RURAL ENERGY ENTERPRISES, INC.

THE FLUE

There is often confusion as to the terms ((flue)) and ((chimney)) and for the purposes of this manual we define whatever duct conveys the products of combustion as the flue, and the term chimney to mean any masonry structure within which the flue may be contained. It is upon ***the flue's ability to provide a consistent negative pressure or draft that the efficiency and reliability of the stove will depend*** and it is therefore important to understand what can affect the flue's performance and how to ensure the flue installation provides your stove with the optimum operating conditions.

However well the fuel metering valve is calibrated, good combustion is dependent on the correct amount of air being supplied to the stove at all times and this is ultimately dependent on a correct and stable negative flue pressure; The initial flue draft is created by the gas confined within the flue being hotter and therefore lighter than the air outside the flue. The tendency for the hot gas to move up the flue is proportional to the height of the flue, since the difference in weight of equivalent columns of air and flue gas is greater the higher the column. Whilst this may be theoretically true, in practice, because the temperature of the flue gas is cooled through the wall of the flue and the flow is slowed by the friction of the internal surface of the flue, the benefits of extreme flue heights are negated.

The need to minimize the fluctuating effects of wind by having very hot flue gas temperatures inducing the greatest possible constant negative pressure within the flue, conflicts with the ideal of utilizing all the heat generated within the stove for heating.

The compromise is to ensure that whatever heat it is necessary to expend on creating a gas flow within the flue, the flue makes the most efficient use of this heat by being constructed with an internal surface as smooth as possible and by being thermally insulated. Both these requirements can be met in an existing chimney by lining it with a stainless steel oil liner insulated with vermiculite or mineral wool, and where no chimney exists, double walled insulated stainless steel flue systems are available.
ULC recommends to use vent type L for the 24,000 BTU stoves and vent type A for the stoves having a higher output.

Atmospheric influences

Wind blowing across the flue terminal will increase the negative pressure within the flue proportionately to the wind speed, but as wind speed is never constant the varying effect this has on the stove would be unacceptable. ***To control this, the stove is fitted with a draught stabilizer.*** When the negative pressure approaches the desirable upper limit the stabilizer will open, drawing air directly into the flue to supplement the flue gases coming from the stove, thereby reducing the negative pressure to within its limits. When the wind speed decreases the stabilizer will close to return the full negative pressure of the flue to

the stove. ***When the stove is commissioned the negative pressure within the stove is measured and the stabilizer is adjusted to suit the characteristics of the flue, ensuring it gives the optimum control.***

If the flue terminal is too low in relation to the roof, or is masked by other buildings, it is possible for winds coming from certain directions to have become so turbulent that the stove's stabilizer will be unable to respond quickly enough to the changing conditions. Trees often create turbulence problems that cause difficulties because they are often overlooked in the search for the culprit. Not only are the aerodynamics of trees changed with the seasons and leaf growth, but a large tree may have no effect for many years and its last foot of growth may never be suspected as the cause of a previously well controlled stove becoming erratic. No ((patented)) cowl fitted to the flue terminal will overcome serious wind turbulence, but minor turbulence can often be reduced to acceptable levels with a suitable ((model)). For major turbulence problems, increasing the height of your existing flue or demolishing the offending obstruction will be the only effective cure.

The term ((down draught)) is often used erroneously to explain almost any flue unable to sustain sufficient thermally induced gas speed to overcome high-pressure zones caused by winds hitting an obstruction beyond the flue terminal. In most instances this is caused by a poor flue cooling the flue gasses and a cure would be effected with ***an insulated pipe.*** True ((down draught)) affects houses situated on or near to hills, when cooling air travels down the hillside.

This wind, called katabatic wind, can normally be controlled with an efficient flue system and suitable cowl, but if the wind causes a high pressure zone at the flue terminal, resetting the flue to the opposite side of the house may be the only effective answer if an otherwise satisfactory flue causes a problem. The opposite condition, when warming air travels up a hillside giving anabatic wind, can produce very high negative flue pressures, which ***will sometimes necessitate a barometric damper being fitted to the flue.***

Windows and doors opened down wind of prevailing winds and the running of large extraction fans without adequate ventilation may cause the flue to stall or even become positively pressurized with potentially dangerous consequences. Any smell of flue gasses within the house should be investigated immediately. Damp weather is one of a multitude of atmospheric conditions blamed for poor flue ((draught)) There is no theoretical or practical foundation for these, only the existence of an oversized, cold and damp chimney needing lining and insulating.

Ventilation

The ventilation to provide the stove with air has to be regarded as an integral part of the flue system, because unless the air passing through the flue is replaced with equal amounts of air entering the house, the flue will cease to function. The colder the outside temperature and the harder the stove is working to maintain the required temperature inside, the colder the incoming air and the greater its flow. No amount of strategically

positioned knitted draught excluders will overcome the laws of physics or your discomfort if ventilation not being given the planning it deserves.

Any room or space containing an appliance should have permanent ventilation opening of free area at least 22 inches (550 mm/sq.) for each BTU (kW) of rated output above *17* BTU (or 5 kW).

Flue Pressure Adjustment

The flue creates the negative air pressure within the stove, which induces the air into the burner. For the correct operation of the burner this airflow must be proportioned to the firing rate of the burner. The following chart illustrates the required negative air pressures relative to the burner settings, with the shaded band giving the tolerance within which the burner will give satisfactory performance.