

## **Purpose**

The purpose of this visit was to investigate severe humidity issues the Veterinary Clinic had been experiencing during the hotter summer months. An evaluation of the buildings HVAC system was performed including (3) RTU's and (4) Exhaust Fans.

## **Findings**

On arrival to the clinic, building pressure was initially measured at -0.009" W.C. Thermostats for RTU-1 and RTU-3 were found in the "FAN ON" position. RTU-2 fan was set to "AUTO."

The clinic manager stated that the building had experienced humidity issues during the hotter summer months. Conditions became so severe drywall had become soft to the touch, paint had begun to peel, and paperwork became damp in the office. Clients, employees, as well as patients experienced significant discomfort.

RTU-1 airflow was read out in high speed with a flow hood. Total flow was measured at 1598/2000 cfm. The outside air damper was found closed. The unit fan speed was then increased to achieve a total airflow of 1886 cfm or 94% of design. The outside air damper was then calibrated to an outside air value of 238 cfm.

RTU-2 airflow was read out in high speed with a flow hood. Total flow was measured at 2121/3000 cfm. The outside air damper was found closed, and the motor sheave found at 5 turns open. The unit fan speed was then increased, adjusting the motor sheave to 1 turn open, to achieve a total airflow of 3077 cfm or 103% of design. The outside air damper was then calibrated to an outside air value of 343 cfm.

RTU-3 airflow was read out in high speed with a flow hood. Total flow was measured at 1606/2000 cfm. The outside air damper was found closed. The unit fan speed was then increased to achieve a total airflow of 1939 cfm or 97% of design. The outside air damper was then calibrated to an outside air value of 218 cfm.

EF-1 total exhaust was measured with a flow hood at 451 cfm out of a design of 400 cfm. The motor sheave was found at 2 turns open and the fan was slowed to 3 turns open for a total airflow of 405/400 cfm.

EF-2, EF-3, and EF-4 were measured with a flow hood and found to be with design airflows.

Discharge air temperatures were measured on all RTU's and they were found to be cooling properly although it was a mild day outside.

At the time of our visit, the following temperatures were measured:

RTU-1 space temperature: 69.3 degrees F, 46.8% Relative Humidity.

RTU-2 space temperature: 68.6 degrees F, 51.3% Relative Humidity.

RTU-3 space temperature: 68.7 degrees F, 49.2% Relative Humidity.

Above ceiling temperature: 70.2 degrees F, 48.4% Relative humidity.

Outside air temperature: 63.2 degrees F, 45.7% Relative humidity.

Thermostats were then programmed to operate the RTU's in "FAN ON" during occupied hours, from 7:15am to 6:00pm. A final building pressure was measured at 0.006" W.C.

## **Conclusion**

Overall, the building was found with several items that could have resulted in humidity issues. Major improvements to the setpoints and performance of the RTU's were made.

The RTU's were all found to have economizers closed and not set up properly inside the controller. The building as a result would have been net -701 CFM when all exhaust fans were running. This can cause humidity problems due to a large amount of unconditioned air entering the building through the building envelope. The RTU's were also found programmed speeds that would have had the RTU's running at airflows lower than designed.

The design outside air for the space would have resulted in a very positive building pressure. All units were also designed for a 20% ratio but this was reduced to 11% for each unit to limit the amount of outside air load being brought into each RTU.

After completion of balancing the RTU's are now operating at design airflow and the outside air dampers are setup to modulate to maintain a constant amount of OA. The lowest fan speeds are set so that the OA ratio will be acceptable even at the lowest speeds. The building pressure is improved to +112cfm.

## **Recommendations:**

- EF-1 should only run when the space is occupied but this controller could not be located. It is critical this be checked so that the fan does not run while the building is unoccupied since it would cause unconditioned/unheated air to be drawn into the space overnight.
- Thermostats must stay in the schedule we programmed so that the fan will run in On mode while the building is occupied. If they run in fan auto it will cause the building pressure to go negative and can cause humidity/comfort issues.
- The outside air temperatures were mild which are not ideal for testing humidity issues. Next summer if issues persist, a follow up visit by National TAB is recommended to quickly check that our set points have not changed.