

BAND TECHNICAL PUBLICATIONS



WOOD STOVES AND CHIMNEYS

October 1984

E78.C2
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Indian and Northern
Affairs Canada

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Canada

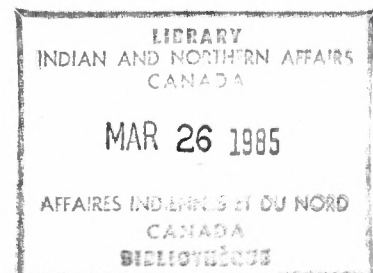
BTP-HS-4

**Technical Services
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WOOD STOVES AND CHIMNEYS

October 1984



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Hon. David E. Crombie, P.C., M.P.,
Minister of Indian Affairs and
Northern Development,
Ottawa, 1984.

QS-3394-000-EE-A1

Cette publication peut aussi être obtenue
en français sous le titre:

Poêles à bois et cheminées

WOOD STOVES AND CHIMNEYS

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WOOD STOVES AND CHIMNEYS1.0 INTRODUCTION

Wood is the prime source of fuel for heating and cooking in some Indian homes. This publication is intended to provide information on selecting, installing and operating wood stoves and heaters, and chimneys. The precautions necessary to use wood safely are also stressed.

This publication is for use by homeowners and tenants, and distribution by band councils.

2.0 STOVES2.1 General Description

In the past many wood stoves were made of thin steel plate, or poor quality cast-iron. The parts were often poor fitting or tended to warp or crack. This meant the stove was no longer airtight after relatively short use.

A modern wood-burning stove is much more airtight. It is made of heavy-gauge steel plate or cast-iron, sometimes lined with firebrick or stainless steel. The door is gasketed and completely sealed, and air control is fully adjustable. In an airtight stove, the air "fans" the fire only through specific adjustable air openings. Because air supply for combustion can be controlled through these openings, combustion is more complete. In addition, many airtight stoves are designed to recirculate combustion gases to achieve more complete combustion and efficiency. They are also very efficient, using 50-75% of the heat energy in the wood.

The flow of air into the firebox of airtight stoves can be controlled manually, by a nonelectric thermostat or by a completely manual thermostat control. Most nonelectric thermostats depend on a bimetal coil that

expands and contracts, closing and opening the draft controls as the fire's temperature warrants. Sometimes the coil behaves unpredictably after a few heating seasons, stretching out of its original shape and causing the draft control to remain open, thus feeding the fire when it should be shutting it down.

2.2 Codes and Standards For Wood Burning Appliances

The Canadian Standards Association (CSA) has published two standards that apply to wood-burning appliances. Standard B365-M1980 "Installation Code for Solid-fuel Burning Appliances and Equipment" contains requirements for installing, maintaining and altering appliances that burn coal, coke, charcoal and wood. Standard B366-M1979 "Solid Fuel-Fired Appliances for Residential Use" covers the actual heater. CSA has tested and certified several types. Certified units bear the "CSA" mark. The installation standard includes requirements for proper clearance and venting.

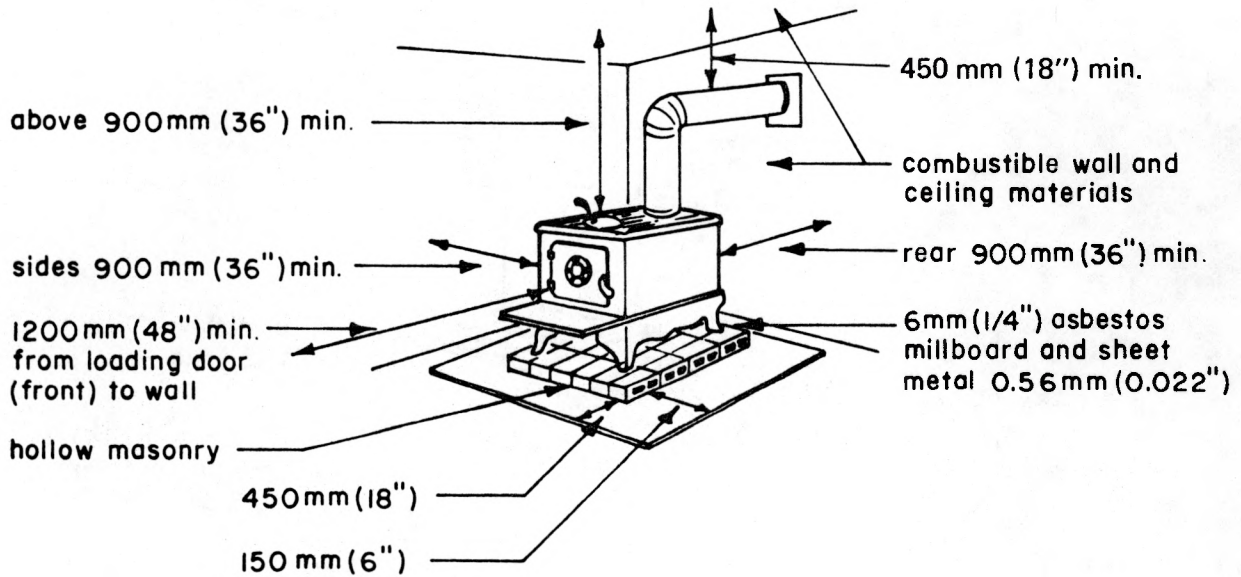
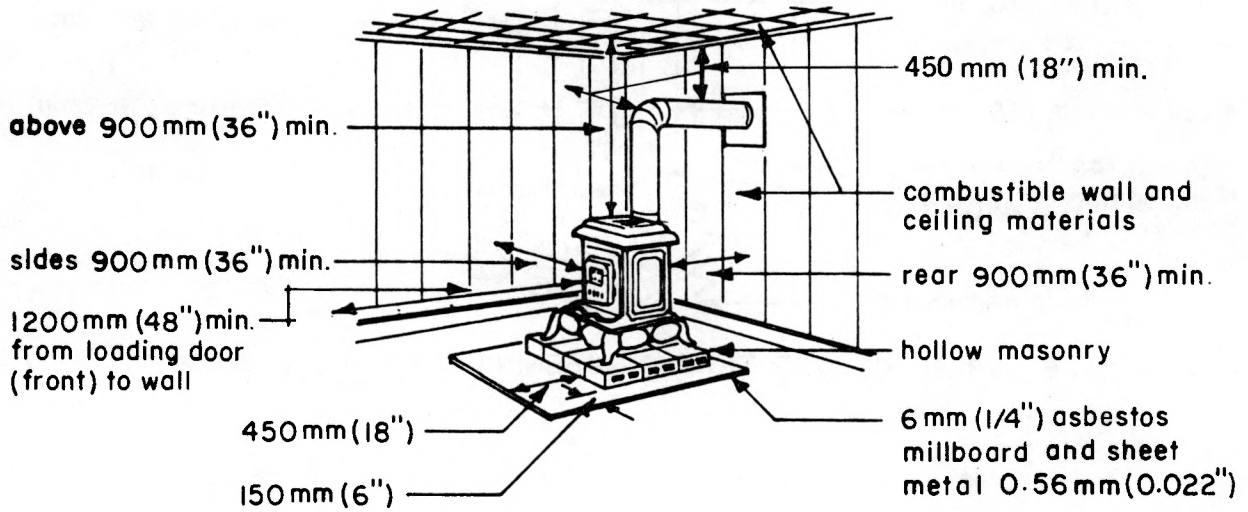
2.3 Minimum Installation Clearances for Stoves and Heaters

Figure 1 illustrates the minimum clearances from walls, floors and ceiling for various types of material.

It should be noted that asbestos, in certain forms, is shown in sketches giving clearances from combustible materials. This does not contravene the Building Code, however, because of the recent asbestos controversy, installation should be at the owner's discretion.

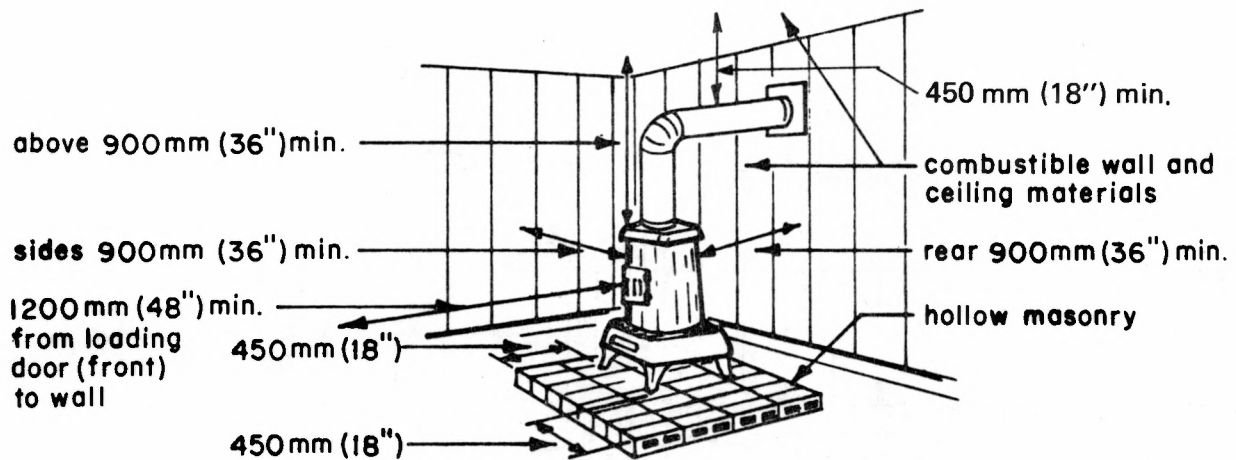
Figure 1

Installation Clearances for (Stoves) (Heaters)

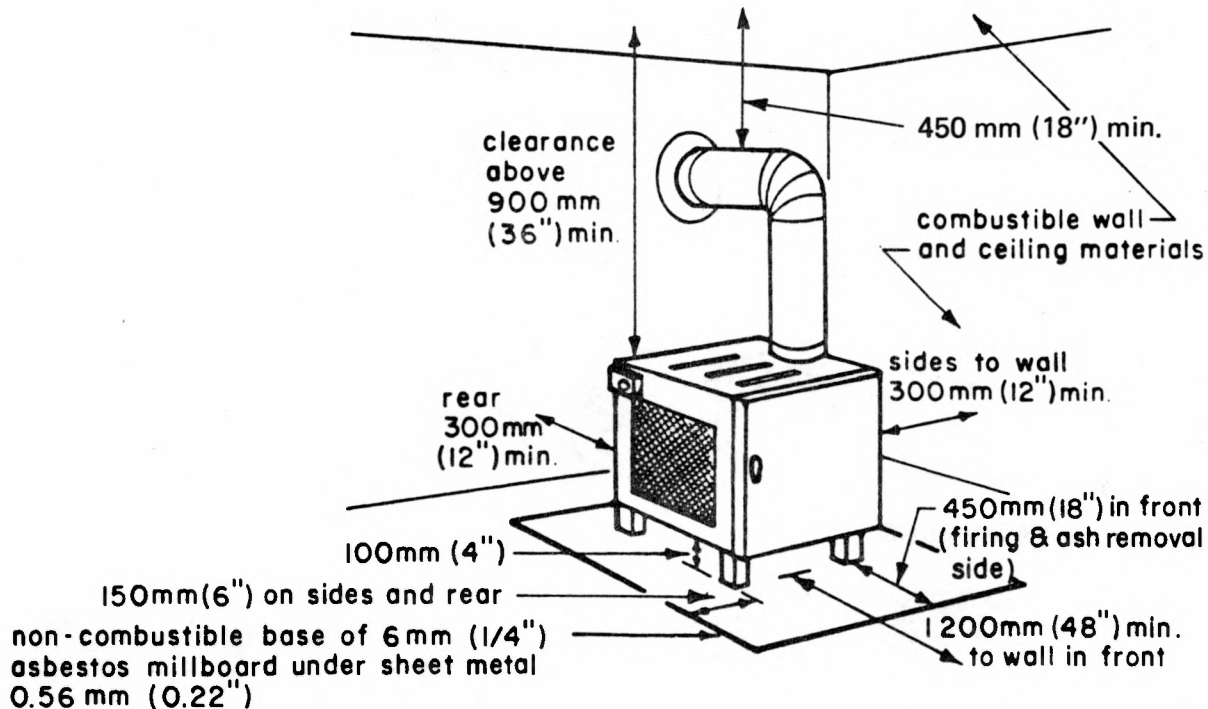


See Figure 5 and Table 1 for reduction of clearances around a flue pipe from combustable wall and ceiling materials.

Figure 1 (cont.)



AIR MUST BE ABLE TO MOVE THROUGH OPENINGS OF HOLLOW MASONRY



NON-COMBUSTIBLE BASE UNDER A CIRCULATING HEATER, STOVE WITH FREE-STANDING LEGS OF 100mm (4") OR MORE

See Figure 5 and Table 1 for reduction of clearances around a flue pipe from combustible wall and ceiling materials.

3.0 CHIMNEYS

3.1 Classes of Chimney

Prefabricated chimneys are classified on the type of fuel being fired. A type "A" chimney is intended for use with solid, liquid or gaseous fuels on appliances in accordance with the standards of the National Building Code of Canada, the Canadian Underwriters' Association and the Canadian Standards Association. The type "A" chimney can also be used where type "B" gas vents are permitted but the reverse is not the case.

3.2 Prefabricated Metal Chimneys

A metal chimney is prefabricated in a factory and usually sold as a package with all the necessary components. It is often referred to as 'easy-to-install'. The most common metal Class "A" chimney is intended for use with all types of fuel. It has three main components:

- a. an inner stainless steel liner;
- b. an insulating mix of volatized silica dust and high temperature rock wool; and
- c. an outer casing made of aluminum, stainless steel or galvanized metal.

3.3 New Standards for Prefabricated Chimneys

3.3.1 General Remarks

Due to the increased use of wood for fuel and the increased incidence of chimney fires, the Underwriters' Laboratories of Canada (ULC) has established a stringent standard known as ULC-S629M. A chimney built to this standard has been tested and listed by ULC for use with gas, oil and wood-fuelled heating units and can withstand temperatures of up to 926°C. In tests, temperatures in excess of 1 093°C have been tolerated. Two chimneys that meet this standard are described below.

3.3.2 The Ryder Chimney

The Ryder chimney is mainly composed of two materials:

- a. kaowool, a solid substance capable of enduring 1 315°C which acts as both the inner liner and the insulation;
- b. and type 430 stainless steel, which forms the outer layer.

3.3.3 The Sentinel Chimney

The Selkirk Metalbestos "Sentinel" chimney is constructed traditionally in three components:

- a. The inner liner is made of 0.4 mm thick type 304 stainless steel, which is 35% heavier than the type 430 used in the standard type "A" chimney. It is a special alloy that resists corrosion and the extremely high temperatures of a chimney fire.
- b. A special formulation of dense inert mineral fibre, over 50 mm thick, keeps the inner liner at a sufficient temperature to minimize creosote build-up. Under sudden heat shock, such as during a chimney fire, the insulation acts as a "thermal delay" and keeps the outer casing cool enough to prevent damage to nearby joists, framing or walls. Flexible, non-metallic retainers at the ends of chimney sections allow the insulation to form a continuous unbroken column from one chimney length to the next. This eliminates hot spots at the joints and ensures that hot gases or flames cannot escape during a chimney fire.
- c. The outer casing is made of 0.3 mm thick type 430 stainless steel which eliminates rust and corrosion problems.

3.4 Codes Relating to Chimneys

Chimneys, in general, must comply with Part 6 of the National Building Code of Canada, current edition.

Since the firing rate of most house chimneys does not exceed 400,000 btu/h, (120 kw), Section 21 of the Residential Standards, current edition, should be referred to. This section makes reference to the following standard on factory-built chimneys.

"Factory - built chimneys shall conform to CAN 4-S604-78, Standard for Factory Built Type 'A' Chimneys".

This standard applies to factory-built Type 'A' chimneys which do not require field fabrication. They are for use with gas, liquid and solid-fuel-fired residential appliances and building heating equipment, where the flue-gas temperatures do not exceed 540°C (1000°F). They are intended for installation in accordance with the National Building Code of Canada (NBC), the Installation Code for Oil Burning Equipment (CSA B139), and the Installation Code for Natural Gas Burning Appliances and Equipment (CAN1-B149.1). They are intended for installation inside or outside buildings to provide an essentially vertical passageway for conveying flue gases to the outside from the appliances described above.

Each chimney component and support assembly is marked to indicate:

- a. the manufacturer's name and address;
- b. model or type number;
- c. minimum clearance to combustible construction;
- d. the type of fuel for which it is intended to be used; and
- e. that the chimney is for connection to appliances normally producing flue gases of 540°C (1000°F) or less.

Parts intended for exterior installation are marked "SUITABLE FOR EXTERIOR INSTALLATION".

Each chimney is provided with installation instructions, which are illustrated and include at least the following information:

- a. the kind of heating appliances which may be connected to the chimney;
- b. any limitations with respect to installation and use, such as maximum height, the joining of two or more parts to make a safe assembly, etc.;
- c. the height the chimney must be above a roof and the minimum distance from walls or other buildings;
- d. the use of rain caps;
- e. the framing of openings in ceilings and floors to provide firestops in joist areas and the installation of firestop-spacer assemblies;
- f. the framing of openings in roofs to provide for support and attachment of roof assemblies; and
- g. the step-by-step process for installing the chimney.

3.5 Masonry Chimneys

A masonry chimney is built on site by a qualified mason. Because of the weight of materials generally used, it must be built on a steel reinforced, concrete foundation. The soil bearing capacity and the depth of frost in the area must be taken into consideration.

The inner liner and outer casing are erected simultaneously. The liner (usually tile) is of required interior dimensions, and standard lengths either of 610 or 760 mm enclosed by concrete block (usually standard 200 mm high). The outer layer consists of brick or stone. It is also necessary to comply with the requirements of the NBC with respect to materials and clearances from combustibles.

3.6 Chimney Liner

The liner is the most important component of a masonry chimney because it is in direct contact with combustible products. The liner is made of clay tile with a 200 or 230 mm interior tile diameter or square section, and usually a standard 610 or 760 mm long section. As pointed out previously, the jointing between tile sections is very important.

3.7 Connections to Chimneys

Connections, mostly smoke pipes and breechings, are very important. They should be constructed of a material with a melting point greater than 1 093°C.

The metal thickness shall conform to the following:

<u>Flue Pipe Diameter (mm)</u>	<u>Minimum Thickness for Sheet Steel (mm)</u>
up to 150	28 GA. (.38)
150 to 200	26 GA. (.45)
200 to 254	24 GA. (.61)
254 to 305	20 GA. (.91)

A breeching (pipe connecting stove and chimney) shall not pass through any floor, ceiling, wall or partition of combustible construction, or any concealed space such as an attic, roof space or closet.

Breechings shall be securely supported by metal or other noncombustible supports. They shall be as short and straight as possible and designed and constructed to allow for expansion. Breechings shall be sloped upward towards the chimney with at least 20 mm per metre of horizontal run, or a 2% slope. They shall enter the side of the chimney through a metal thimble or masonry flue ring, and shall have a tight connection to the chimney, but shall not extend into it. In the case of a prefabricated chimney the manufacturer's adaptor shall be used.

Homeowners sometimes consider connecting a wood-fired appliance to a chimney which is already in use. While it is best for every heating unit to have its own chimney, two appliances can be connected into the same chimney provided that the precautions listed in the NBC are taken. These include the following:

- a. Every appliance must have its own draft control and breeching.
- b. The wood burning unit must be connected below the breeching of any oil or gas unit.
- c. If two wood stoves are being installed, the one with the smaller collar must have its breeching enter the chimney above the larger and these breechings must be at least 150 mm apart vertically.
- d. All clearances from combustibles specified in the various codes and regulations must be applied to both new and existing breechings and chimneys (see Table 1).

3.8 Chimney Construction and Installation Details

Figures 2-8 illustrate the construction, minimum clearances and installation details for the two types of chimneys.

FIGURE 2

INSTALLATION INSTRUCTIONS

◦ CHIMNEY TYPE

A type "A" CHIMNEY listed by Underwriters' Laboratories of Canada is suitable for use with solid, liquid and gas fuel fired appliances.

◦ CHIMNEY HEIGHT:

Finish chimney at least 1m above the point where it comes through the roof and at least .6m above any surface or structure within a horizontal distance of 3m.

◦ FRAMING INSTRUCTIONS:

Choose the place for the Chimney in the structure, so that it can be installed without re-locating or cutting sills, plates or major load bearing partitions or members. Having the chimney location, frame the hole to match the inside dimensions for chimney support:

The openings in the floors and ceiling shall be framed with the inside dimensions: TO ALLOW 50mm CLEARANCE ALL AROUND.

The roof openings shall be framed to allow the chimney to pass through the roof with 50mm clearance to combustible framing and roof structures.

◦ 7 SIMPLE STEPS WILL INSTALL THE CHIMNEY

STEP 1 CHIMNEY SUPPORT:

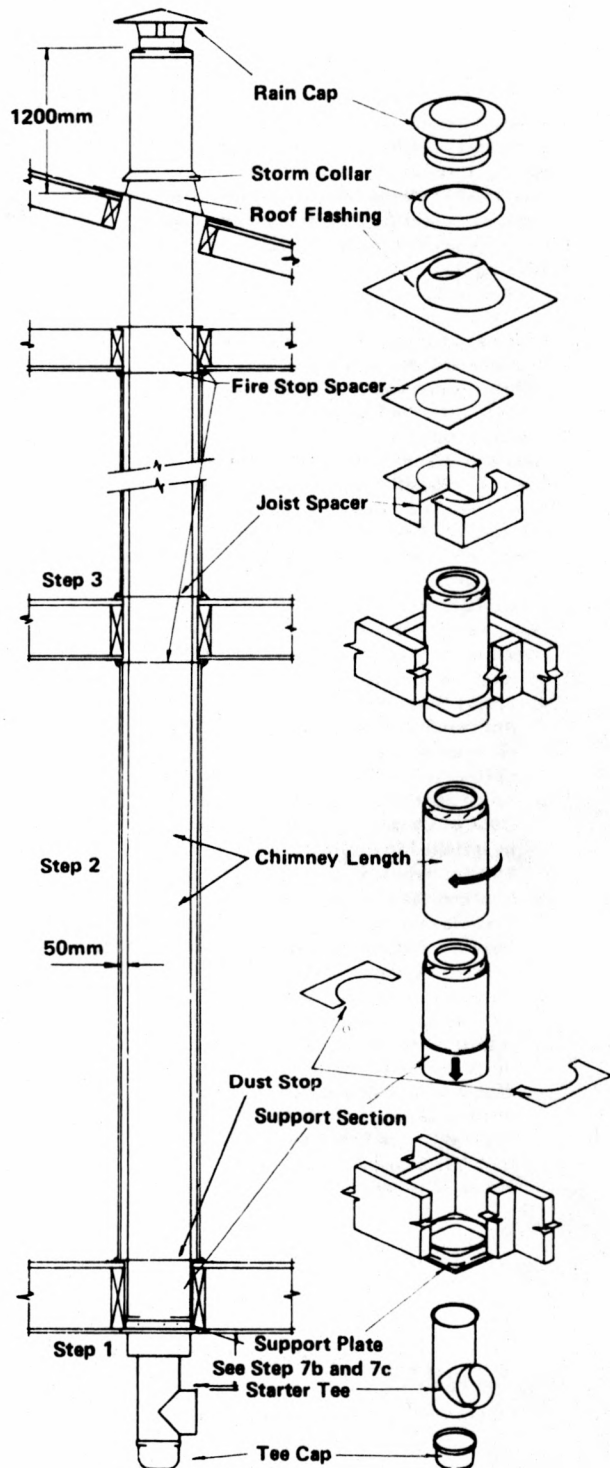
- Secure chimney Support Plate to the floor joist, ceiling joist or framed hole from which the chimney will be supported as follows:
- Place Support Plate up into opening from below.
 - Nail Support Plate to framing, using four 50mm common nails in each side.
 - Lower Starter Section length into Support Plate from above.

STEP 2 CHIMNEY LENGTHS:

Start the chimney by coupling the first chimney length by simple clockwise twist. Erect the chimney itself by adding chimney lengths one upon the other end twisting clockwise into place.

STEP 3 JOIST SPACER:

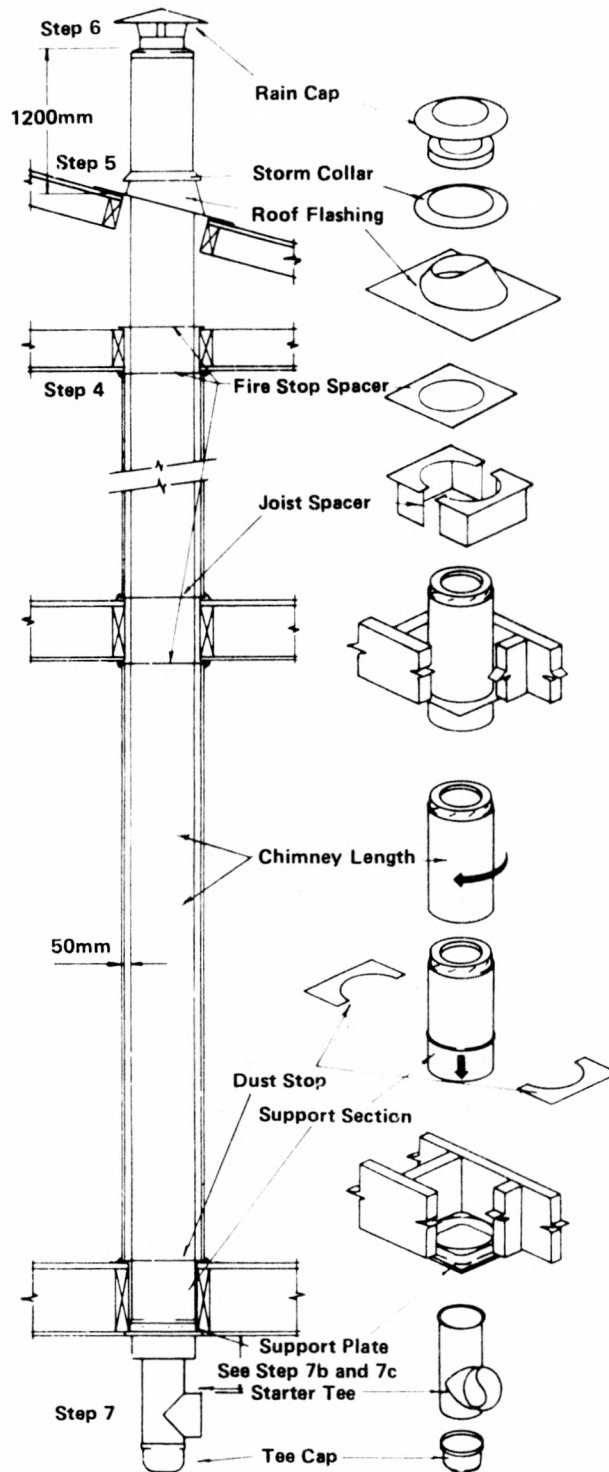
Where the chimney passes through the second floor a joist spacer shall be installed by placing it into the framed opening from above. For joist smaller than 50 x 250mm, the radiation shield of the joist spacer should be cut to suit. Nail the joist spacer into position.



TYPICAL PREFABRICATED CHIMNEY ASSEMBLY – COMPONENTS

FIGURE 2 (Continued)

- STEP 4 FIRESTOP SPACERS:**
When the chimney passes through a floor or ceiling, install Firestop Spacers by nailing them into position one Firestop Spacer BELOW the framed opening, one Firestop Spacer ABOVE the framed opening. Be sure the chimney is centred in the opening, before nailing Firestop in place.
- STEP 5 ADJUSTABLE ROOF FLASHING:**
Slip adjustable roof flashing over chimney casing and nail securely to roof, top and (nearest roof peak) UNDER shingles, lower end OVER shingles to provide watershed. Apply waterproof mastic compound above top of flashing cone and chimney casing; then tighten Collar into position over mastic application to insure a watertight joint.
- STEP 6 RAIN CAP:** Place Rain Cap on last section of chimney and couple by a simple clockwise twist.
- STEP 7 BASE TEE:** You are now ready to complete your chimney installation by attaching the Base Tee to the base of the chimney, as follows: —
- Secure Base Tee to chimney flue protrusion at the bottom of the chimney by turning tightening bolt on tee until firmly fastened.
 - To comply with the National Building Code of Canada, the Base Tee must be installed to insure a clearance of 460mm between connecting smoke-pipe and tee and unprotected combustible material. Use Base Tee and Base Tee Extension to obtain 460mm clearance.
 - Clearance to combustibles may be reduced to a minimum of 230mm if additional protection is provided by .38mm sheet metal spaced out 25mm by non-combustible material, or for alternative methods refer to the N.B.C. Use Base Tee without Base Tee Extension when 230mm clearance is desired.



TYPICAL PREFABRICATED CHIMNEY ASSEMBLY – COMPONENTS

Figure 3

Chimney Clearance from Combustible Construction

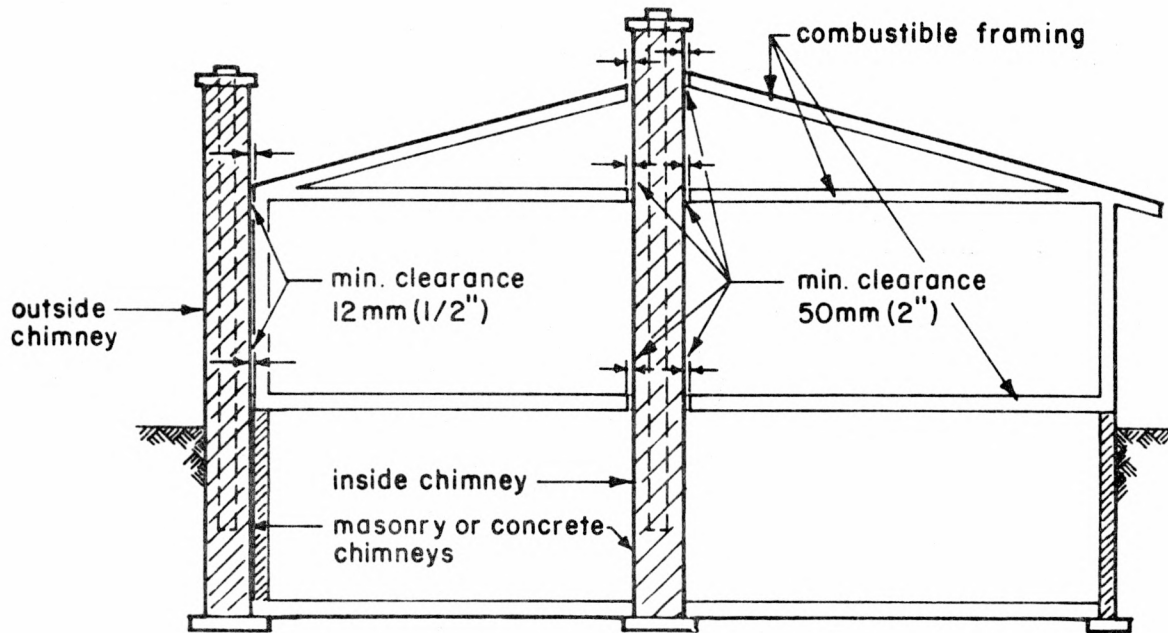


Figure 4

Metal Thimble

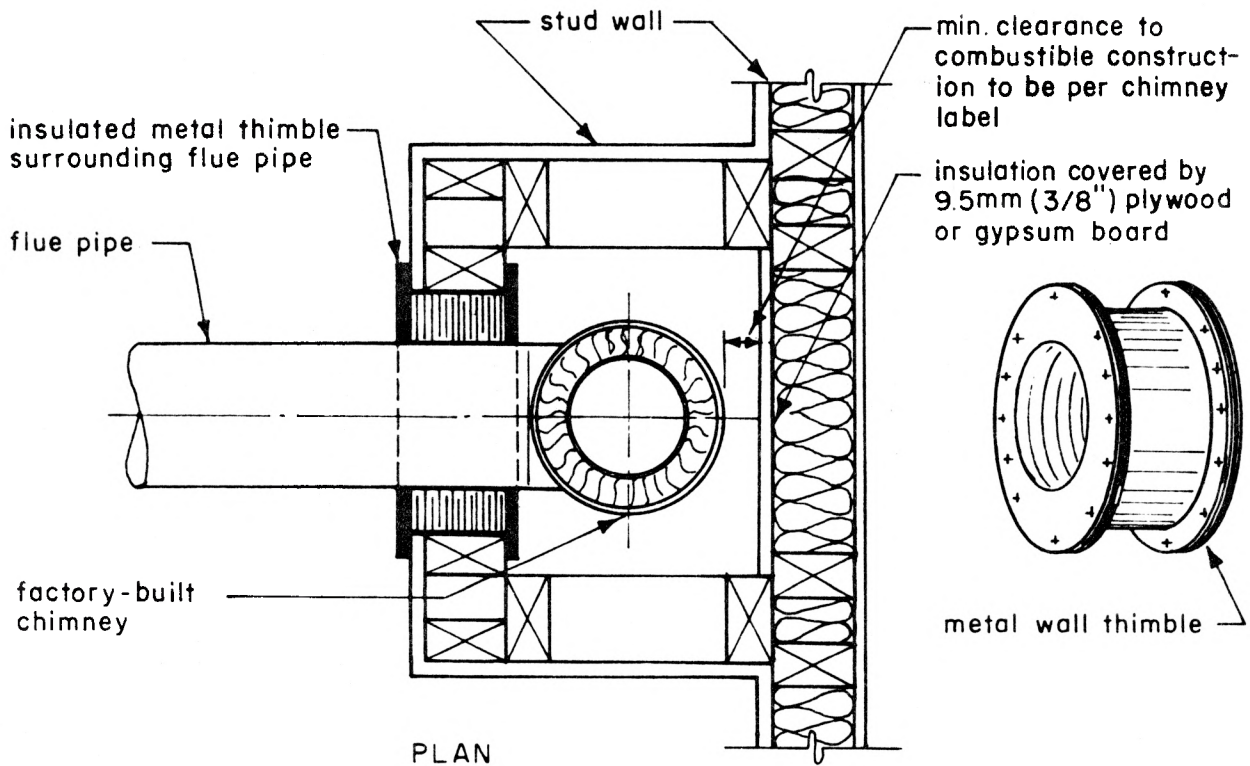


Figure 5

Minimum Clearances for Flue Pipes

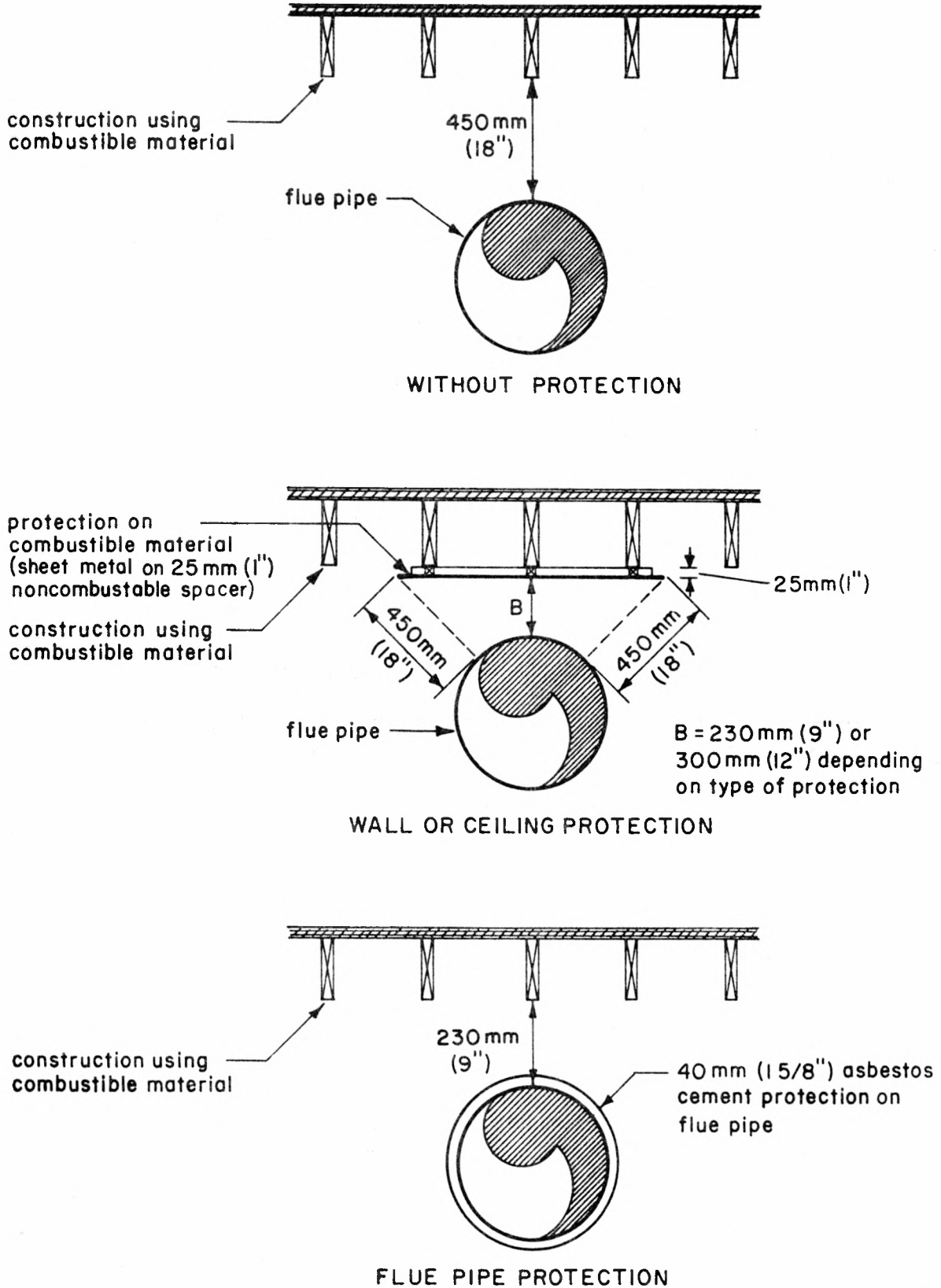
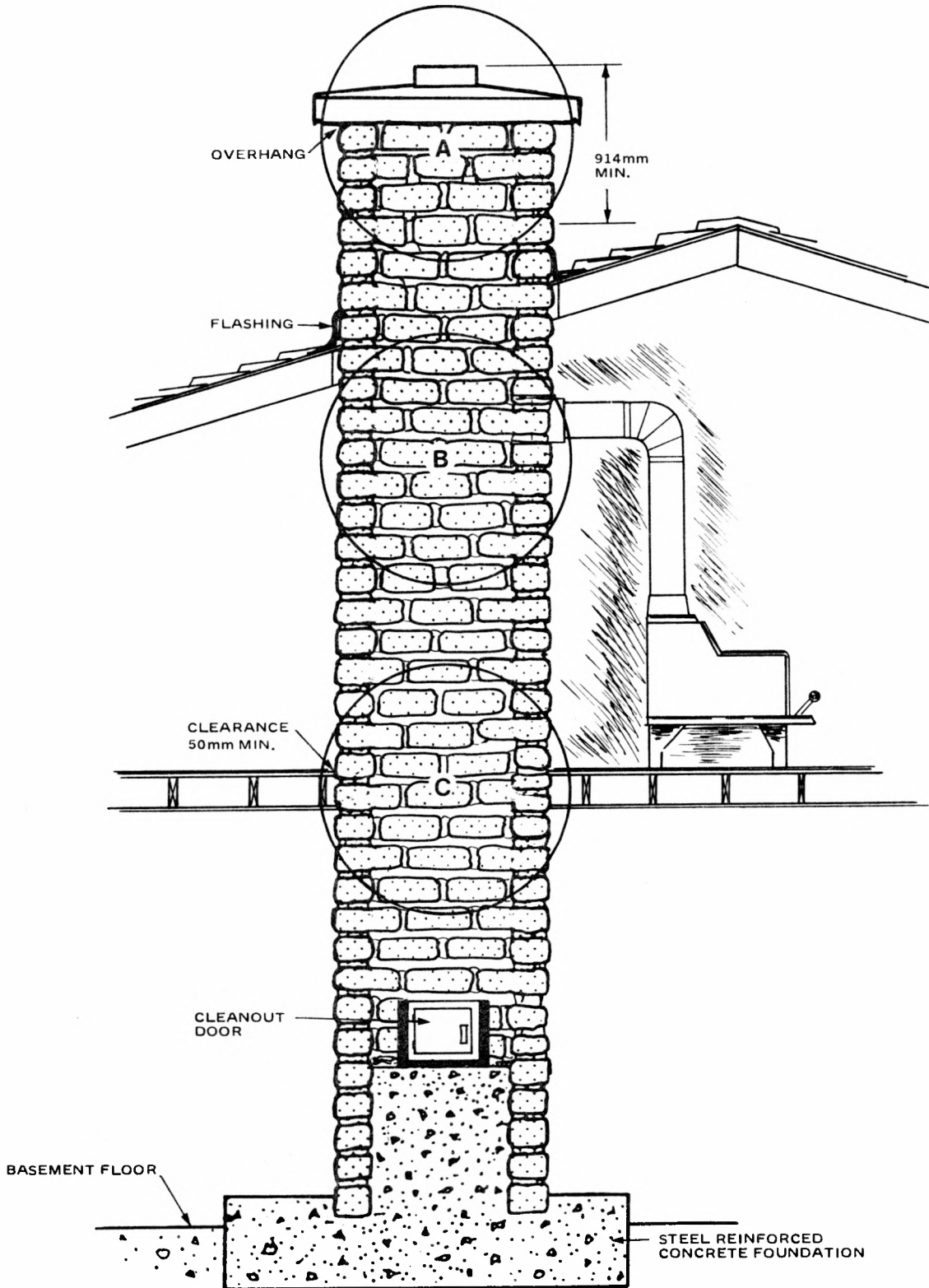


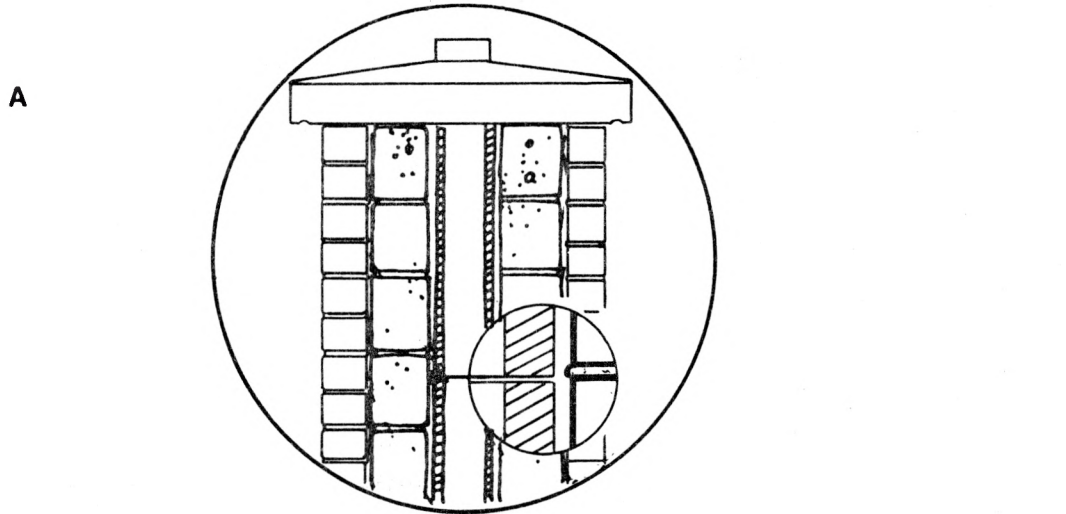
Figure 6



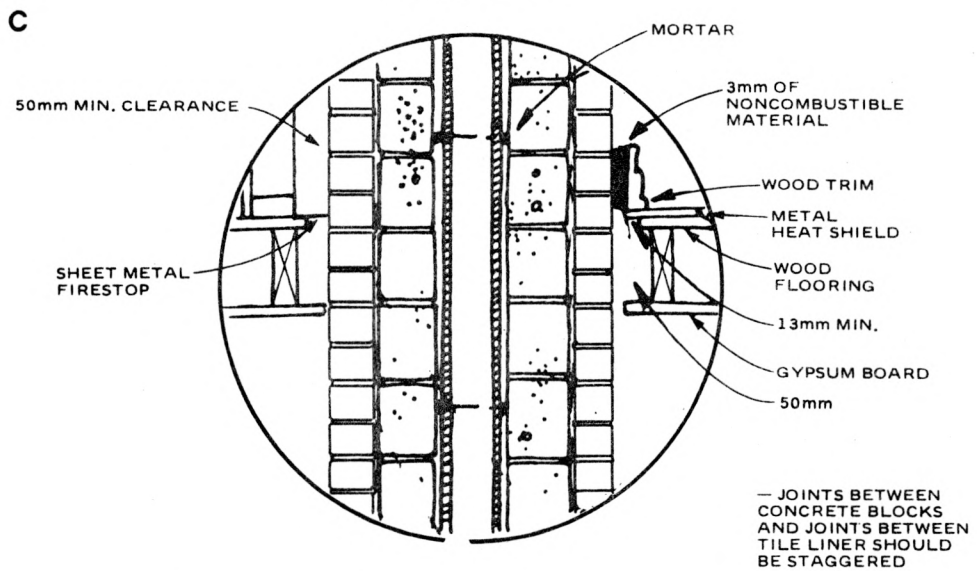
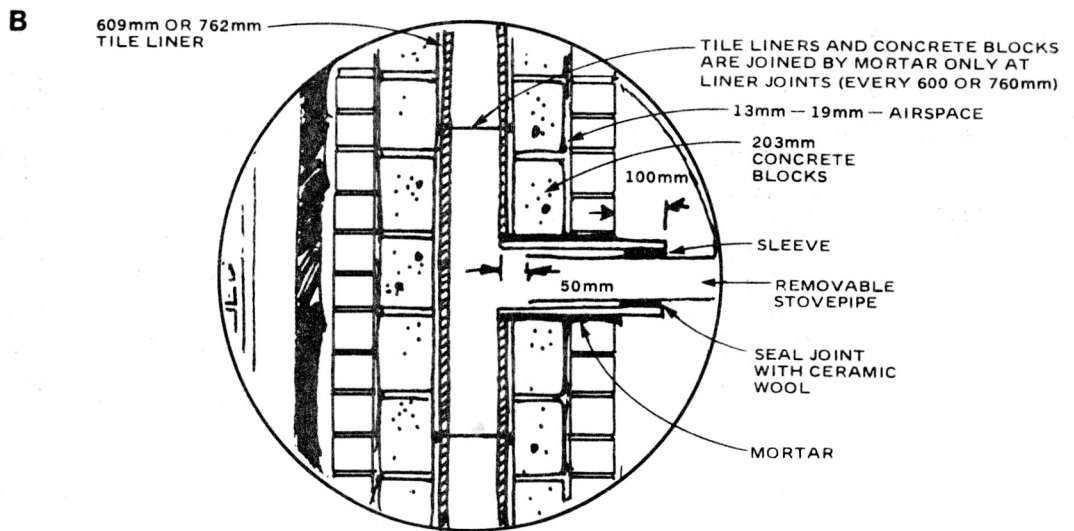
FOUNDATION EXTENDS 300mm MIN. BEYOND CHIMNEY ON ALL FOUR SIDES

MASONRY CHIMNEY – CONSTRUCTION DETAILS

Figure 6
(cont.)



EACH TILE LINER TO BE GAS TIGHT BY BEDDING IN A THIN MORTAR JOINT.



MASONRY CHIMNEY - CONSTRUCTION DETAILS

Figure 7

Chimney Caps and Flue Height

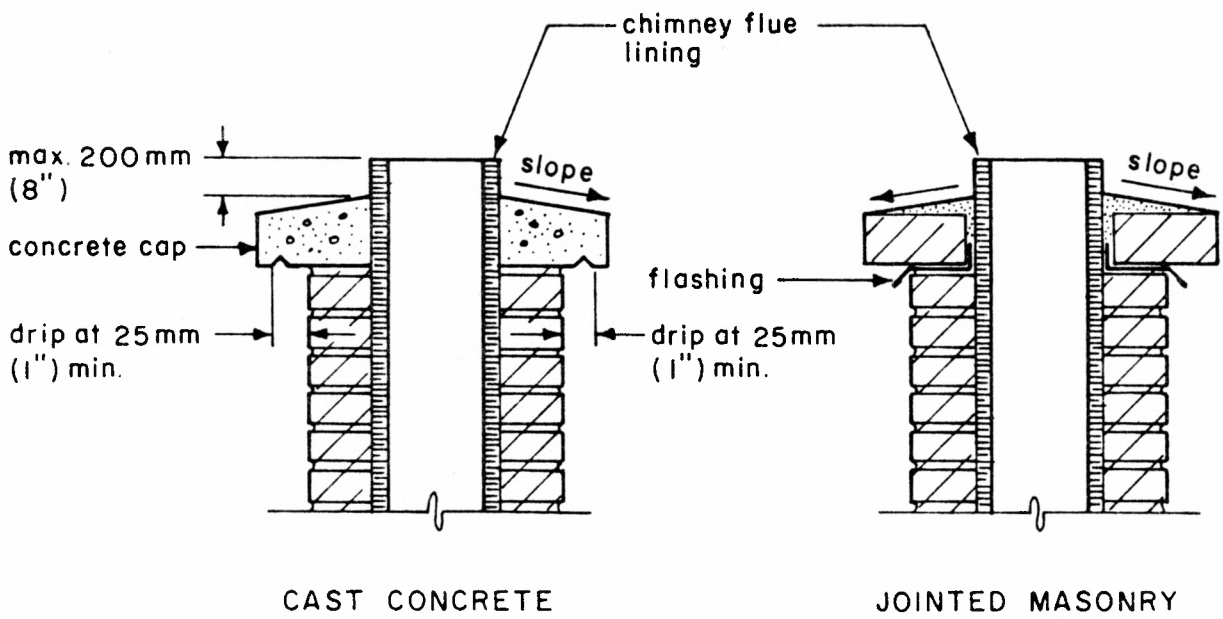
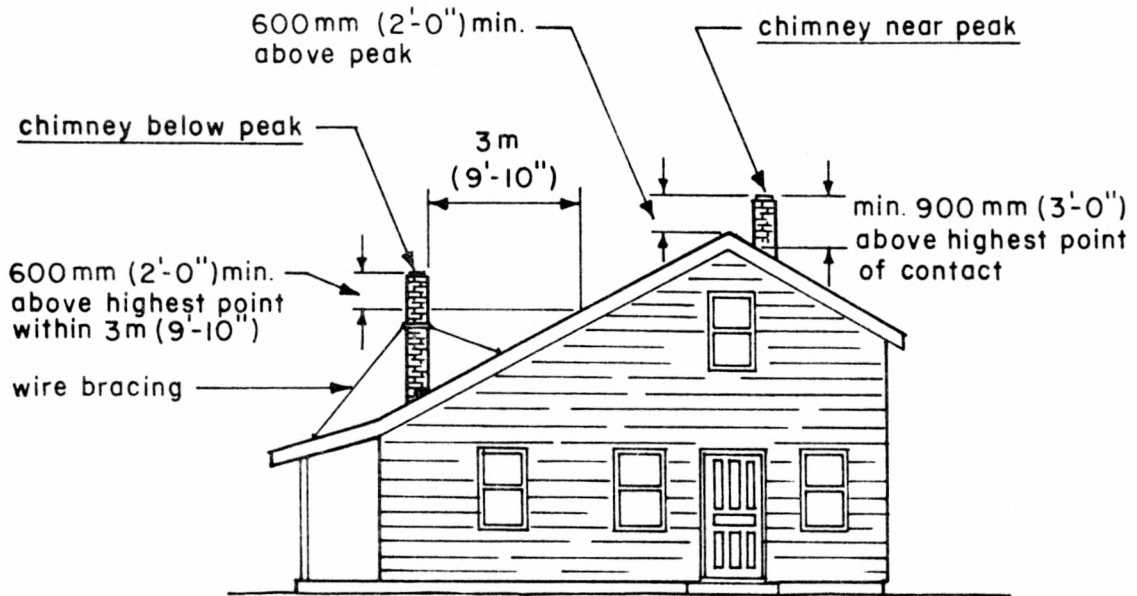
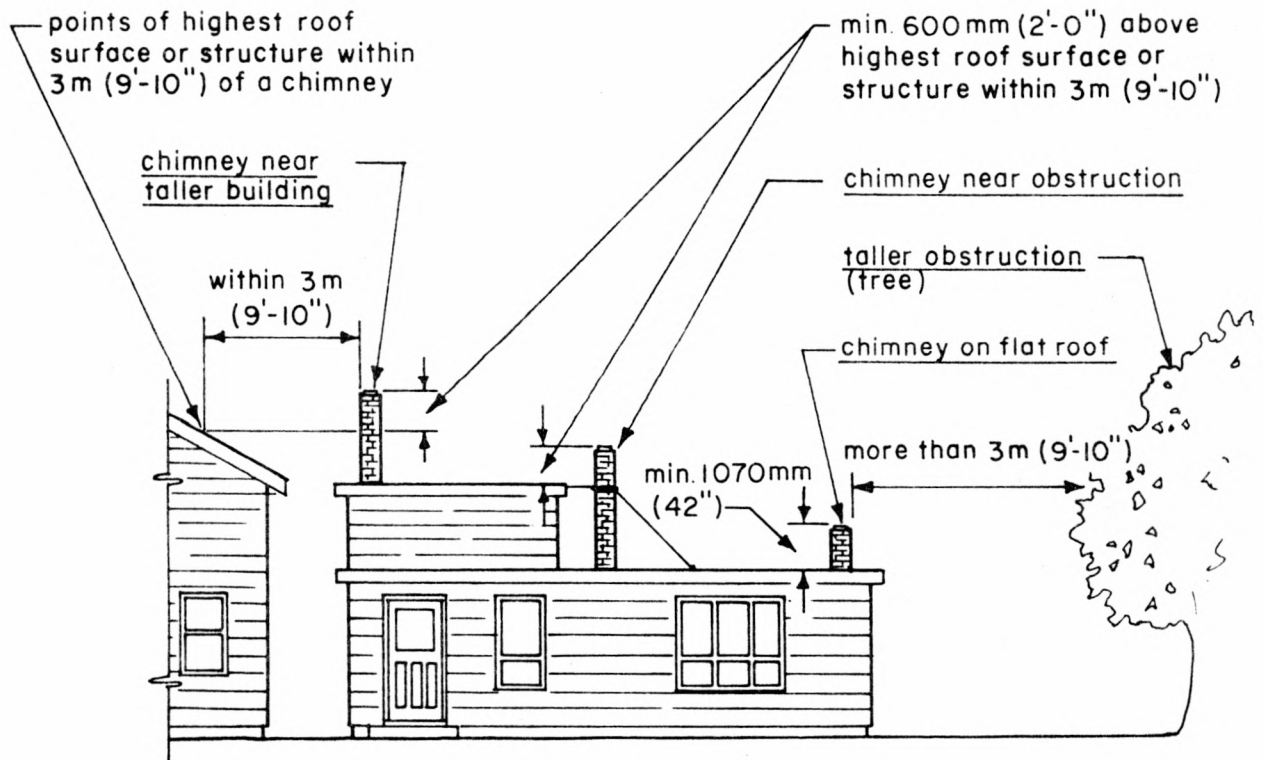


Figure 8



PITCHED ROOF



FLAT ROOF

07/08/84

Table 1

Reduction of Clearances Around a Flue Pipe

<u>Type of Protection</u>	<u>Position</u>	<u>Required distance:</u>	<u>May be reduced to:</u>
6.3 mm (1/4") asbestos millboard spaced 25 mm (1") from the wall using non-combustible spacers	All around	450 mm (18")	300 mm (12")
0.33 mm (0.013") sheet metal on 25 mm (1") asbestos millboard	All around	450 mm (18")	300 mm (12")
0.33 mm (0.013") sheet metal spaced 25 mm (1") from the wall using non-combustible spacers	All around	450 mm (18")	225 mm (9")
0.33 mm (0.13") sheet metal on 3.2 mm (1/8") asbestos millboard spaced 25 mm (1") from the wall using non-combustible spacers	All around	450 mm (18")	225 mm (9")
6.3 mm (1/4") asbestos millboard on 25 mm (1") mineral fibre batts reinforced with wire mesh or equivalent	All around	450 mm (18")	150 mm (6")
0.69 mm (0.027") sheet metal on 25 mm (1") mineral fibre batts reinforced with wire or equivalent	All around	450 mm (18")	75 mm (3")
6.3 mm (1/4") asbestos cement board or 6.3 mm (1/4") asbestos millboard	All around	450 mm (18")	No reduction
6.3 mm (1/4") cellular asbestos	All around	450 mm (18")	No reduction

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