Section 4 - Construction Considerations

General

A Temp-Cast fireplace and brick facade weighs over 6000 lbs (2720kg) in most installations, not counting the chimney and concrete pad. Proper footings and foundations are required and existing supports must be inspected by a competent person before being used.

In a new installation, a footing must be poured on undisturbed compacted soil. A concrete block foundation is then raised and a concrete pad is poured on top of the foundation to the level of the unfinished floor.

The chimney is connected at the **bottom** of the heater and is supported by the same pad which supports the heater. For this reason, the layout of heater and its chimney must be decided before the footing and foundation dimensions can be calculated.

Chimney Systems

Temp-Cast heaters require at least 18ft (5.5m) of 8"x12" (200mm x 300mm) or 8" I.D. (300mm) round chimney. Clay, refractory and stainless steel liners are suitable. Both masonry and HT (i.e. "high temperature") factory built chimneys are acceptable.

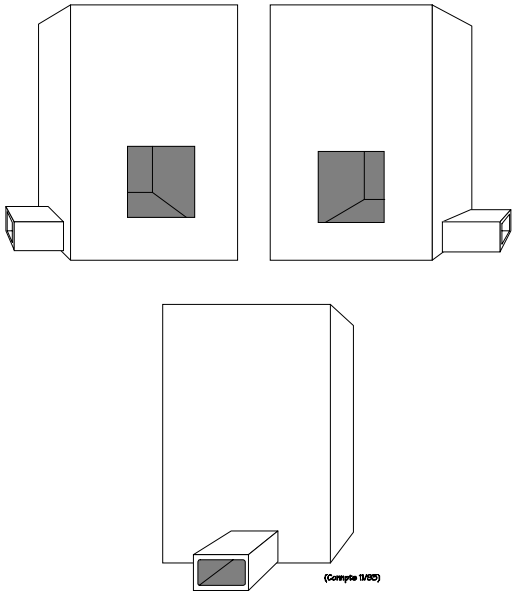
Masonry chimneys should have liners that are laid with refractory mortar and are carefully aligned so that a ledge is not formed from one liner to the next. In addition, a 1/2" (25mm) space should be maintained between the liner and the brickwork, for necessary expansion. The best liners have overlapping or "ship-lap" joints.

Every chimney should have provision for cleaning, with a tight fitting door near the base.

An existing chimney should be inspected by a qualified chimney sweep and approved by the local building official.

The chimney can be connected on either side or at the back of the fireplace, as in Figure 17. You may also want a "balancing" false chimney on an opposite side for aesthetics.

Fig. 17



Chimney Draft

Chimney draft, that unseen force that we trust will cause smoke to rise up the chimney and out of the house, is the single most important aspect of good chimney design and the most overlooked.

Hot air (i.e. hot gases or smoke) rises because it is lighter than the air around it. In a chimney, this rising warm air (i.e. "draft") draws in oxygen to feed the fire. Without good draft, good combustion is impossible and smoke spillage is inevitable. Unfortunately, there are several factors which can defeat chimney draft. The three most common are ***exterior chimneys, negative pressure*** and ***the stack effect.***

Exterior Chimneys

The greater the temperature difference between the air in the chimney at the stove connection and the air outside at the top of the chimney, the stronger the draft. (This is why smoke spillage and hard starts are more common in early fall and late spring, when the temperature difference between inside and outside is the least.) In addition, the longer this temperature difference can be maintained (i.e. the taller the chimney), the greater the draft.

A tall and warm interior chimney produces the best draft, while cold exterior chimneys cause stubborn lighting, smoky fires and chronic smoke spillage. ***For this reason, we do not recommend venting our fireplaces (or any combustion appliance) to a chimney constructed outside the warm envelope of the home.*** If a chimney in an unheated space is unavoidable, then an insulated factory built chimney is best, since it will heat up faster and keep the exhaust gases warmer for a longer period of time, improving the draft. *(Ensure that the chosen chimney system can be connected with an **approved** masonry adapter.)*

Negative Pressure

Compounding the cold chimney problem is the air-tight design of some homes. In these homes, the air usage in the home is very tightly controlled. If make-up air is not sufficient, exhaust fans can de-pressurize the home, causing a *negative pressure condition*. In this case, air is drawn into the house from unexpected sources - down the chimneys serving the gas furnace, the fireplace, the wood stove, etc. This causes varying degrees of chimney failure. This can range from the fireplace that is difficult to start, to the wood stove that spills smoke whenever the door is opened, to the most serious, when a complete flow reversal brings smoke and gases **down** the chimney and into the home. Flow reversal is the most dangerous because it occurs most often when the burn rate is at its lowest, at the start of a fire or at the end. In the case of a wood stove, this could occur during the night while occupants are sleeping, when the burn rate is slowed to preserve an all night fire. ***Breathing combustion gases, especially carbon monoxide, from a wood or gas appliance, is a serious health hazard and can be fatal.*** (Even that "nice woodsy" smell associated with wood fires, caused by mild smoke spillage is unhealthy and should be avoided.)

In recent field tests of Canadian homes, varying degrees of combustion spillage in assorted furnaces, fireplaces and wood stoves were detected in an alarming percentage of the homes tested. In addition, smoke spillage was observed at the exterior fresh air intake of a factory-built fireplace. Just because we call it an intake doesn't mean that air will flow in - it will flow in the direction dictated by the pressure of the house.

The Stack Effect

In many 2 or 3 storey homes, another phenomenon which effects draft sometimes occurs, called the ***stack effect***.

A good chimney system, as we have seen, will be a tall column or stack, insulated from the cold outside air, with an opening at the top.

If the warm air in the home has an easy access out of the house in the upper floors, such as through leaky windows, then the whole house may become a chimney stack - a tall column of warm air with an opening at the top.

With the *stack effect*, cool air is drawn into the home in the basement, through leaky walls, and doors (i.e. a "drafty" basement) or ***down the furnace or fireplace chimney***. The warming air flows up through the middle of the house and exits near the roof. The stack effect can be mild, causing occasional spillage or it can be strong enough to create a flow reversal in basement chimneys.

Replacement Air

When planning your home and your Temp-Cast installation, ensure that the total air requirements of the house, its occupants, exhaust devices and all combustion appliances are considered.

Where a forced air furnace or an air distribution duct is included in the house design, a replacement air device, such as the "Plus Air" is highly recommended. This device is sized according to the needs of the home and provides a supply of healthy, fresh air, on a demand basis, to your forced air system. It supplies whatever air is needed, whether the furnace is running or not and can effectively counteract the effects of negative pressure and the stack effect.

Footings, Foundations & Floor Pads

The footing dimensions are 4" (100mm) larger than the foundation dimensions in all directions. Ideally, it should be at least 8" (200mm) thick and reinforced with 1/2" (12.5mm) steel rod, laid in a grid pattern, 6" (150mm) on centre, starting at least 3" (75mm) in from the outside edges. The footing must be built on compacted undisturbed soil or another stable material.

A *non-combustible cap*, such as heavy gauge steel roofing, must be used on top of the foundation, to act as a form for the floor pad. The supporting floor pad upon which a single heater is built must be at least 6" (150mm) thick and ideally have 1/2" (12.5mm) reinforcing bar laid in a grid 6" (150mm) on centres, starting at least 3" (75mm) in from the sides.

Provision must be made in the concrete floor pad for an air intake hole and an ash drop. *(See Section 5.)*

The floor pad can also serve as the hearth in front of the fireplace, required 16" (400mm) in front and at least 8" (200mm) either side of the loading doors, as detailed in the plans included in Section 5.

Leaving one side of the foundation open will allow the hollow core to be used for storage and permit access to the fireplace air intake and ash dump. *(See Fig. 19)* In this case, a site-fabricated metal boot should be used to connect the air intake to the 6" (150mm) exterior fresh air supply and a metal pipe or masonry chase used for the ash dump.

Outside Air Supply

An outside air supply is required in most new homes in North America.

If required, outside air can be provided with an optional air intake damper and locally obtained pipe. A 6" (150mm) round smooth duct is built into the top course of foundation blocks, which will feed necessary air into a 15" x 2" (380mm x 50mm) hole located in the floor pad, directly in front of the unfinished core. The duct is vented to the outside wall under the floor joists and can be equipped with an optional "Hoyme" electrically operated damper. Activating the switch opens the damper to provide outside air for the duration of the burn and is closed when burning is complete.

Fig. 18

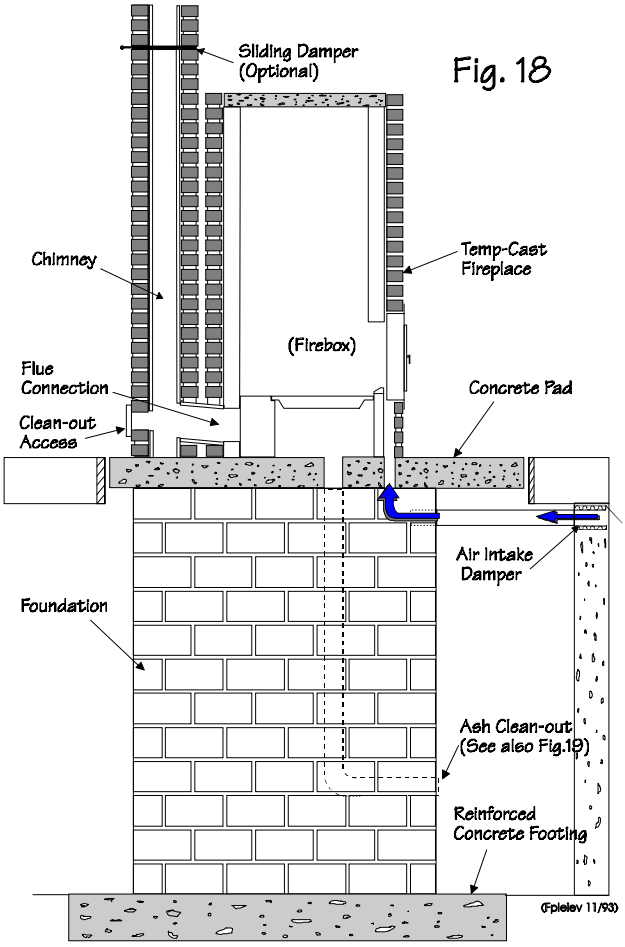
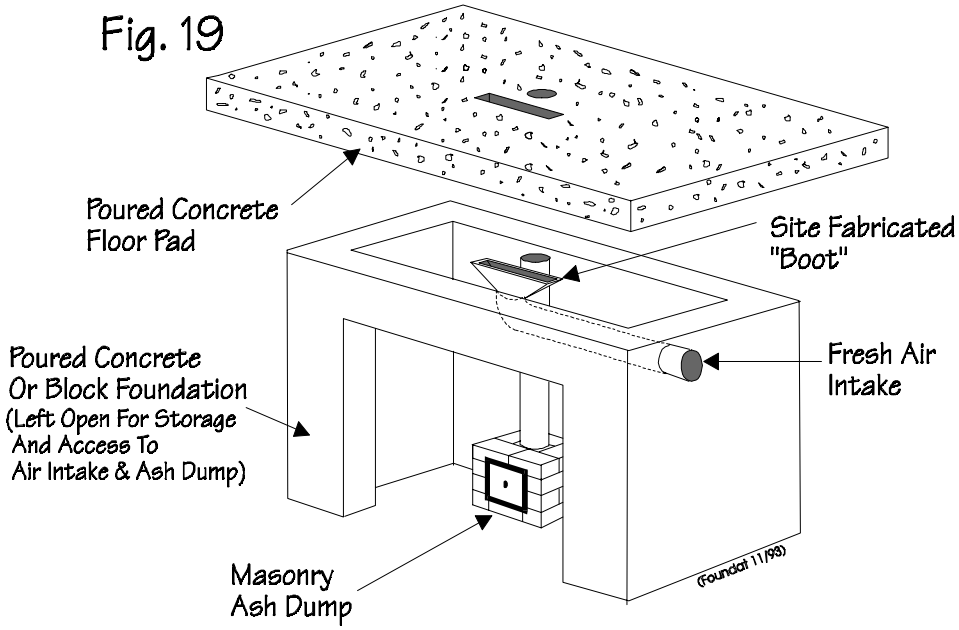


Fig. 19



The intake should be installed on the windward side of the house, at the lowest point available.

In a basement installation **with** outside air, the fireplace can be installed on a raised hearth, if ceiling height permits. Air is then ducted into the raised hearth and fed to the front of the fireplace and into the door frame. If ceiling height precludes this option, a raised hearth can be constructed around the front and two sides of the fireplace and air is then ducted to the door frame.

In a basement installation **without** outside air, an optional air supply door is installed under the fireplace doors to direct air into the air slot. This will permit combustion air to enter via the air supply door, travel up behind the facade and enter the door frame to feed the fire.

Double-Stacking

When additional heat beyond the capacity of one fireplace is needed, two fireplaces can be built, one on top of the other, on two different floors of the home.

Double stacking fireplaces in this way saves the expense of separate footings and foundations, since they share one footing and the lower fireplace masonry work acts as the foundation for the upper fireplace. *(See Fig. 21)*

In addition, two flues can be contained in the same chimney, for additional labour and material savings. The fireplaces then work independently of one another and may be fired alternately or together (draft permitting.)

Footings in this case should be 12" (300mm) thick, with 2 grids of 1/2" (12.5mm) reinforcing bar 6" (150mm) on centres. One grid is placed in the bottom third of the footing, and the second is placed in the top third. The lower fireplace facade is carried to the ceiling level, a non-combustible support such as metal roofing is placed on top, and the floor pad for the upper fireplace is poured over it.

Chimneys for Double-Stacked Fireplaces

When double-stacked units are being considered, each must have its own flue. Chimneys for double-stacked units can be placed on left and right sides of the two heaters, or can be located at the rear of the fireplaces. In each case, the chimneys are supported on the lowest level. The flues continue through the concrete floor pad of the upper fireplace but the brickwork of the lower chimneys stops just above ceiling level and the upper floor pad is poured on top of these bricks, around the flue tiles. This allows the lower chimney brickwork to act as the support for part of the upper floor pad and chimneys. *(Refer to Fig. 21)*

Furthermore, each chimney flue must only service one fireplace and may not be connected to any other appliance.

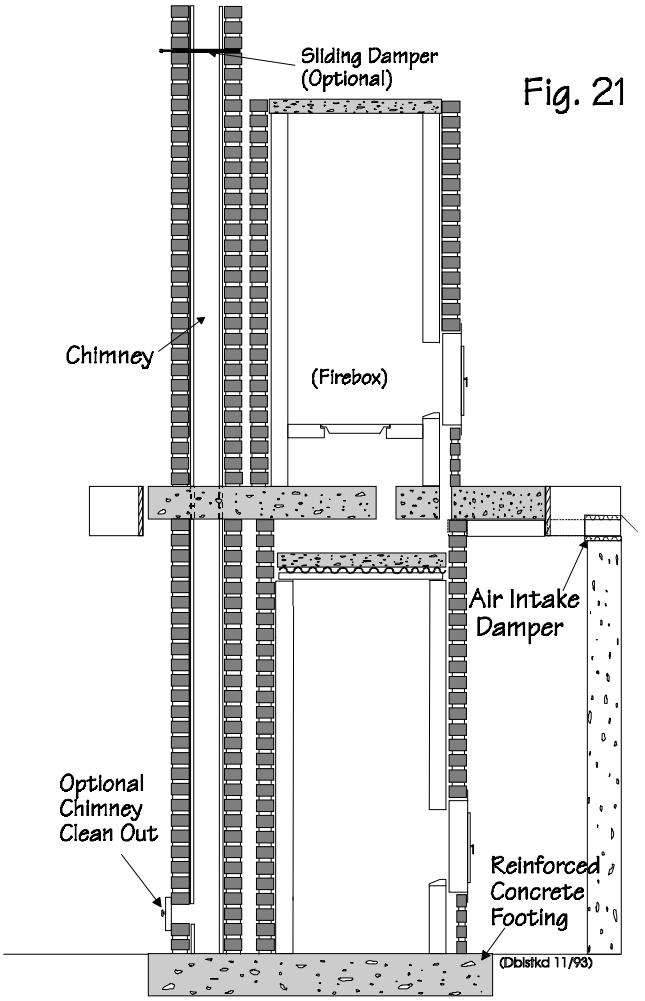


Fig. 21

Ash Removal

An ash drop can be easily incorporated in the floor pad. A 6" (150mm) diameter hole is formed in the pad so that ashes drop into a 6" (150mm) metal pipe to the bottom of the block foundation. A masonry ash dump with a chimney clean-out door can be constructed *(as in Fig. 19)* or the ash pipe can simply be fitted with a

tight end-cap. *(If the foundation is not left open, this pipe is continued to the outside of the foundation and capped or terminated at a soot door, as in Fig. 18. In this case, the ash pipe should be made from stainless steel liner, for durability.)*

Ashes for the upper unit in a double-stacked installation can drop to a concrete ash pit on top of the lower fireplace. They are accessed by a recess formed by the mason in the top of the lower fireplace. It must be equipped with a tight-fitting door. Alternately, ashes can be removed by lifting out the firegrate in the firebox.

Whatever method is chosen for handling ashes, care must be taken to ensure that the air intake function and ash cleanout are physically separated, to prevent excess air entering the firebox via the ash drop hole under the firegrate. Excess air into the fire from below may increase particulate emissions, and defeat the door air-wash system.

Dampers

Most installations will benefit from the use of a chimney damper, installed as high as possible for convenient operation. (The higher the damper, the more warm air is trapped in the chimney. This will capture more heat and greatly assist chimney draft at start-up.) *(See Fig. 18)*

A damper is especially recommended with standard cast-iron non-airtight doors, to maximize the heat-storing ability of the fireplace. Access to the damper, such as from the loft adjoining a cathedral ceiling, must be considered when planning the layout of the heater and its chimney.

If a sliding damper is used, a chimney cap is suggested to keep rain off it. We also strongly advise that a carbon monoxide alarm, such as that by "First Alert", be used in conjunction with all chimney dampers, as an extra margin of safety if the damper is closed prematurely.

One of the most effective chimney dampers is a "roof-top" damper. It is installed at the very top of the chimney, and is controlled by a stainless steel cable. Its main advantage is that it seals the entire length of the chimney, trapping warm air inside. This provides an extra boost for quickly establishing a strong draft. It also acts an impenetrable chimney cap. It will keep out rain, snow, birds and animals, and prevent down drafts caused by winds.

Clearances & Buildings Codes

Although Temp-Cast fireplaces are efficient heaters, they are also site-built masonry fireplaces constructed of refractory components and as such conform to national building codes in Canada and the United States.

We don't recommend that you enclose your Temp-Cast fireplace in any type of wall, since you will be hindering some of its radiant ability. However, if a wall enclosure is unavoidable, we recommend clearances of 4" (100mm) to combustible construction on the sides and back of the fireplace and 10" (250mm) clearance overhead. *(Refer to fig. 24).* Combustible materials should not be placed within 48" (1200mm) in front of the fire doors.

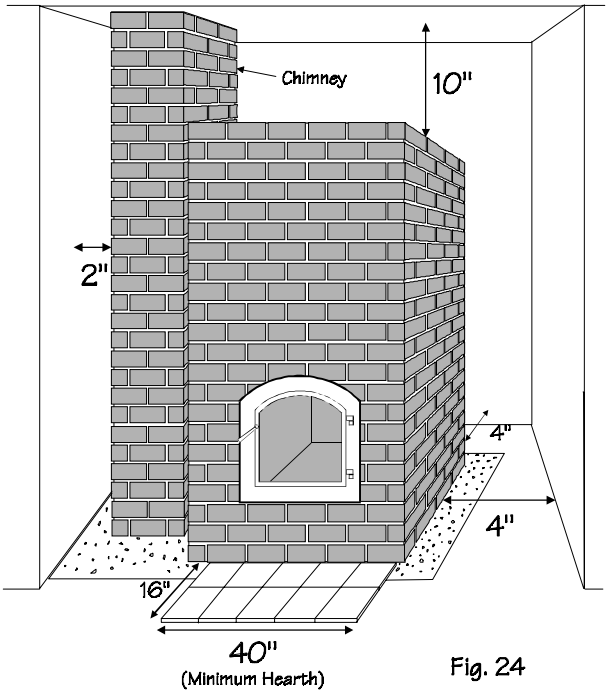


Fig. 24

In most jurisdictions, masonry chimneys and most factory-built chimney systems require a clearance to combustibles of 2" (50mm) from top to bottom.

NOTE: a combustible wall with non-combustible

material applied directly to it without an intervening air space *IS STILL A COMBUSTIBLE WALL FOR PURPOSES OF CLEARANCES.* If clearances must be reduced, a simple method is to build a wall behind the fireplace, in the area of concern, constructed of "wonderboard" (a 1/2" [12.5mm] cement sheet) installed on metal studs. This wall section must extend 8" (200mm) beyond the sides of the fireplace.

NOTE:

Where the precise overall dimensions of the Temp-Cast and its facade are critical, for clearances, support or other reason, the masonry facade material must be chosen before final dimensions can be determined. Your mason must be consulted, to determine the final lay-out of the facade, which in many cases results in greater overall dimensions than indicated on the plan drawings in Section 5. If in doubt that there will be at least 4" clearance all around, allow an extra few inches to be certain.

Wood Storage

Temp-Cast fireplaces perform equally well with softwood or hardwood, lumber scraps, branches, or bundles of twigs, up to 50 lbs (22kg) per firing. ***The only requirements are that the wood be dry (20% moisture or less) and suitably sized.*** Ideally, the pieces should be approximately of the same diameter for maximum efficiency. Reserve larger pieces (up to 4" [100mm] diameter) for adding when the firebox is fully heated.

Outdoor wood storage must ensure that the supply is loosely stacked (criss-cross or "log-cabin" style is best) so that air can circulate around all pieces. The wood supply should have a roof to keep off rain and snow and should also be open enough to allow good ventilation.

Improper storage may prevent the wood from drying to the proper moisture content of 20%. Wood that is not dried to this level of moisture may create excess air pollution and impair the heating ability of the fireplace.

Planning Summary

You should now be able to consider all these variables and sketch the fireplace, chimney, supporting floor pad, foundation and footing. (Keep in mind it is generally easier to build a rectangular pad than one that tries to follow the shape of the heater-chimney-hearth footprint.) For your convenience, we have included several of the most common plan designs and details.

Additional Sources of Information

Considered by many to be the most comprehensive book written on masonry heaters, ***"The Book of Masonry Stoves"***, by David Lyle, can be obtained by writing to Heating Resource Company, Box 300, Acworth NH 03601.

The Canadian Government also has an excellent new publication, ***"A Guide to Residential Wood Heating"***, from Energy Publications, Canada Communications Group, Ottawa, Ontario K1A 0S9. (Fax# 819-994-1498)

Involving Professionals

Many homeowners are able to successfully plan their own fireplace installations with this booklet and the included plans.

However, for special requirements, you may also want to consider the services of a professional. Your architect and contractor are experts in their various fields who can provide essential services.

Please contact us directly if clarification of any point is needed or if you would like to receive our installation and promotional video.

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DUE TO VARIANCE IN SOIL, SEISMIC, AND OTHER LOCAL CONDITIONS, WE RECOMMEND THAT YOU CONFIRM ALL DIMENSIONS FOR FOOTINGS, FOUNDATIONS, FLOOR PADS AND CLEARANCES WITH YOUR LOCAL BUILDING AUTHORITY.