### NEW Economizer Repair and Optimization

###### Description

Economizers are designed to use unconditioned outside air (OSA) instead of mechanical cooling to provide cooling when exterior conditions permit. When the OSA temperature is less than the changeover temperature (determined by a static setpoint or a reference return air sensor) up to 100% OSA is supplied to help meet the facility’s cooling needs, thus reducing mechanical cooling energy and saving energy. An economizer that is not working or is not properly adjusted can waste energy and cause comfort issues. This HVAC Economizer Optimization measure involves the repair and optimization of common economizer problems such as adjusting changeover setpoint, repairing damper motors & linkages and replacing non-working sensors and/or controllers. These repairs and adjustments result in proper operation which maximizes both occupant comfort and energy savings.

This measure is only appropriate for single zone packaged rooftop units. Custom calculations are required for savings for multi-zone systems.

In general the HVAC Economizer Optimization measure may involve both repair and/or optimization;

**Economizer Repair** – The Economizer repair work is preformed to ensure that the existing economizer is working properly. This allows the system to take advantage of free cooling and ensure that the system is not supplying an excess amount of outside air (OSA) during non-economizing periods.

* **Replace Damper Motor** – If the existing damper motor is not operational, the unit will be replaced with a functioning motor to allow proper damper modulation.
* **Repair Damper linkage** – If the existing linkage is broken or not adjusted properly, the unit will be replaced or adjusted to allow proper damper modulation.
* **Repair Economizer Wiring** – If the existing economizer is not operational due to a wiring issue, the issue will be repaired to allow proper economizer operation.
* **Reduce Over Ventilation** – If the unit is supplying excess OSA, the OSA damper position will be adjusted to meet minimum ventilation requirements.
* **Economizer Sensor Replacement** – If the unit is equipped with a nonadjustable dry bulb (i.e. snapdisk) or malfunctioning analog sensor, the sensor is replaced with a new selectable sensor.
* **Economizer Control Replacement** – If the existing economizer controller is not operational, the unit will be replaced or upgraded to allow for proper economizer operation.

**Economizer Optimization**- The economizer optimization work is preformed to ensure that the existing economizer system is set up properly to maximize use of free cooling for units located in a particular climate zone.

* **Economizer Changeover Setpoint Adjustment** – If the unit is equipped with a fully operational economizer, the controller is adjusted to the appropriate changeover setpoint based on ASHRAE 90.1 (Figure 1 - *Table 6.5.1.1.3 High-Limit Shutoff Control Settings for Air Economizers)* for the corresponding climate zone.
* **Enable Integrated Operation** – If the unit is equipped with a fully operational economizer and is not set up to allow a minimum of two stages of cooling (1st stage – Economizer Only & 2nd Stage – Economizer & Mechanical cooling), the unit will be wired to allow two stage cooling

This measure was developed to be applicable to the following program types:  RF, DI.

If applied to other program types, the measure savings should be verified.

###### Definition of Efficient Equipment

The efficient equipment condition is defined by fully functional economizer that is programmed to meet ASHRAE 90.1 economizer changeover setpoint requirements for the facility’s climate zone and changeover control type (Figure 1 - Table 6.5.1.1.3 High-Limit Shutoff Control Settings for Air Economizers)[[1]](#footnote-1).

Figure 1 – Baseline ASHRAE High-Limit Shutoff Control Settings

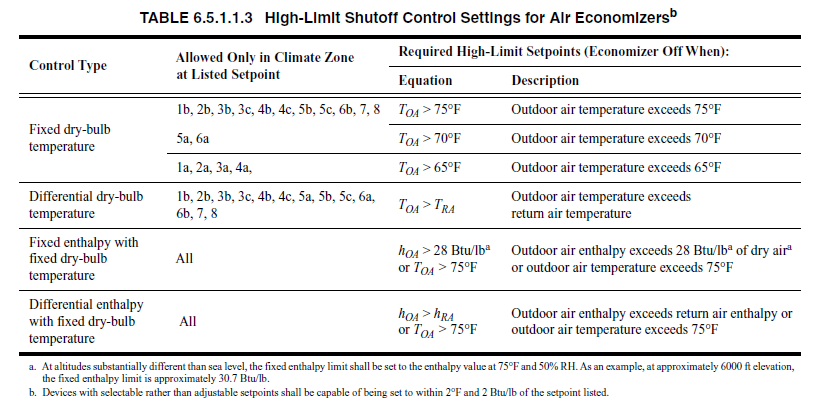
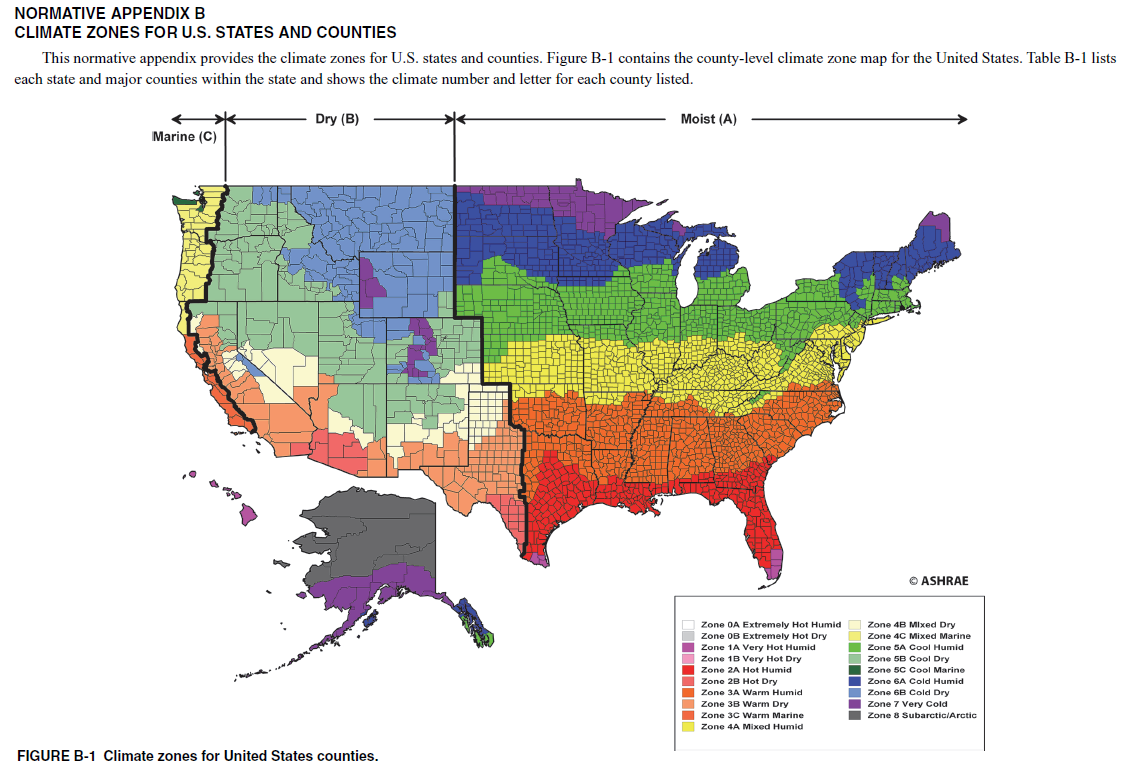


Figure 2 – ASHRAE Climate Zone Map



###### Definition of Baseline Equipment

The baseline for this measure is an existing economizer installed on a packaged single zone rooftop HVAC unit. The existing economizer system is currently not operating as designed due to mechanical and/or control problems, and/or is not optimally adjusted.

###### Deemed Lifetime of Efficient Equipment

The measure life is assumed to be 5 years[[2]](#footnote-2).

###### Deemed Measure Cost

The cost for this measure can vary considerably depending upon the existing condition of the economizer and the work required to achieve the required efficiency levels. Measure cost should be determined on a site-specific basis.

###### Loadshape

Loadshape C03 - Commercial Cooling

###### Coincidence Factor

N/A

Algorithm

###### Calculation of Energy Savings

The savings calculation methodology uses a regression equation to calculate the energy savings for a variety of common situations[[3]](#footnote-3).

###### Electric Energy Savings

∆kWh = [Baseline Energy Use (kWh/Ton) – Proposed Energy Use (kWh/Ton)] \* Cooling Capacity (Tons)

The following equations are used to calculate baseline and proposed electric energy use[[4]](#footnote-4).

Electric Energy Use Equations (kWh / ton)

| **Building Type** | **Changeover Type** | **Equation** |
| --- | --- | --- |
| Assembly | Fixed Dry-Bulb (DB) | cz+CSP\*-2.021+EL\*-16.362+OAn\*1.665+OAx\*-3.13 |
| Dual Temperature Dry-Bulb (DTDB) | cz+EL\*-11.5+OAn\*1.635+OAx\*-2.817 |
| Dual Temperature Enthalpy (DTEnth) | cz+EL\*-17.772+OAn\*1.853+OAx\*-3.044 |
| Fixed Enthalpy (Enth) | cz+CSP\*-5.228+EL\*-17.475+OAn\*1.765+OAx\*-3.003 |
| Analog ABCD Economizers (ABCD) | cz+CSP\*-2.234+EL\*-16.394+OAn\*1.744+OAx\*-3.01 |
| Convenience Store | DB | cz+CSP\*-2.021+EL\*-16.362+OAn\*1.665+OAx\*-3.13 |
| DTDB | cz+EL\*-11.5+OAn\*1.635+OAx\*-2.817 |
| DTEnth | cz+EL\*-17.772+OAn\*1.853+OAx\*-3.044 |
| Enth | cz+CSP\*-5.228+EL\*-17.475+OAn\*1.765+OAx\*-3.003 |
| ABCD | cz+CSP\*-2.234+EL\*-16.394+OAn\*1.744+OAx\*-3.01 |
| Office - Low Rise | DB | cz+CSP\*-3.982+EL\*-27.508+OAn\*2.486+OAx\*-4.684 |
| DTDB | cz+EL\*-20.798+OAn\*2.365+OAx\*-3.773 |
| DTEnth | cz+EL\*-30.655+OAn\*2.938+OAx\*-4.461 |
| Enth | cz+CSP\*-8.648+EL\*-25.678+OAn\*2.092+OAx\*-3.754 |
| ABCD | cz+CSP\*-3.64+EL\*-24.927+OAn\*2.09+OAx\*-3.788 |
| Religious Facility | DB | cz+CSP\*-0.967+EL\*-6.327+OAn\*2.87+OAx\*-1.047 |
| DTDB | cz+OAn\*2.968+OAx\*-0.943 |
| DTEnth | cz+EL\*-9.799+OAn\*3.106+OAx\*-1.085 |
| Enth | cz+CSP\*-2.773+EL\*-7.392+OAn\*2.941+OAx\*-0.974 |
| ABCD | cz+CSP\*-1.234+EL\*-7.229+OAn\*2.936+OAx\*-0.995 |
| Restaurant | DB | cz+CSP\*-1.131+OAn\*3.542+OAx\*-1.01 |
| DTDB | cz+EL\*-10.198+OAn\*4.056+OAx\*-1.279 |
| DTEnth | cz+OAn\*3.775+OAx\*-1.031 |
| Enth | cz+CSP\*-2.13+OAn\*3.317+OAx\*-0.629 |
| ABCD | cz+CSP\*-0.95+OAn\*3.313+OAx\*-0.647 |
| Retail - Department Store | DB | cz+CSP\*-2.243+EL\*-21.523+OAx\*-1.909 |
| DTDB | cz+EL\*-14.427+OAn\*0.295+OAx\*-1.451 |
| DTEnth | cz+EL\*-25.99+OAn\*0.852+OAx\*-1.951 |
| Enth | cz+CSP\*-4.962+EL\*-16.868+OAn\*-0.12+OAx\*-1.418 |
| ABCD | cz+CSP\*-2.115+EL\*-16.15+OAn\*-0.125+OAx\*-1.432 |
| Retail - Strip Mall | DB | cz+CSP\*-1.003+OAn\*3.765+OAx\*-0.938 |
| DTDB | cz+OAn\*3.688+OAx\*-0.676 |
| DTEnth | cz+OAn\*4.081+OAx\*-1.072 |
| Enth | cz+CSP\*-2.545+OAn\*3.725+OAx\*-0.788 |
| ABCD | cz+CSP\*-1.175+OAn\*3.708+OAx\*-0.809 |

Where:

CZ = Climate Zone Coefficient

*=* Depends on Building Type and Changover Type (see table below)

|  |  | **Electric Climate Zone Coefficients** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Building Type** | **Changeover Type** | **CZ1**  **(Rockford)** | **CZ2**  **(Chicago)** | **CZ3 (Springfield)** | **CZ4 (Belleville)** | **CZ5 (Marion)** |
| Assembly | DB | 874.07 | 886.73 | 1043.38 | 1071.48 | 1072.20 |
| DTDB | 698.45 | 711.89 | 870.13 | 899.51 | 903.10 |
| DTEnth | 702.06 | 715.42 | 873.43 | 902.76 | 906.50 |
| Enth | 851.95 | 865.43 | 1020.65 | 1047.10 | 1053.32 |
| ABCD | 884.19 | 897.63 | 1053.12 | 1080.58 | 1086.35 |
| Convenience Store | DB | 1739.12 | 1787.09 | 2128.78 | 2206.65 | 2245.93 |
| DTDB | 1389.28 | 1436.30 | 1780.99 | 1863.45 | 1904.89 |
| DTEnth | 1398.42 | 1446.82 | 1789.71 | 1869.89 | 1912.59 |
| Enth | 1643.51 | 1691.34 | 2032.83 | 2112.21 | 2157.63 |
| ABCD | 1692.80 | 1740.62 | 2082.35 | 2162.73 | 2207.68 |
| Office - Low Rise | DB | 674.06 | 687.17 | 899.17 | 993.84 | 989.16 |
| DTDB | 583.62 | 597.02 | 811.39 | 907.61 | 903.58 |
| DTEnth | 588.94 | 602.11 | 816.02 | 912.49 | 908.26 |
| Enth | 668.83 | 682.23 | 893.61 | 987.52 | 986.59 |
| ABCD | 690.27 | 703.52 | 915.27 | 1009.94 | 1008.59 |
| Religious Facility | DB | 613.26 | 630.50 | 853.53 | 923.99 | 931.74 |
| DTDB | 518.40 | 535.45 | 760.76 | 832.57 | 840.72 |
| DTEnth | 513.59 | 531.20 | 756.26 | 829.13 | 837.26 |
| Enth | 576.94 | 594.17 | 817.64 | 888.37 | 897.18 |
| ABCD | 593.78 | 611.04 | 834.69 | 905.83 | 914.27 |
| Restaurant | DB | 1397.27 | 1430.45 | 1763.21 | 1837.63 | 1872.18 |
| DTDB | 1191.82 | 1225.12 | 1558.32 | 1633.95 | 1669.13 |
| DTEnth | 1192.84 | 1226.77 | 1559.41 | 1635.13 | 1671.11 |
| Enth | 1343.56 | 1377.52 | 1710.11 | 1783.66 | 1821.67 |
| ABCD | 1373.72 | 1407.70 | 1740.43 | 1814.74 | 1852.55 |
| Retail - Department Store | DB | 717.89 | 730.07 | 968.85 | 1034.78 | 1035.06 |
| DTDB | 628.83 | 641.70 | 883.37 | 951.09 | 951.33 |
| DTEnth | 629.35 | 641.90 | 882.84 | 951.33 | 951.44 |
| Enth | 705.06 | 717.99 | 956.42 | 1020.57 | 1024.45 |
| ABCD | 728.60 | 741.47 | 980.19 | 1045.30 | 1048.57 |
| Retail - Strip Mall | DB | 800.69 | 818.68 | 1070.39 | 1129.87 | 1133.84 |
| DTDB | 692.97 | 711.31 | 965.63 | 1026.68 | 1030.41 |
| DTEnth | 698.12 | 716.34 | 970.06 | 1031.78 | 1035.72 |
| Enth | 784.54 | 803.35 | 1054.37 | 1112.72 | 1120.74 |
| ABCD | 810.10 | 828.86 | 1080.11 | 1139.39 | 1146.95 |

CSP = Economizer Changeover Setpoint (°F or Btu/lb) (actual in ranges below)

|  |  |  |
| --- | --- | --- |
| **Economizer Control Type** | | **Economizer Changeover Setpoint** |
| Dry-Bulb | | 60°F - 80°F |
| Dual Temperature Dry-Bulb | | 0°F -5°F delta |
| Dual Temperature Enthalpy | | 0 Btu/lb -5 Btu/lb delta |
| Enthalpy | | 18 Btu/lb – 28 Btu/lb |
| Analog ABCD Economizers | A | 73°F |
| B | 70°F |
| C | 67°F |
| D | 63°F |
| E | 55°F |

EL = Integrated Economizer Operation (Economizer Lockout)

= 0 for Economizer w/ Integrated Operation (Two Stage Cooling)

= 1 for Economizer w/ out Integrated Operation fan that runs intermittently (One Stage Cooling)

Oan = Minimum Outside Air (% OSA)[[5]](#footnote-5)

= Actual. Must be between 15% -70%. If unknown assume

Functional Economizer – 30%

Non functional Economizer (Damper failed closed) – 15%

Non functional Economizer (Damper failed open) - 30% (Assume Minimum Ventilation (Three Fingers)[[6]](#footnote-6))

Oax = Maximum Outside Air (%)i

= Actual. Must be between 15% -70%. If unknown assume

Functional Economizer – 70%

Non functional Economizer (Damper failed closed) – 15%

Non functional Economizer (Damper failed open) –– 30% (Assume Minimum Ventilation (Three Fingers))

**EXAMPLE**

A low rise office building in Rockford (Climate Zone 1) is heated and cooled with a packaged Gas (92 kBtu output) / DX (5 Ton) RTU. The RTU is equipped with a fixed dry-bulb outside air economizer and is programed for integrated operation. When the technician inspects the RTU they find that the changeover setpoint is programmed to 62°F, which does not meet ASHRAE economizer high limit shut off air economizer recommendations. After further investigation it is found that the OSA damper motor is not operational and is providing 30% outside air.

The technician replaces the damper motor and allow for proper OSA damper modulation (30% Min OSA & 70% Max OSA). They also adjust the fixed dry-bulb changeover setpoint to meet the ASHRAE economizer high limit shut off air economizer recommendation of 70°F.

∆kWh = [Baseline Energy Use (kWh/Ton) – Proposed Energy Use (kWh/Ton)] \* Cooling Capacity (Tons)

Baseline Energy Use (kWh/Ton) = Equation for Office Low Rise

= cz+CSP\*-0.967+EL\*-6.327+OAn\*2.87+OAx\*-1.047

= 674.06+62\*-0.967+0\*-6.327+30\*2.87+30\*-1.047

= 668.8 kWh/Ton

Proposed Energy Use (kWh/Ton) = Equation for Office Low Rise

= cz+CSP\*-0.967+EL\*-6.327+OAn\*2.87+OAx\*-1.047

= 674.06+70\*-0.967+0\*-6.327+ 30\*2.87+70\*-1.047

= 619.2 kWh/Ton

∆kWh = [668.8 (kWh/Ton) – 619.2 (kWh/Ton)] \* 5 Tons

= 49.6 kWh/Ton \* 5 Tons

= 248.08 kWh

###### Summer Coincident Peak Demand Savings

N/A - It is assumed that repair or optimization of the economizer will not typically have a significant impact summer peak demand.

###### Natural Gas Savings

∆Therms = [Baseline Energy Use (Therms/kBtuh) – Proposed Energy Use (Therms/kBtuh)] \* Output Heating Capacity (kBtuh)

The following equations are used to calculate baseline and proposed electric energy use.

Natural Gas Energy Use Equations (therms / kbtu output)

| **Building Type** | **Changeover Type** | **Equation** |
| --- | --- | --- |
| Assembly | Fixed Dry-Bulb (DB) | cz+OAn\*0.0853 |
| Dual Temperature Dry-Bulb (DTDB) | cz+OAn\*0.0866 |
| Dual Temperature Enthalpy (DTEnth) | cz+OAn\*0.0866 |
| Fixed Enthalpy (Enth) | cz+OAn\*0.0855 |
| Analog ABCD Economizers (ABCD) | cz+OAn\*0.0855 |
| Convenience Store | DB | cz+OAn\*0.26 |
| DTDB | cz+OAn\*0.263 |
| DTEnth | cz+OAn\*0.263 |
| Enth | cz+OAn\*0.261 |
| ABCD | cz+OAn\*0.261 |
| Office - Low Rise | DB | cz+OAn\*0.3 |
| DTDB | cz+OAn\*0.301 |
| DTEnth | cz+OAn\*0.301 |
| Enth | cz+OAn\*0.3 |
| ABCD | cz+OAn\*0.3 |
| Religious Facility | DB | cz+OAn\*0.35 |
| DTDB | cz+OAn\*0.348 |
| DTEnth | cz+OAn\*0.348 |
| Enth | cz+OAn\*0.349 |
| ABCD | cz+OAn\*0.349 |
| Restaurant | DB | cz+OAn\*0.0867 |
| DTDB | cz+OAx\*-0.038+OAn\*OAx\*0.00149 |
| DTEnth | cz+OAx\*-0.038+OAn\*OAx\*0.00149 |
| Enth | cz+OAn\*0.0878 |
| ABCD | cz+OAn\*0.0878 |
| Retail - Department Store | DB | cz+OAn\*0.319 |
| DTDB | cz+OAn\*0.318 |
| DTEnth | cz+OAn\*0.318 |
| Enth | cz+OAn\*0.318 |
| ABCD | cz+OAn\*0.318 |
| Retail - Strip Mall | DB | cz+OAn\*0.215 |
| DTDB | cz+OAn\*0.216 |
| DTEnth | cz+OAn\*0.216 |
| Enth | cz+OAn\*0.215 |
| ABCD | cz+OAn\*0.215 |

Where:

CZ = Climate Zone Coefficient

*=* Depends on Building Type and Changover Type (see table below)

|  |  | **Natural Gas Climate Zone Coefficients** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Building Type** | **Changeover Type** | **CZ1**  **(Rockford)** | **CZ2**  **(Chicago)** | **CZ3 (Springfield)** | **CZ4 (Belleville)** | **CZ5 (Marion)** |
| Assembly | DB | -0.03 | -0.55 | -1.06 | -1.28 | -1.71 |
| DTDB | -0.02 | -0.57 | -1.11 | -1.34 | -1.79 |
| DTEnth | -0.02 | -0.57 | -1.11 | -1.34 | -1.79 |
| Enth | -0.03 | -0.55 | -1.06 | -1.29 | -1.72 |
| ABCD | -0.03 | -0.55 | -1.06 | -1.29 | -1.72 |
| Convenience Store | DB | 2.95 | 0.50 | -1.48 | -2.96 | -5.56 |
| DTDB | 3.06 | 0.52 | -1.56 | -3.11 | -5.81 |
| DTEnth | 3.06 | 0.52 | -1.56 | -3.11 | -5.81 |
| Enth | 2.96 | 0.50 | -1.49 | -2.98 | -5.59 |
| ABCD | 2.96 | 0.50 | -1.49 | -2.98 | -5.59 |
| Office - Low Rise | DB | 5.83 | 3.02 | 0.46 | -0.92 | -4.13 |
| DTDB | 5.98 | 3.08 | 0.41 | -1.03 | -4.36 |
| DTEnth | 5.98 | 3.08 | 0.41 | -1.03 | -4.36 |
| Enth | 5.85 | 3.03 | 0.46 | -0.93 | -4.16 |
| ABCD | 5.85 | 3.03 | 0.46 | -0.93 | -4.16 |
| Religious Facility | DB | 9.23 | 6.71 | 3.75 | 2.40 | -0.80 |
| DTDB | 9.41 | 6.83 | 3.77 | 2.39 | -0.86 |
| DTEnth | 9.41 | 6.83 | 3.77 | 2.39 | -0.86 |
| Enth | 9.25 | 6.73 | 3.75 | 2.40 | -0.80 |
| ABCD | 9.25 | 6.73 | 3.75 | 2.40 | -0.80 |
| Restaurant | DB | 8.30 | 6.54 | 4.94 | 4.00 | 1.95 |
| DTDB | 10.51 | 8.71 | 7.07 | 6.10 | 4.00 |
| DTEnth | 10.51 | 8.71 | 7.07 | 6.10 | 4.00 |
| Enth | 8.28 | 6.51 | 4.91 | 3.96 | 1.90 |
| ABCD | 8.28 | 6.51 | 4.91 | 3.96 | 1.90 |
| Retail - Department Store | DB | 8.20 | 5.86 | 3.19 | 1.25 | -2.59 |
| DTDB | 8.35 | 5.94 | 3.18 | 1.18 | -2.75 |
| DTEnth | 8.35 | 5.94 | 3.18 | 1.18 | -2.75 |
| Enth | 8.21 | 5.87 | 3.18 | 1.24 | -2.61 |
| ABCD | 8.21 | 5.87 | 3.18 | 1.24 | -2.61 |
| Retail - Strip Mall | DB | 6.40 | 4.35 | 2.07 | 0.49 | -2.18 |
| DTDB | 6.51 | 4.38 | 2.03 | 0.39 | -2.34 |
| DTEnth | 6.51 | 4.38 | 2.03 | 0.39 | -2.34 |
| Enth | 6.41 | 4.35 | 2.06 | 0.48 | -2.20 |
| ABCD | 6.41 | 4.35 | 2.06 | 0.48 | -2.20 |

**EXAMPLE**

A low rise office building in Rockford (Climate Zone 1) is heated and cooled with a packaged Gas (92 kBtu output) / DX (5 Ton) RTU. The RTU is equipped with a fixed dry-bulb outside air economizer and is programed for integrated operation. When the technician inspects the RTU they find that the changeover setpoint is programmed to 62°F, which does not meet ASHRAE economizer high limit shut off air economizer recommendations. After further investigation it is found the OSA damper motor is not operational and is providing 30% outside air.

The technician replaces the damper motor and allow for proper OSA damper modulation (30% Min OSA & 70% Max OSA). They also adjust the fixed dry-bulb changeover setpoint to meet the ASHRAE economizer high limit shut off air economizer recommendation of 70°F.

∆Therms = [Baseline Energy Use (Therms/kBtuh) – Proposed Energy Use(Therms/kBtuh)] \* Output Heating Capacity (kBtuh)

Baseline Energy Use (Therms/kBtuh) = Equation for Office Low Rise

= cz+OAn\*0.3

= 5.83+30\*.3

=14.8 Therms/kBtuh output

Proposed Energy Use (Therms/kBtuh) = Equation for Office Low Rise

= cz+OAn\*0.3

= 5.83+30\*.3

=14.8 Therms/kBtuh output

∆Therms = [14.8(Therms/kBtuh output) – 14.8 (Therms/kBtuh output)] \* 92kBtuh output

= 0.0 (Therms/kBtuh output) \* 92kBtuh output

= 0 Therms

###### Water Impact Descriptions and Calculation

N/A

**DEEMED O&M COST ADJUSTMENT CALCULATION**

N/A

**MEASURE CODE: CI-HVC-ECRP-V01-160601**

1. ASHRAE, Standard 90.1-2013 - https://www.ashrae.org/resources--publications/bookstore/standard-90-1 [↑](#footnote-ref-1)
2. [California Public Utilities Commission, DEER 2014 EUL Table D08 v2.05](http://www.deeresources.com/files/DEER2013codeUpdate/download/DEER2014-EUL-table-update_2014-02-05.xlsx) [↑](#footnote-ref-2)
3. For more information on methodology, please refer to workpaper submitted by CLEAResult titled “CLEAResult\_Economizer Repair\_151020\_Finalv2.doc”. Note that the original ComEd eQuest models were used in the analysis, rather than the VEIC developed models used elsewhere. VEIC do not consider this a significant issue as adjustments from the ComEd models were focused on calibrating EFLH values, not to overall energy use metrics. We also believe using the ComEd models is likely more conservative. It may be appropriate to update the analysis with the updated models at a later time. [↑](#footnote-ref-3)
4. This approach allows the savings estimate to account for the operational attributes of the baseline as well as the proposed case, yielding a better estimate than an approach that assumes a particular baseline or proposed energy use to determine savings. [↑](#footnote-ref-4)
5. DNV GL, “HVAC Impact Evaluation Final Report WO32 HVAC – Volume 1: Report,” California Public Utilities Commission, Energy Division, HVAC Commercial Quality Maintenance (CQM) (1/28/14) [↑](#footnote-ref-5)
6. Technician rule of thumb taken from CPUC ‘HVAC Impact Evaluation Final Report’, WO32, 28Jan 2015, p18. [↑](#footnote-ref-6)