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# CHIMNEYS, COMBUSTION APPLIANCE AND SMOKE NUISANCE

SEMINAR

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0945h Registration
1000h Presentation

Ryedale District Council
Ryedale House
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# NACE – A BRIEF INTRODUCTION

NACE is the foremost authority with regard to compliant flue system lining, structural chimney engineering, mechanical flue system diagnostics, and masonry chimney design & construction. Our mission statement is to: "*Ensure the safety of all fuel users in the UK and Ireland, who depend on a chimney or flue for the operation of a heating appliance, by providing a register of competent chimney engineers for all types of chimney work."*

The National Association of Chimney Engineers (NACE) was originally formed in 1982 by an amalgamation of mainstream chimney component manufacturers and qualified lining practitioners who recognised a failure in the meeting of National Occupational Standards (NOS) and the level of poor installation work carried out by many unqualified individuals. This was prior to the existence of any Competent Person Scheme (CPS). For over thirty years NACE has become an industry accepted authority with regard to correct technical interpretation of masonry and metal chimney systems, flue mechanics, fire risk, domestic consumer safety and a point of reference for professionals and consumers alike to share our considerable knowledge base.

The NACE register of competent chimney engineers and technicians continues to be a recognised method of resourcing domestic chimney related installation projects and where trained and experienced personnel can be relied upon to carry out safe as well as fully compliant workmanship.

NACE recognised from the outset that structural masonry/metal chimneys and the flue systems serving them were, in accordance with the Building Regulations, 'Controlled Services / Environments' therefore, any intended interference, rectification, installation or repair work on a domestic or commercial property had to be initiated firstly by creating a traceable audit trail and then physical workmanship carried out in a sensitive, knowledgeable and mechanically competent manner with a heavy emphasis on consumer safety and the protection of property, paramount at all times.

Of the 26 million (approximately) properties within the UK, no two structural chimneys, combustion appliances or design of flue system will be the same. It is this vast and sometimes convoluted landscape that requires specific expertise to resolve many of the building and thermo-dynamic issues created today when modern appliances are installed to defective, dangerous and unfit chimneys, as well as flue systems.

The Department for Communities and Local Government (DCLG) considers that a three-day basic dry installation (theory only) solid fuel course is sufficient enough training to allow individuals registered with a CPS, to carry out articulate and mechanically competent work in a domestic environment in particular where elderly/infirm or vulnerable members of our communities rely heavily on the integrity

of such people to provide a service ‘fit for purpose’ this unfortunately is not in our experience always the case.

NACE is recording the highest levels ever of consumer complaint with regard to non-compliant and defective workmanship. Registrants continue to demonstrate astronomical levels of both mechanical as well as administrative incompetence. This clearly confirms that many installations are therefore not ‘fit for purpose’ and these, when identified, have been found to represent both health and safety concerns. Active policing of the current system and of its registrants does not appear to occur even on an irregular basis. Only when a ‘fait accompli’ occurs will a response be considered. This is wholly unacceptable when the safety and wellbeing of consumers, their property and lives are put at risk.

There is considerable gravity and a heavy emphasis on integrity attached to any work carried out in a domestic environment and where the proceeds of such work if not undertaken competently may lead to damage, injury or at worse, a fatality. Many installers lack an understanding of consumer law or respect consumer rights in accordance with the ‘Consumer Protection Act’ have never heard of Document 7 of the Building Regulations (Workmanship and Materials) or that the issuing of a consumer right to cancel contact is a mandatory requirement in accordance with the ‘Consumer Rights Act 2015’ or refer to the requirements of the Environmental Health / Clean Air Act when installing a new chimney system.

NACE has and continues to monitor as well as recognise the rapid increase in the level and complexity of domestic consumer complaint and responded in a robust and pro-active manner, we continue to share our knowledge and attempt through education and communication to promote higher learning by those directly and indirectly involved in what is a very expert area. NACE continues wherever possible to raise standards and properly interpret risk, safety and compliant regulation in a digestible manner and where our expert knowledge and technical competence is called for provide this support in either civil or criminal procedures. Our concerns regarding fire risk, working at height, compliant workmanship, duty of care and safety remain extremely important factors when called upon to inspect or investigate a domestic complaint where third party involvement often causes turbulence in what would otherwise be tranquil waters.

For those wishing to join the NACE register completion of a technically robust set of exam papers and a ‘one to one’ telephone interview are a pre-requisite requirement, applicants are required to demonstrate their technical and mechanical capabilities in conjunction with an invasive on-site inspection, this alone does not guarantee acceptance and those successfully registered are closely monitored and assessed during their first 12-months registration.

NACE also recognises the true value of mentoring and the benefits of properly qualified technicians nurturing and guiding new candidates who may not have the depth of experience required initially.

The NACE Specialist Apprenticeship Programme (SAP), wholly supported by the Construction Industry Training Board (CITB), is the leading and professionally recognised industry route to achieving NVQ L2 Chimney Engineering status. NACE is, and continues to be, committed to the raising of standards and workmanship within our industry as well as the enforcement of: Approved Document J, Minimum (NOS) National Occupational Standards, Installer awareness of consumer safety, Fire risk liability, Compliancy, minimum requirements of 'Document 7' (Workmanship & Materials) of the Building Regulations, the Party Wall etc. Act and the Consumer Rights Act 2015.

NACE is professionally recognised as an authority by:

- CITB
- Environmental Health
- Health & Safety Executive (HSE)
- Local Authority Building Control (LABC)
- National Federation of Roofing Contractors (NFRC) - a CPS manager
- Oil Firing Technical Association (OFTEC) - a CPS manager
- Society for the Protection of Ancient Buildings (SPAB)
- Solid Fuel Association (SFA), but to name a few.

Masonry chimneys and the flue systems serving them are, according to the Building Regulations, 'Controlled Services', therefore any alteration to such an environment requires notification to local authority prior to an alteration / remedial works being undertaken or the installation of any component. This scenario is further exacerbated when the building occupant(s) demonstrate health issues and where properties are either listed or thatched and where the risk of fire is prevalent.

Current NACE case work and history reference:

1) Increase of incorrect lining / re-lining of existing masonry flue shafts.
2) Failure of competent pre-installation structural / flue system design surveillance.
3) Technically incompetent interpretation of 'Controlled Services'.
4) Incorrect flue system components and connections used.
5) Pre-requisite fire risk evaluation failure.
6) Pre-requisite safety failure.
7) General failure of any 'Duty of Care'.
8) Failure to provide an audit trail.
9) Registrants working outside of their CPS remit.
10) Exaggeration of authority / gaining advantage by pecuniary measures.
11) Failure to advise and inform consumers correctly.
12) Failure to provide 'Professional Indemnity'.
13) Failure to apply to the 'Party Wall etc. Act'.
14) Failure to apply to the requirements of Document 7 (Materials and workmanship).
15) Failure to provide consumers with the requirements of 'Regulation 2008'.

16) Failure to provide consumers with either a ‘Method Statement’ or ‘Scope / Programme of Works’ identifying component, cost or process to install.
17) Failure to protect consumer’s property.
18) Failure to apply to the ‘Work at Height Regulations’ and the penalties involved.
19) Failure to identify dangerous structures and fire risks.
20) Lack of artisan skills.
21) Failure to advise or disclose to LABC / Conservation thus potentially ‘null & voiding’ consumer insurance claims.
22) Non-approved appliance installation.
23) Failure to provide (incorrect completion of) regulatory notices.

Attendees may wish to discuss these and other related issues during today’s seminar.

# NACE – A SEMINAR / Q&A OPPORTUNITY FOR EH PROFESSIONALS

## 1) Understanding how heavy smoke is produced from solid fuel appliances

Dense (heavy) smoke is often caused by the use of fuels with a high moisture content, high concentration of bituminous resin and where these fuels are burned incorrectly. This is usually without adequate combustion air supply and more often than not, poor user operation procedure resulting in low flue gas temperatures and condensates occurring. This scenario is further exacerbated by a combination of less than favourable localised atmospheric conditions, incorrect flue termination, badly designed flue systems, incorrect sighting of controlled services, insufficient combustion air ventilation and incorrect appliance refuelling.

Overbearing tree lines and buildings or a chimney system terminating in a known low pressure zone can cause what is commonly referred to as the 'Duvet' effect to occur. This is where visible smoke is seen to settle and blanket over roofs and entire buildings.

What consumers consider to be a 'dry' fuel is often far from correct. The storing of any combustible product unless fully covered and ventilated will result in moisture being absorbed irrespective of circumstance, fuels should be kept in a ventilated but dry environment with sawn / cut timber tested with a moisture meter to determine acceptable minimum levels have been met prior to use.

Clean flue-ways are also an essential element to correct operation and use, before any diagnostic test is attempted flue path integrity should be confirmed by way of a technical camera survey with the results competently interpreted. Any identifiable debris or detritus that is likely to reduce the internal dimension of a flue shaft representing a restriction and therefore a potential fire risk must be removed.

Clean appliances are also essential, in particular where wood or coal burning occurs on a continuous or semi-continuous basis. Before any test is considered the appliance throat plate must be removed and cleared of debris and structurally confirmed as 'fit for purpose'. This component must not be buckled or show any signs of degradation. Where off-sets are located in a masonry or rigid metal chimney system, these should be confirmed as being no less than 45 degrees to the horizontal. Shallow off-sets or off-sets of less than 45 degrees to the horizontal will most likely collect flammable debris representing a direct fire hazard and which cannot simply be removed by sweeping upwards. If this area cannot be adequately cleaned, then testing of both appliance and 'controlled service' should not be undertaken.

Quite simply, the installation of either an appliance and a system chimney in accordance with the requirements of the Building Regulations, along with approved

component parts, will not automatically guarantee an appliance will operate in accordance with the manufacturers requirements or that exhaust gases will be permanently ejected to atmosphere on each and every ‘firing up’.

Furthermore, unless intrusive camera inspections are undertaken to establish clear flue ways, dimensional continuity to confirm flue shaft integrity, any diagnostic test procedure and subsequent result may very well be flawed.

One area of a new installation that is often overlooked is the effect of smoke or fumes discharging from one house impacting on neighbouring properties. With the growth in wood burning and biomass installations this is becoming a more common issue, with claims of nuisance being made by neighbours with reference to newly installed chimney systems and appliances.

In truth this shouldn’t really be happening because both Building Regulations and standards dating back many decades have requirements to ensure people’s health isn’t affected by the products of combustion from any of the available fuels.

Building Regulations Requirement J2 states: “Combustion appliances shall have adequate provision for the discharge of products of combustion to the outside air.” The intention of this requirement is to allow the products of combustion to discharge at a point where they will be safely dispersed into the atmosphere without causing localised air pollution, either back into the building housing the appliance or into surrounding dwellings.

The National Annex (NA) to BS EN 15287-1 (Chimneys. Design, installation and commissioning of chimneys) gives a great deal of advice on design parameters that should achieve this requirement. However, section NA.4.7 (Height and position of chimney outlets above roofs), closes with the statement “***It should always be borne in mind that topographical features may require heights in excess of the quoted minimum and local experience should be sought as appropriate.***”

It is the installer’s responsibility to ensure that their installation complies to the minimum requirements of ADJ and Document 7 of the Building Regulations. At the point of commissioning, the installer should check that any smoke or visible fumes from the first firing of the appliance are seen to exit freely from the terminal. Once flue gases have reached optimum temperature visible smoke should not be identifiable. Visible smoke or fumes should not be returned to ground level because of localised down draughts, therefore carrying out an investigation into localised atmospheric conditions prior to any installation would be a most prudent consideration.

It may be that an installation has been carried out following all the generic guidance given in Building Regulations ADJ, yet smoke nuisance still occurs. This is most likely due to localised topographical and atmospheric conditions such as proximity of the building to other taller buildings or tree lines or the house being situated within a

depression or at the base of a steep hill. If smoke does return to ground level, it will be necessary to carry out remedial works to overcome the situation.

Some experimentation may often be required to locate the cure. Some common remedies to this type of issue can (for example) be to extend the height of the chimney termination above any extended recirculation zone, or if a closed-top terminal is fitted this should be immediately removed and changed for an open terminal, this will allow the exit velocity of flue gases to carry combustion products higher into the atmosphere.

The old British standard BS 6461-1: 1984 (Installation of chimneys and flues for domestic appliances burning solid fuel (including wood and peat). Code of practice for masonry chimneys and flue pipes) gave excellent guidance and included the requirement for ensuring smoke and fumes are discharged safely.

This standard was replaced in 2007 by the European installation standard BS EN 15287-1 (amended 2010).

Within the NA to BS EN 15287-1, chimney design includes a requirement that in relation to the roof, terminals should be located to avoid as far as possible zones of wind pressure that are likely to cause down draught. In addition, it is essential to avoid flue gases discharging in a position where they can enter a window or skylight capable of being opened, or an air inlet to a ventilating system. The intention of the design is to discharge the products of combustion high into the atmosphere where they can be dispersed safely and not be pulled back down to ground level by areas of down draught.

## 2) Understanding what constitutes an ‘Approved’ appliance

Although it is reasonably simple to purchase a closed appliance (stove) it is not that straight forward when it comes to installing these products. The Domestic Building Services Guide and Construction Products Regulation (CPR) require that any combustion appliance is manufactured with correct components and in accordance with European Harmonisation, this infers a responsibility upon a manufacturer to meet strict UK consumer safety and efficiency rating requirements (currently minimum 65%).

All combustion appliances those burning wood and / or coal must have been independently type tested by a recognised third party test facility and a standalone European Certificate of Conformity (ECC) issued, thus allowing the product to be categorised as 'CE' approved. Furthermore, a European Declaration of Performance (DoP) signed by either a senior production engineer or Director of a manufacturer must also be provided confirming the product meets both European and UK standards. Finally, each approved appliance must carry an Appliance Data Plate (ADP).

The ADP is attached to the rear of an appliance and confirms both efficiency and further important consumer information on output etc.

An approved appliance should not be confused with an appliance which has been exempt by the Department for Environment, Food and Rural Affairs (Defra) for use in a smoke controlled environment, Defra exempt appliances can also be used in non-smoke controlled environments only if the product in question meets the above criteria, the retail industry as well as CPS registrants continue to install appliances unfit for use and that fail basic consumer safety although these are not illegal to purchase.

## 3) Defra approved appliances

### a) What are they?

Defra is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland. Manufacturers of Defra appliances will have met the design requirements of Defra where such combustion products are intended for use in a smoke control area and where only authorised and designated smokeless fuels may be used. These are referred to as 'Defra approved appliances'.

Non-approved appliances may also burn smokeless fuel, but at much higher optimum flue temperatures. These types of appliance are unlikely to produce the levels of operational efficiency required (currently 65% minimum) and may not be supported with either a DoP or ECC, nor will these appliances have been independently type tested.

Defra approved appliances may, in accordance with manufacturer's installation requirements, be installed using a reduced 5″ lining system compared to minimum guidance requirements (within ADJ) of 6″. However, other than the reference to change of top slider / airwash control non-Defra and Defra appliances are in every sense mechanically the same.

### b) How do they work?

All solid fuel appliances have a top slider or airwash control. This allows an external regulated airflow to 'wash' over the door glass for the purposes of keeping a clear visual reference to the fire occurring within the combustion chamber. Often when appliances are shut down (air controls closed), unburned fuel is left to smoulder. This is due to the rapid decrease in combustion air flow over and within the combustion chamber causing a decrease in flue gas speed and temperature.

Most appliance air ventilation controls are manufactured to be closed, creating an almost ‘air tight’ environment. This, combined with unburned and smouldering fuel will most likely result in heavy smoke building up within the combustion chamber allowing little opportunity for spent gases to exhaust to atmosphere. This can be a lethal cocktail, in particular where negative air flow or turbulence causes intermittent downdraft and hence leakage of CO amongst other dangerous volatiles (if not completely burned off) to slowly escape into the fabric of a building, causing potential long-term health issues.

To neutralise such occurrences, Defra approved appliances support a mechanically altered non-closable top slider / airwash control thus allowing a ‘trickle’ air effect to occur within the combustion chamber. This in turn (if the appliance is used in accordance) should provide enough combustion air through and over any non-combusted fuel and for such material to burn out efficiently without causing high volumes of smoke to be experienced.

### c) Installation compliance

Defra approved appliances can be installed to flue systems of 5” and above. Procedural installation requirements in accordance with ADJ will be the same for any Defra or non-Defra product.

## 4) Understanding related fire risks

Poor installation methods and planning, incorrect ignition distances to combustible material, lack of proper thermal protection to adjacent combustible material, incorrect storage of combustible material within a fireplace, heavily bitumen saturated flue shafts, poorly designed flue systems, collapsed flue shafts in both single and multi-occupancy environments, masonry defects and failures, failed flue paths and systems, structural masonry failure, timber frame issues, thatched buildings and roof voids and the correlation to high fire risk, neighbouring property and party wall issues are, if taken individually or together, representative of potential loss and possible injury / fatality.

## 5) Duty of care and liability

Document 7 of the Building Regulations, as well as references within Part J of the Building Regulations, HSE Work at Height and BSEN 15287, clearly indicate that responsibility for compliance rests with the building owner and those carrying out regulated works. All CPS registrants, no matter what the combustion fuel intended, have an onerous 'Duty of Care' upon them directly related to compliance and consumer safety and not profit. Liability for not having identified third party faults and / or non-compliances leading to injury and / or a fatality may be looked upon by a crown court as having been negligible in duty.

## 6) Understanding the relationship between Building Regulations, physical installations, methods and procedures

Any combustion appliance must be installed in accordance with the requirements of Part J of the Building Regulations. According to part J, chimneys and flues are considered 'Controlled Services' and anything attached referred to as 'Controlled Appliances'.

Where a domestic property owner decides to employ a CPS registrant to carry out such work LABC / BCB approval is not required, as an individual with only 3-days classroom theory experience is, according to UKAS and DCLG, considered competent and 'fit for purpose'. NACE would argue that this is not a sufficiently robust enough system as it seemingly allows virtually anyone to sign off what is often complicated and at times sensitive work to a domestic environment. Proof continues to be established given the high levels of non-compliant, as well as dangerously incompetent work, NACE registers.

LABC and / or BCB will not interfere or pass judgement on any CPS installation. If the property owner is found to be in breach of sections 34, 35 or 36 of the Building Regulations (Act) then enforcement procedures may be considered, although this is to our knowledge, a very rare occurrence.

Both LABC officers and BCB's follow the guidance's within Part J of the Building Regulations, although many do not interpret the contents properly having no immediate 'hands on' experience of either appliance or chimney system installation. This represents considerable confusion when members of the public are provided with conflicting information on procedures and methods by both CPS registrants (fitters) and those in authority. Both parties lacking any proper knowledge or understanding of controlled services.

## 7) Understanding the impact of atmospheric, meteorological and topographical issues upon solid fuel appliance use

Wind pattern variation, severe turbulence and known areas of low pressure can all wreak havoc on the ability of any combustion appliance to vent exhaust gases to the atmosphere. This scenario is made considerably worse where buildings are found to be in a depression with either overbearing buildings or tree lines in close proximity. It is a known failure by installers to undertake any pre-installation tests that would alert them to such atmospheric and topographic issues prior to work being carried out and this continues to be an area of CPS contention.

Reference to meteorological weather patterns or an on-line historical search of atmospheric weather conditions in any given area will give some idea to prevailing wind direction as well as known pressure zones. Irrespective of installation procedure and component / fuel use, adverse weather conditions may lead to an

appliance becoming unusable with CO leaking through ventilation controls or at best an entire test operation a ‘hit and miss’ affair.

## 8) Understanding correct masonry / metal chimney system design, installation and termination

Masonry chimney’s prior to the inception of the Building Regulations in 1966 were of random design and construction. Many are now in a very poor state of repair and many more bordering on dangerous. It is to these ‘controlled services’ that many of today’s combustion appliances are connected, albeit dangerously.

Appliance operation is tantamount to correct flue design and construction. All new buildings dating from 1st February 1966 will have a masonry chimney with either a sectional clay or concrete lined flue. Prior to this date it was a ‘free for all’ with regard to design. Modern heat efficient appliances are constantly being installed to old and mostly defective masonry chimney’s and flue systems amounting to a ‘recipe for disaster’, NACE registers many consumer complaints of this type.

Confirmation of safe and compliant masonry chimney’s, as well as the flue systems serving them, can only be achieved using state of the art surveillance equipment with the results properly interpreted by qualified experts. Confirmation of the integrity of flue shaft masonry, mortar and design prior to use and testing is essential.

Convoluted flue shafts, incorrect and dangerous types of cowl, offsets oft less than 45 degrees to the horizontal, decreased flue shaft dimensions and diameters, defective masonry mortar, collapsed mid-feathers / flue walls, flue shaft breaches and sectional flue shafts out of alignment will singularly or together likely result in flue gas restriction, flue gas cooling, condensate build up, volatile and particulate emission, fire risk, leakage of carcinogenic materials including CO and smoking. Flue systems serving open fires may have one or two ‘offsets’ which should not be less than 45 degrees to the horizontal with no long runs between any two offsets. Flue systems serving open fires in accordance with ADJ and BSEN 15287 (post 1966) should be calculated so that flue shaft dimensions are relative to height, width and depth of a fireplace recess. This of course will not be the case in properties with masonry chimneys built prior to 1966 or where period fireplace inglenooks are found with oversized vacuous flues.

Where a designated approved rigid chimney system is used the same rules apply, if in conjunction with open fire use, however, the use and installation of either a masonry or metal flue system requires a different approach when a closed appliance (stove) is attached / installed.

## 9) Correct testing, observation, interpretation, evaluation, defect recognition and diagnosis of solid fuel appliance failures

Solid fuel installations are broadly made up of a number of component parts, such as:

- Hearths.
- Fireplace openings / standalone appliance.
- Chimney products.
- Appliances.
- Metal work.
- Cowls.
- Insulation

Part J of the Building Regulations suggests that post installation checks and tests be carried out on both appliance and chimney system (if installed), as well as commissioning of new appliances. Testing of appliances and installed chimney systems using specific diagnostic equipment is essential as is the identification of defects in either of the above.

Qualified observation and interpretation of identified faults is an expert area and any such faults, imagined or not, should be reported to NACE for correct technical interpretation and compliancy.

## 10) Correct use of fuels and their impact on the environment

There are numerous manufactured fuels on the market as well as wood and coal. NACE is aware that virtually all types of household rubbish is being used to create cheap heat without a thought for the environment or consumer health or to the potential damage caused to both appliance and flue system.

Given the increase in smoke related complaints registered with NACE very little, if any, thought process appears to currently be employed when an appliance and a chimney system is installed and where the operation of such appliances fail due to adverse weather conditions. CPS managers do not evidently consider the value of incorporating environmental impact training within current DCLG requirements with theory only courses devoid of any such learning. Certainly ADJ only suggests that a pre-inspection regime is considered, sadly this remains a non-mandatory requirement.

The same applies to operator / end user education and appropriate fuel use. Defra approved appliances must be operated using designated smokeless fuels. All other appliance types should use wood at ≤ 20% moisture content and bituminous free products at 0% moisture content. Burning any tight grained timber will require considerable pre ignition, therefore coal should be considered on for instance a multi-fuel appliance burning such material as oak, cedar, birch or beech, but only as

a means to provide sufficient ignition heat and never as a heat source unless the flue concerned can be confirmed as ‘impervious’.

Many operators / end users will reply upon everyday newspaper as an ignition source when attempting to ignite either timber or coal or both. Newspaper is cellulose based and by nature will flare suddenly promoting, if lucky, a few seconds of pre-ignition heat resulting in copious amounts of unnecessary smoke, this failure to ignite will most probably cause kindling to smoulder thus exacerbating the entire testing affair.

Very few operator / end users will consider the benefits of non-petroleum fire lighters or follow manufacturers re-fuelling guide lines. Overfilled combustion chambers will result in appliances suffocating and failing to produce sufficient flaming.

## 11) Identifying incorrect appliance operation

The general consensus of appliance operators / end users would appear to be that ‘heat output’ correlates to ‘continuous over fuelling’. This is dynamically and dangerously incorrect as combustion air supply will denote the speed at which fuel burns and the level of heat to room dissipation experienced.

Proper combustion air operation and refuelling in accordance with manufacturer’s guidelines should result in an appliance operating at optimum temperature. The use of a ‘magnetic thermometer’, although uncalibrated, will allow some operational control, however, this is no substitute for correct user operation of an appliance or of its controls.

Over fuelling, in conjunction with poor operational control, will most likely result in ‘super heating’ of an appliance occurring. Operational temperatures in excess of 260$^{o}$c and above have been recorded resulting in appliance warping, fracturing and enough ‘thermal shock’ to be produced resulting in domestic roof fires occurring. On occasions, although rare, appliances have been known to have exploded, inflicting serious injuries to the general public in obvious public related environments.

When carrying out a test it is essential to identify that:

- A flue has been swept properly prior to any live load test
- The appliance is both ‘fit for purpose’ and meets current safety parameters and efficiency
- Fire bricks and throat plates are undamaged and in place
- The chimney is structurally sound or if re-lined there are no visual faults, defects or non-compliances
- The appliance and / or chimney does not represent a fire risk to the building inhabitants or to the fabric of the building.

Where a system chimney has been installed, it will be necessary to confirm that:

- The flue ways are clear of any obstruction
- The flue dimensions are continuous throughout, without restriction
- The design, as well as installation, is in accordance with ADJ and BSEN 15287.

At this point the operator should provide / demonstrate:

a) How the appliance is loaded
b) Type of pre-ignition material
c) Moisture readings
d) Fuel type
e) Air control settings
f) Correct completion and positioning of Chimney Data Plate
g) Confirmation proper positioning of CO alarm
h) Copy of CPS or LABC Certificate of Compliance.

When considering a type test irrespective of appliance, correct air control operation must be mechanically verified, appliance internals physically / visually inspected, structural integrity confirmed and appliance connections properly sealed.

## 12) Identifying operator / end user fuel abuse

The most obvious signs of operator / end user fuel abuse are the blacking or tarring of an appliance door glass, blacking of firebricks, over firing resulting in warped doors, warped and rotted throat plates and inoperable air supply controls.

Over loading of combustion chambers, burning of incorrect materials such as cardboard (contains Diisobutyl Phthalate) or medium-density fibreboard (MDF) (manufactured with varying levels of arsenic, phenolic resin, polymeric diphenylmethane diisocyanate (PMDI) and urea formaldehyde content), bitumen based coal products, pine (as a heat source) household waste and painted / treated timber products are completely unsuitable.

## 13) Identifying correct burning procedures and temperature levels

Appliance manufacturers properly identify correct methods and procedures for efficient burning of known combustible material. As a rule, pine, due to its high content of creosote and other flammable resins is not recommended as a heat source but suitable for ignition purposes only with tight grained hard woods and smokeless coal highly recommended.

Appliance temperatures are crucial, 99% of operators / end users have little, if any, grasp of the importance of running their appliances in accordance with

manufacturer's instructions or have invested in a magnetic temperature gauge. Most, if not all, operators / end users run their appliances 'blind'.

To properly identify running temperatures of a combustion appliance a simple 'thermal probe' could be used or a digital / thermal analyser. These diagnostic products are far more efficient and will give exact readings and can be easily sourced.

Points 10 and 11 can also be referred to within this section.

## 14) The importance of 'Combustion Air'

Part J of the Building Regulations is somewhat ambiguous with regards to combustion air requirements. Guidance directs that any closed appliance (stove) burning solid fuel, wood or coal and under 5kw will not require any additional ventilation, however, as many of us today live in almost airtight environments, some ventilation is likely to be required whatever the circumstances and to achieve manufacturers flue draft requirements irrespective of regulatory guidance
.
Open fire use will of course require proper calculated forms of ventilation based upon height, width and depth of a fireplace opening and flue dimension.

## 15) Understanding the impact of particulate / volatile emissions from solid fuel appliances upon health

It is an accepted fact that when wood or coal, singularly or combined, are burned in a domestic environment, particulate emission is experienced, even from approved and efficient appliances. Quite simply, when an appliance door is opened (depending upon room pressure) fine particles of dust (PM2.5) will be drawn into a living area and subsequently into the human respiratory system. This will also occur, although far greater in impact, where 'open fires' are used. Atmospheric changes in wind direction, variant and random air pressure changes and general turbulence may cause 'downdraft' (reverse air flow) and result in additional leakage of particulate matter through open appliance air ventilation controls into living spaces. This scenario is further exacerbated where uncontrollable open fires are in use and where there is little, if any, control over such volatile emissions entering inhabited living areas.

There are at least 1,000 second hand fires, stoves, fireplaces and associated pieces of equipment for sale (for example on EBay) at any given time. More, if one considers the entire Internet and the second hand trade. Many of these cast iron and steel appliances, open fire cast inset fireplaces and surrounds have been identified as 'unfit for purpose'. These will not meet any known European DoP or will

they meet the requirements of the CPR and minimum consumer safety and UK efficiency levels, with at least 85% of such appliances and components found to be incorrectly, non- compliantly and dangerously installed. Many appliance installations have been identified as non-compliant, some installed with various identified defects and others left in a dangerous and at times lethal condition, the recipient often has little idea of what constitutes either good practice or that the installation carried out complies.

The operational safety and fitness of any appliance should therefore be considered, as well as its approval status, and these confirmed before any formal opinion is offered.

During the period 2013/14 (according to HETAS) upwards of 250,000 certificated installations were registered. A further 250,000 appliances of unknown origin and condition were installed, without any accountable audit trail, with many of these appliances installed, no doubt, by unauthorised personnel and left in a mechanically unsafe condition.

The following published documents confirm our concern that wood smoke continues to represent considerable worldwide health issues:

a) Royal College of Physicians – 'Every Breath We Take' (The lifelong impact of air pollution) 2016

b) DEFRA – Draft Evidence Annex (Assessment of plans to improve air quality in the UK) 2015

c) DEFRA – Tackling Nitrogen Dioxide (Towns & cities) 2015

d) DEFRA – Emission of Air Pollutants (UK 1970 – 2014)

e) Kings College London (PM10 from wood burning in London ahead of the RHI

f) Public Health Denmark (DNA Damage in rats after intratracheal instillation or oral exposure to ambient air and wood smoke particulate matter)

g) Air Quality in Europe Report 2014

h) Environmental Protection UK - Solid Fuel & Air Quality (An update for local authorities) 2013

i) WHO Residential Heating with Wood & Coal (Health impacts & policy options) 2015.

## 16) Understanding the limited authority of CPS registrants

CPS registrants are authorised to install:

a) A Stove.
b) Open fire components.
c) Chimney components, to include flexible liners.
d) Register / Closure plate.
e) Associated components.

CPS registrants are not permitted or authorised to make structural changes to a fireplace opening, chimneys or flue shaft, change from one fuel use to another without notification, undertake any works to a listed building or a building of historical importance without conservation approval, alter or change the design or structural integrity of an existing flue system.

## 17) Understanding the relationship between solid fuel appliances, flues systems and insulation

All combustion appliances produce carcinogenic products; some clear and undetectable, as with gas, and some more obvious, as with the burning of wood, coal or oil.

For any combustion appliance to operate properly it will most probably be connected to a ‘controlled service’ (masonry / metal flue shaft) and vent directly to atmosphere. For any combustion product to properly exhaust, the route for this to occur must be unrestricted without the potential for friction to take place, with offsets of no less than 45 degrees to the horizontal, and where a closed appliance (stove) is installed, no more than 4 offsets in any new chimney system.

Contrary to belief, offsets in flue shafts tend to slow flue gases, therefore, where fuels with high moisture content are used, the flue shaft is found to be on a gable end / flank wall, the liner is uninsulated and low burning temperatures are experienced flue gas temperature will evidently drop resulting in resin based condensation to occur and then adhere to the flue shaft. Products of combustion in particular those produced from the burning of wood or coal at low flue gas temperature may cause bituminous material to build up and adhere to flue walls. It is this detritus, built up over a period time that when in contact with a constant heat source, will either ignite or at worse reconstitute into a viscous state and create the type of smoke nuisance often referred to.

For any solid fuel appliance to operate properly and at optimum performance, the chimney / flue system must be structurally sound and completely vertical. Where any offset occurs, the distance between such offsets must be minimal and without a dramatic change in direction. Flue shafts must be continuous and where sectional,

with socket uppermost, in complete alignment and properly jointed with refractory fire cement, not an intumescent material.

Defective, badly designed and restricted flue systems will do nothing to aid the products of combustion reaching atmosphere. Burning below given temperatures, incorrect combustion air providence and the use of fuels, with even low moisture content values, will almost certainly guarantee a smoky environment.

Many appliance and chimney system installations, including the relining of masonry chimneys with flexible liners, take place without any mechanical consideration or qualified technical interpretation of the surrounding environment. The same applies to masonry chimneys found on listed buildings and to thatched roof properties. The relining of any flue system is not a mandatory requirement, although many will convince a consumer it is an essential element of an installation; this is misleading and quite untrue.

Warm flues will always draw faster; quite simply warm air is lighter than cold air and with sufficient combustion air entering a warm and vertical flue shaft, products of combustion can be safely carried away. This is not the case where, for instance, a gable end / flank wall installation has occurred and a flexible liner has not been insulated. Insulating a flue found in the middle of a building makes little sense as the property itself will act as insulation, although it has to be established that any such installation does not represent a fire risk to other parts of the building.

An external masonry chimney and serving flue system with structural brickwork of no more than 4” depth will, if relined, certainly require insulating. If left uninsulated, heat dissipation through a single course of brickwork will occur resulting in the chilling and slowing of flue gases. Insulation also acts as a thermal barrier; essential where very high flue gas temperatures are likely to be achieved within a flammable environment.

## 18) Understanding what type of environment & fuel / appliance use will cause condensation

Condensation is caused by the burning of moisture saturated fuels and is further exacerbated by low flue gas temperatures. Gable end installations and un-insulated flue systems (flexible) will suffer more due to position and increased likelihood of external drops in temperature affecting flue gases with only 4” of masonry between internal flue and external weather condition.

## 19) Understanding what triggers 'dew point' and when is this likely to occur

Dew point is achieved when flue gases start to cool down, this can be triggered by a drop in external temperature and / or when fuel with excessive levels of moisture is used. Dew point is a random occurrence. Moisture in fuel can be avoided by using

proper storage techniques and deployment of every day diagnostic equipment to monitor acceptable levels.

**20) Understanding what constitutes a safety risk**

There are numerous domestic safety issues arising from any solid fuel installation from the fabric of a building to trip hazards and associated fire risks.

The following are just a few examples:

a) Lateral distance to a combustible surface.
b) Trip hazard.
c) Decorative timber beams above fireplaces.
d) Inadequate ventilation.
e) Part Wall issues.
f) Particle emission from defective appliances.
g) Consideration of consumer related health issues.
h) Cross terminal contamination.
i) Structural masonry issues.
j) Poor chimney sweeping processes and interpretation.

**21) Understanding minimum regulatory & BSEN requirements for the installation of solid fuel appliances, metal chimney systems and hearths**

Part J of the Building Regulations, Document 7 (materials and workmanship) and BSEN 15287, as well as the Consumer Rights Act 2015 and the HSE Offences (corporate manslaughter definitive guidelines) document, all have an impact on method, process and duty of care.

**22) How to identify and register defects, failures and non-compliance's**

At present, other than through the NACE register system, there is no official method or process to record solid fuel installation / chimney and flue system defects or how these may be properly identified and interpreted.

Identification of a defect is an expert area as well as notification of any non-compliance, these should when found be notified to NACE for further action.

**23) Identifying correct P/a + / - has been achieved in accordance with prescribed manufacturers flue draft requirements**

This is achieved by proper test procedures being achieved in accordance with approved manufacturer’s appliance requirements.

## 24) What are approved components

Approved components are those with clear and traceable CE markings. Any such component should have been independently type tested and proved to be 'fit for purpose'.

## 25) Working with NACE and sharing of our knowledge base

NACE has accrued for over 30 years a considerable reference library of technical, as well as compliant and regulatory documentation, consumer law, BSEN and NOS directives, properly interpreted and easily digestible for professionals, consumers and those that undertake installation projects.

Interested EH professionals may apply to join NACE at a discounted rate and enjoy access to our entire document support system. This can only be achieved through direct membership, however, EH related inquiries and the issuing of general technical advice will be provided should clarity and confirmation on any related subject be required.

NACE continues to raise standards, providing a solid and well established foundation for EH professionals, wishing to carry out solid fuel related smoke nuisance inspections and test evaluations, to expand their knowledge and competence in our particular industry.

NACE also provides a 'one to one' mentoring service for those wishing to properly interpret difficult site environments, where test systems employed are carried out correctly and consumer related smoke nuisance complaints are investigated competently.

# HETAS REGISTRANTS – OUR CONCERNS

Official government statistics for the period 2013/14 confirm there were approximately 26.4 million homes in the UK with many of these domiciles being traditionally built. This does not account for the increase in new build properties encompassing masonry chimneys with internal sectional lined flue systems.

It is an established fact that chimney systems and flue components continue to be installed incompetently and, in many cases, non-compliantly. This is demonstrated on almost a daily basis.

Technical chimney engineering, masonry and metal chimney systems and components, as well as flue system construction, design and thermal-dynamics are areas of subsequent technical expertise. Regrettably current Competent Person Schemes (CPS) do not make any allowance for either diagnosis or remedial corrective works to a masonry chimney structure or to a masonry or metal flue system.

The National Association of Chimney Engineers (NACE) recognises there is unfortunately a complete lack of any formal training or guidance available within the artisan trades relating to chimney engineering. It is worth noting that the National Farmers' Union (NFU) insure over 150,000 listed and thatched properties throughout the UK. However, they do not have access to any formally qualified chimney engineering guidance with regard to installation and re-instatement works, targeted remedial repairs on listed or thatched properties or in correlation with the use and operation of combustion appliances and where these exist in a fire risk environment.

Sadly, many elements of chimney re-instatement and repair are undertaken by un-qualified personnel, DIY opportunists and builders with even less knowledge of statutory regulations and insurance requirements. Many domestic pre-purchases are surveyed and sales agreed upon with little understanding of the condition, required compliance, fire risk or safety of existing fireplaces and in situ appliances in particular where these are likely to be found in either listed or thatched environments.

**THE PEMBROKESHIRE HERALD**

Council warning over faulty installation of wood or coal burners
Posted by Amy Owen on 3 December 2015

County Hall

HOUSEHOLDERS in Pembrokeshire who have had wood or coal burning stoves installed in their properties by the late Steven Poole from Johnston are urged to avoid using them and to get them checked as soon as possible, as they could be dangerous.

The advice comes from Pembrokeshire County Council and HETAS, the official body recognised by government to approve solid fuel domestic heating appliances, fuels and services.

It follows a court case in which Mr Poole (trading as SM Poole) pleaded guilty to regularly fitting wood burning stoves in Pembrokeshire contrary to legal requirements.

The case was heard at Haverfordwest Magistrates Court a short while before his death, of which Council officers were sorry to learn.

The court heard that he sometimes fitted flue connections incorrectly so that they were dangerous. He was also supposed to supply and fit carbon monoxide (CO) detectors, which he failed to do.

He would then certify to HETAS (the Heating Equipment Testing & Approval Scheme) with whom he was registered, that he had correctly carried out the installation and all safety requirements when he had not.

HETAS recommend that any stoves fitted by SM Poole should be tested by an independent HETAS-registered engineer to establish whether they are safe to use, if this has not already been done.
“Mr Poole fitted a large number of wood or coal burning stoves in Pembrokeshire over the last six or seven years,” said Cllr Huw George, Cabinet Member for Environmental and Regulatory Services.

“We are very concerned that there could be several hundred incorrectly fitted stoves in the county, which may very likely be unsafe.”

The prosecution was brought by Pembrokeshire County Council’s Public Protection Trading Standards team. It followed a consumer complaint received about a wood burning stove which Mr Poole fitted at the consumer’s home. Mr Poole was formally interviewed and admitted to officers that he regularly fitted wood burning stoves contrary to legal requirements.

The information was passed to HETAS who tested 12 appliances installed by SM Poole, and reported that 10 out of the 12 stoves were found to be dangerous.

HETAS subsequently wrote to more than 500 of its customers, suggesting they should have their appliances tested, and have dealt with the responses from customers who responded with concerns.

However, Cllr George said that Pembrokeshire’s Public Protection department was not convinced that many people had responded to the letters.

“We are concerned that a significant number of people may not have responded to the letters and we urge anyone affected to contact HETAS without delay,” he said.

There may also be other consumers whose details were not passed to HETAS by Mr Poole and who would not be on the HETAS database.

HETAS CEO Bruce Allen says regular chimney sweeping and stove servicing is essential to keep appliances operating safely and should be happening as part of a normal safety routine for stove owners.

“Many customers will have had stoves serviced and chimneys swept since the installation as part of the regular safety routine required for wood or coal burning stoves, so will already be aware if there are any safety issues,” he said.

“If there is any doubt, get a HETAS registered installer or chimney sweep to undertake the necessary maintenance and safety checking.”

“In particular, householders need to ensure ventilators are never blocked and batteries of CO alarms should be regularly tested.”

ADVICE:

The advice to anyone who has had a wood or coal burning stove fitted by SM Poole is as follows:

- Do not use the stove unless or until it has been checked by an independent HETAS-registered engineer or a HETAS-approved chimney sweep

- Buy a carbon monoxide detector if you don't have one already. Carbon monoxide detectors are available at most supermarkets or home and garden stores

CONTACT:

- Contact HETAS for details of local HETAS-registered engineers or HETAS-approved chimney sweeps who can come and check your wood or coal burning stove. HETAS can also provide more information and advice

- Telephone: 01684 278170

- Email: info@hetas.co.uk

- The HETAS office is open Monday to Friday 8:30am to 5pm, closing on Friday at 4:30pm

- There is also lots of advice and a list of local HETAS-registered engineers and chimney sweeps on their website at www.hetas.co.uk