

The 174-Box Audit

43 Units Fighting Themselves

BUILDING SIZE

90,000 SF

VAV BOXES AUDITED

174

BOXES IN CONFLICT

43 of 174 (25%)

WHAT HAPPENED

A client engaged HVAC Asset Management to investigate a 90,000 square-foot commercial building with two chronic problems: comfort complaints that never resolved despite constant service calls, and energy bills that seemed excessive for the building's size and occupancy. The incumbent service company had inspected the rooftop equipment thoroughly. Their conclusion was correct — every rooftop unit was operating as designed. The equipment was not the problem.

The audit moved downstream to the VAV (Variable Air Volume) distribution system. Of the 72 hot water reheat VAV boxes throughout the building, 33 were simultaneously heating and cooling. The building was paying twice for conditioned air — once to chill it at the central air handler, and a second time to reheat it at the box — while tenants experienced neither consistent temperature nor any relief from their complaints.

CORRECTIVE ACTION

A box-by-box forensic audit identified four failure modes responsible for the simultaneous heating and cooling conflict. None had been flagged by the incumbent contractor. Each represents a failure that standard PM protocols are not designed to catch.

1. Leaking or Stuck "Let-By" Reheat Valve

The Failure: The control valve that admits hot water to the reheat coil fails to close completely. Even when the BAS reports the valve at 0% open, hot water is letting by the seat and flowing through the coil.

The Consequence: The box delivers maximum cooling air while the coil simultaneously radiates heat. The two streams mix, leaving the tenant with lukewarm air and the owner with a compounding energy bill. The BAS log shows no fault because, by its measurement, the valve is closed.

Fix: valve repacking or seat replacement, typically under \$150 in parts.

2. Failed Proportional Actuator

The Failure: The actuator — the motor that physically positions the valve — loses calibration or strips its internal gears over time. No standard PM checklist tests for actuator calibration.

The Consequence: The BAS sends a signal to cool, but the actuator remains physically locked in a heating position. Because the thermostat never reaches setpoint, the system ramps up cooling air ever harder to compensate for heat it is accidentally producing.

Fix: actuator calibration or replacement, typically a 10–30 minute field procedure.

3. Simultaneous Heating/Cooling Logic Error (Deadband Failure)

The Failure: The deadband — the temperature range where neither heating nor cooling occurs — has been set too narrow or eliminated entirely by a "temporary" control override that became permanent. The controller begins hunting.

The Consequence: The system attempts to hold an exact setpoint. At 72.1°F it dumps cold air; at 71.9°F it opens the hot water valve. In a poorly programmed or overridden system, both commands trigger simultaneously.

Fix: BAS logic audit and deadband restoration — no parts required.

4. Failed Airflow Sensor (Pitot Tube)

The Failure: A clogged or failed pitot tube means the VAV box cannot measure how much air is actually flowing through it. Unable to confirm airflow, the controller defaults to a maximum-air safety position to prevent zone starvation.

The Consequence: The system simultaneously moves maximum cold air into the zone and opens the reheat valve to prevent overcooling — energy waste in both directions at once.

Fix: pitot tube cleaning or sensor replacement, a low-cost field repair that standard PM does not include.

KEY TAKEAWAY

When a contractor determines the rooftop equipment is operating correctly, the immediate focus should be the interior air system. However, in this case it was missed completely. The repair was simple: correct the VAV boxes fighting themselves. The actual repair — a valve repacking kit or a 10-minute actuator calibration — costs almost nothing by comparison. The real problem is that no one was looking. A building with 43 out of 174 boxes in simultaneous heating/cooling conflict does not fail overnight. It fails incrementally, one miscalibrated actuator and one leaking valve seat at a time, while every service report says the equipment is operating correctly. Correct operation at the equipment level does not mean the system is functioning. This is exactly what a forensic audit is designed to find — and what a standard service contract will never tell you. Especially if no one's looking.

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