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Hoyme Manufacturing Inc.
4336 – 41 Street
Camrose, Alberta
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Dear Cliff:

Re: Combustion Air Dampers vs Combustion Air "Pots"

All fossil fuel burning appliances require air for complete combustion. Some high efficiency furnaces draw air directly from outside and vent combustion products outside. Mid-efficiency furnaces, in Alberta, draw combustion air from inside the building so a source of outside air is desirable. This outside air source usually takes the form of a duct from the outside to near the appliance. Unless the structure is virtually free of holes or leaks, cold air flows into the house under the influence of wind pressure and temperature pressure difference. Since no buildings are free of leaks the flow is more or less continuous.

Several solutions to the problem of continuous flow have been proposed but the two most common are a damper and a combustion air "pot". Operation of the dampered combustion air is simple – when the appliance is fired, the damper opens, and the flow starts. When the appliance is turned off the damper closes and flow stops.

Proponents of the C/A "pot" argue that this is also the case – when the appliance is fired, air flow starts – stopping when the appliance is shut off. This would be theoretically possible if the furnace flue was the only leak in the envelope – and unlikely occurrence. High level openings such as the chimney connected to the hot water tank, cracks around windows, doors and electrical boxes all allow air exchange with the outside. The distribution of holes in the envelope and the combination of wind pressure and stack effect (density differences between inside and outside) set the location of what is called "neutral pressure levels" (the height at which inside and outside pressure are the same). Holes above the neutral pressure level flow out - holes below flow in. The combustion air supply, usually terminating near the basement floor is, under most conditions, below the neutral pressure level and as such air flows into the structure in spite of the C/A "pot". This not always the case: operation of a supply fan (fresh air supply) in an unbalanced mode (supply greater than exhaust) can lower the neutral pressure level below the C/A resulting in outflow.

The addition of a C/A "pot" to the C/A duct reduces the flow of combustion air (during both appliance firing and off periods) not through some magical buoyancy balance but by simply adding more flow resistance to the C/A duct. The air exiting a C/A pot "feels warmer" primarily due to the lower velocity of air diffused over a larger exit area. If the flow actually stops the implication is that something inside or outside the structure is causing a pressure change across the C/A duct.

I trust that this will explain why a damper on a combustion air duct provides positive control of cold air while a combustion air "pot" does not.

Sincerely,

M. Y. Ackerman

Mark Y. Ackerman P.Eng.