General Information

Site ID #

Surveyor Name: Building Name:

Date: Primary Contact: Phone:

Building Address:

City Zip

Start Time: Finish Time:

Interview Questions

The following interview questions will be used to help us identify unobservable aspects of your building. These aspects include occupancy history, schedules, and heating and cooling controls. Answers to these questions will be coupled with data collected from our walk-through audit to produce a computer model which simulates the annual energy use of the building.

Building Overview

Q1. What is the overall floor area affected by the new construction/remodeling/renovation at the site?

. Compare this value to the square footage value located on the “On- Site Form”. Please comment on any discrepancies below.

Q2. What is the floor area served by small HVAC units?

❏ same as overall building floor area

❏ SF

Q3. How many floors?

Q4. Characterize the site by circling the appropriate description:

1. New building (“green field”)

2. Alteration of existing building

3. Addition to existing building

4. Alteration of existing building and addition to existing building

Q5. Circle the appropriate building type description:

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | Large office | 11 | Hospital |
| 2 | Small office | 12 | Medical Clinic |
| 3 | Restaurants | 13 | Hotel/Motel |
| 4 | Large retail | 14 | Miscellaneous |
| 5 | Small Retail |  |  |
| 6 | Food Stores |  |  |
| 7 | Refrigerated Warehouse |  |  |
| 8 | Non-Refrigerated Warehouse |  |  |
| 9 | Elementry / Secondary School |  |  |
| 10 | College / University |  |  |

Building Areas

Q6. Which statement best describes the operation of the building?

( ) The entire building operates on basically the same schedule

( ) There are areas of the building (departments, tenants, etc.) that have substantially different operating schedules

Q7. If different areas of the building (departments, tenants, etc.) have substantially different operational schedules, divide the building into up to five areas with differing schedules, and provide a name for each area:

1.

2.

3.

4.

5.

Notes:

|  |  |  |
| --- | --- | --- |
| ❏ Building-Wide | - or - | Area # and Area Name |
| (fill out only one page) |  | (fill out one page per area) |

Schedules

The following questions will help us establish schedules for the building.

Q8. What would be the best way to group the days of the week to describe the operation of this area?

One of the three operation levels must be assigned to each day of the week.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | M | Tu | W | Th | F | Sa | Su | Holiday |
| Full operation: | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ |
| Light operation: | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ |
| Closed: | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ | ❏ |

Q9. Are there any months that this area has higher or lower than normal operating hours? Indicate months of increased or decreased operating hours. Normal (100%) is assumed for blank entries.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Lighting | HVAC | Equip and Process |
| % of Normal | % of Normal | % of Normal |
| Jan | % | % | % |
| Feb | % | % | % |
| Mar | % | % | % |
| Apr | % | % | % |
| May | % | % | % |
| Jun | % | % | % |
| Jul | % | % | % |
| Aug | % | % | % |
| Sep | % | % | % |
| Oct | % | % | % |
| Nov | % | % | % |
| Dec | % | % | % |

Q10. Which holidays are observed (check all that apply)

❏ New Years day ❏ MLK day ❏ Presidents’ day ❏ Easter days

❏ Memorial day ❏ July 4th ❏ Labor day ❏ Columbus day

❏ Veteran’s day ❏ Thanksgiving days ❏ Christmas days

Note: Holidays for 2001

|  |  |  |  |
| --- | --- | --- | --- |
| Holiday | Day/Date | Holiday | Day/Date |
| New Years day | Mon Jan 1 | Labor day | Mon Sep 3 |
| MLK day | Mon Jan 15 | Columbus day | Mon Oct 8 |
| Presidents’ day | Mon Feb 19 | Veteran’s day | Sun Nov 11 |
| Easter | Sun Apr 15 | Thanksgiving | Thur Nov 22 |
| Memorial day | Mon May 28 | Christmas | Tue Dec 25 |
| July 4th | Wed Jul 4 |  |  |

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| ❏ Building-Wide | - or - | Area # and Area Name |
| (fill out only one page) |  | (fill out one page per area) |

Q11. Draw a line that describes the occupancy schedule for a full operation day.

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Hour

Q12. Draw a line that describes the occupancy schedule for a light operation day.

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Hour

Q13. Draw a line that describes the occupancy schedule for a closed operation day.

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| ❏ Building-Wide | - or - | Area # and Area Name |
| (fill out only one page) |  | (fill out one page per area) |

Q14. Draw a line that describes the schedule of use for interior lighting for a full operation day.

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Hour

Q15. Draw a line that describes the schedule of use for interior lighting for a light operation day.

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Hour

Q16. Draw a line that describes the schedule of use for interior lighting for a closed operation day.

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| ❏ Building-Wide | - or - | Area # and Area Name |
| (fill out only one page) |  | (fill out one page per area) |

Miscellaneous equipment and plug loads refer to any electrical equipment located in the conditioned space which is not lighting or HVAC

Q17. Draw a line that describes the schedule of use for miscellaneous equipment and plug loads for a full operation day.

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Q18. Draw a line that describes the schedule of use for miscellaneous equipment and plug loads for a light operation day.

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Hour

Q19. Draw a line that describes the schedule of use for miscellaneous equipment and plug loads for a closed operation day.

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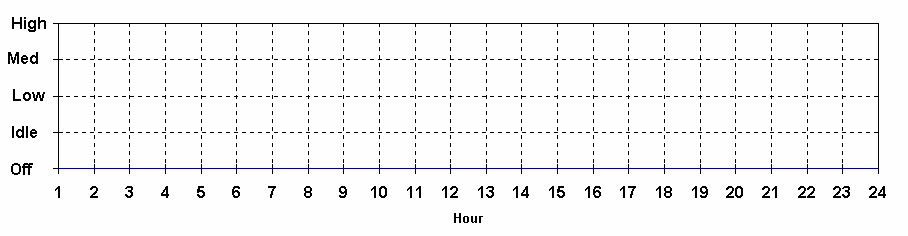
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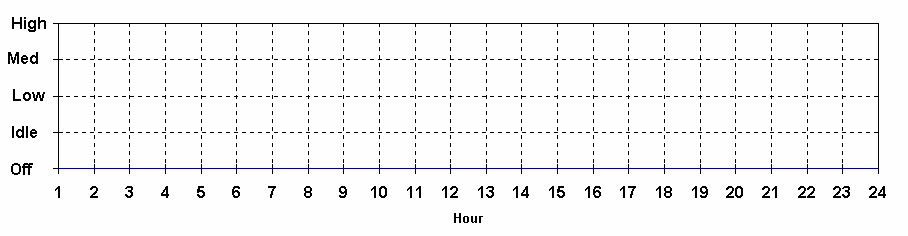
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| ❏ Building-Wide | - or - | Area # and Area Name |
| (fill out only one page) |  | (fill out one page per area) |

Kitchen Operation

Q20. If the area has a commercial kitchen, draw a line that describes the schedule of use for kitchen equipment for a full operation day.



Q21. If the area has a commercial kitchen, draw a line that describes the schedule of use for kitchen equipment for a light operation day.



|  |  |  |
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| ❏ Building-Wide | - or - | Area # and Area Name |
| (fill out only one page) |  | (fill out one page per area) |

Room Thermostat Setpoints

Q22. Enter the values for heating and cooling thermostat setpoints during normal (occupied) and setback

(unoccupied) periods

|  |  |  |
| --- | --- | --- |
| Period | Heating Setpoint | Cooling Setpoint |
| Occupied |  |  |
| Unoccupied |  |  |

Set CSP to 99 for “off,” set the HSP to 45 for “off”

Q23. Who is responsible for thermostat setpoint maintenance?

❏ Occupants ❏ Management ❏ HVAC service company

❏ Other (list)

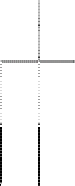
Q24. Are room temperatures in this area controlled by the building EMS? Y N DK Q25. Does the setback schedule in this area follow the fan on/off schedule? Y N DK

If the answer is N or DK, define the setback schedule below:

Q26. Draw a line that defines the occupied and unoccupied mode for a full operation day. DK

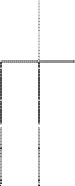
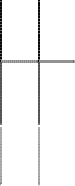
|  |  |
| --- | --- |
| Occupied |  |
| Unoccupied |
|  | 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 |

Q27. Draw a line that defines the occupied and unoccupied mode for a light operation day. DK



|  |  |
| --- | --- |
| Occupied |  |
| Unoccupied |
|  | 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 |

Q28. Draw a line that defines the occupied and unoccupied mode for a closed operation day. DK

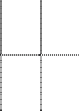


|  |  |
| --- | --- |
| Occupied |  |
| Unoccupied |
|  | 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 |

HVAC Fan System Operation

This section is used to establish the fan system schedule. List the hours that the fans are “on” or “off.” “On” indicates occupied mode, where the fans run continuously. “Off” indicates unoccupied mode, where the fans cycle on only if needed to satisfy space temperature needs, or are shut off regardless of space temperature..

Q29. Draw a line that describes the fan system operation for a full operation day: DK



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| on |  | | | | | | | | | | | | | | | | | | | | | | | |
| off |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

Q30. Draw a line that describes the fan system operation for a light operation day. DK



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| on |  | | | | | | | | | | | | | | | | | | | | | | | |
| off |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

Q31. Draw a line that describes the fan system operation for a closed operation day. DK



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| on |  | | | | | | | | | | | | | | | | | | | | | | | |
| off |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

Q32. Is the fan system described above controlled by the building EMS? Y N DK

Q33. Is the fan system described above controlled using an optimum start algorithm? Y N DK

Note: For fans with optimal start/stop, indicate the building occupancy schedule - e.g. the time when the building needs to be at normal operating temperature.

Q34. List the nighttime (off cycle) control strategy for the fan system described above:

❏ Stay off regardless of room temperature

❏ Cycle on if any room requires heating or cooling

❏ DK

List the selected packaged HVAC systems that run on this schedule below:

HVAC Design and Control

The following questions will help us to understand how the HVAC systems operate in the building. (These questions are designed to be answered by someone familiar with the operation of the building mechanical and control systems.)

Q35. Does the building have a central energy management system (EMS)? Y N DK

In each question below, indicate if the control action specified is initiated by the central EMS.

Q36. What is the minimum cooling supply air temperature setpoint °F DK

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Q37. | How is the supply air temperature controlled?  ❏ Fixed |  |  |  | ❏ EMS? |
|  | ❏ Reset based on outside air temp  ❏ Reset based on zone temp  ❏ DK |  |  |  |  |
| Q38. | Are CO2 sensors used to control outdoor air quantities? | Y | N | DK | ❏ EMS? |

Shades and Blinds

Q39. If there are shades or blinds on windows, which best describes their general use?

❏ Always open

❏ Always closed

❏ Operated by occupants to control comfort

❏ Open when space is occupied, closed otherwise

Swimming Pools (only if indoors and served by system studied)

Q40. If the building has a heated swimming pool, what water temperature is maintained? °F DK Q41. If the building has a heated swimming pool, is a pool cover used? Y N DK

Q42. If a cover is used, at what time is it normally put on the pool? (military time, blank if DK) Q43. If a cover is used, at what time is it normally removed from the pool? (military time) Spas (only if indoors and served by system studied)

Q44. If the building has a spa, what water temperature is maintained? °F DK Q45. If the building has a spa, is a cover used? Y N DK

Q46. If a cover is used, at what time is it normally put on the spa? (military time, blank if DK) Q47. If a cover is used, at what time is it normally removed from the spa? (military time)

Packaged HVAC Systems

AC- AC- AC- AC-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Equipment Name |  |  |  |  |
| Location |  |  |  |  |
| Manufacturer |  |  |  |  |
| Model No (outdoor) |  |  |  |  |
| Model No (indoor) |  |  |  |  |
| Serial Number |  |  |  |  |
| Cooling Cap (ton) |  |  |  |  |
| Cooling Efficiency | EER  SEER | EER  SEER | EER  SEER | EER  SEER |
| Heating Fuel | Elec / Other | Elec / Other | Elec / Other | Elec / Other |
| Heating Capacity  (kBtuh)) |  |  |  |  |
| Heating Efficiency) | COP  HSPF AFUE | COP  HSPF AFUE | COP  HSPF AFUE | COP  HSPF AFUE |
| Supply CFM |  |  |  |  |
| Supply fan hp |  |  |  |  |
| Sup fan mtr effic |  |  |  |  |
| Sup fan control | Const / Cycles ❏ EMS | Const / Cycles ❏ EMS | Const / Cycles ❏ EMS | Const / Cycles ❏ EMS |
| Ret/Rel fan hp |  |  |  |  |
| Rel fan mtr effic |  |  |  |  |
| OA Control | Fix/Tmp/Enth ❏ EMS | Fix/Tmp/Enth ❏ EMS | Fix/Tmp/Enth ❏ EMS | Fix/Tmp/Enth ❏ EMS |
| Min OA Fraction |  |  |  |  |
| Tstat Make/Mod |  |  |  |  |
| Tstat Location |  |  |  |  |

Note: heating capacity for heat pumps is for compressor only; circle COP or HSPF for heat pumps, AFUE for gas heat

Note variance from plans and as-built; rooftop heat sources, curb leakage, accessibility, unusual tstat mounting or location.

Ducts Outside Conditioned Space

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| System | Type | Location | Dia or L x  W (in) | Lineal  Ft | Construction | R-Value | Notes |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |
|  | ❏ Supply  ❏ Return | ❏ Plenum  ❏ Outside  ❏ Uncond. |  |  | ❏ Sheet Metal  ❏ Flex  ❏ Fiberglass  ❏ Duct Board |  |  |

Note variance from plans and as-built

Zone

Name Zone Multiplier

Exterior Walls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Assembly Name | Type | Insul R | HC | Orientation | H (ft) | W (ft) |
|  | Code | or U-value |  | (N, NE, E, ,NW) |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | R U |  |  |  |  |
|  |  | R U |  |  |  |  |
|  |  | R U |  |  |  |  |
|  |  | R U |  |  |  |  |
|  |  | R U |  |  |  |  |
|  |  | R U |  |  |  |  |
|  |  | R U |  |  |  |  |
|  |  | R U |  |  |  |  |
|  |  | R U |  |  |  |  |

Height and width are gross dimensions, including windows

Enter “0” for R-value if uninsulated, leave blank if unknown

|  |  |
| --- | --- |
|  | Wall Construction Type |
| 1 | Face Brick + Brick |
| 2 | Face Brick + Poured Concrete |
| 3 | Face Brick + Concrete Block |

Roof

|  |  |
| --- | --- |
|  | Wall Construction Type |
| 4 | Poured Concrete + Finish |
| 5 | Concrete Block + Finish |
| 6 | Wood Frame Wall |

|  |  |
| --- | --- |
|  | Wall Construction Type |
| 7 | Metal Frame Wall |
| 8 | Curtain Wall |
| 9 | Open |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Assembly Name | Type Surf | Surf | Ceil | Roof | L (ft) | W (ft) | Tilt | Orient | Plen H | Plen | Ret |
|  | Code Code | Color | Insul | Insul |  |  | (deg) | (deg) | (ft) | Wall  R | Air |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | R  U | R  U |  |  |  |  |  |  | ❏ |
|  |  |  |  |  |  |  |  |  |  |  |  | ❏ |
|  |  |  |  |  |  |  |  |  |  |  |  | ❏ |
|  |  |  |  |  |  |  |  |  |  |  |  | ❏ |

Height and width are gross dimensions, including skylights

Enter “0” for R-value if uninsulated, leave blank if unknown

Tit = 0 for horizontal, Orient = 0 for North

|  |  |  |  |
| --- | --- | --- | --- |
| Roof Surface | | | |
| 1 | Paint | 4 | Metal roofing |
| 2 | Elastomeric coating | 5 | Asphalt shingles or roll |
| 3 | Single ply membrane | 6 | Gravel (ballast) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Color | | | | | |
| 1 | White | 4 | Grey | 7 | Med Brn |
| 2 | Silver | 5 | Green | 8 | Dk Brn |
| 3 | Lt grey | 6 | Lt Brn | 9 | Black |

|  |  |
| --- | --- |
|  | Roof Type |
| 10 | Concrete Deck Roof. |
| 11 | Wood Frame Roof |
| 12 | Metal Frame Roof |

Zone (contd)

Window/Skylight Types

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ref. No. | Assembly Name | No. | Glazing | Frame | Features | Meas.Trans. | SHGC | U- value |
|  |  | Panes | Type | Type | (circle) |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 |  |  |  |  | Low e /  gas fill |  |  |  |
| 2 |  |  |  |  | Low e /  gas fill |  |  |  |
| 3 |  |  |  |  | Low e /  gas fill |  |  |  |
| 4 |  |  |  |  | Low e /  gas fill |  |  |  |
| 5 |  |  |  |  | Low e /  gas fill |  |  |  |
| 6 |  |  |  |  | Low e /  gas fill |  |  |  |
| 7 |  |  |  |  | Low e /  gas fill |  |  |  |
| 8 |  |  |  |  | Low e /  gas fill |  |  |  |
| 9 |  |  |  |  | Low e /  gas fill |  |  |  |
| 10 |  |  |  |  | Low e /  gas fill |  |  |  |

|  |  |
| --- | --- |
|  | Glass Type |
| 1 | Clear |
| 2 | Tinted |
| 3 | Reflective |
| 4 | Fritted (diffusing) |

Window/Skylight Geometry

|  |  |
| --- | --- |
|  | Plastic Type |
| 5 | Clear Plastic |
| 6 | Tinted Plastic |
| 7 | White Plastic |
| 8 | Translucent |

|  |  |
| --- | --- |
|  | Window Frame Type |
| 1 | Standard Metal Frame |
| 2 | Thermally Broken Frame |
| 3 | Wood/Vinyl Frame |
|  |  |

|  |  |
| --- | --- |
|  | Skylight Frame Type |
| 4 | Standard Metal Frame w/ Curb |
| 5 | Thermally Broken Frame w/ Curb |
| 6 | Standard Metal Frame w/o Curb |
| 7 | Thermally Broken Frame w/o Curb |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ref | Tilt | Orient | H (ft) | W (ft) | Qty | Int. | Otr Ex | OH | OH | Side | Side | Skylite Oper? |
| No. |  |  |  |  |  | Shade  Type | Shd% | Offset | Proj | Fin Ofst | Fin Proj | Shape |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |
|  |  |  |  |  |  |  |  |  |  |  |  |  | Y/ N |

Tit = 0 for horizontal, Orient = 0 for North. Tilt applies only to skylights. Side fins apply only to windows.

Otr Ex Shd% refers to exterior shading from adjacent buildings, building self-shading, thick vegetation, hillsides etc. Interior Shade Type: 1 = Blinds; 2 = Light Shades or Drapes; 3 = Dark Shades or Drapes

Skylight Shape: 1 = Domed; 2= Flat; 3= Pyramid; 4= Ridge; 5= Vault

Space

Name

Floor Area SF

Corridor/Restroom/Support Area % Space Multiplier Maximum Number of People

Circle appropriate occupancy code:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | Auditorium | 14 | Office - Other | 26 | Hotel function | 39 | Gymnasium |
| 2 | Church /chapel | 15 | Computer center | 27 | Hotel guest room | 40 | Library |
| 3 | Convention, meeting | 16 | EEG/EKG/MRI/Radiation | 28 | Hotel lobby | 41 | Locker room |
| 4 | Courtroom | 17 | Hospital - Emergency | 29 | Barber, beauty shop | 42 | School shop |
| 5 | Exhibit | 18 | Hospital general area | 30 | Bowling alley | 43 | Swimming pool |
| 6 | Main entry lobby | 19 | Hospital laboratory | 31 | Coin op laundry | 44 | Aircraft hanger |
| 7 | Motion picture theater | 20 | Hosp.patient rm/ nursery | 32 | Comm’l dry cleaners | 45 | Auto repair workshop |
| 8 | Performance theater | 21 | Hosp. therapy (OT, PT) | 33 | Grocery | 46 | General C&I work, high bay |
| 9 | Bars, lounge, casino | 22 | Hospital Pharmacy | 34 | Mall, arcade, atrium | 47 | Precision C&I work |
| 10 | Dining | 23 | Hospital Radiology | 35 | Retail, whlse sales flr | 48 | Storage, warehouse |
| 11 | Kitchen | 24 | Hospital Recovery | 36 | Classroom | 49 | Other (Describe) |
| 12 | Bank/financial institution | 25 | Hosp. Surgical & OB suite | 37 | Day care | 50 | General C&I, low bay (<25 ft) |
| 13 | Medical / clinical office |  |  | 38 | Dormitory |  |  |

Note: Codes 16 – 25 are for hospitals only

Lighting

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Fixture | Fixture Count | Mount. | Track | Controls (circle | % fix | % ctrl |
|  | Code |  | Type | Length | all that apply) | ctrl | oper |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |
|  |  |  |  |  | 1 / 2 / 3 / 4 | ❏ EMS? |  |  |

Lighting Control Codes

1 = Occupancy sensor 2 = Daylight - contin. dimming 3 = Daylighting - stepped 4 = Lumen maintenance

Fixture Mounting Type Codes

1 = Rec 2 = Dir 3 = Ind 4 = Ind-Dir 5 = Plug-in Task 6 = Furn. Int. Task. 7 = Track 8 = Exempt

Space contd

Miscellaneous Equipment and Plug Loads

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Equip. | Count | Usage | kW/ Unit | Motor HP | kBtuh | Under |
|  | Code |  | Factor | or | or | Input | Hood? |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |
|  |  |  |  |  |  |  | Y / N |

Usage factor: Fraction of time equipment in use (0.0 – 1.0) to account for seldomly used equipment. Default is 1.0

Equipment - Record kW for equipment without default or if default is not appropriate

|  |  |  |  |
| --- | --- | --- | --- |
|  | Equipment Description | Equip  Code | Default  kW |
| Grocery | Meat Grinder | 21 | 7. |
|  | Meat Saw | 22 | 2.5 |
|  | Meat Slicer | 23 | 0.25 |
|  | Wrapper | 24 | 0.9 |
|  | Check stand | 25 | 1.5 |
| Hospital | Laboratory Equipment | 26 |  |
|  | Monitoring, Life Support | 27 | 1.1 |
|  | EEG | 30 | 1.1 |
|  | EKG | 31 | 1.1 |
|  | MRI | 32 | 26. |
|  | X-ray machine | 33 | 5. |
|  | Radiation Therapy Machine | 34 | 10. |
| Indust | Air Compressor | 35 |  |
|  | Welder | 36 |  |
|  | Battery Charger | 37 | 1.5 |
|  | Machine Tools | 38 |  |
|  | Motor | 39 |  |
| Misc. | Other | 40 |  |
|  |  |  |  |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Equipment Description | Equip  Code | Defaul  t kW |
| General | Personal Computer w/ Monitor | 1 | 0.5 |
|  | Terminal | 2 | 0.15 |
|  | Laser Printer | 3 | 0.85 |
|  | Small Copier | 4 |  |
|  | Medium Copier | 5 |  |
|  | Large Copier | 6 |  |
|  | Fax Machine | 7 | 0.1 |
|  | Mini-Computer + Periph | 8 | 1.0 |
|  | Main Frame Computer +  Periph | 9 |  |
|  | Microwave | 10 | 1.7 |
|  | Misc. Appliance | 11 |  |
|  | Television | 12 | 0.15 |
|  | Washer | 13 | 0.5 |
|  | Dryer | 14 | 4. |
|  | Cash Register | 15 | 0.15 |
|  | Box Crusher | 16 | 10. |
|  | Gasoline pump | 17 | 0.7 |
|  | ATM | 18 | .5 |
|  | Video game | 19 | .5 |
|  | Exercise equipment | 20 | .5 |

Refrigerated Cases

Zone:

Name Type Qty Unit

Dim. (ft, CF)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |
|  |  |  |  |  |  | Int / Rem |  |

Walk-in

SF

Product Comp Loc Door type (Reach- in)

|  |  |
| --- | --- |
| Door Code | Door Type |
| 1 | Single glazed |
| 2 | Double glazed |
| 3 | Triple glazed, |
| 4 | Quadruple glazed |

Enter SF for walk-in or walk-in/reach-in only

|  |  |
| --- | --- |
| Product  Code | Product |
| 1 | Ice Cream |
| 2 | Frozen Food |
| 3 | Fresh Meat |
| 4 | Deli |
| 5 | Dairy/Beverage |
| 6 | Produce |

|  |  |  |  |
| --- | --- | --- | --- |
| Type  Code | Case Description | Unit  Dim. | Default  kW/unit |
| 1 | Island, open, single-level narrow | ft | 0.1 |
| 2 | Island, open, single-level wide | ft | 0.1 |
| 3 | Island, open, island, single level  double | ft | 0.2 |
| 4 | Island, closed, single-level narrow | ft | 0.1 |
| 5 | Island, closed, single-level wide | ft | 0.1 |
| 6 | Island, closed, single level double | ft | 0.2 |
| 7 | Open Single-deck | ft | 0.3 |
| 8 | Open Multi-deck | ft | 0.3 |
| 9 | Reach-in Multi deck | ft | 0.3 |
| 10 | Closed rear-entry multi-deck | ft | 0.03 |
| 11 | Curved glass rear entry multi deck | ft | 0.06 |
| 12 | Walk-in / Reach-in | ft | 0.3 |
| 13 | Walk-in | ft | 0.015 |
| 14 | Under counter Reach-in | CF | 0.03 |
| 15 | Blast Chiller | CF | 0.03 |
| 16 | Ice Maker | CF | 0.04 |
| 17 | Residential Reach-in Refrigerator | CF | 0.03 |
| 18 | Residential Reach-in Freezer | CF | 0.03 |
| 19 | Residential Closed Coffin Freezer | CF | 0.03 |
| 20 | Refrigerated Vending Machine | CF | 0.03 |
| 21 | Water cooler | each | 0.5 |
| 22 | Slurpee, frappaccino machine | each |  |
| 23 | Other | kBtuh |  |

Foodservice

Kitchen Equipment

Appliance Name Qty Type Fuel KW or Volts /

Zone:

kBtuh Trade Size Hood

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | Elec. / Other |  | A  / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |
|  |  |  | Elec. / Other |  | / |  |  | Y / N |

Hoods

Name Type Size

(SF)

Flow

(cfm)

Fan hp Makeup Air

Source

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Canopy / Island Canopy / Backshelf |  |  |  | Cond / Uncond |
|  | Canopy / Island Canopy / Backshelf |  |  |  | Cond / Uncond |
|  | Canopy / Island Canopy / Backshelf |  |  |  | Cond / Uncond |
|  | Canopy / Island Canopy / Backshelf |  |  |  | Cond / Uncond |
|  | Canopy / Island Canopy / Backshelf |  |  |  | Cond / Uncond |
|  | Canopy / Island Canopy / Backshelf |  |  |  | Cond / Uncond |

|  |  |  |  |
| --- | --- | --- | --- |
| Type  Code | Description | Trade  size | Default  kW/unit |
| 15 | Oven, convection, combi, or  retherm | doors | 3.8 |
| 16 | Food warmer | ft | 0.6 |
| 17 | Heated display case | ft | 0.5 |
| 18 | Microwave oven |  | 1.7 |
| 19 | Toaster, pop-up |  | 1.8 |
| 20 | Toaster, conveyor |  | 4.6 |
| 21 | Coffee pot | burners | 1. |
| 22 | Steam table | ft | 0.6 |
| 23 | Dishwasher, single tank | racks/hr | 0.3 |
| 24 | Dishwasher, conveyor | racks/hr | 0.1 |
| 25 | Steam jacketed kettle | qt | 0.4 |
| 26 | Braising pan/skillet | qt | 0.1 |
| 27 | Other | kW |  |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Type  Code | Description | Trade  size | Default  kW/unit |
| 1 | Broiler (include  cheesemelter) | ft | 1.7 |
| 2 | Char Broiler | ft | 3.7 |
| 3 | Griddle, single sided | ft | 4.5 |
| 4 | Griddle, clam shell | ft | 7.5 |
| 5 | Fryer, countertop | lb | 0.3 |
| 6 | Fryer, free-standing | lb | 0.3 |
| 7 | Fryer, pressure | lb | 0.3 |
| 8 | Fryer, donut | lb | 0.3 |
| 9 | Kettle, Pasta cooker | qt | 0.25 |
| 10 | Heat lamps | lamps | 0.5 |
| 11 | Range top | ft | 5. |
| 12 | Oven, pizza or bake | decks | 7. |
| 13 | Oven, conveyor | decks | 13. |
| 14 | Oven, range | ft | 2. |

Pools/ Spas

Name Location Surface

Area (SF)

|  |  |  |
| --- | --- | --- |
|  | Outside / Inside |  |
|  | Outside / Inside |  |
|  | Outside / Inside |  |
|  | Outside / Inside |  |

Incidents

Circle any incidents as applicable:

|  |  |  |
| --- | --- | --- |
| 1 | None to report | 7 Contact person unavailable or unaware of survey appointment |
| 2 | Complaint about rates | 8 Customer expressed dissatisfaction with survey (list reason(s)) |
| 3 | Complaint about energy costs or lack of savings | 9 Property damage occurred during on-site survey |
| 4 | Complaint about outages or power quality | 10 Personal injury occurred during on-site survey |
| 5 | Complaint about technology reliability | 11 Other (list) |
| 6 | Complaint about utility customer service |  |

Designers

From the Mechanical plans, record the name, address and phone of the firm responsible for the mechanical design and Title 24 MECH compliance:

Mechanical Designer: Name:

Address:

Phone:

Title 24 MECH compliance: Name:

Address:

Phone:

System / Zone Association Checklist

DOE-2 “Virtual” System ----Æ 1 2 3 4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Packaged HVAC |  |  |  |  |
| AC-1 |  |  |  |  |
| AC-2 |  |  |  |  |
| AC-3 |  |  |  |  |
| AC-4 |  |  |  |  |
| Zone 1 |  |  |  |  |
| Zone 2 |  |  |  |  |
| Zone 3 |  |  |  |  |
| Zone 4 |  |  |  |  |

Interview “Area” / Audit “Zone” Association Checklist

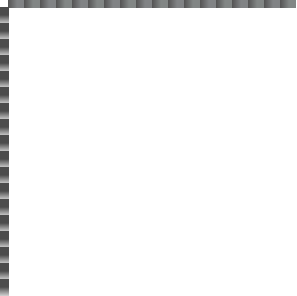
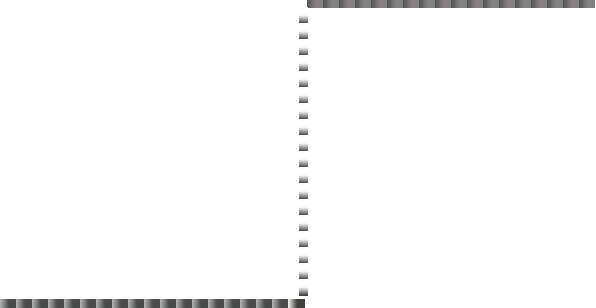
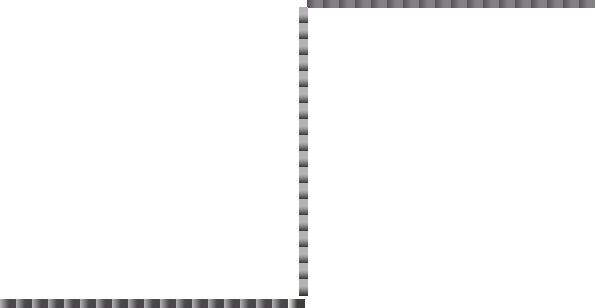
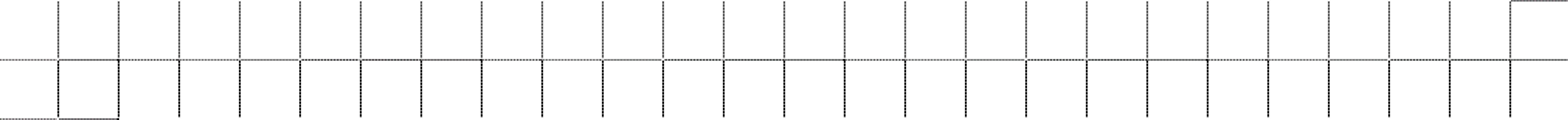
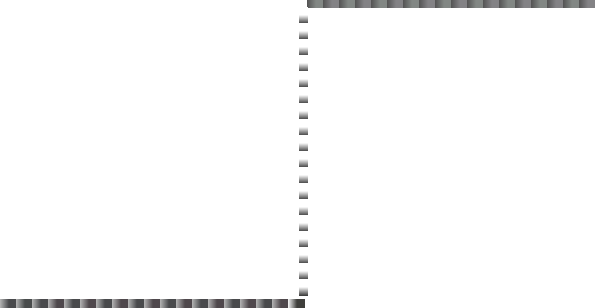
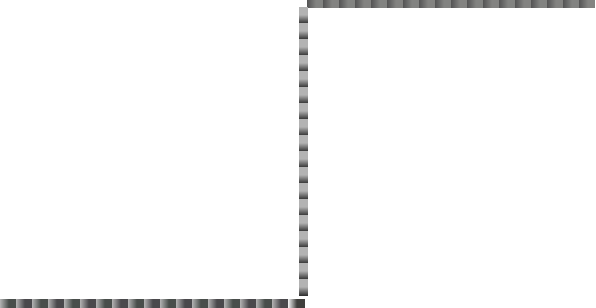
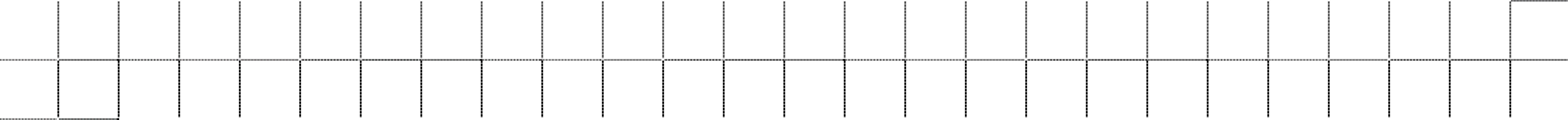
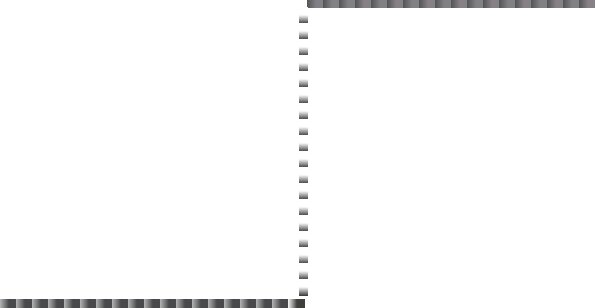
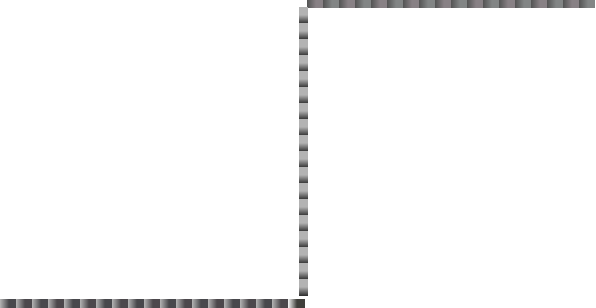
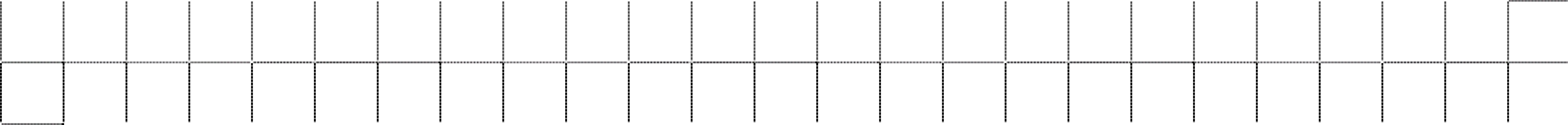
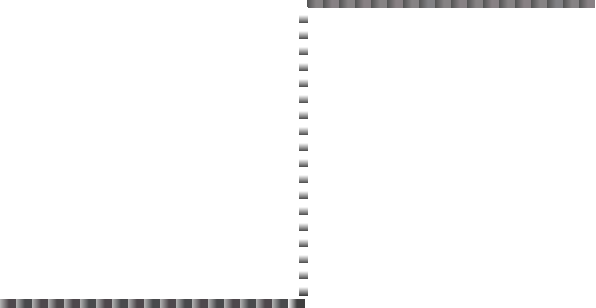
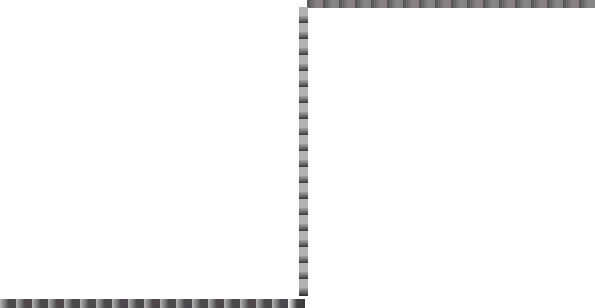
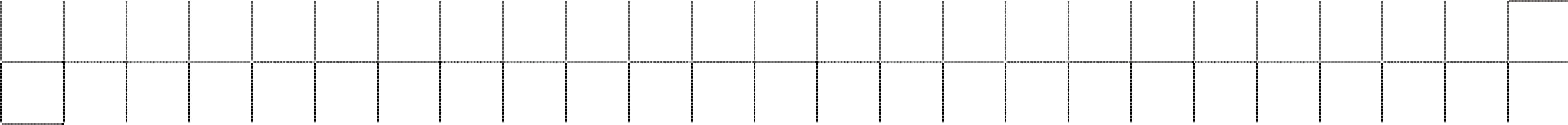
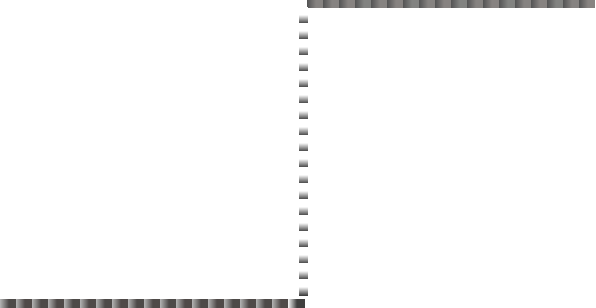
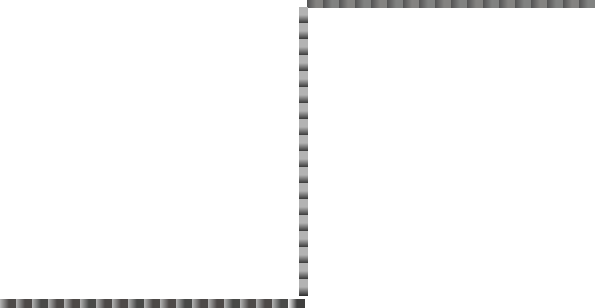
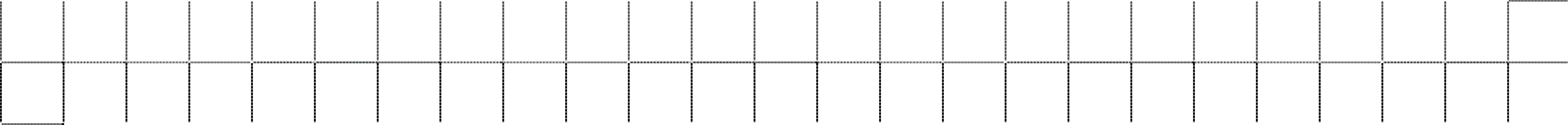
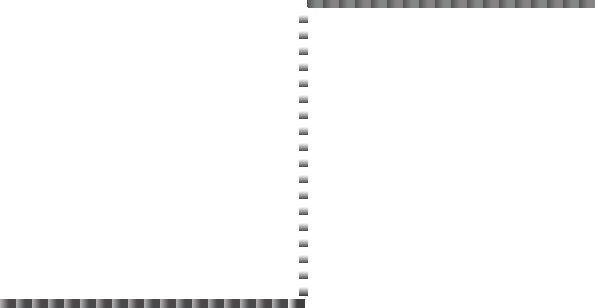
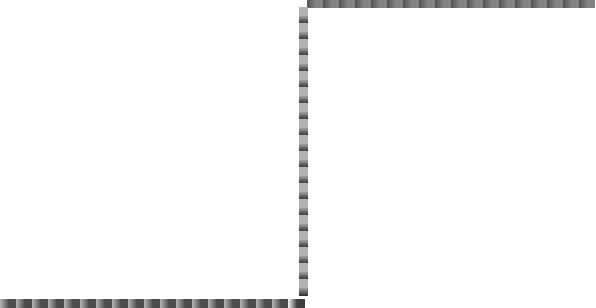
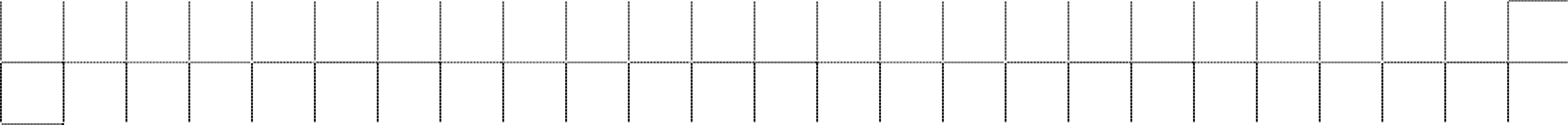
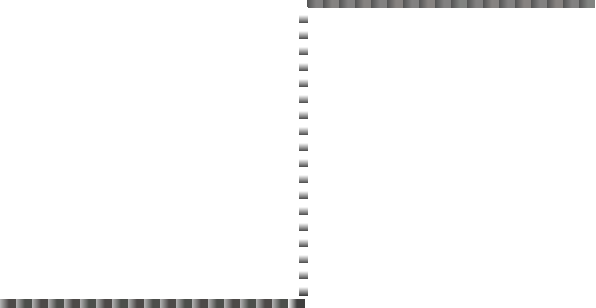
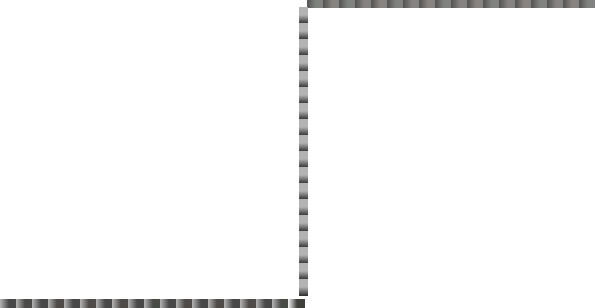
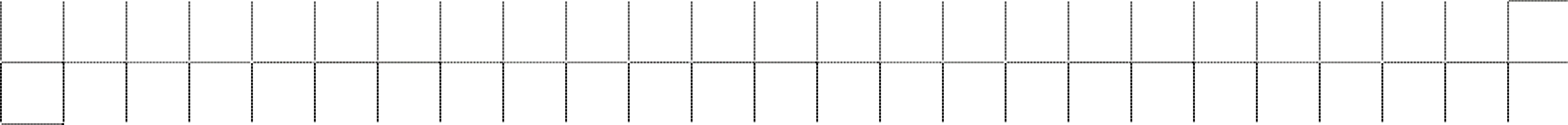
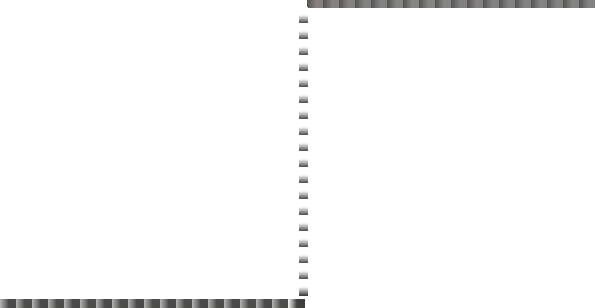
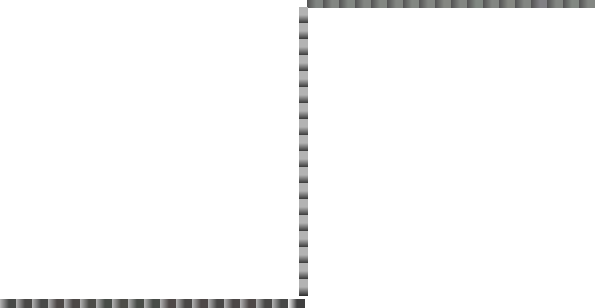
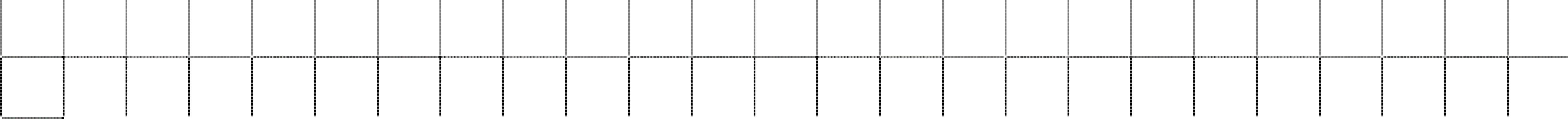
Areas 1 2 3 4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Zone 1 |  |  |  |  |
| Zone 2 |  |  |  |  |
| Zone 3 |  |  |  |  |
| Zone 4 |  |  |  |  |

Space/Zone Association

Zone

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Space | Z 1 | Z 2 | Z 3 | Z 4 |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
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| 23 |  |  |  |  |
| 24 |  |  |  |  |



Sketch of Building Floor Plan

Be sure to include dimensions, North arrow, and zone and HVAC equipment locations

Employee Survey of Thermal Comfort

This is a short survey of your personal comfort while at work. Think about your comfort throughout the year. Does it change seasonally? How do you feel about your comfort? It should take you just a minute or two to complete the survey.

1) While at work, are you comfortable (from a temperature standpoint)?

 None of the time

 Occasionally

 About half of the time

 Most of the time

 All of the time

2) If you are uncomfortable, is it: (check any that may apply)

 Too Hot

 Too Cold

 Too Drafty

 Air Quality is poor (odors, dust, etc.)

3) If you are uncomfortable, when does it occur? (check all that may apply)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  During the Winter |  | Too Hot |  | Too Cold |  Drafty |
|  During the Spring or |  | Too Hot |  | Too Cold |  |
| Fall |  | Too Hot |  | Drafty |  |
|  During the Summer |  | Too Cold |  | Drafty |  |

4) Does your work typically keep you at your desk/workstation:

 20% of the time or less

 20-40% of the time

 40-60% of the time

 60-80% of the time

 80 % or more of the work day

5) My work area is: (check all that apply)

 In an area that is further than 15 feet from an outside wall of the building.

 Within about 15 feet from a North wall of the building.

 Within about 15 feet from a South wall of the building

 Within about 15 feet from an East wall of the building

 Within about 15 feet from a West wall of the building

6) Please add any other comments regarding comfort to the back of this card. Thank You!!

Functional Performance Test

CARRIER Single-Package RTU

High Efficiency Electric Cooling/ Gas Heating with Durablade or Economizer Dry-bulb Economizer Model# 48HJD/HJE/HJF

1. Prerequisite Checklist

Onsite survey form complete

Power is present at all involved equipment

2. Economizer Model Verification

Note the economizer make and model number.

3. Functional Performance Testing

General Conditions of Test (date, time, ambient conditions, occupancy, etc.)

4. Preliminary Procedures

First test that the economizer damper actuator is operational

(this can only be performed on units with the Economi$er, not on Durablade units)

Procedure:

1. Locate the economizer controller

2. Make a note as to the current location of the minimum damper position adjuster

3. Slowly move the adjuster CW and CCW and verify that the damper moves accordingly. If the damper will not move, the unit fails the test and no further testing is necessary. If the damper moves with the adjuster, then proceed with the tests below. There may be a short delay before movement is witnessed.

4. Re-adjust the minimum damper position control to its original position.

Ready the thermostat interface for jumper testing and install the MDL sensors

Remove the wires from the connection board located in the RTU control panel that control the cooling and fan operation:

Note: the wires will either be connected between the “connection board” and a “relay pack module” or the “connection board” and the thermostat. Make notes below as to which wires were wired to which terminals.

Procedure:

1. Turn off RTU power via the main disconnect

2. Record existing thermostat wiring.

3. Remove and “wire-nut” the wire on terminal Y1

4. Remove and “wire-nut” the wire on terminal Y2

5. Remove and “wire-nut” the wire on terminal G

6. Install the supply, return and mixed air temperature MDL sensors, as well as the current measurement

7. Turn the power back on via the main disconnect

1) Normal Control Without Economizer

Adjust the OA temperature setting such that it is below the current OAT (or apply heat to the OA

sensor), and jumper R to G and R to Y1 so that there is a call for cooling stage 1 and fan operation.

Expected Response: SF runs, economizer moves to minimum damper position, compressor 1 turns on, heat is off. Barometric relief damper should be closed.

2) Normal Control With Economizer Active

Adjust the OA temperature setting such that it is above the current OAT (use cold “tech” spray on the OA sensor if necessary), and jumper R to G and R to Y1 so that there is a call for cooling stage 1 and fan operation.

Expected Response: SF runs, economizer modulates open to meet the discharge air temp setting of approximately 55F. Compressor 1 is off, heat is off. Barometric relief dampers open with increasing OA flow. (If supply air is above 57F, OA damper opens. If supply air is between 57F and 52F, damper

stays in current position. If supply air is below 52F, damper closes to minimum position)

• Return the economizer enable setpoint to 71F (OA temperature setting), and re-install the thermostat wires

Functional Performance Test

Standard Single-Package RTU

High Efficiency Electric Cooling/ Gas Heating with Honeywell Economizer

1. Prerequisite Checklist

Onsite survey form complete

Power is present at all involved equipment

2. Economizer Model Verification

Note: Enthalpy only will only have one enthalpy sensor for the outside air condition. Differential enthalpy will have outside air and return air measurements.

If on the W7459 economizer controller there are:

 wires on terminals ‘SO’ and ‘+”, then an outside air enthalpy sensor is present.

 wires on terminals ‘SR’ and ‘+”, then a return air enthalpy sensor is present.

 wires on terminals ‘SO’ and ‘+”, and a jumper on terminals ‘SR’ and ‘+”, then your system is a single point outside air enthalpy economizer

 If both ‘SO’ and ‘SR’ have sensors attached, then it is a differential enthalpy economizer

If an outside air enthalpy sensor is used, the model number should be C7400. If an outside air temperature sensor is used, the model number is C7650A.

3. Functional Performance Testing

General Conditions of Test (date, time, ambient conditions, occupancy, etc.)

4. Preliminary Procedures

First test that the economizer damper actuator is operational

Procedure:

1. Locate the economizer controller

2. Make a note as to the current location of the minimum damper position adjuster

3. Slowly move the adjuster CW and CCW and verify that the damper moves accordingly. If the damper will not move, the unit fails the test and no further testing is necessary. If the damper moves with the adjuster, then proceed with the tests below. There may be a short delay before movement is witnessed.

4. Re-adjust the minimum damper position control to its original position.

Ready the thermostat interface for jumper testing and install the MDL sensors

Remove the wires from the connection board located in the RTU control panel that control the cooling and fan operation:

Note: the wires will likely be connected to the thermostat.

Procedure:

1. Turn off RTU power via the main disconnect

2. Record existing thermostat wiring.

3. Remove and “wire-nut” the wire on terminal Y1

4. Remove and “wire-nut” the wire on terminal Y2

5. Remove and “wire-nut” the wire on terminal G

6. Install the supply, return and mixed air temperature MDL sensors, as well as the current measurement

7. Turn the power back on via the main disconnect

1) Normal Control Without Economizer

Change the enthalpy setting on the controller to ‘D’ for testing purposes.

Either warm-up or spray moisture near the OA enthalpy sensor (use a hot damp rag on the OA sensor if necessary) such that the enthalpy is above the lockout setpoint (or above the return air enthalpy sensor if present), and jumper R to G and R to Y1 so that there is a call for cooling stage 1 and fan operation.

Expected Response: SF runs, economizer moves to minimum damper position, compressor 1 turns on, heat is off. Barometric relief damper should be closed.

Note: The LED on the economizer controller lights when the OA is suitable for free cooling – during this test, the LED should be off.

2) Normal Control With Economizer Active

Change the enthalpy setting on the controller to ‘A’ for testing purposes. Be sure to return it to its original position when the tests are completed.

Cool down the OA enthalpy sensor (use cold “tech” spray near the OA sensor in the airstream if necessary) such that the enthalpy is below the lockout setpoint (or below the return air enthalpy sensor if present), and jumper R to G and R to Y1 so that there is a call for cooling stage 1 and fan operation.

Expected Response: SF runs, economizer modulates open to meet the discharge air temp setting of approximately 55F. Compressor 1 is off, heat is off. Barometric relief dampers open with increasing OA flow.

Note: The LED on the economizer controller lights when the OA is suitable for free cooling. If the LED

does not illuminate properly, make note of this in your records.

• Return the economizer enable setpoint to its original setting, and re-install the thermostat wires

Functional Performance Test

TRANE Single-Package RTU

High Efficiency Electric Cooling/ Gas Heating with Economizer

Model# YCD/YCH

1. Prerequisite Checklist

Onsite survey form complete

Power is present at all involved equipment

2. Economizer Model Verification

Locate the economizer controller “Unit Economizer Module” (UEM) – remove the fresh air adjustment panel located on the unit end panel to access the UEM. In the bottom left corner are terminals labeled J7,J8,J9,J10. If there are wires on any of these terminals then likely there is an enthalpy control instead of dry-bulb control present.

Note the economizer make and model number. If on the UEM economizer controller there are:

 wires on terminals ‘J7’ and ‘J8’, then a return air enthalpy sensor is present.

 wires on terminals ‘J9’ and ‘J10’, then an outside air enthalpy sensor is present.

 If only outside air enthalpy sensor is present, then your system is a single point enthalpy economizer

 If both air enthalpy sensors are present, then your system is a differential enthalpy economizer

 If neither return or outside air enthalpy/humidity sensors are present, then it is a temperature only economizer. The OA sensor is located near the condenser and is a small metal probe.

If an outside air enthalpy sensor is used, the model number should be C7600A. (it is actually a humidity sensor, because the TRANE unit measure outside air temperature from a different control module, located on the control board ‘UCP’, terminals J1-15 and J1-16)

3. Functional Performance Testing

General Conditions of Test (date, time, ambient conditions, occupancy, etc.)

4. Preliminary Procedures

First test that the system controls are operational

Procedure:

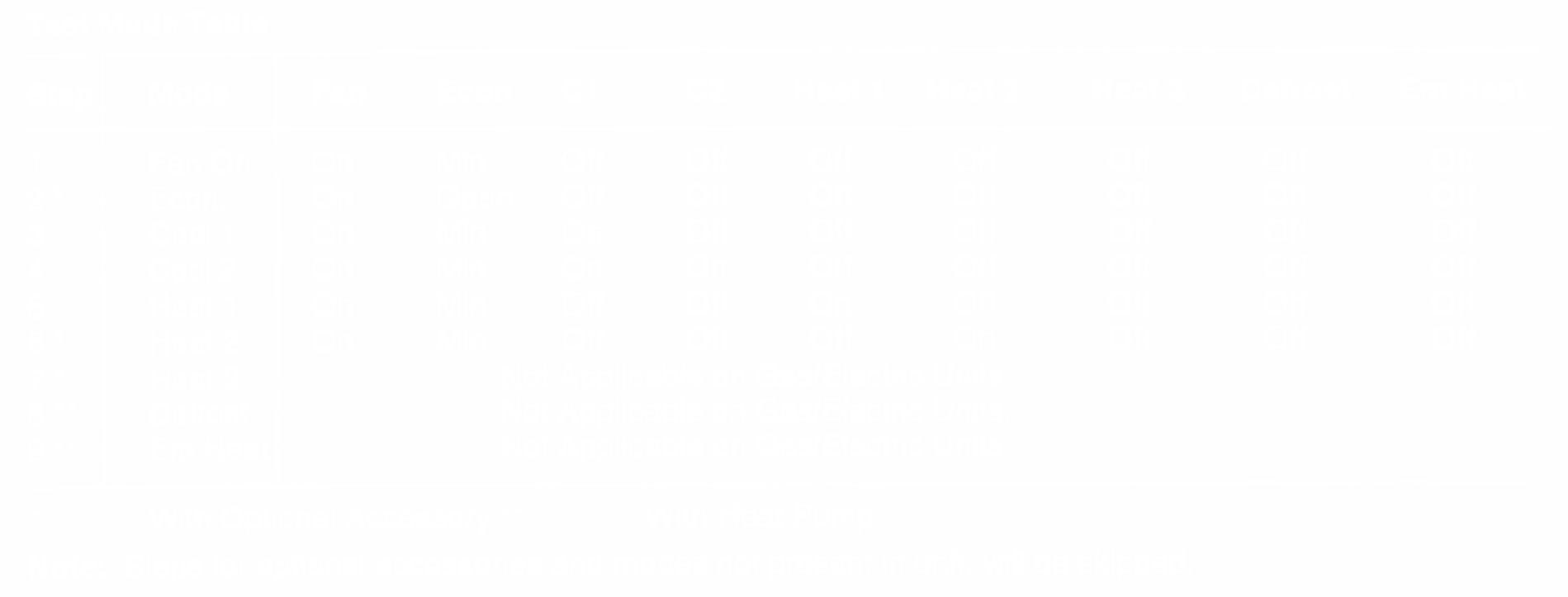
1. Locate the Low Voltage Terminal Strip (LTB)

2. To begin the Step Test Mode, place a jumper across “TEST1” and “TEST2” terminals for 2 to 3 seconds, then remove them.

3. When the test mode is initiated, the light on the Unitary Control Processor (UCP) will blink and the system will begin the first test step, and turn on the fan (see table below).

4. To continue to the economizer step, reapply the jumper to the test terminals for 2 to 3 seconds. Pay special attention to step 2 to witness if the economizer damper opens during this test.

5. To terminate the test mode, continue stepping through the modes until the UCP indicator light glows constantly. At the end of the test mode, the indicator light will glow constantly and control will revert to the zone sensor.



Test that the economizer damper actuator is operational

Procedure:

1. Locate the economizer controller “Unit Economizer Module” (UEM) – remove the fresh air adjustment panel located on the unit end panel to access the UEM

2. Locate the “Minimum Damper Position” adjustment pot on the UEM. Make a note as to the current location of the minimum damper position adjuster

3. Note the approximate minimum damper position as percent open to outside air .

4. Slowly move the adjuster CW and CCW and verify that the damper moves accordingly.

Fully CCW = 0% outside air, Fully CW = 50% outside air. If the damper will not move, the unit fails the test and no further testing is necessary. If the damper moves with the

adjuster, then proceed with the tests below. There may be a short delay before movement is witnessed.

5. Note the existing “SW1” and “SW2” switch setting on the UEM board (if the switch is towards the center of the UEM board, it is in the ON state)

6. Re-adjust the minimum damper position control to its original position.

Install the MDL sensors

Procedure:

1. Turn off RTU power via the main disconnect

2. Install the supply, return and mixed air temperature MDL sensors, as well as the current measurement

3. Turn the power back on via the main disconnect

The following tests require 2 people with communication radios to efficiently perform. If this is feasible, then continue with the tests. One person will need to be at the unit, and another at the thermostat.

1) Normal Control Without Economizer

Adjust the OA economizer setting such that it is below the current OAT (moving SW1 to OFF, and SW2 to ON will result in a 55°F OA temperature setting), and adjust the thermostat down so there is a call for cooling stage 1 and fan operation

Expected Response: SF runs, economizer moves to minimum damper position, compressor 1 turns on, heat is off. Barometric relief damper should be closed.

2) Normal Control With Economizer Active

Adjust the OA temperature setting such that it is above the current OAT (use cold “tech” spray on the OA sensor if necessary), and adjust the thermostat down so there is a call for cooling stage 1 and fan operation (same as test#1 setting).

Note: Moving SW1 to ON, and SW2 to OFF will result in a 65°F OA temperature setting (and high enthalpy requirement), and/or use cold “tech” spray on the OA sensor if necessary.

Expected Response: SF runs, economizer modulates open to meet the discharge air temp setting of between 50F and 55F. Compressor 1 is off, heat is off. Barometric relief dampers open with increasing OA flow.

• Return the economizer enable switches (SW1 & SW2) to their original settings as noted on this page.

Functional Performance Test

Standard Single-Package RTU

High Efficiency Electric Cooling/ Gas Heating with Dry-bulb Economizer

1. Prerequisite Checklist

Onsite survey form complete

Power is present at all involved equipment

2. Economizer Model Verification

Note the economizer make and model number.

3. Functional Performance Testing

General Conditions of Test (date, time, ambient conditions, occupancy, etc.)

4. Preliminary Procedures

First test that the economizer damper actuator is operational

Procedure:

1. Locate the economizer controller

2. Make a note as to the current location of the minimum damper position adjuster

3. Slowly move the adjuster CW and CCW and verify that the damper moves accordingly. If the damper will not move, the unit fails the test and no further testing is necessary. If the damper moves with the adjuster, then proceed with the tests below. There may be a short delay before movement is witnessed.

4. Re-adjust the minimum damper position control to its original position.

Ready the thermostat interface for jumper testing and install the MDL sensors

Remove the wires from the connection board located in the RTU control panel that control the cooling and fan operation:

Note: the wires will likely be connected to the thermostat.

Procedure:

1. Turn off RTU power via the main disconnect

2. Record existing thermostat wiring.

3. Remove and “wire-nut” the wire on terminal Y1

4. Remove and “wire-nut” the wire on terminal Y2

5. Remove and “wire-nut” the wire on terminal G

6. Install the supply, return and mixed air temperature MDL sensors, as well as the current measurement

7. Turn the power back on via the main disconnect

1) Normal Control Without Economizer

Adjust the OA temperature setting such that it is below the current OAT (or apply heat to the OA

sensor), and jumper R to G and R to Y1 so that there is a call for cooling stage 1 and fan operation.

Expected Response: SF runs, economizer moves to minimum damper position, compressor 1 turns on, heat is off. Barometric relief damper should be closed.

2) Normal Control With Economizer Active

Adjust the OA temperature setting such that it is above the current OAT (use cold “tech” spray on the OA sensor if necessary), and jumper R to G and R to Y1 so that there is a call for cooling stage 1 and fan operation.

Expected Response: SF runs, economizer modulates open to meet the discharge air temp setting of approximately 55F. Compressor 1 is off, heat is off. Barometric relief dampers open with increasing OA flow.

 Return the economizer enable setpoint to 71F (OA temperature setting), and re-install the thermostat wires

Functional Performance Test

Standard Single-Package RTU

High Efficiency Electric Cooling/ Gas Heating with Enthalpy Economizer

1. Prerequisite Checklist

Onsite survey form complete

Power is present at all involved equipment

2. Economizer Model Verification

Note: Enthalpy only will only have one enthalpy sensor for the outside air condition. Differential enthalpy will have outside air and return air measurements.

3. Functional Performance Testing

General Conditions of Test (date, time, ambient conditions, occupancy, etc.)

4. Preliminary Procedures

First test that the economizer damper actuator is operational

Procedure:

1. Locate the economizer controller

2. Make a note as to the current location of the minimum damper position adjuster

3. Slowly move the adjuster CW and CCW and verify that the damper moves accordingly. If the damper will not move, the unit fails the test and no further testing is necessary. If the damper moves with the adjuster, then proceed with the tests below. There may be a short delay before movement is witnessed.

4. Re-adjust the minimum damper position control to its original position. Ready the thermostat interface for jumper testing and install the MDL sensors

Remove the wires from the connection board located in the RTU control panel that control the cooling and fan operation:

Note: the wires will likely be connected to the thermostat.

Procedure:

1. Turn off RTU power via the main disconnect

2. Record existing thermostat wiring.

3. Remove and “wire-nut” the wire on terminal Y1

4. Remove and “wire-nut” the wire on terminal Y2

5. Remove and “wire-nut” the wire on terminal G

6. Install the supply, return and mixed air temperature MDL sensors, as well as the current measurement

7. Turn the power back on via the main disconnect

1) Normal Control Without Economizer

Either warm-up or spray moisture near the OA enthalpy sensor (use a hot damp rag on the OA sensor if necessary) such that the enthalpy is above the lockout setpoint (or above the return air enthalpy sensor if present), and jumper R to G and R to Y1 so that there is a call for cooling stage 1 and fan operation.

Expected Response: SF runs, economizer moves to minimum damper position, compressor 1 turns on, heat is off. Barometric relief damper should be closed.

2) Normal Control With Economizer Active

Cool down the OA enthalpy sensor (use cold “tech” spray near the OA sensor if necessary) such that the enthalpy is below the lockout setpoint (or below the return air enthalpy sensor if present), and jumper R to G and R to Y1 so that there is a call for cooling stage 1 and fan operation.

Expected Response: SF runs, economizer modulates open to meet the discharge air temp setting of approximately 55F. Compressor 1 is off, heat is off. Barometric relief dampers open with increasing OA flow.

• Return the economizer enable setpoint to its original setting, and re-install the thermostat wires

Spot power measurements for 3-phase delta connected loads (Nearly all 3-phase motors fit this category):

There are two techniques described here. For consistency, use the phase to neutral method unless the ground is not reliable. Using the Phase-to-neutral method gives you a direct indication of power factor. Use the Phase-to-phase method only if a good neutral or ground connection cannot be established.

Phase-to-neutral method:

Technically, there isn’t a neutral available to perform this technique. However, the ground can often be substituted if there’s a good connection between ground and the neutral in the building.

Three power measurements are required.

Here’s the step-by-step procedure when using a single-phase power meter (All our fluke power meters are single-phase meters):

1. Connect the black voltage lead to Neutral (or ground)

2. Connect the red voltage lead to Phase A

3. Connect the current clamp to Phase A, being sure to verify that the clamp is facing the right direction. Click the phase check button on the fluke to verify proper connection.

4. Read and record the power voltage, current, and power factor measurement

5. Move the voltage lead and current clamp to Phase B and repeat step 4.

6. Move the voltage lead and current clamp to Phase C and repeat step 4.

7. Disconnect the voltage leads

Phase-to-phase method:

Only two power measurements are required.

Here’s the step-by-step procedure when using a single-phase power meter (All our fluke power meters are single-phase meters):

1. Connect the black voltage lead to Phase B

2. Connect the red voltage lead to Phase A

3. Connect the current clamp to Phase A, being sure to verify that the clamp is facing the right direction. Click the phase check button on the fluke to verify proper connection.

4. Read and record the power measurement

5. Read and record the current measurement for Phase A

6. Read and record the voltage measurement for Phase A-B

7. Move the red voltage lead from Phase A to Phase C. Leave the black voltage lead on

Phase B.

8. Move the current clamp to Phase C, being sure to verify that the clamp is facing the right direction. Click the phase check button on the fluke to verify proper connection.

9. Read and record the power measurement

10. Read and record the current measurement for Phase C

11. Read and record the voltage measurement for Phase C-B

12. Move the current clamp to Phase B

13. Read and record the current measurement for Phase B.

14. Disconnect the voltage leads

Methods for measuring power on single-phase loads connected phase-to-phase

(many condenser and supply fans fall in this category):

This can be accomplished in two ways. Either technique can be used. Regardless of the technique used, NOTE ON THE FORM that this is a single-phase load operating phase- to-phase.

Use the phase-to-neutral method, described above. Since there are only two connections to the load, only two power measurements are required.

Use the phase-to-phase method, described above, using the unused phase as the reference. It may or may not be Phase B.

The following technique does not work, although intuitively it seems like it should work properly. Don’t use it:

Take a single measurement of current, voltage, power factor, and power with the voltage leads connected to the phases serving the load. This method does not provide a good measurement of power factor.

NBI SMALL HVAC ECONOMIZER TEST DATA

|  |  |  |  |
| --- | --- | --- | --- |
| Site ID# |  | Date |  |
| Building Name |  | General outside air conditions |  |
| Participants |  |  |  |

RTU Name/ number

RTU Manufacturer

Economizer Present? (Y/N)

Economizer Make and Model#

Economizer setpoint setting (A,B,C,D or switches SW1, SW2)

Minimum OA damper position (%) Record the minimim damper position

adjuster setting

Does the actuator move, and the linkage operate? (Y/N)

Economizer type: (check one) single point temperature differential temperature single point enthalpy differential enthalpy

Thermostat Wire Colors:

R - power

G - Fan

Y1 - Cool stage 1

Y2 - Cool stage 2

Are there jumpers between the thermostat wire? Note which wires.

Does the economizer respond to cold

CEC/NBI PIEaiRr oPnrotjheectsensor? (Y/N)

12/2001