Using the Heating Load Estimator

This **tool is designed for rough estimations, training, and gut checks** of heating loads for existing equipment or to truth check a Manual J or ASHRAE based heating load calculator. **This is NOT intended to replace Manual J or locally approved heat load calculators.**

For each temperature range and construction type, a range of Btuh/sq ft is provided. The simple approach is to use the bolded, central number. This is most commonly used when checking another tool as a guide. Homes with basements tend to have less heat loss in winter, but slightly more in late spring and early fall. To that point, a second set of estimated BTUH/sq ft has been provided for basement homes.

For evaluating an existing heating system capacity to determine if right, under, or over sized, it's most helpful to generate a range. If the equipment capacity in a heating climate is HIGHER than the range, it is likely oversized. If LOWER than the range, it is likely undersized.

If a blower door number is known, then using the appropriately aligned number may provide greater accuracy. A home where the CFM50 divided by the square footage of the home is 0.75 to 1.0, the home is of average tightness. Below 0.75 indicates a somewhat tight home. Over 1.0 is a somewhat leaky home. See next slide for a visual representation…

Find Winter Design Temperatures here (recommend using most current year data): ASHRAE Climatic Design Conditions or use the winter design temperatures assigned by local codes/programs.

CFM50/Square Foot assessment

Notes and Example

Building tightness is most useful when compared to the building size.

If you don't know the blower door number, use the center value for insulation level vs design temp.

If you do know the blower door number, refer to the table on the right of this slide.

Somewhat tight, average, somewhat leaky

CFM50\Sq Ft	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	*Sq Ft Home*
749	0.749	0.599	0.499	0.428	0.375	0.333	0.300	0.272	0.250	0.230	0.214	
1000	1.000	0.800	0.667	0.571	0.500	0.444	0.400	0.364	0.333	0.308	0.286	
1250	1.250	1.000	0.833	0.714	0.625	0.556	0.500	0.455	0.417	0.385	0.357	
1500	1.500	1.200	1.000	0.857	0.750	0.667	0.600	0.545	0.500	0.462	0.429	
1750	1.750	1.400	1.167	1.000	0.875	0.778	0.700	0.636	0.583	0.538	0.500	
2000	2.000	1.600	1.333	1.143	1.000	0.889	0.800	0.727	0.667	0.615	0.571	
2250	2.250	1.800	1.500	1.286	1.125	1.000	0.900	0.818	0.750	0.692	0.643	
2500	2.500	2.000	1.667	1.429	1.250	1.111	1.000	0.909	0.833	0.769	0.714	
2750	2.750	2.200	1.833	1.571	1.375	1.222	1.100	1.000	0.917	0.846	0.786	
3000	3.000	2.400	2.000	1.714	1.500	1.333	1.200	1.091	1.000	0.923	0.857	
3250	3.250	2.600	2.167	1.857	1.625	1.444	1.300	1.182	1.083	1.000	0.929	
3500	3.500	2.800	2.333	2.000	1.750	1.556	1.400	1.273	1.167	1.077	1.000	
CFM50												

Somewhat Tight
Average
Somewhat Leaky

Heating Load Estimator

Design Load ROUGH Estimator/Gut Checker Btuh/sq. ft. Climate Winter Design Temp in °F @99% (best for dual fuel HPs or when code requires) Climate Winter Design Temp in °F @99.6% (for all electric heat pumps, but follow code/permitting requirements)				
	Below – 10°F	**-10°F to 5°F**	**5°F to 20°F**	**Above 20°F**
No wall insulation (leaky, average, tight)	50, **47**, 44	44, **41**, 38	38, **35**, 32	32, **30**, 28
2x4 Const w/ Insul (leaky, average, tight)	27, **25**, 23	24, **22**, 20	21, **19**, 17	19, **17**, 15
2x6 Const w/ Insul (leaky, average, tight)	20, **18**, 16	17, **15**, 13	15, **13**, 11	13, **11**, 10
Newer const 2012 + (leaky, average, tight)	17, **16**, 15	15, **14**, 13	13, **12**, 11	11, **9**, 8

Original estimator created by the Northwest Energy Efficiency Alliance, edited for variable capacity heat pumps by Dan Wildenhaus

Heating Load Estimator – Basement Houses

Design Load ROUGH Estimator/Gut Checker Btuh/sq. ft.				
Climate Winter Design Temp in °F @99% (best for dual fuel HPs or when code requires) Climate Winter Design Temp in °F @99.6% (for all electric heat pumps, but follow code/permitting requirements)				
	Below – 10°F	**-10°F to 5°F**	**5°F to 20°F**	**Above 20°F**
No wall insulation (leaky, average, tight)	47, **44**, 41	41, **38**, 35	35, **32**, 29	30, **28**, 26
2x4 Const w/ Insul (leaky, average, tight)	25, **23**, 21	22, **20**, 18	19, **17**, 15	17, **15**, 13
2x6 Const w/ Insul (leaky, average, tight)	18, **16**, 14	15, **13**, 11	13, **11**, 9	11, **10**, 9
Newer const 2012 + (leaky, average, tight)	16, **15**, 14	14, **13**, 12	12, **11**, 10	9, **8**, 7

Original estimator created by the Northwest Energy Efficiency Alliance, edited for variable capacity heat pumps by Dan Wildenhaus

Heating Load Estimator with ducts outside the thermal envelope

Design Load ROUGH Estimator/Gut Checker Btuh/sq. ft. Climate Winter Design Temp in °F @99% (best for dual fuel HPs or when code requires) Climate Winter Design Temp in °F @99.6% (for all electric heat pumps, but follow code/permitting requirements)				
	Below – 10°F	**-10°F to 5°F**	**5°F to 20°F**	**Above 20°F**
No wall insulation (leaky, average, tight)	53, **50**, 47	47, **44**, 41	41, **38**, 35	35, **33**, 31
2x4 Const w/ Insul (leaky, average, tight)	30, **28**, 26	26, **24**, 22	23, **21**, 19	21, **19**, 17
2x6 Const w/ Insul (leaky, average, tight)	23, **21**, 19	20, **18**, 16	17, **15**, 13	15, **13**, 11
Newer const 2012 + (leaky, average, tight)	20, **19**, 18	18, **17**, 16	15, **14**, 13	13, **11**, 10

Original estimator created by the Northwest Energy Efficiency Alliance, edited for variable capacity heat pumps by Dan Wildenhaus

Example

- Home is 2x4 construction with insulation. No basement.
- **Home tightness is not known.**
- Home is 2,000 square feet
- Home is expecting to have a dual-fuel/hybrid heat pump.
- Home is in a location where the winter design temperature at 99% is -2°F.
- Existing system is a 60k BTU furnace

Design Load ROUGH Estimator/Gut Checker Btuh/sq. ft.				
Climate Dual Fuel HP Winter Design Temp in °F @99% Climate All Electric HP Winter Design Temp in °F @99.6%				
	Below – 10°F	**-10°F to 5°F**	**5°F to 20°F**	**Above 20°F**
No wall insulation (leaky, average, tight)	50, **47**, 44	38, **41**, 44	32, **35**, 38	32, **30**, 28
2x4 Const w/ Insul (leaky, average, tight)	27, **25**, 23	24, **22**, 20	21, **19**, 17	19, **17**, 15
2x6 Const w/ Insul (leaky, average, tight)	20, **18**, 16	17, **15**, 13	15, **13**, 11	13, **11**, 10
Newer const 2012 + (leaky, average, tight)	17, **16**, 15	15, **14**, 13	13, **12**, 11	11, **9**, 8

A projected range for the heating load is likely to be between:

24 x 2,000 = **48,000**

20 x 2,000 = **40,000**

System is likely oversized!

Example 2

- Home is 2x4 construction with insulation. No basement
- **Home tightness is known:**
  - **Blower door test is 1750 CFM50**
- Home is 2,000 square feet
- Home is expecting to have a dual-fuel/hybrid heat pump.
- Home is in a location where the winter design temperature at 99% is -2°F.
- Existing system is a 48k Btu furnace

Design Load ROUGH Estimator/Gut Checker Btuh/sq. ft. Climate Winter Design Temp in °F @99% (best for dual fuel HPs or when code requires) Climate Winter Design Temp in °F @99.6% (for all electric heat pumps, but follow code/permitting requirements)				
	Below – 10°F	**-10°F to 5°F**	**5°F to 20°F**	**Above 20°F**
No wall insulation (leaky, average, tight)	50, **47**, 44	38, **41**, 44	32, **35**, 38	32, **30**, 28
2x4 Const w/ Insul (leaky, average, tight)	27, **25**, 23	24, **22**, 20	21, **19**, 17	19, **17**, 15
2x6 Const w/ Insul (leaky, average, tight)	20, **18**, 16	17, **15**, 13	15, **13**, 11	13, **11**, 10
Newer const 2012 + (leaky, average, tight)	17, **16**, 15	15, **14**, 13	13, **12**, 11	11, **9**, 8

Using the blower door number to get a more specific design load estimate

1750 / 2000 = 0.875 = Average

Heating load estimate = **44,000 Btuh**

System is within the right nominal size