

HVACK

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Reference Guide

#### **Evaporate Condenser Ratings**

An evaporative condenser rated at a condensing temperature of 100°F and a wet fault temperature or 70°F will have rating factors under other conditions as follows:

| Condenser<br>Temp. 'F | Entering Air Wet Bulb Temp. 'F |      |      |      |      |      |
|-----------------------|--------------------------------|------|------|------|------|------|
|                       | 5/5"                           | 60"  | 65"  | 701  | 757  | 701  |
| 90                    | 0.96                           | 0.86 | 0.75 | 0.63 | 0.50 | 0.43 |
| 95                    | 3.13                           | 1.03 | 0.91 | 0.80 | 0.67 | 0.59 |
| 100                   | 3.32                           | 1.22 | 1.11 | 1.00 | 0.87 | 0.79 |
| 105                   | 3.55                           | 1.41 | 1.54 | 1.20 | 1.08 | 1.00 |
| 110                   | 1.71                           | 1.62 | 1.52 | 1.41 | 1.29 | 1.22 |
| 115                   | 1.99                           | 1.85 | 1.75 | 1.65 | 3.54 | 2.47 |
| 120                   | 2.20                           | 2.33 | 2.02 | 1.93 | 1.81 | 1.75 |

#### Compressor Capacity vs Refrigerant

| Refrigerant<br>Temp. 'F | Heat Rejection<br>Ratio (s) | Capacity % Based on |      |           |      |
|-------------------------|-----------------------------|---------------------|------|-----------|------|
|                         |                             | 50°F                | 40°F | 2019      | 50°F |
| 50                      | 1.36                        | 100                 |      |           |      |
| 40                      | 1.18                        | 83                  | 100  |           |      |
| 3/3                     | 1.31                        | 69                  | 43   |           |      |
| 20                      | 1.16                        | 5-6                 | 67   | 100       |      |
| 1.0                     | 1.19                        | 4.6                 | 541  | 90        |      |
| - 0.                    | 1.45                        | 3.6                 | 43   | 500 64 CO | 100  |
| -10                     | 1.53                        | 28                  | 34   | 50        | . 79 |
| +2/0                    | 1.64                        | 22                  | 26   | 3.0       | 6.1  |
| -100                    | 1.77                        | 15                  | 3.6  | 2.7       | 43   |
| -80                     | 1.92                        | 30                  | 12   | 100       | 2.0  |

(a) For sealed compressors.

The capacity of a typical compressor is reduced as the evaporating temperature is reduced because of increased specific volume (ou ft/lb) of the refrigarant and lower compressor volumetric efficiency. The average 1 hy compressor will have a capacity of nearly 12,000 bts/hr per ton, at 40°F refrigarant temperature, 100°F condensing temperature. A 10° rise/fall in condensing temperature will reduce/increase capacity about 6%.

#### **Cooling Tower Ratings**

| Temperatures *F |            |              |                                 |  |  |
|-----------------|------------|--------------|---------------------------------|--|--|
| Wort Warter     | Cold Water | West Builtin | Capacity Factor<br>0.65<br>1.00 |  |  |
| 90              | 90         | .70          |                                 |  |  |
| - 後文            | 62         | 70           |                                 |  |  |
| 95              | 915        | 70           | 1.24                            |  |  |
| 90              | 80         | 72           | 0.74                            |  |  |
| 92              | 102        | 72           | 0.66                            |  |  |
| 95              | 10 Min     | 72           | 1.12                            |  |  |
| 95              | 65         | 24.5         | 1.00                            |  |  |
| 95              | 65         | 76           | 0.88                            |  |  |
| 39.5            | 20 205- 20 | 2.76         | 0.75                            |  |  |
| 9.5             | 65         | 80           | 0.62                            |  |  |

Hot water - Cold Water - Range

Cold Water - Hot Water - Approach

The Capacity factor is a multiplier by which the capacity at any common assumed condition may be found if the rating at some other point is known. Factors are based on heat rejection ratio of 1.25 (15,000 btu/hr per ton) and gpm/fom flow rate.

Example: at 95-85-80, the capacity is 0.62/0.85 or 0.75 that of the rating of 90-80-70.

Capacity is reduced as the flow rate per ton is increased.

If the refrigerent temperature is below 40°F, the heat rejection will be greater than 15,000 btw/hr per ton.

Evaporation will cause increasing deposits of solids and fouling of the condenser tubes unless water is bled off. A bleed of 1% of the circulation rate will result in concentrations of twice the original solids (two concentrations), and 0.5% bleed will result in three concentrations.

#### Horsepower Per Ton

At 100°F condensing temperature vapor enters the compressor at 65°F

| Refrig. Temp. 'F | 40   | 2.0  | 0    | -20  | -4.0 |
|------------------|------|------|------|------|------|
| Practical Avg.   | 0.87 | 1.20 | 1.70 | 2.40 | 3.20 |

# **Proper System Charging**

#### Subcooling Charging Method - TXV (Expansion Valve)

Subcooking is defined as: The temperature of a liquid refrigerant when it is cooked below its condeming to expectation. Subcooking takes place in the condemics and is determined by subtracting the liquid line temperature (as read on a the remonster strapped on the liquid line) from the saturation temperature (gauge temperature - the temperature that corresponds to the pressure read on the high side of the gauge).

 Locate the unit required subcooling from the name plate or product literature (Typically 8-12"Y).

(2) Measure Squid line temperature - convert to pressure.

(10 Subtract the required subcooling (1) from the converted temperature (2).

This is the required liquid line temperature.

(4) Measure the liquid line temperature. If the measured temperature does not equal the required liquid line temperature:

- Add refrigerant to lower the temperature
- . Remove refrigerant to raise the temperature
- Allow a tolerance of n/- 3°F.

#### Superheat Charging Chart - Cooling - Non TXV (Expansion Valve)

Superheat is defined as: The temperature of vapor refrigerent above its saturation point (evaporation) temperature. Superheat occurs in the evaporator and is determined by subtracting the saturation temperature (the temperature that corresponds to the pressure read on the low-side gauge) from the suction line temperature (as read on a thermometer strapped on the suction line).

#### Respectived Superheart Condenser Entering Air - Dry Bulls 199 31.27 1900 164 765 100 25-60 50.00 bc. 16.77 31.50 20.70 20 1.8 56 3.3 13 JE 16 200 20.00 2.6 657 370 2546 2018 3.55 3.5 3.3 180 360 电 244 21 1.80 30.25 27 500 2.4 21 1.80 2.75 27 2.4 23 1.9 340 34.4 3700 30.75 20.50 30.76 18-854 37.180 31.7% DOM: 50.00 20.7% 2.30 400 3-8 346 3.5 33. 3.8 356 254 22 2.0 3.7 407 60 200 346

- 76 45 49 49 39 37 35 39 39 29 27 26
  (1) Measure the outdoor air (dry bulb) temperature, and indoor wet bulb temperature.
- (2) Find the required superheat from the chart.
- (3) Measure the suction line pressure convert pressure to temperature.
- (4) Add the required superheat (2) to the converted temperature (1). This is the required suction line temperature.
- (5) Measure the suction line temperature. If the suction line temperature does not equal the required suction line temperature (4):
- Add refrigerant to lower the suction line temperature.
- Remove refrigerant to sake the saction line temperature.
- Allow a tolerance of n/- 3°F

# **Hvac Quick Reference Guide**

**Charles Nehme** 

#### **Hvac Ouick Reference Guide:**

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