Chiller Performance Parameters

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ME 415: Refrigeration & Building Mechanical Systems

Refrigeration Capacity/Performance

- **1 ton refrigeration**: heat absorbed by 1 ton (2000 lb) of ice melting at 0^oC in 24 hours.
- 1 ton ref. = 3.516 kW = 12000 BTU/hr = 200 BTU/min
- Coefficient of Performance, $COP = \frac{Refrigeration\ Effect}{Net\ Work\ Required}$
- Energy Efficiency Ratio, $EER = \frac{RE\ in\ BTU/hr}{Power\ required\ in\ W}$
- $kW/ton \Rightarrow$ power required per ton of refrigeration

$$kW/ton = \frac{3.516}{COP} \qquad EER * kW/ton = 12$$

EER	COP	kW/ton
6.0	1.758	2.0
12.0	3.516	1.0
24.0	7.032	0.5

Integrated Part-Load Value (IPLV)

- COP or EER:

$$IPLV = 0.01A + 0.42B + 0.45C + 0.12D$$

- kW/ton:

$$IPLV = \frac{1}{\frac{0.01}{A} + \frac{0.42}{B} + \frac{0.45}{C} + \frac{0.12}{D}}$$

$A \equiv$ COP or EER or kW at 100% capacity
$B \equiv$ COP or EER or kW at 75% capacity
$C \equiv$ COP or EER or kW at 50% capacity
$D \equiv$ COP or EER or kW at 25% capacity

Minimum Performance for VC System (ASHRAE 90.1)

type	COP	IPLV
Air cooled, with condenser, capacity < 150 ton	2.7	2.8
Air cooled, with condenser, capacity > 150 ton	2.5	2.5
Air cooled, condenserless, all capacity	3.1	3.2
Water cooled, reciprocating, all capacity	3.8	3.9
Water cooled (screw & centrifugal) < 150 ton	3.8	3.9
Water cooled (screw & centrifugal) 150< < 300 ton	4.2	4.5
Water cooled (screw & centrifugal) > 300 ton	5.2	5.3