

INFORM

INFORMATION FOR HISTORIC BUILDING OWNERS

Domestic Chimneys & Flues



Washed out joints – fine ashlar joints, and thicker joints in rubble chimneys become washed out over time, this leads to water ingress and progressive loss of structural stability. Repointing and sometimes re-rendering is required, as well as checking the condition of the cope stones.

Often chimneys acquire fittings and fixtures from previous services and installations, especially TV aerials, which, when no longer in use, should be removed as once loose they start to rub and loosen the stonework; spalling ironwork can also lift blocks off their beds through oxide jacking.

Degradation of stone - for reasons of exposure, flue gasses and salts, stones of most types tend to suffer more erosion and damage when used on a chimney. On investigation, what may appear to be sound masonry, may be quite friable and may need replacement, especially on the hidden inside face. For this reason, and those above, it is likely that a chimney will need rebuilding every 100 years or so. Close inspection by a building conservation professional is advised before remedial action, and listed building consent may be required. Discuss your plans with the local authority before proceeding with any work.

Plant growth can become a problem, and can greatly accelerate the decay of a chimneyhead and stack. Broadly, if a plant or small tree has become established, it should be taken that the roots are some way into a loose and degraded core, and may indicate that some rebuilding is required. At the very least, vegetations and stem material should be removed and the stump poisoned.

When carrying out work on a chimney, ensure that any replacement work matches the original, in colour, texture and compressive

strength. If the cope is being replaced it should be done in stone, with the correct drip detailing on the underside to ensure water is shed clear. Many traditional buildings have a string course or band of projecting masonry that throws water clear of the gable.

In some cases chimneys have been removed. While re-instatement is favoured, it is likely to require consent, and in any event needs to copy in style, detail and material those in the same building or terrace. The replacement of a masonry chimney stack with a rendered brick alternative is not supported, although was common practice in recent times.

Flues

The flue is probably the harder element to deal with, due to the hidden nature of its construction. Indications of flue problems are smoke ingress in an upstairs or neighbouring property, fragments of stone or mortar coming down the chimney, or problems with the fire not drawing properly or smoking. In more extreme cases render may be cracked and bulging, and staining is visible on interior and exterior surfaces. Frequently it is water in the flue that is the driver of such symptoms, entering through a poorly maintained chimney or defective gable render. The soot and other deposits that form in a flue tend to be water absorbing or hygroscopic, and can hold moisture if inappropriate renders or mortars are used. Such moisture leads to slight movement in frost, potentially admitting further water. On rubble elevations there may even be holes in the wall into the flue itself.

Repairs to flues

Excessive loss of pargetting and internal masonry can make using the chimney hazardous. Internal timber elements can become exposed, and combustion gasses

can escape from the flue into other rooms or properties. In multiple occupancy buildings, such as tenements, the flue arrangements can be complex, and the structure of the chimneys becomes an important safety issue, especially if the gable is freestanding. Relining or rebuilding of flues is really the only solution in one of the following ways:

- Inserting a flexible metal liner. Normally done for a boiler or wood burning stove, this is the least disruptive to the household, but requires correct termination at the top and bottom. It is advisable to ensure the void within the chimney is ventilated. The main benefit of this is that it is reversible, but not suitable for an open hearth.
- Fitting of ceramic flue liners. This is arguably the better long term solution, as it addresses the internal structure of the flue. However, it tends to reduce the bore of the flue so ensure a size of liner is commensurate with the type of fire or appliance to be used. Holes are made in the wall every 1.5 m or so, and a ceramic liner is inserted and bedded in a weak lime mortar. This process is continued up the wall until the chimney is reached. The process is disruptive, although if the flue can be accessed from the outside this is reduced, but with the consequent need for scaffold. It is also possible to rebuild the flue in the original manner, with stone bridges and slab lining, although this is more time consuming and thus expensive.
- Poured cement based re-lining. There are many franchises offering this option. Essentially they craft a cement lining, temporarily held within a removable rubber former. The poured lining fills all voids within the flue, including holes into rooms where care needs to be exercised. However, this method also reduces the bore of the

flue and due to the cementitious nature of the poured material, does not allow proper movement of water vapour within the wall. If the wall and flue are dry or internal, it can be effective, but caution should be exercised when considering this method for external gables or exposed chimneys.



A flue relined from the outside.



A new flue on the outside face of the gable



Chimneys and cans are a dominant and distinctive feature of the urban environment.

The chimney and flue system are an integral part of the structure, function and aesthetic composition of a traditional building and often the streetscape in which the building sits. They are structural elements that require care and maintenance, although due to the location this is frequently omitted. This Inform will outline the basic elements of a flue and chimney system and identify common faults, their diagnosis and the principles of how to deal with them.

History and Development

Chimneys have long been part of domestic construction, and have come to be part of the urban and rural archetype. Originally homes did not have chimneys, and fumes were vented through the roof, but since the early middle ages high status building were fitted with effective fireplaces and flues. Sometime later domestic dwellings adopted flues, although many Hebridean blackhouses had no chimney in the early 20th C. The type of fuel burnt has also affected the design of flues and chimneys – generally lower calorific value fuels such as wood and peat require bigger openings and flues, different fuels such as coal and anthracite can burn effectively through narrower bore flues and chimneys although most types of fuel will work in most hearths.

Basic structure of flues

Single or multiple flues were normally built into the thickness of a masonry wall, frequently on the gable ends. In larger properties with internal masonry walls, flues were run up through internal walls. In cases where there have been flue problems, or a hearth was added, flues have been added against a gable, sometimes externally or internally. The shape of the flue is normally a square or a rectangle, earlier flues from the 16th C tended to be much flatter rectangles, reflected in the shape of the chimney head.

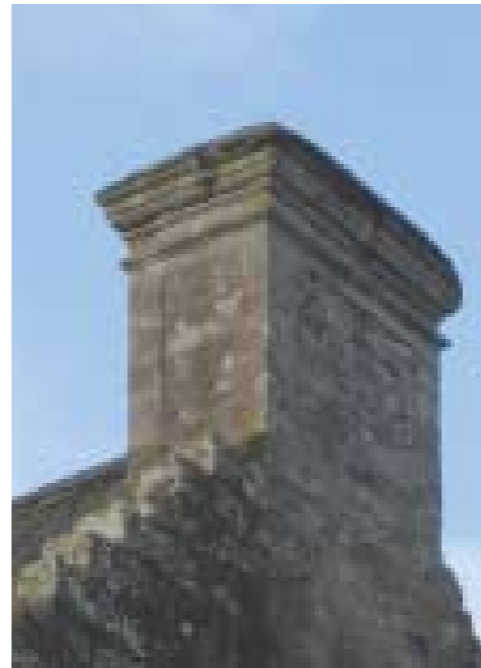
Much depended on the budget, but in house construction the masons would build an opening for the fire, and continue the flue up within the wall. The size and openings of hearths varied with use and status; on plan, earlier medieval openings were sometimes semicircular, while most Georgian or Victorian openings are rectangular or trapezoidal. Internally the flues were lined with smooth plastered masonry

(a layer of lime mortar sometimes called pargetting). As fuels have become more energy intensive, flues have tended to become smaller and more effectively lined. Where the builders had to fit a large number of flues within a gable, such as a tenement, stone slabs were used to separate flues. The pattern of these slabs can sometimes be seen on gable ends of tenements. Later in the 19th C, ceramic flue liners were used, as well as being quicker to fit and build, they have also proved more durable, as they seem better able to resist corrosive flue deposits.

In small 18thc rural properties flues were often built against a masonry wall in timber and clay, sometimes called a “hanging lumb”. Such survivals are rare and if encountered, should be retained. The clay coating, and the relatively low temperature of the smoke does mean that these could be safely employed as a flue.



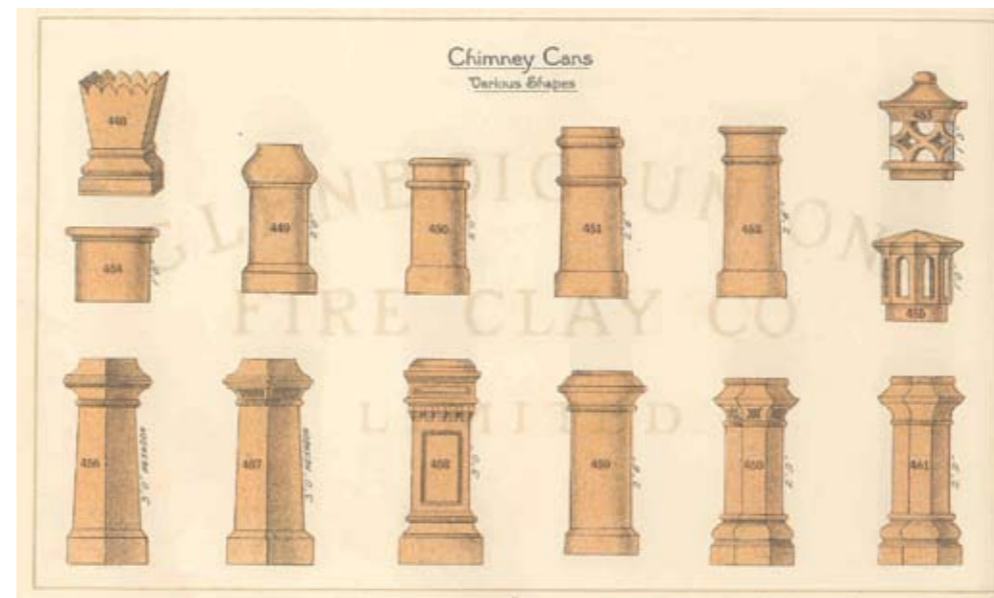
Stone bridges visible on the gable of this tenement in Edinburgh.



Banding on this late 17th C chimney.



19th C Cans with bird grilles.



Victorian trade catalogue showing the wide variety of styles available.

Basic Structure of Chimneys stacks

The chimney flue terminates at the chimney head, sometimes called a stack, essentially the element above the roofline. Likewise of masonry, the chimney could be built of rubble or ashlar, with bridges of slab or composite stone if there is more than one flue. The design and disposition of chimneys on a dwelling are much more than routes out for smoke - they deliberately conveyed subtle messages of home and status; historically builders and architects took full advantage of this.

Capping the chimney is the cope, a single, or several dressed stones that provide the level top. Styles of finishing chimney heads have changed over the years, and can provide indications of the buildings age. Patterns have varied over time, from sloped copes with rolled edges of the 16th C, to very square tabulated corniceing and drip details on some 19th C Chimney heads. Banding (raised margins) on the chimney quoins can give clues as to the original surface finish of the chimney and possibly elevation. Sometimes the cope stones secured together with iron or bronze dogs secured with hot poured lead.

Up until the late 18th C, chimney heads were finished with a cope only, but from the 19th C all but the largest chimneys were finished with clay pots or cans. They developed in many styles, with some 19th C ones being very decorative indeed. The pot is sometimes set into a slight recess in the cope, and mortared in or “haunched” with mortar.

Ventilation

An important function of the chimney system in a traditional structure is ventilation, even

when no fire is lit. The rising air in the chimney draws new air into the room from under the floor and behind plastered surfaces, keeping void spaces and hidden areas dry.

Problems and issues

Due to the heat of the flue gasses, their composition, and the exposed nature of the chimney, flues and chimneys take a lot of wear from use and the elements. Common problems, and indicative solutions are:

Chimneys

Chimney Cans. Over time, the haunching washes out or becomes cracked, and the chimney pots, or cans become loose. This will require re-bedding in fresh mortar. Occasionally the can itself becomes cracked and broken and they should be replaced. Invariably styles are limited, but cans should be matched where possible - in height and colour as a minimum. If the fire is not used the can should be covered, preferably with a conical galvanised cover fitted with bird netting. Ceramic covers are available, but do limit ventilation somewhat. If there is evidence of damp in the chimney they should not be used.



A mid 19th C chimney and cans showing a variety of problems.

In the past an additional chimney flue and stack was often built adjacent to the gable. This is not an acceptable solution, as it spoils the appearance of the elevation.

Issues with Smoking

A smoking chimney can be caused by many things, including physical blockage from failures above. In addition, there is a strict relationship between the size of the opening in the room, and the size of the opening at the chimney head. Normally the proportion is 1/10, but historically much consideration was given to the optimal shape and design of an opening. The most well known is Count Rumford's work of the late 18th C. If the flue has been relined for a stove, and if an open fire is favoured, it will not draw well.

There are many advanced thoughts on how to improve draw, that range from the shape of the hearth to types of cowl on the pot. Other factors come into play, including topography and type of fuel being burnt, but generally speaking most unaltered flues should work well.

Sweeping

Where original fireplaces are still in active use flues should be swept at least annually to remove soot deposits from the inside of the chimney. Failure to do this will result in a build up of soot, and in the case of a wood fire, tar deposits. These deposits are potentially flammable and should be cleared to avoid the possibility of a chimney fire.

Further Information and reading:

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Society for the Protection of Ancient Buildings

www.spab.org.uk

*A. Jackson and D. Day, Period House,
ISBN 000-7192754*

*K. Wedd, The Victorian Society Book of the Victorian
House, ISBN 978-1845132941*

*J. Gilbert and A. Flint, The Tenement Handbook,
ISBN 978-1873190142*

*The Care and conservation of Georgian Houses,
4th Edition, Butterworth 1995*

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