Monday, March 28, 2022

Condensing Boiler Venting Material (Part 2)

Monday Morning Minutes | by Norm Hall, March 28, 2022

Proper venting of hydronic condensing boilers is critical for the safety of occupants and the successful operation of the heating plant. Part one of this two-part series introduced the materials available and what some of the code language allows. This article will provide information so the engineer and contractor can make an informed decision about what to use in condensing boiler venting materials.

Note: This article reviews the pros and cons of many materials available for venting in 2022. We will mention some key points from various codes in Michigan and Ohio. This is not an in-depth study of codes. It is important for the reader to verify all state and local codes as well as the requirements of the boiler manufacturer.

Part One of this series introduced the vent materials of PVC, CPVC, Polypro., and AL29-4C stainless. It also showed some maximum operating temperatures for each material. Let us focus on those temperatures.

Condensing Boiler Venting Temperatures

The nature of condensing hydronic boilers is their ability to operate at return water temperatures low enough to cross the dewpoint. This allows the vapor contained in the flue gas to become condensate and drain out of the boiler and vent. It drops the temperature of the flue gas.

When a boiler is condensing properly, the flue gas is about 20ºF to 30ºF above the return water temperature. What happens when the engineer designs the system, and the owner operates the system with a deep temperature difference or ΔT? Here is an example from a

previous R. L. Deppmann Monday Morning Minutes (MMM) titled Condensing Boiler Temperature Rest for Increased Efficiency.

We design the system for a supply temperature of 180°F and a return temperature of 140°F. At design, the vented gas temperature would be about 160°F to 170°F. As the return temperature drops due to boiler temperature reset, the gas temperature follows.

Will the Vent Temperature Always be Slightly Higher Than the Return?

The engineer selects the venting materials to specify for condensing boilers. Can the engineer depend on the vent temperature being 20°F higher than the design return water temperature? The simple answer is NO.

To start, there is an assumption that the terminal units will collectively provide the heat transfer scheduled at the temperatures scheduled. The terminal units are step-sized and for a given flow rate and supply temperature, the return temperature will be the variable.

Another critical issue is fouling of the heat exchanger and maintenance. Every condensing boiler manufacturer has an important maintenance schedule. Most owners do not do the required maintenance. The maintenance helps keep the efficiency high, allowing less excess temperature up the vent. Poor maintenance or boiler operating issues will show up in significant raises in flue temperatures. Temperatures well above 250°F is possible.

Another concern is whether the condensing boiler your client owns operates at the efficiency it published. One of the manufacturers we represent tested their product and a well-known competitive product. At full fire and a 130°F water temperature our boiler flue temperature was 160°F. The competitor was at 230°F!