

Heat Load Calculation Primer

Sizing air conditioning units

When sizing air conditioning one is calculating the heat load of an operation (assembly, manufacturing, offices, etc.) in order to determine the quantity and sizes(s) of the cooling units required to offset the heat radiation

To accurately determine the heat load one must survey and account for every source of heat within the space that is to be conditioned. This survey will yield a sum of watts - because electrical device heat output is always expressed in watts. The watts may then be converted into BTUs (British thermal units) per hour and the cooling equipment sized accordingly.

Conversion formula - 1 watt = 3.41 BTU

For instance a 40 watt light bulb, when on, produces 40 x 3.41 or 136.4 BTUs per hour and a tower workstation rated (found on the information plate on the back of the device) at 350 watts would produce 1,198.5 BTUs hourly.



An informational client bulletin prepared by TiCon Commercial Inspection which specializes in commercial and industrial per-purchase and pre-lease property assessment in the Bay Area and the California Central Valley

Heat loads typical of commercial buildings

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No.	Item	Watts	BTUs/hr
1	Workstation (each)	200.	682
2	Monitor (each)	200.	682
3	Human Body (each)	130.	442
4	2x4 Florescent light (each)	107.	365
5	Exterior Windows (S.F. of surface Area)	1.3	4.4
6	Exterior Walls (S.F. of surface Area)	0.65	2.2
7	Ceilings (S.F. of surface Area)	0.7	2.4
8	Other heat generators - these would be printers, copiers, or any heat producing device not listed above. Use equipment data plate to determine watts	?	?

Use the conversion formula above to convert watts (on device name plate) to BTUs and add to your survey - see example below

Here's a real life example

The sample survey below is based on a 5,984 s.f. space improved as office. The building is rectangular (68' x 88') with walls 16 feet high and has 1,368 square feet of exterior glass. The design occupancy load is 60. Light fixture count is consistent with Title 24 Energy conservation Law.

Item	Quantity	BTU ea	Total BTUs
Workstation (each)	60	200.	40,920
Monitor (each)	60	200.	40,800
Human Body (each)	60	130.	26,520
2x4 Florescent light (each)	73	107.	26,645
Exterior Windows (S.F. of surface Area)	1,368	4.4	6,019
Exterior Walls (S.F. of surface Area)	4,992	2.2	10,982
Ceilings (S.F. of surface Area)	5,984	2.4	14,361
*Other heat generators	10	4,501	45,010
		Total BTUs	211,257
* Free standing copier 1,320 watts x 3.41 = 4,501 BTUs			

Cooling equipment capacity is rated by "ton", a throwback to the days prior to the general use of mechanical refrigeration. To help the public understand this new fangled technology, scientists and refrigeration salesmen, had to explain coldness in a measurable way to their customers. Coldness was defined as a relationship between one ton (2,000 lbs.) of ice and the BTUs (heat) that it absorbed when melting over a 24 hour period which proved to be **12,000 BTUs**.

So, in our sample above one divides the sum of 211,257 BTUs by 12,000 BTUs per ton, yielding a cooling demand of 17.6 tons or one ton/ per 341 square feet.

Keep in mind that this article is presented in this "rule of thumb" context and that in any specific case there will be variations in the results.

By Sam Burkhouse - TiCon Commercial Inspection

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