8/13/2007

Credit Interpretation Request

This CIR is a follow-up to the 2/26/2007 ruling for our 120,000 sq. ft. laboratory project. The EAc1 ruling dated 2/26/2007 indicates "the project may opt to model the VAV system as energy neutral". Does this include the exhaust fan system? G3.1.2.9 indicates the baseline "System fan electrical power for supply, return, exhaust and relief (excluding power to fan powered VAV boxes) shall be calculated using the following formulas". This formula listed may be suitable for determining baseline fan power in an office, but it seems like the fan power for any lab building would significantly exceed this number because of the exhaust fan requirements, pressure drop through fume hoods and exhaust air valves, etc.

For example, a typical lab could have 0.01 to 0.05 inches of room differential pressure, plus 0.5 inches drop through the fume hood, plus 0.2 to 0.6 inches through the exhaust air valve, and plus 0.75 to 1.5 inches through the exhaust HEPA filter. This totals to about 1.46 to 2.65 inches of additional pressure drop for a lab exhaust system vs. office exhaust. The lab exhaust may also have about 0.5 inches of additional pressure drop associated with generating stack velocity on the discharge of the fan. Lab exhaust will have a slight pressure drop reduction from office exhaust since the lab system will not have fire dampers (0.2 to 0.3 inches), but this is not enough to offset all the other lab system pressure drops.

For our specific project, we have modeled both the baseline and proposed case as VAV systems per the 2/26/2007 ruling. When we use G3.1.2.9 to calculate the supply and exhaust fan power in the base case and we model the proposed case with our actual supply and exhaust fans, the proposed case fan power is more then double the base case due to the exhaust fans. The proposed case fan power is greater then 500,000 kwh per year while the base case is closer to 200,000 kwh per year. For our proposed model, both the supply and exhaust are variable speed with high efficiency motors, but we are still penalized on fan power when comparing to the base case using G3.1.2.9. Can the VAV exhaust in a lab be modeled as energy neutral?

Ruling

The applicant is requesting further clarification on CIR ruling dated 2/26/2007.

The applicant may utilize Addendum ac of ASHRAE Standard 90.1-2004 as well as the related changes to Appendix G to get credit for the pressure drop associated with laboratory exhaust systems. Addendum ac modified the fan power allowance in Section 6 of Standard 90.1. Included in this modification is an exemption for the fans exhausting air from fume hoods. When these fans are exempted, the allowed horsepower for the entire system is required to be reduced by an adjustment factor contained in TABLE 6.5.3.1.1B.

When Addendum ac was developed, the related section of appendix G was also modified and those changes are reproduced below. These changes to Appendix G as well the requirements of Addendum ac may be used by the applicant.

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G3.1.2.9 Supply Fan Power. System fan electrical power for supply, return, exhaust, and relief (excluding power to fan-powered VAV boxes) shall be calculated using the following formulas:

For Systems 1 and 2
Pfan = CFMS * 0.3

Where does this come from?

For Systems 3 through 8
Pfan = bhp x 746 / Fan Motor Efficiency

where
Pfan = electric power to fan motor (watts) and
bhp = brake horsepower of baseline fan motor from Table G3.1.2.9
Fan Motor Efficiency = the efficiency from Table 10.8 for the next motor size greater than the brake horsepower using the Enclosed Motor at 1800 RPM
CFMS = the baseline system maximum design supply fan air flow rate in cubic feet per minute

TABLE G3.1.2.9 Baseline Fan Brake Horsepower:
Baseline Fan Motor Brake Horsepower:
Constant Volume Systems 3 – 4 // Variable Volume Systems 5 – 8
CFMS * 0.00094 + A // CFMS * 0.0013 + A

Where A is calculated according to 6.5.3.1.1 using the pressure drop adjustment from the proposed building design and the design flow rate of the baseline building system. Do not include pressure drop adjustments for evaporative coolers or heat recovery devices that are not required in the baseline building system by Section G3.1.2.10.
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