Looking at the picture of the economizer, what would happen if everything was operating properly except the Return air damper became stuck ½ open?

When the economizer outside air and relief air dampers fully opened the unit would not be bringing in all outside air because the return air damper would not close and some return air would bypass and mix with the air coming through the outside air damper.

When the economizer outside air and relief air dampers moved to the minimum position, the return air damper would not fully open and would restrict the airflow. This would possibly decrease the total fan CFM and increase the amount of outside air coming in and the amount of air going out through the relief damper.

Looking at the picture of the economizer, what would happen if everything was operating properly except the relief air damper became stuck wide open?

When the economizer outside air damper closes down to the minimum position, and return air damper fully opens up, a large amount of outside air will generally come back into the return through the open relief damper because it is generally closer to the suction side of the fan and has less resistance to airflow than the return duct does.

In the cooling mode, this results also in pressurizing the building without removing the heat, and may lead warm discharge air temperatures and high indoor humidity levels.

In the heating mode it results in over pressurizing the building and possibly overwhelming the heat exchanger’s design capabilities resulting in cool air being distributed.

An ERV is designed to bring in 250 CFM. It was measured with a fan powered flow hood and found to be only bringing in 150 CFM. What is the most likely cause for the low airflow?

If it is a new installation the duct could have openings (leaks), or it could be undersized. However, one should always check the filter. All filters are generally ignored by building operators.

An energy recovery ventilator (ERV) designed to remove 400 CFM is listed as 60% efficient at transferring heat. How many CFM would need to be heated or cooled to room temperature?

400 CFM would need to be heated or cooled to room temperature since all of the air would only transfer 60% of the exhausted heat.

For the ERV above, convert the CFM to fully cooled/heated and totally unheated/uncooled proportions for calculating the load easily.

The equivalent amount of air fully heated or cooled = 400 CFM × 0.60 = 240 CFM

The equivalent amount of air needing to be fully heated or cooled = 400 CFM – 240 CFM = 160 CFM

Field Notes:

Studies have been done that state the over 80% of the economizers in existing rooftop package HVAC systems are not working correctly. Damper adjustment and operation to design specifications is the weakest link in most economizer installations. Thus, verification that all of the dampers are operating together is important. Often there is the appearance that there is no relief damper and thus, no relief. In many cases the relief is a damper that is opened by building pressure located somewhere in the building. In those cases, a technician needs to make sure the building will not over pressurize in the economizer mode by placing it in the economizer mode and locating the relief damper to make sure it is set to open at a reasonable pressure. Often they are never set and they may not be located in a place where they can relieve the pressure caused by bringing in 100% outside air. For example, the relief damper may be enclosed by a fire wall in one office.