipe).

The only situation where 90° angle elbow or tee are permitted is where it is necessary to make a horizontal connection to the appliance rear outlet . In such instances, the horizontal length shall be no greater than 150mm measured from the outlet to the inner flue wall.

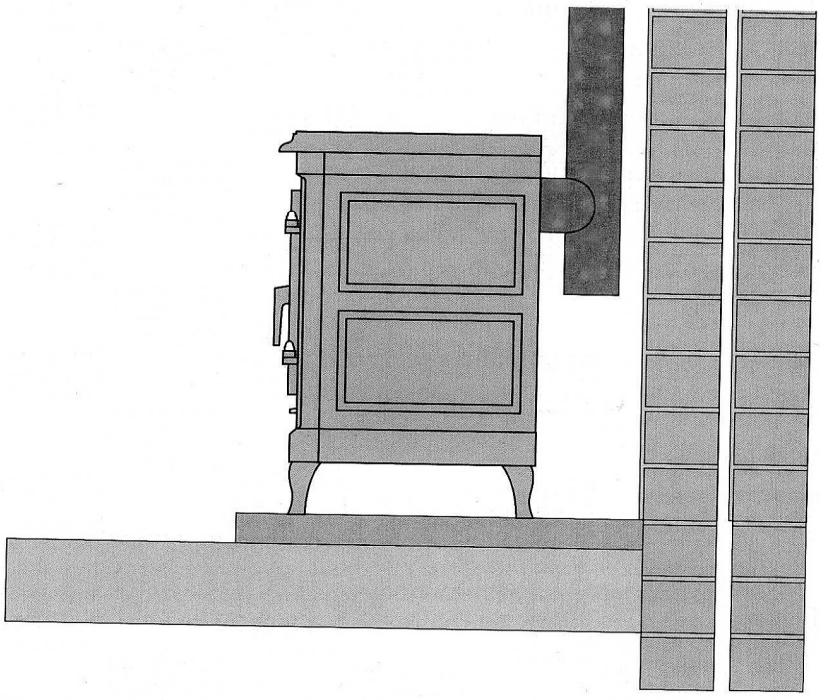


Figure 7.2 Stove with a rear outlet and 90° tee with trap for cleaning access

The terminal outlet of the chimney must comply with the requirements of Building Regulations ADJ, Diagrams 17 and 18 (See appendices). Wherever possible it is advisable to terminate the system as high as practically possible to minimise the risk of poor chimney performance as a consequence of adverse wind and air pressure problems.

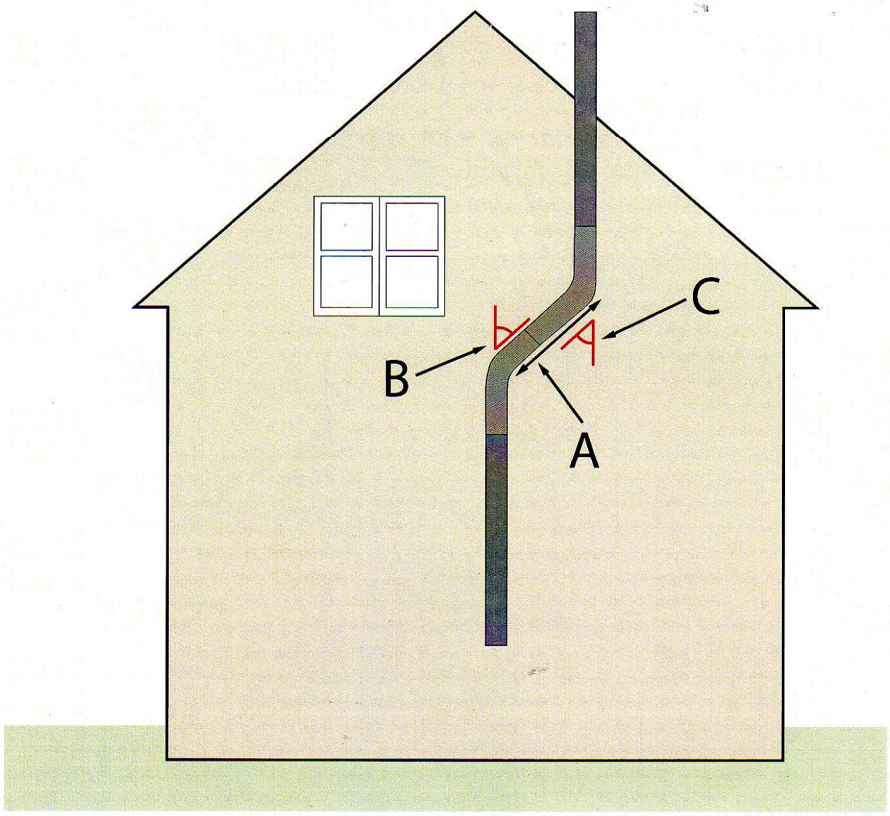


Figure 7.3 Example of an external chimney system installation

A. No more than 20% of the total chimney length

B. Maximum 45° offset

C. Maximum 45° offset

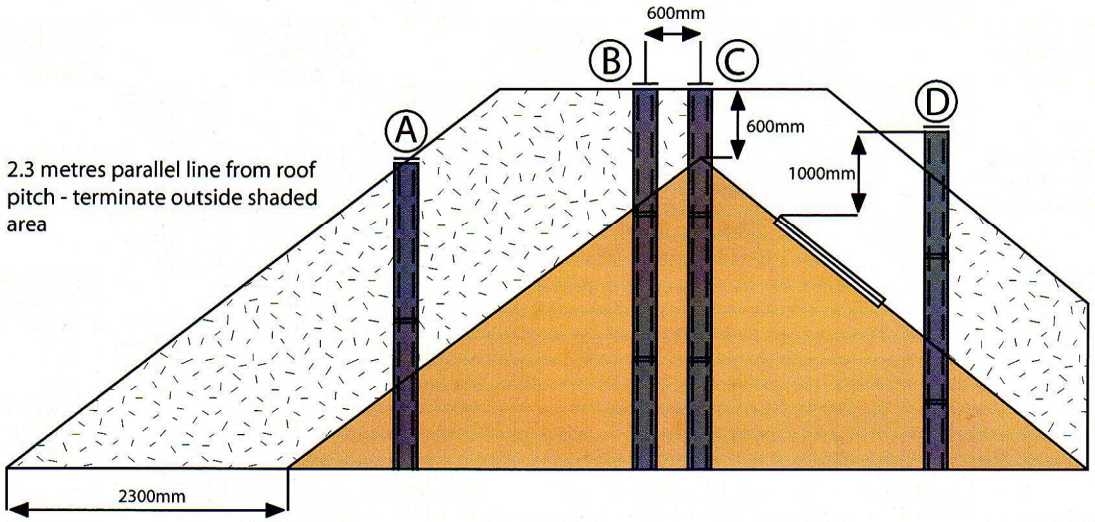


Figure 7.4 Termination details for solid fuel installations.

A. 2.3 metres horizontally clear of the roof surface and at least as high as the ridge on low pitched roofs or 1m above the intersection with the roof. If the roof is made from a combustible material the chimney must also terminate a minimum 1.8m above the chimney intersection with the roof (i.e. thatched roof).

B. If terminating up to 600mm away from the ridge then the chimney should terminate as 600mm above the ridge. If the roof is made from a combustible material the chimney must also terminate a minimum 1.8m above the chimney intersection with the roof.

C. If terminating directly through the ridge then the chimney should terminate at least 600mm above it.

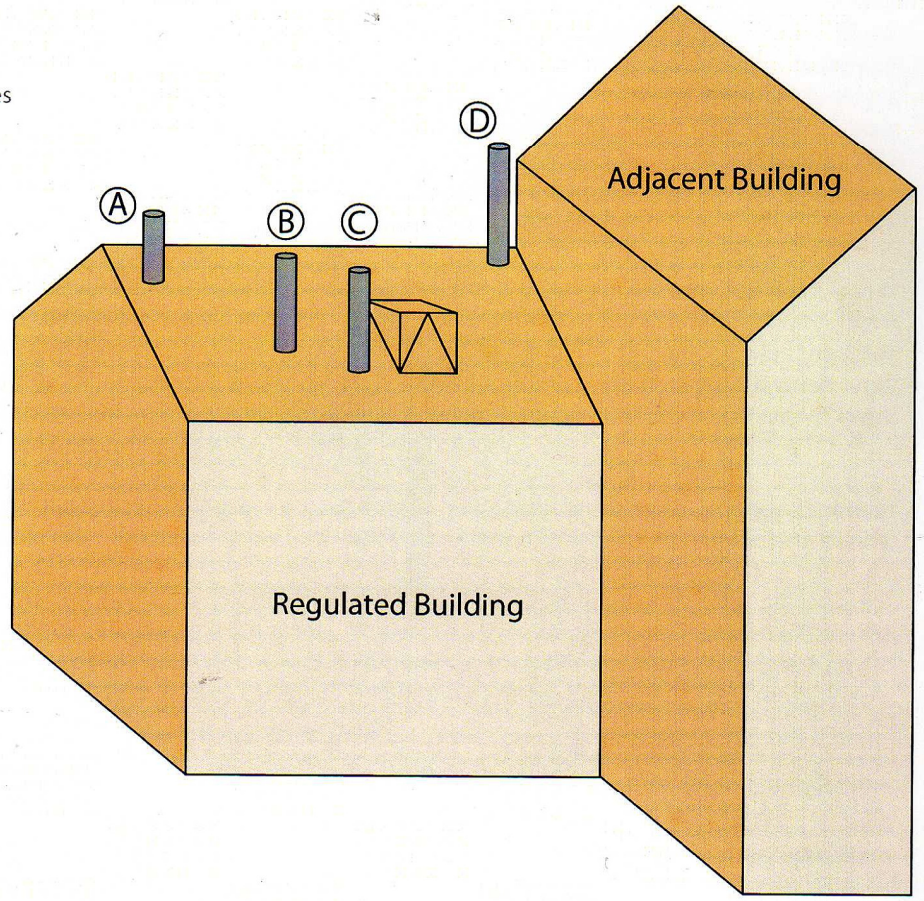
D. If the termination is located within 2.3 metres of an openable window or dormer, then it must terminate 1 metre above the top of the opening.

See Appendix part b for HETAS guidance on thatched properties

25° Pitch 1080 ↑

35° Pitch

Figure 7.5 Flue outlet positions for solid fuel appliances



Point where flue passes through weather surface (Notes 1, 2)		Clearances to flue outlet
A	At or within 600mm of the ridge	At least 600mm above the ridge
B	Elsewhere on a roof (whether pitched or flat)	At least 2300mm horizontally from the nearest point on the weather surface and: a) at least 1000mm above the highest point of intersection of the chimney and the weather surface; or b) at least as high as the ridge.
C	Below (on a pitched roof) or within 2300mm horizontally to an openable rooflight, dormer window or other opening (Note 3)	At least 1000mm above the top of the opening.
D	Within 2300mm of an adjoining or adjacent building, whether or not beyond the boundary (Note 3)	At least 600mm above any part of the adjacent building within 2300mm.

Notes

1) The weather surface is the building external surface, such as its roof, tiles or external walls.

2) A flat roof has a pitch less than 10°.

3) The clearances given for A or B, as appropriate, will also apply.

4) A vertical flue fixed to an outside wall should be treated as equivalent to an inside flue emerging at the nearest edge of the roof.

It is important therefore to take care with the design of a new chimney system to ensure it meets the above criteria whilst avoiding close proximity to combustible elements within the property.

Building Regulations require a data plate be completed and fixed within the property, providing essential information about the performance and specification of the system chimney and appliance erected. See diagram 1.

Occasionally, due to site conditions, it may be necessary to utilise a combination of specialised components to suit specific needs. When these components are from different types of System chimney, that are not from the same manufacturer, they are together classified as a "custom chimney" and the installer is responsible for their correct selection, installation and use.

In such cases, manufacturers provide connectors to allow rigid stainless steel extensions to a brick chimney using a special Anchor Plate, together with adaptors to join flexible flue liners to the rigid system. See figure 7.6.

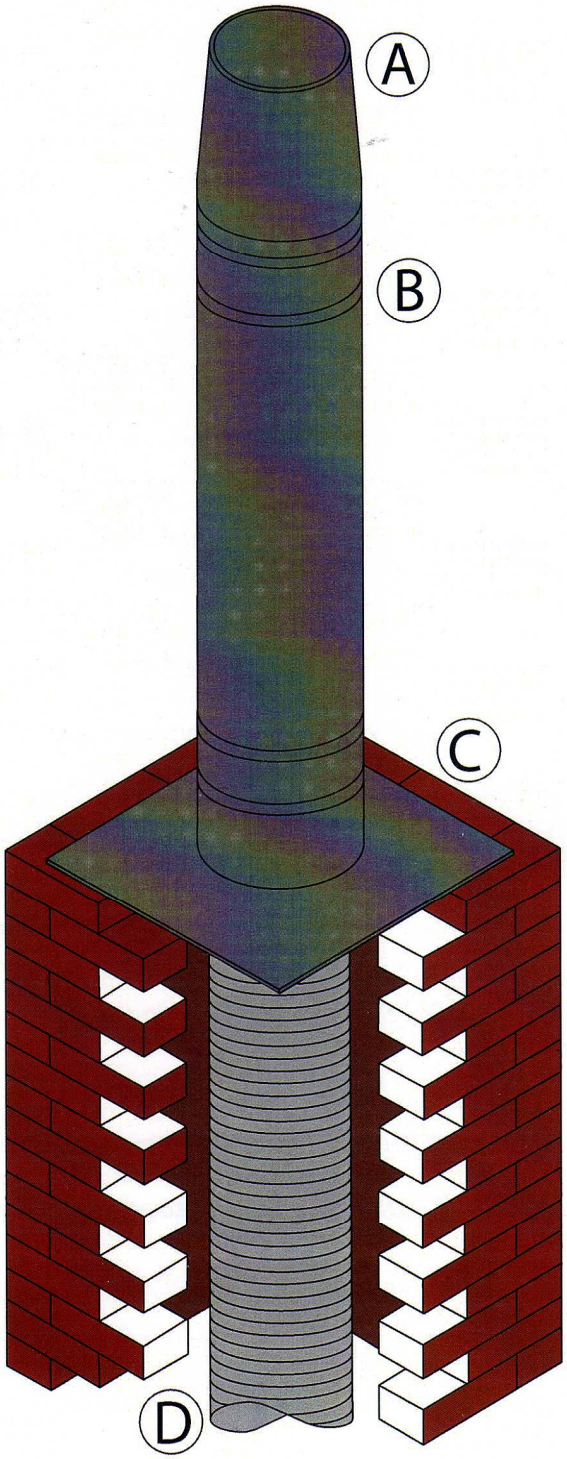


Figure 7.6 Extension of a masonry chimney

A. Open terminal

B. Locking band

C. Anchor plate adaptor

D. Twin walled flexible flue liner

Where repair or modification work is to be carried out on an existing chimney and connecting flue pipe, the installer must ensure the flue is fit for the intended purpose, before allowing it to be used. First check the existing notice plate and carry out a smoke draw test as required in the original commissioning and a visual inspection to ensure that it has been installed in accordance with Building Regulation requirements and the manufacturers installation instructions.

If the chimney is custom built or the notice plate is missing or there has been a chimney fire then carry out a thorough visual inspection (perhaps using video cameras) and pressure smoke test. This is essential on any chimney that is suspect to failure. Failing to test for suitability could lead to eventual claims for liability in the event of a house fire or carbon monoxide (co) incident. Remember to check the air supply to the room of the appliance, and in such cases always insist on installing a CO monitor on completion of the work.

Module 8 Typical Internal System Chimneys

In accordance with Building Regulations ADJ, it is essential that sufficient clearances are maintained between the outer surface of the system chimney and any combustible materials such as wall coverings or ceiling joists. Manufacturer's guidance on clearances must be followed, which may vary subject to specification, normally shown as measurement (Gxx). This also includes making sure that it is installed in a manner that prevents combustible material coming into contact at a *later date* with the chimney (i.e. clothes etc).

Internally, where the System Chimney passes through a ceiling and floor joist space, it is a requirement that it shall not have any joints in the space between the ceiling and floor board. The lower end of the chimney must extend at least 150mm below the ceiling and any single skin connecting flue pipe must have a clearance of 3x the diameter of the flue pipe to any combustible materials (unless shielded) or the measured distance (M) as declared by manufacturers in accordance with BS EN 1856-2.

Importantly, it must not breach the fire separation requirements of Building Regulations Approved Document B. Section B3 paragraph 7.11 states -

'If a flue or duct containing flues or appliance ventilation duct(s), passes through a compartment wall or compartment floor, or is built into a compartment wall, each wall of the flue or duct should have a fire resistance of at least half that of the wall or floor in order to prevent the by-passing of the compartmentation.'

Paragraph 7.12 to 7.14 on fire-stopping continues –

'In addition to any other provisions in this document for fire-stopping:

A. Joints between fire-separating elements should be fire-stopped.

And – *'Proprietary fire-stopping and sealing systems,(including those designed for services penetrations) which have been shown by test to maintain the fire resistance of the wall or other element, are available and may be used.'*

For system chimneys fitted to appliances capable of producing flue gas temperatures in excess of 250°C and in cases where the upper system is enclosed, required fire-stop plates and support plates must be fitted as illustrated in diagram 13 on page 25 of ADJ (shown below) together with manufacturer's installation instructions.

It is considered that when a factory made metal chimney is installed where it is necessary to penetrate any floor or wall, the level of fire resistance should be as good or better than it was before the installation of the chimney with the BS 476-20 standard of 30 minutes fire stopping performance criteria accepted as the 'pass' requirement.

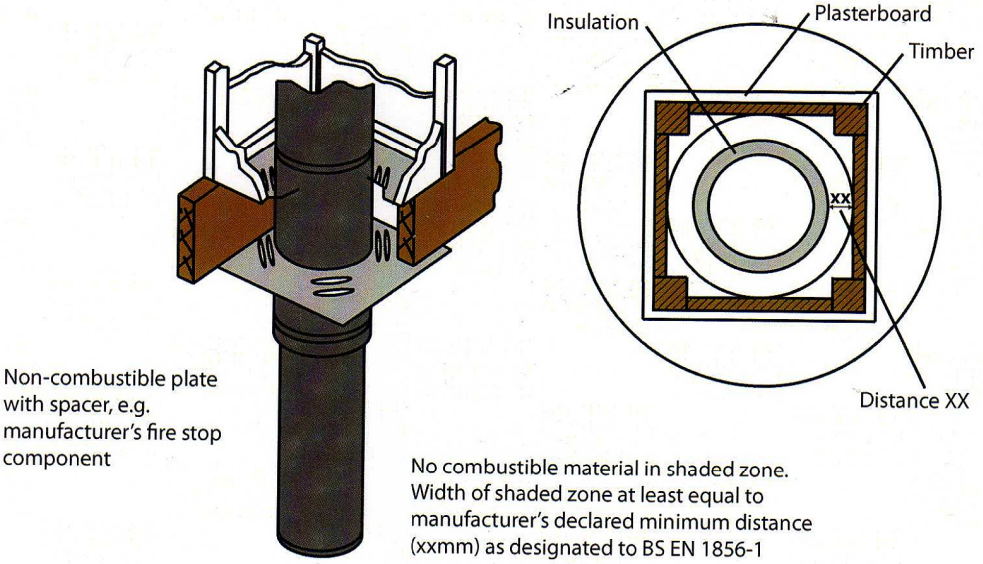


Figure 8.1 Ventilated firestops & clearances to combustibles

Some manufacturers require ventilated fire stops and ventilated support plates only, others require ventilated ceiling supports with an intumescent matrix, which will close off ventilation slots in the event of a fire. Others still require a shield in the joist area. In all cases it is essential to follow manufacturer's guidance on this issue.

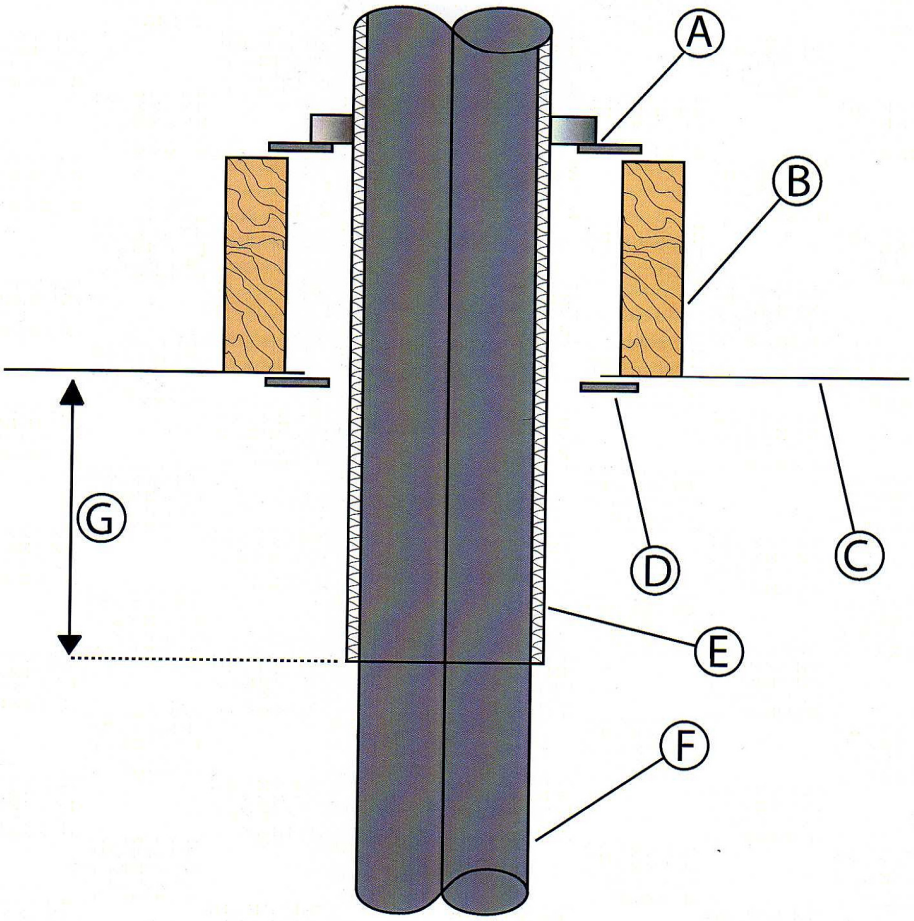


Figure 8.2 Ventilated Ceiling Support

A. Support Plate

B. Combustible Floor Joist

C. Plasterboard Ceiling

D. Fire Stop

E. Twin Wall Insulated Flue

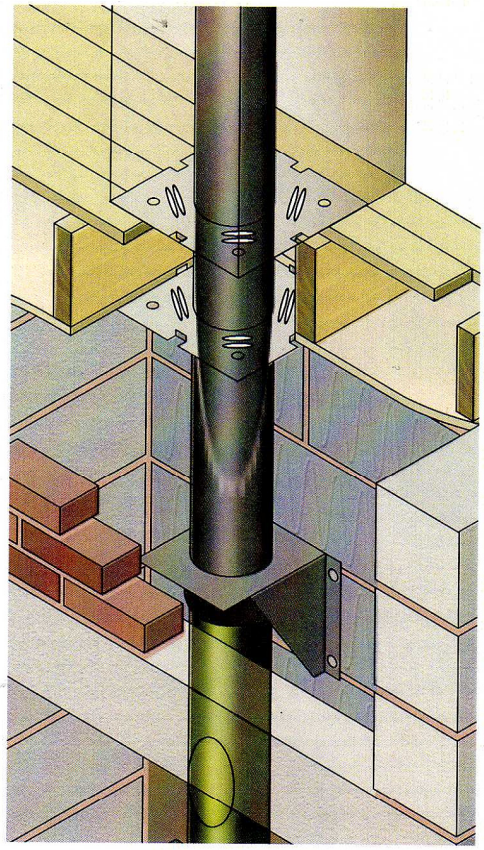
F. Connecting Flue Pipe (Max length 1.8m)

G. 150mm Minimum or to manufacturers installation instructions

Where a system chimney passes through a non-combustible floor or where the system above the floor is open (not enclosed), non-ventilated fire-stops and support plates may be used as illustrated below. Distance to any combustibles xxmm as declared by system chimney manufacturer must be respected.

Where system chimneys pass through an upper floor it is essential that clearances to combustible surfaces are maintained in accordance with manufacturer's requirements. It may be necessary to trim floor/ceiling joists to achieve the appropriate clearance. This must be carried out in a recognised and safe manner in order not to weaken the structure and should be left to a person competent to do so (such as a qualified carpenter).

Figure 8.3 Ventilated firestop

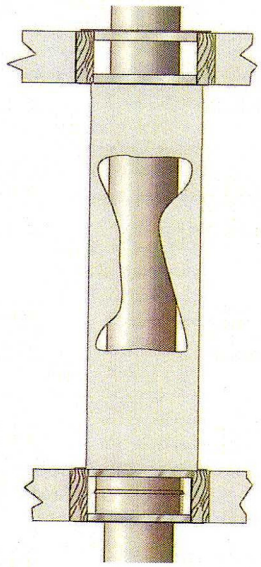


Concealed System Chimneys

1.47 *Where a system chimney is routed within a void, appropriate means of access at strategic locations should be provided to allow the following aspects to be visually checked and confirmed. This is necessary both when the appliance is first installed and subsequently when the appliance is serviced:*

- *The system chimney is continuous throughout its length*
- *All joints appear correctly assembled and are appropriately sealed*
- *The flue is adequately supported throughout its length*
- *Any required gradient of fall back to the boiler (required to recover the condensate produced as part of the combustion process) and any other required drain points have been provided.*

Figure 8.4 A concealed flue within an enclosure



A means of access for a *system chimney* needs to be sufficiently sized and positioned to allow a visual inspection to be undertaken. Diagram 7.5 below shows an acceptable approach for a *system chimney* in an enclosure. Inspection access should be at least 1000mm^2 where necessary to allow sufficient access to the void to inspect along the length of the *system chimney*.

Flues should not pass through another dwelling since access for inspection may not always be available to that dwelling and *chimney system* running through it. *Flues* may pass through communal areas including purpose-designed ducts where inspection access is provided.

Any 'means of access' should not impair any fire, thermal or acoustic requirements of the Building Regulations. Refer to the relevant guidance in Approved Documents B, L and E. Where necessary, inspection panels or hatches should be fitted with resilient seals and provide a similar standards of thermal and acoustic isolation to the surrounding structure.

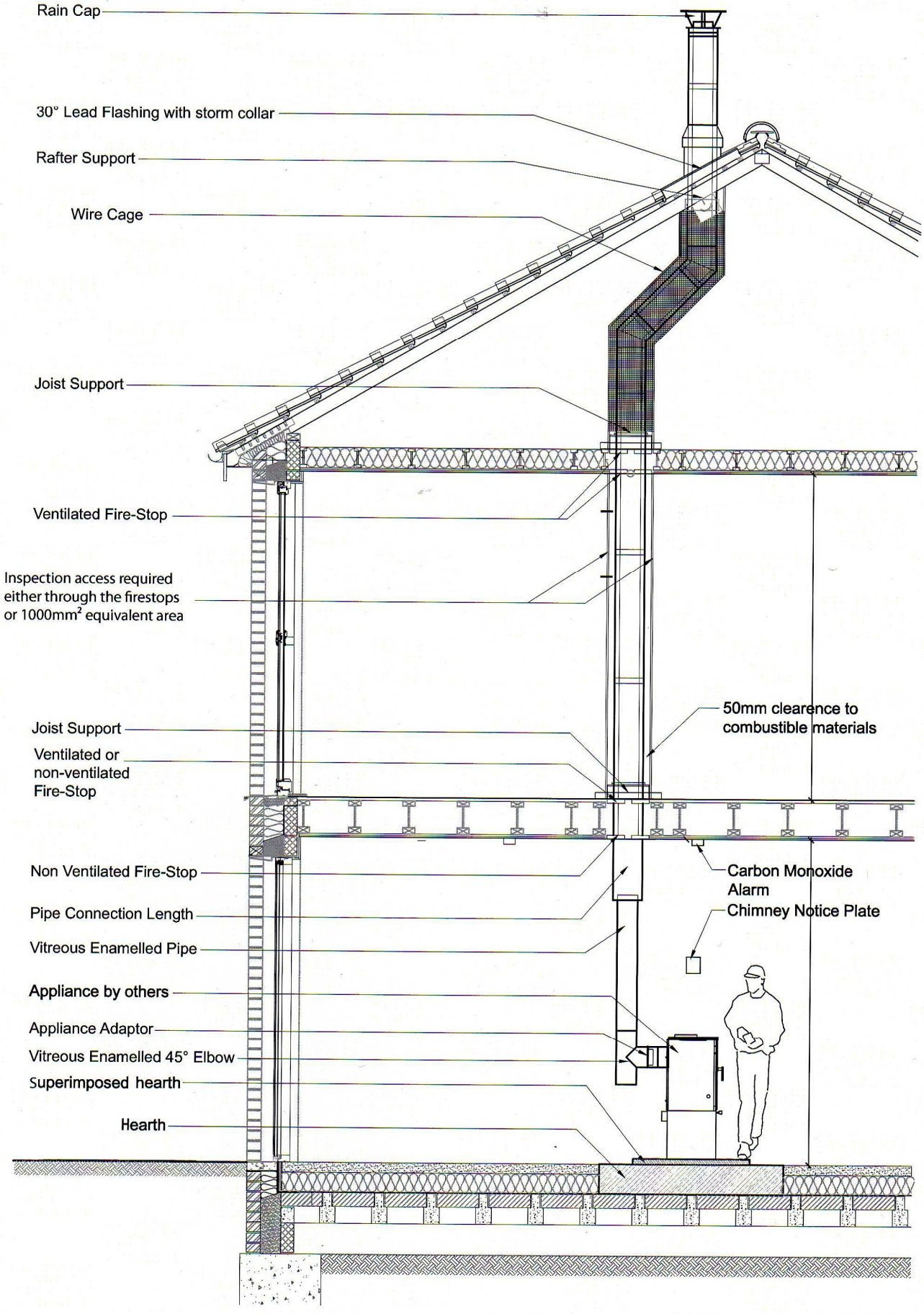


Figure 8.5 An internal chimney system

If the system passes through any part of the house where the hot outer surface of the chimney could be touched by occupants or come into contact with combustible materials such as furnishings or stored materials in cupboards and roof-spaces, the Building Regulation requires it should be enclosed in a suitable way. This may be provided by boxing-in the chimney system or attaching a suitable protective wire mesh frame in roof-spaces etc. These are available from some system manufacturers.

Where the chimney system is enclosed within studwork etc, the minimum clearance to combustible materials must be observed and it must be ventilated in accordance with the manufacturers installation instructions. When a system chimney is routed within such a void, appropriate means of access should be provided to allow visual inspection in accordance with ADJ paragraphs 1.47 diagram 14. Adequate ventilation must be provided as per manufacturers fire-stop arrangements.

The weight of the chimney system is considerable, therefore appropriate support may be required by way of a base support bracket and floor/ceiling support plates. In all cases check the manufacturers installation instructions. Various components are available to ensure weather-proofing is maintained where components pass through the weather surface, such as flashings and storm collars. Where the chimney extends beyond 1.5m above the last support ofthe roof, guy wire supports or other proprietary components such as structural clamp bands must be used in accordance with manufacturer's instructions.

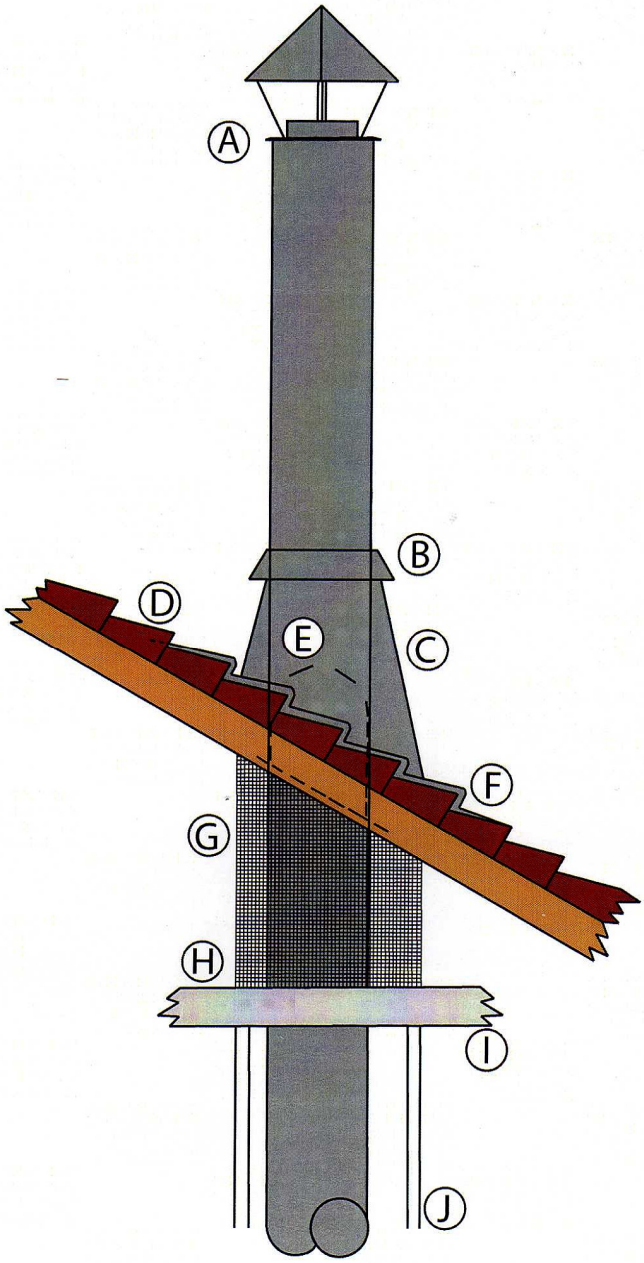


Figure 8.6 Typical Roof Penetration

A. Termination height to be in accordance with Approved Document J

B. Storm collar

C. Flashing

D. Flashing tucked under roof tiles

E. Roof/Rafter support

F. Flashing over roof tiles

G. Mesh enclosed within loft

H. Support plate

I. Vented fire below the joists

J. Chimney system boxed within bedroom

Module 9 Typical External System Chimneys

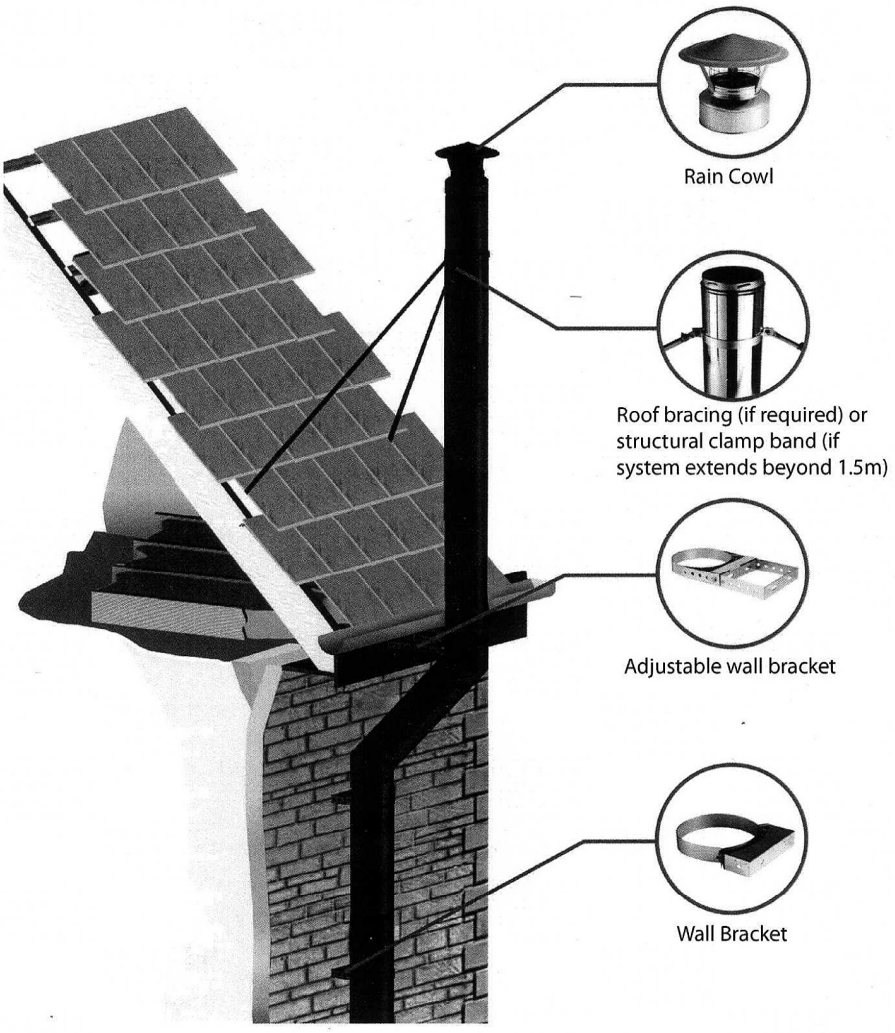
To locate the chimney system up the outside of a dwelling, it must pass through the outer wall of the property. Particularly where the wall is of cavity wall construction, it is essential to provide a sleeve through which the system chimney can be installed. The ends of the sleeve shall be cut at a 45° angle flush with the wall surface. Suitable straight and angled sleeves are available from manufacturer's component lists.

Externally, the chimney shall be adequately supported with support brackets supplied by the manufacturer. The support components must be used at intervals determined by the load bearing criteria laid down in the manufacturer's installation instructions. Similarly, Wall Bands shall be used to hold the structure secure in accordance with manufacturer's guidance.

Where an external installation requires the chimney to offset past a roof overhang, elbows should be used to form as shallow an angle as possible, which should be securely braced using wall bands.

As with internal systems, if the chimney extends beyond 1.5m above the last support bracket, the chimney must be provided with additional support such as a guy wire bracket to which rigid stays should be connected or other proprietary solutions such as structural clamp bands. All supports should be fitted in accordance with manufacturers installation instructions. See illustration below for an example of chimney bracing.

Figure 9.1 External Chimney Support & Rain Cowl



Many manufacturers provide external colour coated sections to allow the chimney to blend into the location. If painting of the chimney is preferred, the surface needs to be thoroughly degreased, dried and primed with a suitable product. A finish coat of external quality paint may be applied as required.

It is recommended that any external galvanised components are protected by suitable paint finish.

In coastal regions, the salt content in the air may degrade the flue outer skin. Some manufacturers recommend painting the surface to provide some additional protection.

A typical external chimney design is shown in figure 9.2 below.

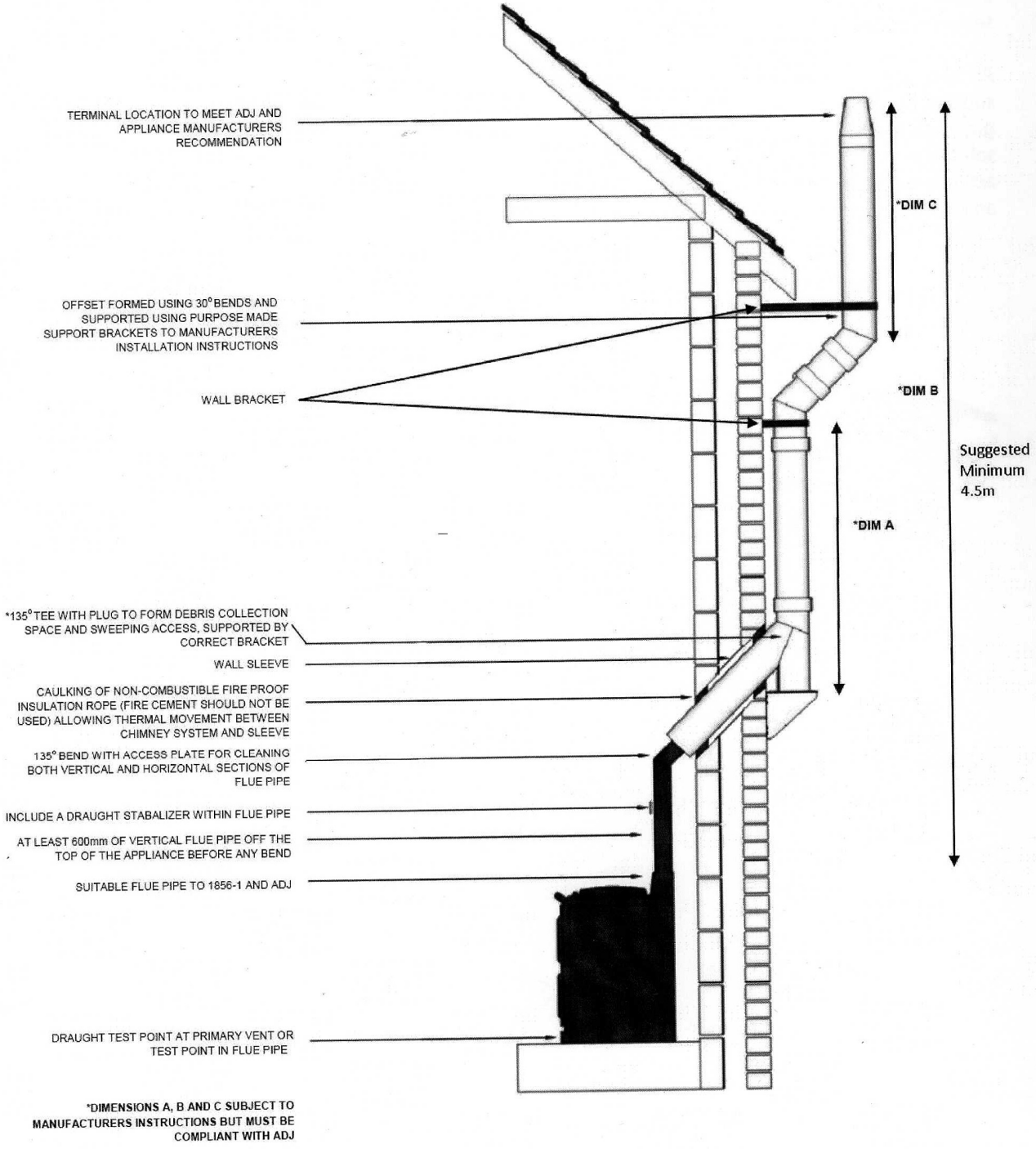


Figure 9.2 External system chimney

Module 10 Terminals

It is important to ensure a suitable terminal is fitted to the top of the chimney system. In many cases an open top stub is adequate for the purpose as the priority is to safely discharge flue gasses to atmosphere without restriction. The outer skin is tapered in design to provide a weather seal to the top section. However, in some situations where weather conditions dictate, rain caps or anti-downdraught terminals may be appropriate additions. The latter terminals may be fitted with bird guards if required, but it is essential the mesh be kept clean by regular sweeping to avoid blockages. Manufacturer's recommendations should always be followed.

Efficient discharge of flue gasses from the chimney is essential for safe operation of the appliance. Any restriction or adverse weather conditions such as high pressure zones and turbulence can cause flue gasses to issue into the room from the appliance. This may lead to the risk of carbon monoxide poisoning. As a consequence, the location of the flue outlet in relation to roof height, prevailing wind directions and openable windows/rooflights are important factors to consider in the design.

The fitting of inappropriate designs of cowl may result in a restriction at the terminal due to the flow of flue gasses being impeded. This may result in the spillage of flue gasses into the living space. In addition, many neighbour disputes come about due to smoke leaving unsuitable terminals horizontally and entering first floor windows or blowing down into gardens.

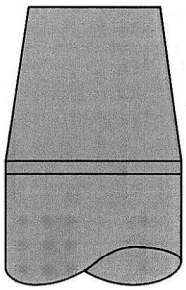


Figure 10.1 Tapered Cowl

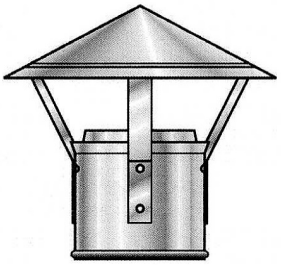


Figure 10.2 A typical rain cap

Module 11 Thatched Properties and Combustible Roof Surfaces

There has been some concern from the Fire Service and the Insurance Industry about the increasing number of thatch fires as a consequence of the rising number of multi-fuel and wood-burning stoves installations in recent years.

Research has revealed that many thatch fires have been caused due to the higher temperature of flue gasses discharged from closed appliances. Previously, in many cases an open fire was in use, which produced much lower flue gas temperatures.

These hotter gases raise the temperature of the chimney brickwork which in turn is conducted through and into the thatch, which is 'tinder dry'. The temperature within the thatch rises to the point where it spontaneously ignites.

It is a possible condition that some insurance companies will insist on a chimney being lined and insulated to reduce the risk of fire.

HETAS, in conjunction with other interested parties, has issued guidance on this issue. It recommends that where possible, the masonry chimney should be lined with a twin-wall insulated rigid system to provide the best protection for the property. This may present technical challenges to installers, but should be explored fully.

See the HETAS guidance document in the appendix to this document or go to www.hetas.co.uk/installer/safety-notices and download 'Chimneys in Thatched Properties'.

Where a new chimney system is to be constructed to the outside of a thatched property, the flue outlet position must comply with ADJ Diagram 18, as shown below.

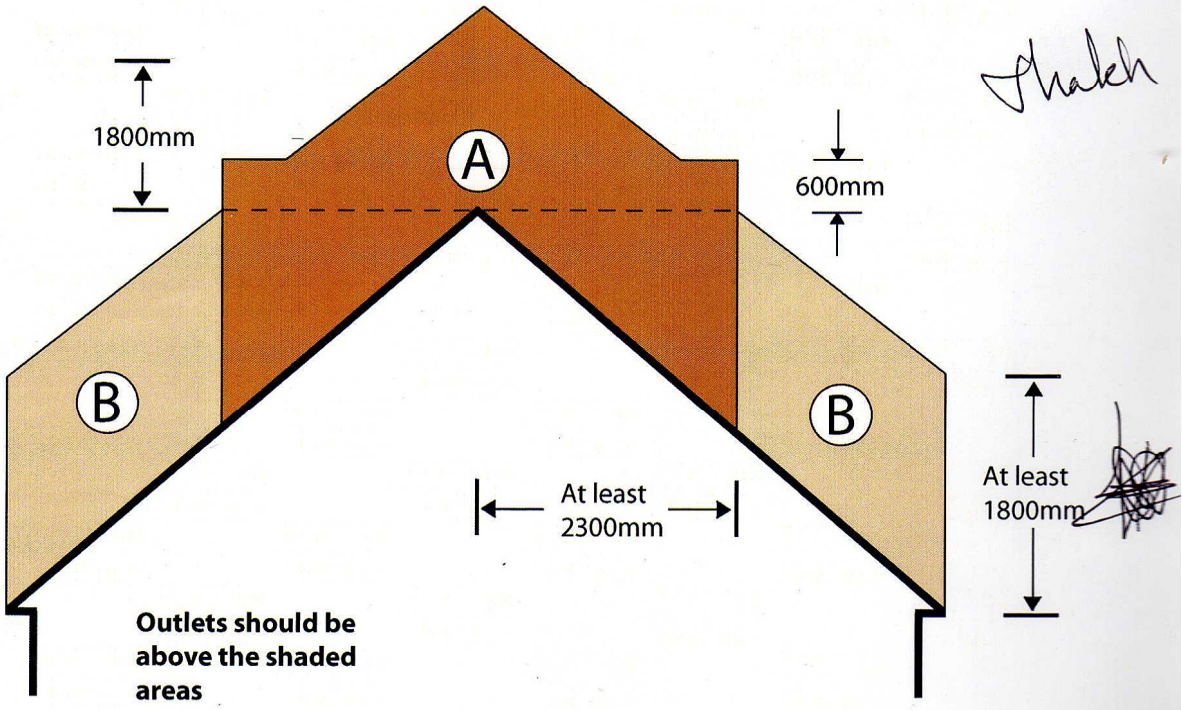


Figure 11.1 Flue outlet positions for solid fuel appliances - clearances to easily ignited roof coverings

A. At least 1800mm vertically above the weather surface and at least 600mm above the ridge.

B. At least 1800mm vertically above the weather surface and at least 2300mm horizontally from the ridge.

Module 12 Sweeping and Maintenance

For safe operation, it is essential the chimney and flue be kept clear at all times. Blockages and restrictions to the flue will reduce the cross-sectional area of the flue which will reduce the flow of flue gases. This will result in poor appliance performance and the risk of flue gas leakage into the property.

It is the responsibility of the installer to ensure that provision is made for sweeping the chimney throughout its length. If this cannot be performed through the appliance, sweeping access via suitable components should be provided.

Chimney sweeping must be undertaken in accordance with manufacturer's guidance but certainly not less than once a year. High volatile fuels such as wood, peat and bituminous coal will require the chimney system to be swept more frequently, subject to usage.

Chimney sweeping should be undertaken by a qualified sweep who is a member of a recognised trade association such as NACS, GMS and APICS who will use the most appropriate equipment for the purpose, test the flue and issue a certificate on completion.

The chimney and flue system should be checked by carrying out a smoke test in accordance with ADJ Appendix E whilst servicing an appliance.

Smoke Test Two

Closed Appliance

- Ensure the appliance is not alight.
- Warm the chimney for about 10 minutes with a blowlamp or similar device.
- Ensure all doors and windows to the room are closed and close any trickle vents or other closable air inlets into the room.
- Place smoke pellet on the grate and ignite it. If the appliance is designed to be burned with the door to the appliance open then the test should be carried out like that but otherwise close doors to appliance and ensure air inlets to the appliance are fully open. For the first 30 seconds watch the smoke and note whether any smoke enters the room. Open a door or window to the room and observe whether the smoke is drawn up the chimney faster.
- If either of the above occur, there may be insufficient ventilation into the room for efficient operation of the flue. Additional ventilation must be provided in accordance with ADJ Table 1.
- Next, go outside and observe whether smoke is coming from one flue terminal only and not from adjacent chimneys or surrounding brickwork.
- If there is evidence of either, the appliance must be closed down for further investigation with a view to repair or lining the flue.

Open Fire

- Ensure the appliance is not alight.
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