PIKES PEAK REGIONAL BUILDING DEPARTMENT

Residential Construction Plans Review

Changes to plan submittals

October 12, 2006

Residential Mechanical (HVAC) and Plumbing plans reviews, performance testing, and the proposed certification of the HVAC system will no longer be required. The Mechanical Committee voted unanimously on October 11, 2006, to amend the 2005 Pikes Peak Regional Building Code, deleting Section 603.2 Duct Sizing of the 2003 International Mechanical Code.

This recommendation has been endorsed by Acting Building Official Dave London, and has been forwarded to the Board of Review for their sanction.

As a result of this change, Residential Construction Plans submitted for review will attach the Heat Loss Calculations and Heat Loss Certificate to verify compliance with Section 309.1 of 2003 International Mechanical Code, and incorporate items listed below in the plans. (These were required on residential plans prior to the adoption of the 2005 Pikes Peak Regional Building Code.)

Combustion air in compliance with Section 304, 2003 International Fuel Gas Code; and indicate if all air is from inside.

Gas-fired furnace and water heater vent locations for each floor

Ventilation for crawlspaces

Ventilation for structural floors

Ventilation for habitable rooms

Furnace BTU input

Floor drains

Toilet access

Shower access, size dimensioned and head location

Water heater location and vent

Attachments to this Memo: Heat Loss Certificate and Heat Loss Calculation form for manual use

These are available on our web site at **www.pprbd.org/plancheck/heat_loss.html**

PIKES PEAK REGIONAL BUILDING DEPARTMENT

Residential HVAC Equipment Certificate

Provide this certificate with heat loss or (optional heat gain) calculations, for all new residential construction and additions: this will be part of the permanent record.

Address or Master Plan #

CALCULATIONS

☐ new structure ☐ new addition ☐ existing structure

☐ existing structure + new addition, requires separate calculations for each

1. Envelope heat loss _____ BTU/hr
2. Infiltration heat loss (.5 ach max) _____ BTU/hr
3. Envelope heat gain (option) _____ BTU/hr
4. Infiltration heat gain (option) _____ BTU/hr
5. Total heat loss add lines 1 & 2 _____ BTU/hr
6. Total heat gain add lines 3 & 4 (option) _____ BTU/hr
7. Type of heating appliance _____ new ☐ existing ☐
   btu/hr input _____/_____ location _____ area served _____
8. Type of heating appliance _____ new ☐ existing ☐
   btu/hr input _____/_____ location _____ area served _____
9. Type of cooling appliance _____ new ☐ existing ☐
   btu/hr input _____ location _____ area served _____
10. Type of cooling appliance _____ new ☐ existing ☐
    btu/hr input _____ location _____ area served _____

SUMMARY

a. Input of heating appliance(s)* _____ BTU/hr
b. Altitude derate (x 0.80) _____ BTU/hr
c. Efficiency derate (output) _____ BTU/hr
d. Electrical heating (1 watt = 3.413 btu/hr _____ BTU/hr
e. **Total Heating Output** _____ BTU/hr
f. **Total Cooling** _____ BTU/hr

*1. If using high / low fired equipment, assign the sum of the low fires on this line.

*2. Total heat output must be greater than total heat loss, but not by more than 30%. This could change if cooling is used as the primary function. The equipment heating function must then be the smallest option available.

I certify that the equipment certificate is correct to the best of my knowledge based on plans provided and calculations performed for the address or master listed above.

Contractor/Homeowner signature _____ Date _____

Print full name of signer and company _____ Phone # _____

Heat Loss Calculation Table for Residential Construction

MANUAL or COMPUTERIZED CALCULATIONS

Contractor/Builder:							Address or Master#:						Date:			
1	Space under consideration						**Crawlspace**		**Basement**		**Main Floor**		**Upper Floor**		**Entire House**	
2	Running perimeter of exterior wall (feet)															
3	Floor area (square feet)															
4	Wall Height (feet)															
TYPE OF EXPOSURE		Material		R	U	ΔT	Area	BTU/hr	Area	BTU/hr	Area	BTU/hr	Area	BTU/hr	Area	BTU/hr
5	Net exposed walls	A.	Concrete earth			25										
		B.	Concrete air			68										
		C.	2x4			68										
		D.	2x6			68										
6	Windows and Glass doors	E.	Window bsmt			68										
		F.	Window other			68										
		G.	Glass door			68										
7	Solid doors	H.				68										
8	Net roof	I.	Flat ceiling			68										
	Skylights	J.				68										
8a	Net roof	Ia	Sloped ceiling			68										
	Pitch in 12															
	Skylights	Ja				68										
9	Floors on grade	K.	Slab insulation			25										
10	Floors / unheated	L.				68										
11	Floors / exterior	M.				68										
12	Building Envelope Heat Loss (Sum rows 5 through 11)							BTU/hr		BTU/hr		BTU/hr		BTU/hr		BTU/hr
13	Infiltration Heat Loss (Row 3 x Row 4 x 0.52)							BTU/hr		BTU/hr		BTU/hr		BTU/hr		BTU/hr
14	Total Heat Loss (Sum Rows 12 and 13)							BTU/hr		BTU/hr		BTU/hr		BTU/hr		BTU/hr
15	Altitude Deration	Caloric deration of natural gas					Output		Output		Output		Output		Total Output	
		Multiply Row 14 by:				1.25		BTU/hr		BTU/hr		BTU/hr		BTU/hr		BTU/hr
16	Efficiency Deration	Efficiency of heating equipment					Input		Input		Input		Input		Total Input	
		Divide Row 15 by:				%		BTU/hr		BTU/hr		BTU/hr		BTU/hr		BTU/hr

Note: If you have Microsoft Excel™ 2000 edition or later, you can download this spreadsheet from our website at www.pprbd.org.

The spreadsheet will perform many of the calculations for you.

Directions for manual calculations:

Enter the Builder's name, the address of the building, and the date.

1. Space under consideration refers to a floor level or portion thereof that is insulated and exposed to the exterior. Follow the calculations in Rows 2 through 16 for each applicable space.
2. Enter the exterior perimeter in feet.
3. Enter the floor area in square feet.
4. Enter the wall height measured from floor surface of one floor to the floor surface of the floor above. For crawlspaces, enter the height from grade to the top of the floor above.

For each insulation material, enter the R or U value for that material. Insulation is usually expressed as an R-value, whereas windows and doors are usually expressed in terms of a U factor. Contact your supplier for more information.

ΔT = Difference in temperature from inside to outside. Already listed.

5. Enter the net surface area of exposed wall in the "Area" column. In order to find this area, multiply the outside wall perimeter from Row 2 by the Wall height from Row 4. Then subtract any openings such as windows or doors. Basement walls may be a mixture of framed walls and foundation walls. These surface areas will have to be calculated separately then added.

   "Concrete earth" is the foundation wall surface area in contact with soil.

   "Concrete air" is the foundation wall surface area in contact with outside air.
6. Enter the net surface area of exposed windows and glass doors in the "Area" Column. This is the rough opening measurement, to include the entire frame, not just the glass in the window or door.
7. Enter the net surface area of exterior doors. A "Solid door" is one that has less than 50% glass. A "Glass door" is one that has more than 50% glass.
8. Enter the net surface area of exposed roof in the "Area" column. Generally, this will be same as the floor level of the top floor. However, some plans have different roof levels.

   For a "Flat ceiling", this area is the same as the floor area of the floor the roof is covering minus any skylights, entered in the row below. This makes the assumption that insulation is being installed just above the ceiling level.

   For a "Sloped ceiling", you need to know the "slope in 12", that is the amount of rise for every 12 units of run in the interior pitch of a vaulted or cathedral ceiling.

   The formula for the modified area is:

$$A_r = A_f \times \frac{\sqrt{P^2 + 144}}{12}$$ where:

   A_r = Modified area of the roof. Enter this value in the table for "Net roof" in column 8a, subtracting any skylights.

   A_f = Floor area of the floor the roof is covering

   P = Pitch rise in 12 units of run
9. For "Floors on grade", enter the area of insulation for the foundation wall below exposed full-height framed walls. This could include walkout basements or slab-on-grade construction.
10. For "Floors / unheated" enter the area of insulated floors over unheated spaces such as un-insulated garages and crawlspaces.
11. For "Floors / exterior" enter the area of insulated floors exposed to the exterior such as porches, overhangs and cantilevers.

Calculate the heat loss for each type of exposure. In rows 5 through 11, the "BTU/hr" column = U x ΔT x Area or (1/R) x ΔT x Area depending on whether U or R has been used as the insulation value. Then sum the heat loss (BTU/hr) across for the "Entire House" column.

12. Sum the individual "BTU/hr" values for each column and enter this value in Row 12 "Building Envelope Heat Loss".
13. Calculate infiltration Heat Loss for each column. Multiply the following: "Floor area" in Row 3 x "Wall height" in Row 4 x 0.52. Enter this value in Row 13 "Infiltration Heat Loss".
14. Sum Rows 12 and 13 and enter this value in Row 14 for the Total Heat Loss for each column. Then sum the values from Rows 12 – 14 across for the "Entire House" column. **These summed values are the values that are entered in the "Summary of Heat Loss Calculations" on the Heat Loss Certificate.**
15. Derate the appliance for altitude. Altitude Deration is a 20% reduction in the appliance output due to the caloric value of natural gas at this altitude. This deration is required REGARDLESS OF HEATING APPLIANCE MANUFACTURER. To arrive at the output BTU/hr value, multiply Row14 by 1.25 and enter this value in Row 15.
16. Derate the appliance for efficiency to find out what the minimum equipment size is for the heat loss calculated. This deration takes the efficiency of the appliance into consideration. This value is available from the equipment vendor. To arrive at the final required input Btu/hr, take the output Btu/hr from Row 15 and divide by the efficiency percentage you list in Row 16.

This form is intended for minimum code compliance. Please consult a licensed heating contractor or design professional for complete energy calculations.