

USEFUL HVAC FORMULAS

ELECTRICAL:

$$\text{POWER (WATTS)} = \text{VOLTS (V)} \times \text{AMPS (A)}$$

*IN SINGLE-PHASE (1 ϕ) APPLICATIONS WITH NO POWER FACTOR CORRECTION.

$$\text{POWER (WATTS)} = \text{VOLTS} \times \text{AMPS} \times 1.73$$

*IN THREE-PHASE (3 ϕ) APPLICATIONS WITH NO POWER FACTOR CORRECTION.

$$\text{VOLTS} = \text{AMPS} \times \text{RESISTANCE (OHMS LAW FOR DC OR RESISTIVE AC CIRCUITS)}$$

$$1 \text{ KILOWATT (KW)} = 1000 \text{ WATTS}$$

$$1 \text{ WATT} = 3.414 \text{ BRITISH THERMAL UNITS PER HOUR (BTUH)}$$

$$\text{CAPACITANCE (MICROFARADS): } \text{MFD} = \text{CAPACITOR AMPS} \times 2654 / \text{CAPACITOR VOLTS}$$

AIR AND HEAT:

HEAT RISE METHOD AIRFLOW CFM (CUBIC FEET PER MINUTE) TEST:

$$\text{SINGLE-PHASE (1}\phi\text{) APPLICATIONS: } \text{CFM} = \text{V} \times \text{A} \times 3.414 / 1.1 / \Delta T \quad (\Delta T = \text{TEMP CHANGE})$$

$$\text{THREE-PHASE (3}\phi\text{) APPLICATIONS: } \text{CFM} = \text{V} \times \text{A} \times 1.73 \times 3.414 / 1.1 / \Delta T$$

$$\text{TOTAL HEAT TRANSFER (CONVECTION): } \text{BTUht} = \text{CFM} \times \Delta H \times 4.5 \quad (\Delta H = \text{ENTHALPY CHANGE})$$

$$\text{SENSIBLE HEAT TRANSFER (CONVECTION): } \text{BTUhs} = \text{CFM} \times \Delta T \times 1.1$$

$$\text{LATENT HEAT TRANSFER (CONVECTION): } \text{BTUhl} = \text{CFM} \times \Delta GR \times 0.68 \quad (\Delta GR = \text{GRAINS/LB CHANGE})$$

$$\text{VELOCITY METHOD AIRFLOW TEST: } \text{CFM} = \text{FREE AREA (SQ. FT)} \times \text{VELOCITY (FEET PER MINUTE)}$$

or $\text{CFM} = \text{VELOCITY (FPM)} \times \text{Ak FACTOR (from OEM Grille Data)}$

$$\text{DUCT PRESSURE DROP (SUPPLY-SIDE): } \text{PD} = \text{SSP}_1 - \text{SSP}_2$$

(SSP₁ = SUPPLY STATIC PRESSURE ENTERING THE AIR-SIDE DEVICE OR DUCT SEGMENT)

(SSP₂ = SUPPLY STATIC PRESSURE LEAVING THE AIR-SIDE DEVICE OR DUCT SEGMENT)

$$\text{DUCT PRESSURE DROP (RETURN-SIDE): } \text{PD} = \text{RSP}_2 - \text{RSP}_1 \quad \text{*DISREGARD NEGATIVE-PRESSURE SIGN}$$

(RSP₁ = RETURN STATIC PRESSURE ENTERING THE AIR-SIDE DEVICE OR DUCT SEGMENT)

(RSP₂ = RETURN STATIC PRESSURE LEAVING THE AIR-SIDE DEVICE OR DUCT SEGMENT)

EXTERNAL STATIC PRESSURE (ESP) DIRECTLY ACROSS AIR HANDLER OR FURNACE:

$$\text{ESP} = \text{SSP}_1 - \text{RSP}_1 \quad \text{*TO SUBTRACT A NEGATIVE, CHANGE THE SIGN AND ADD THE REAL NUMBERS}$$

USUALLY PD AND ESP ARE EXPRESSED IN INCHES WATER COLUMN (IWC) 1 IWC = 27.7 PSI

$$\text{FRICTION RATE (IWC/100 FT.)} = \text{AVAILABLE STATIC PRESSURE (ASP)} \times 100 / \text{TOTAL EFFECTIVE LENGTH (TEL)}$$

*USED IN DUCT SIZING DO NOT USE A RULE OF THUMB LIKE "0.1" OR "0.08" ...*CALCULATE THE FRICTION RATE*



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