

## Multifamily Facility Management Services

---

### AIR ECONOMIZER AND ENTHALPY CONTROL

#### Description:

Whenever outdoor air has a lower total heat content than building air, it is possible to use it to cool the building directly, saving money by reducing operation of the air conditioning equipment. This can be accomplished by adding an automated economizer cycle to the air conditioning system. The two main components of an economizer cycle are air dampers and controls, which sequence these dampers in conjunction with the air conditioning equipment.

In order to make effective use of outdoor air for cooling, a set of dampers is required both for outdoor air and return air. One or both of these may already be existing in a system, or may need to be added. Control for the economizer cycle can be provided by a device that monitors and responds to dry bulb temperatures only, or one that monitors and responds to both dry bulb and wet bulb temperatures (sometimes called an enthalpy control).

The operation of a dry bulb temperature economizer is fairly straightforward. On a call for building cooling, a dry bulb economizer will first check the temperature of outdoor air. When this temperature is below a certain setpoint, the economizer will automatically open the outside air damper to provide 100% outside air directly to the air conditioning system to cool the building. Under some conditions, this alone will satisfy the cooling requirements. However, if additional cooling is needed, the economizer will turn on the air conditioning equipment to supplement this outside air. In addition, the amount of outside air that continues to be used by the system will be modulated by the economizer, depending on whether outside air or building return air is coolest. Above a certain outside temperature, using outside air to cool the building is not economical at all. Under these conditions, the economizer will close the outdoor air damper to the minimum position necessary to satisfy ventilation requirements, and the air conditioning equipment will function using the maximum amount of return air possible.

An enthalpy control works similarly except that it responds to both dry bulb temperature and relative humidity in the return air duct and in the outdoors. It then computes which air source will impose the least load on the cooling system and uses that source. Since the enthalpy control is measuring both temperature and humidity, it will provide a more accurate changeover point for the system. As a result, it will save more money than a simple dry bulb economizer. However, because the enthalpy control also costs much more, it is usually only recommended on systems with an air flow capacity of at least 75,000 cfm.

Generally, it is cost-effective to add an economizer cycle to large central systems, or to rooftop systems that are designed to accept one. It is difficult and costly to add an economizer to an older rooftop unit which is not designed for one. An economizer also may not be worthwhile on some very small rooftop units, even if they can accept one. Naturally, the larger the system, the quicker the economizer pays for itself.

Even if the air conditioning system in a building already has an economizer cycle, it is important that its operation is checked as part of regular system maintenance. Despite having been installed in perfect condition, economizer controls can become inaccurate with time. Mechanical wear and tear and aging of materials can affect their calibration. Enthalpy controls in particular are prone to going out of calibration. As a result, it is good practice to annually check the calibration of all economizer controls against a known reference, and to re-calibrate when necessary. This includes thermostats, humidistats and damper activators. In addition, the outside air dampers themselves should also be checked regularly for proper operation.

### **How to Implement:**

A qualified, licensed heating, ventilation and air conditioning contractor will need to be hired to install an economizer cycle on an air conditioning system. Ideally, it should be a contractor who is familiar with the brand and type of equipment in the building. The contractor should also be experienced with economizer controls so that the thermostat/humidistat controlling the outside air damper is set appropriately.

Trained maintenance staff can complete regular maintenance on the system, including calibration and repair of controls and dampers. Otherwise, a contractor can be hired to perform these annual maintenance tasks.