

# HVAC Economizers 101

## Section #10

General Maintenance, Testing, and  
Troubleshooting of Packaged RTU  
and Central AHU Economizer

# Section #10 General Maintenance, Testing, and Troubleshooting of Packaged RTU and Central AHU Economizers

- Economizer Settings and Controls
- Air Flow Inspections and Basics
- Basic PM for AHU and RTU
- Checklists for Economizers
- Physical Inspection Tips for Any Economizer
- Utilizing Decision Tree Flow Charts
- PM Procedures for Central AHU
- PM for Air Dampers
- Troubleshooting Basics for Fan Systems

# Economizer Settings and Controls

In low humidity climates, a lower setting on the enthalpy controller is better.

- Adjust A-B-C-D setting to “D” (**Humid Climates**)
  - For changeover control, economizer should be disabled and outside air damper at minimum if outside air conditions are greater than 55°F (drybulb) or between 20 and 22 Btu/lb (enthalpy).
- Adjust A-B-C-D setting to “A” (**Dry Climates**)
  - For changeover control, economizer should be enabled and outside air damper modulate full open if outside air conditions are less than 85°F (drybulb) or between 23 and 32 Btu/lb (enthalpy).
- Need two-stage commercial thermostat to alleviate comfort problems
- An “integrated” economizer provides best energy efficiency.

# Air Flow Inspection

- Verify actual supply air flow across evaporator coil utilizing a flow grid to determine actual cfm.
- Verify minimum and maximum outside air flow with a flow grid or flow plate.
- Minimum air flow set by:
  - Minimum potentiometer on Honeywell Controls
  - Many factory RTU will have independent minimum control settings, verify with manufacturer's manuals
  - Built up AHU will have to be adjusted via the DDC control vendor

# Air Flow Measurements

- Supply and Return Air Flow
  - Traverse supply duct
  - Use flow measuring device
  
- Outside Air Flow
  - Traverse supply and return duct. Difference is outside air
  - Differential temperature method
  - Use flow measuring device

# Flow Plates Measure Air Flow Accurately



# Air Flow Basics

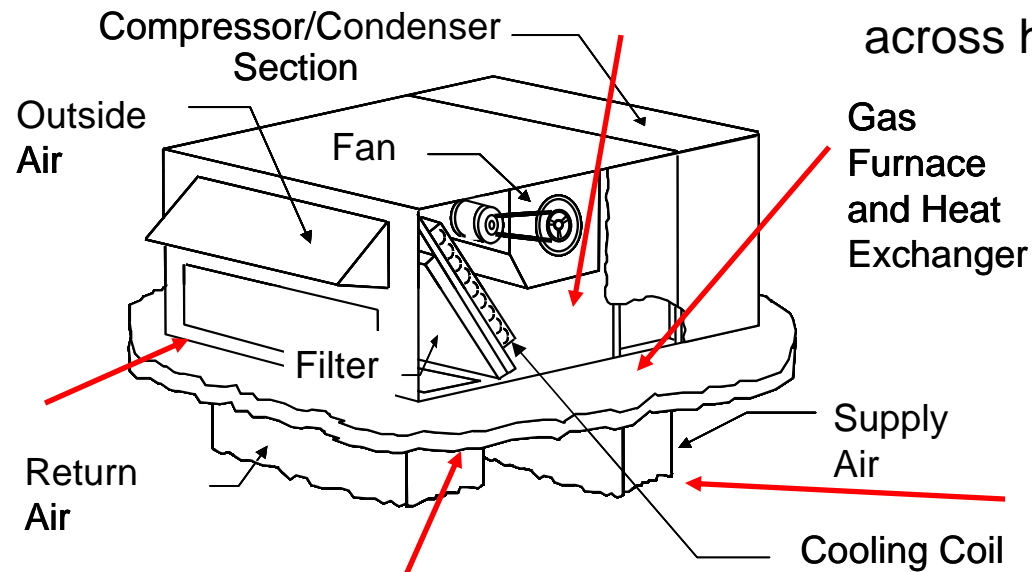
- Minimum air flow
  - Outside air too low – less than 5%
- Return damper modulates with outside air damper, depending upon economizer control routine, outside air conditions and building (or return air) temperature
- Supply air flow
  - Rule of thumb – 350 to 400 cfm/ton. Note this will vary on each job. Refer to original plans to determine design cfm.

# PM for Rooftop Units with Gas Heating and AC

Check fan belts biannually and lube motor.

Check temp. drop across heat exchanger.

Check outside air intake for blockage. Clean as needed.



Gas Furnace and Heat Exchanger

Check supply air for CO gas annually.

Supply Air

Cooling Coil

Change air filters as needed. Clean inside and outside coils annually.





# Checklist to Evaluate Economizers for Potential Operating Problems

## Basic Test for Damper Inspections

Is there an independent minimum outdoor air damper?

**Yes** - This is generally the best situation because it will allow the minimum outdoor air flow rate to be set and regulated independently from the economizer related maximum outdoor air function.

***Follow-up and Recommendations:*** Include functional testing in the inspection plan targeted at ensuring that the minimum outdoor air damper is set up properly to achieve the design intent for the system.

**No** - Lack of an independent minimum outdoor air damper can lead to economizer related operating problems. The two most likely issues are:

- The minimum flow is much higher than required because of the non-linear relationship between flow and damper stroke causing excessive energy consumption.
- Low or no minimum outdoor air flow into the building causes indoor air quality problems (IAQ) and/or problems with pressure relationships

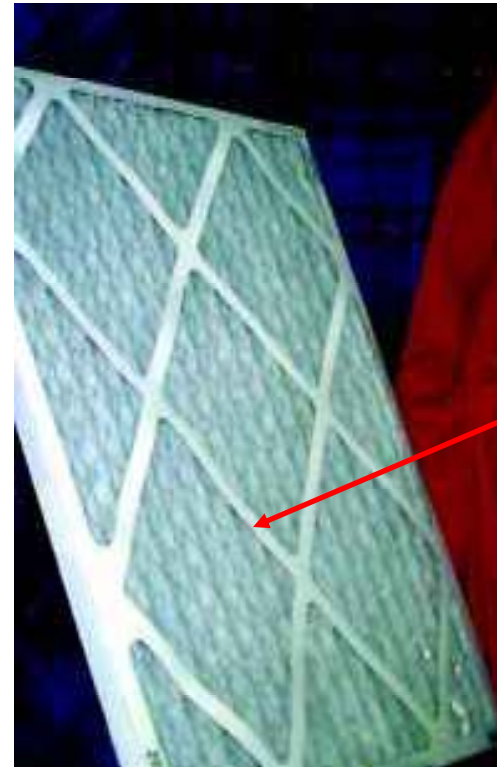
# Physical Inspections of any RTU or Built-Up AHU

- Check air filter condition
- Inspect belts
- Verify electrical connections are solid
- Repair leaks in duct system
- Verify damper operation

# Air Filters Need to be a Maintenance Priority



This is a dirty  
air filter

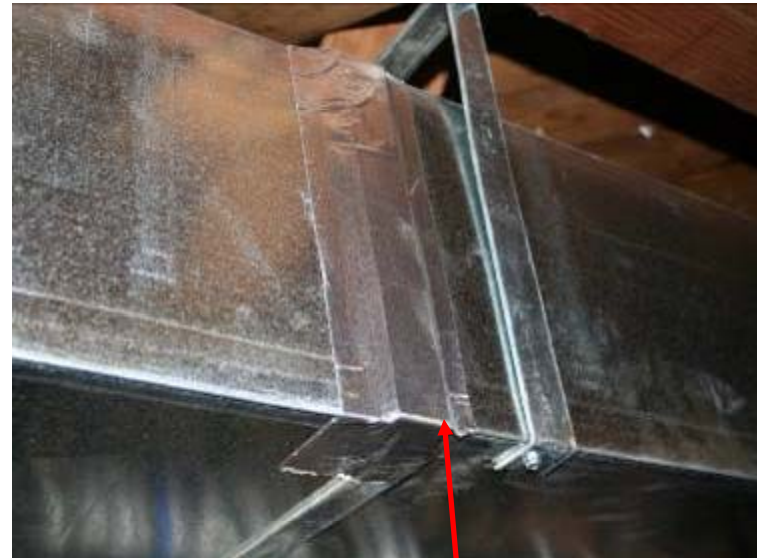


This is a  
clean air filter

# Ducts Need to be Clean, Sealed, Repaired or Replaced



This is a dirty duct

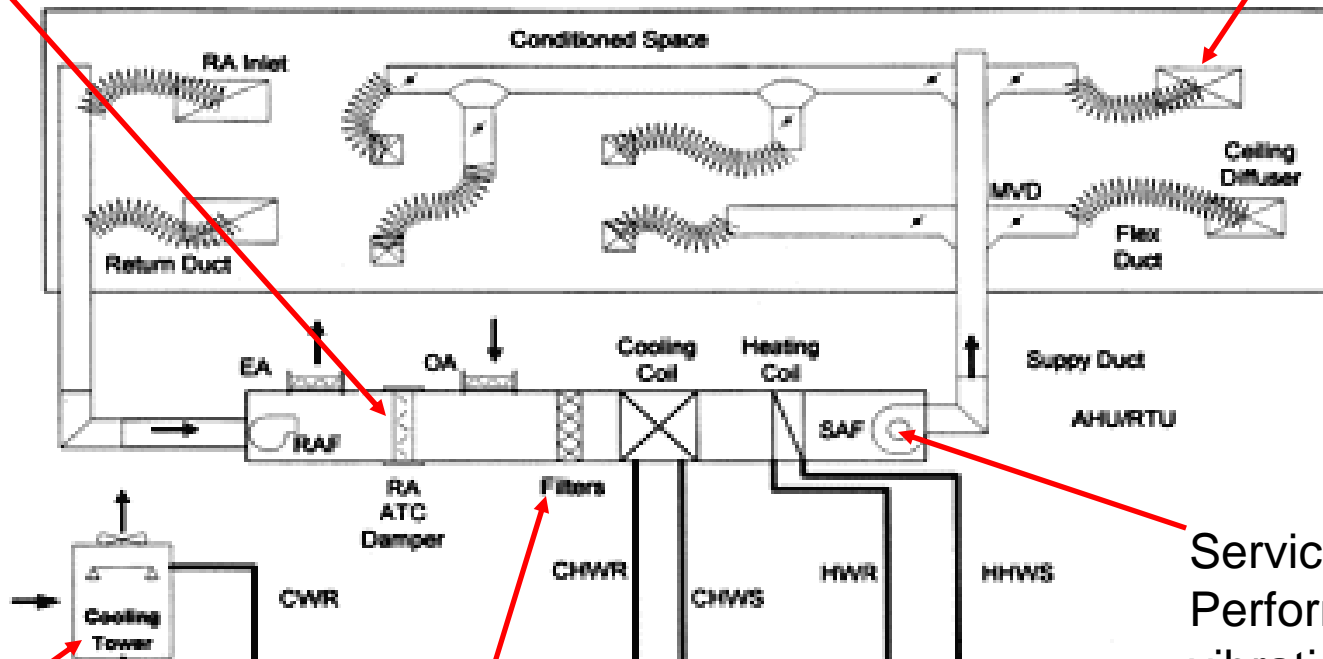


This is a sealed duct

# PM Procedures for AHU Fan and VAV and Cooling Tower Maintenance

Inspect operation of all dampers.

Inspect VAV boxes and/or ceiling diffusers.

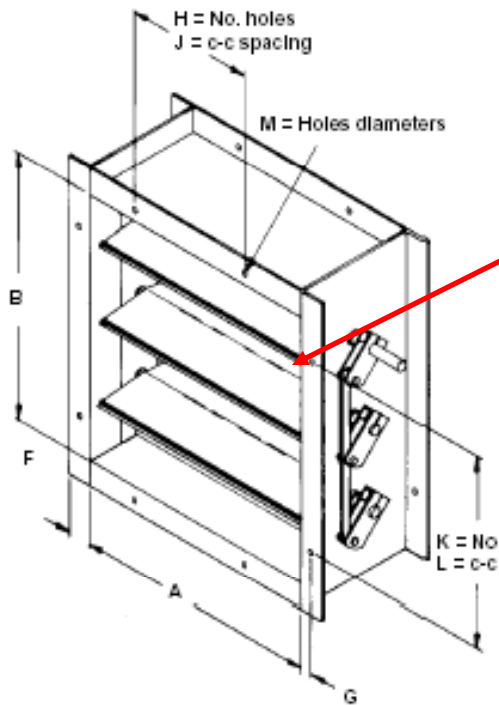


Clean cooling towers.

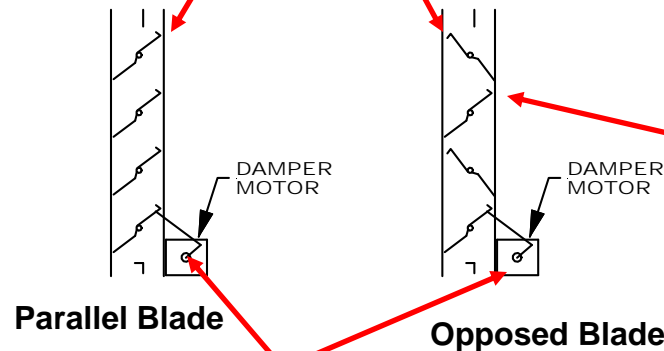
Replace or clean air filters.

Service AHU.  
Perform vibration analysis.

# PM for Air Dampers



Check damper seals and clean as needed.



Check for air leakage with damper motor powered off.

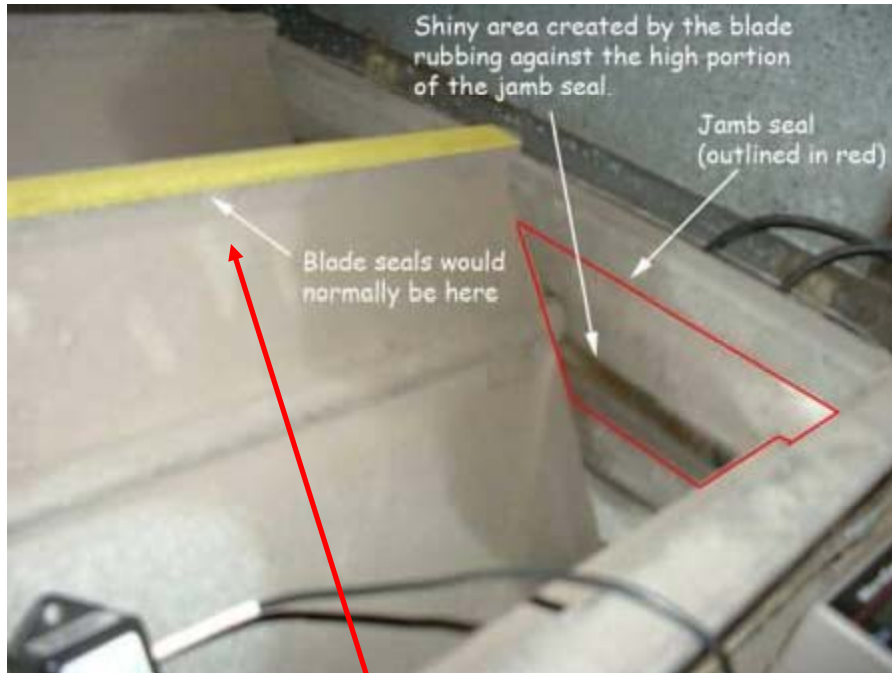
Adjust damper as needed to begin normal starting position with power off.



Ceiling Fire Dampers  
*Courtesy of Ruskin Co.*

Diagram with permission of Energy User News

# Air Dampers with Good Seals vs. Bad or No Seals



This is a good damper seal.



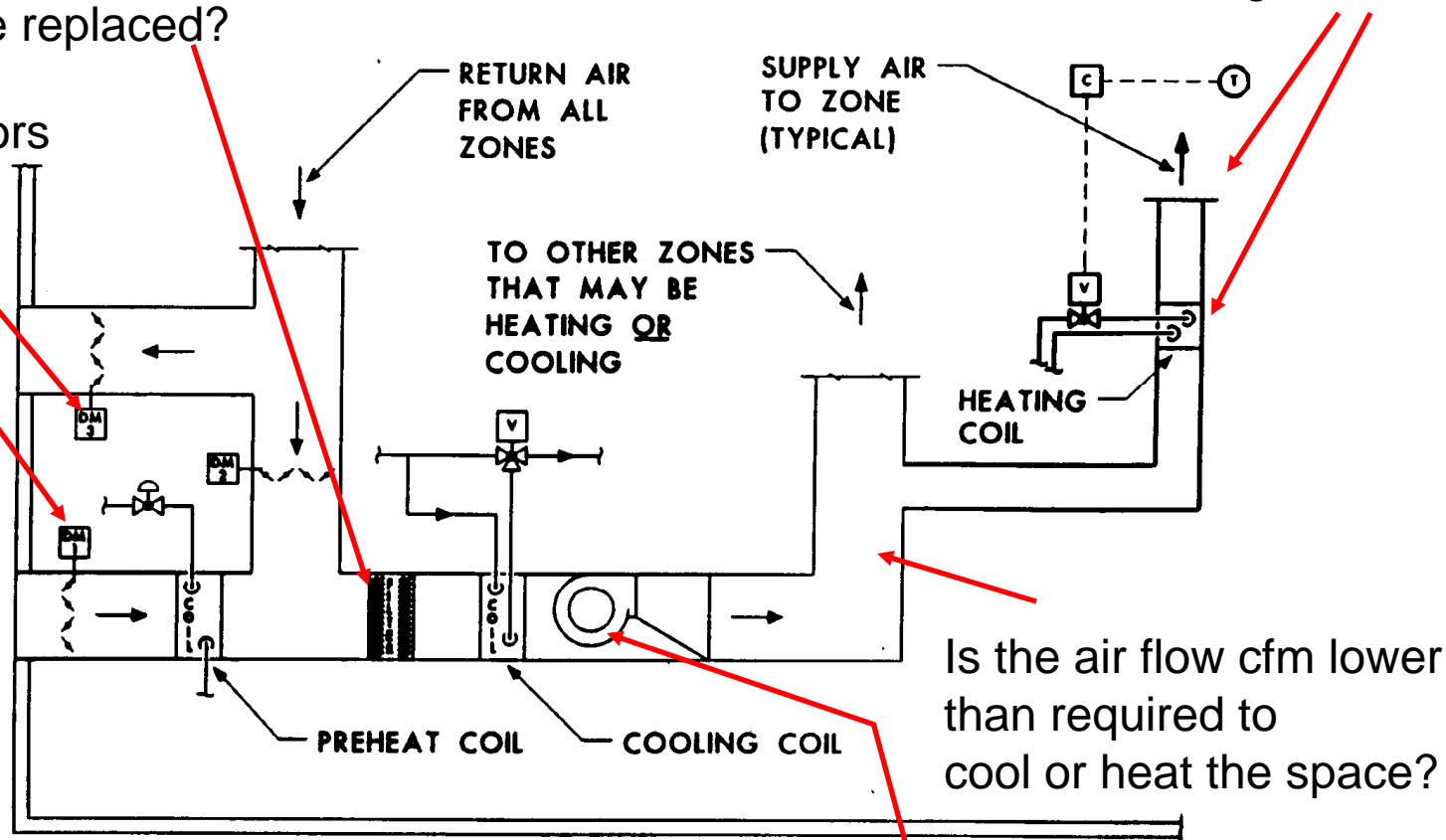
This is a bad damper seal.

# Troubleshooting Basics for Air side Economizers and Central AHU Fan Systems

Are the coils restricted?  
Are the filters dirty or need to be replaced?

High velocity air noise?  
Is the unit box restricting CFM?

Are the actuators operating?



Is the air flow cfm lower than required to cool or heat the space?

Drive or bearing noise?



## Exercise #10

(Provide Answers below on notes page)

1. In low humidity climates, what is the preferred enthalpy setting on the Honeywell controller?
2. How is minimum air flow adjusted on most economizer controls?
3. What are three physical checks that should be performed on any RTU or central AHU?
4. How is the OA damper checked for air leakage?
5. If the customer complains about air quality in the building, what key components should be checked?