

information

BULLETIN

Humidity: Just The Facts Please

Condensation and excessive humidity are problems often blamed on direct gas-fired heating systems. It seems so obvious since it is a fact that the combustion process of direct gas-fired heaters produces moisture. Therefore, intuition says the heaters must be to be blame. One consultant has even gone so far as to state in an article “the HVAC designer should have realized that a direct-fired heating system is not compatible with any northern climate.”

So what are the real facts?

Condensation on interior surfaces of a building is the most common indicator of a moisture problem. Condensation only occurs when moisture-bearing air 1) comes into contact with a surface whose temperature is below the dewpoint of the air, and 2) is static long enough to form a cold air film along an exposed surface so that the air cools below its dewpoint and releases some of its water.

Every building has many sources of moisture, and therefore designers must plan to prevent condensation during the design process. Sources of moisture include people, processes that use water, products that release water as they cure (such as wood and concrete) and processes that create water (such as combustion and propane fork trucks).

The principal means of preventing moisture problems are 1) creating a vapor barrier on the warm side of the wall and roof systems, and 2) improving ventilation to remove the moisture that does occur. Where these means are not employed, condensation problems can result, the seriousness of which depends on a variety of factors.

Some end users are concerned about the space getting too dry during the heating season. For example, 40% to 60% Relative Humidity (RH) is recommended for paper storage. This is a problem for indirect fired heaters that can drop humidity levels down to less than 20% during the winter.

To learn more about how heating systems affect the humidity in buildings, Cambridge expanded the scope of its Building Study program to include

datalogging RH. Readings are taken every half hour over a period of several weeks. It is extremely important to gather time-related data that shows how the heating system and the building interact. Admittedly, getting these facts requires a great deal of effort. More effort than our aforementioned engineer who also said, “I have calculated that a 1 million BTU/hr direct-fired heater will introduce over 2000 pounds of water into the building.” This simple calculation does not consider all the facts, including indoor/outdoor temperatures and RH, size and type of building or the real world operating conditions.

Studies like the one pictured below, reflect the true operation of our heating system and the building dynamics. This data shows the RH in the building can drop when our heaters are in operation and can rise when the heaters are not in operation.

Whatever intuition may say about the likelihood of moisture problems when using direct-fired heating, the facts are clear. Direct-fired heating can help solve humidity problems, not cause them!

