

HVAC RULES OF THUMB

AIRFLOWS

SUPPLY AIR	0.5 TO 1.5 CFM / SQ. FT. OFFICE AREA 2.0 CFM / SQ. FT. ELECTRICAL, MECH. ROOMS
RETURN AIR	80% OF SUPPLY AIR FOR NON LAB AREAS NO RETURN AIR FOR LAB AREAS
OUTSIDE AIR	20% OF SUPPLY AIR 15 TO 35 CFM / PERSON MINIMUM

HEATING & COOLING

SENSIBLE	$1.08 * CFM * dTEMP$
LATENT	$0.68 * CFM * dGRAINS$
TOTAL	SENSIBLE + LATENT
SHR RATIO	SENSIBLE / TOTAL
COOLING	TYPICAL 0.75 TO 0.95 SHR COOLING 300 TO 400 SQ.FT. / TON OFFICE AREAS 50 TO 300 SQ.FT. / TON MANUFACTURING AREAS 100 TO 300 SQ.FT. / TON LABS 50 TO 150 SQ.FT. / TON ELECTRICAL, PC ROOMS
HEATING	TYPICAL 0.90 TO 1.0 SHR HEATING 30 TO 60 BTUH / SQ.FT. OFFICE AREAS 40 TO 240 BTUH / SQ.FT. MANUFACTURING AREAS 40 TO 120 BTUH / SQ. FT. LABS 80 TO 240 BTUH / SQ.FT. ELECTRICAL, PC ROOMS

UTILITIES

STEAM	$LB/HR STEAM = BTUH HEATING / 960$
WATER	$BTUH = 500 * GPM * Dtemp$
ELECTRIC	$KW = VOLT * AMP * PF / 1000$ (1 PHASE) $KW = 1.73 * VOLT * AMP * PF / 1000$ (3 PHASE) TYPICAL PF OF 0.75 TO 0.95 $BHP = VOLT * AMP * PF * EFF / 746$ (1 PHASE) $BHP = 1.73 * VOLT * AMP * PF * EFF / 746$ (3 PHASE)

EQUIPMENT

FANS	$BHP = CFM * TSP / (6356 * EFF)$ TSP= IN WC TYPICAL EFF OF 0.50 TO 0.65 FOR FANS $CFM2 = CFM1 * (RPM2 / RPM1)$ $SP2 = SP1 * (RPM2 / RPM1)^2$ $BHP2 = BHP1 * (RPM2 / RPM1)^3$
PUMPS	$BHP = GPM * HEAD / (3960 * EFF)$ HEAD = FT H2O TYPICAL EFF OF 0.60 TO 0.90 FOR PUMPS $GPM2 = GPM1 * (RPM2/RPM1)$

$$HD2 = HD1 * (RPM2 / RPM1)^2$$

$$BHP2 = BHP1 * (RPM2 / RPM1)^3$$

CONDENSERS	3 GPM / TON AT 10 F dTEMP	
EVAPORATORS	2.4 GPM / TO AT 10 F Dtemp	
REFRIGERATION	3 LB / TON CHARGE	
DESIGN CONDITIONS		
INDOOR	78 F DB / 65 F WB / 73 GR	SUMMER
	75 F DB / 58 F WB / 45 GR	WINTER
OUTDOOR	93 F DB / 74 F WB / 96 GR	SUMMER
	5 F DB / 3 F WB / 0 GR	WINTER
DUCT VELOCITIES	1000 TO 1300 FPM SUPPLY MAINS	
	600 TO 900 FPM SUPPLY BRANCH	
	500 TO 900 FPM OUTDOOR AIR INTAKES	
	1500 TO 2200 FPM FAN OUTLETS	
	250 TO 350 FPM FILTERS	
	500 TO 900 FPM RETURNS	
	1400 TO 2000 FPM VAPORS, FUMES, SMOKE	
	2000 TO 2500 FPM FINE LIGHT DUST	
	2500 TO 3500 FPM DRY DUST AND POWDERS	
	3500 TO 4000 FPM AVERAGE INDUSTRIAL DUSTS	
	4000 TO 4500 FPM HEAVY DUSTS	
	4500 TO ? FPM HEAVY OR MOIST DUSTS	
CAPTURE VELOCITIES	80 TO 120 FPM FACE OF HOODS	
	50 TO 100 FPM DEGREASING, EVAPORATION	
	100 TO 200 FPM WELDING, CONTAINER FILLING	
	200 TO 500 FPM PAINTING, CRUSHING	
	500 TO 2000 FPM GRINDING, ABRASIVES	
VELOCITIES AT WORKER	50 TO 75 FPM AIR CONDITIONED SPACE	
	75 TO 125 FPM SITTING	
	100 TO 200 FPM STANDING	
	1000 TO 4000 FPM RELIEF STATIONS	
DUCT PRESSURE DROP	0.05 TO 0.15 IN WC/100 FT DUCT LOSS	
CONVERSIONS	1 TON = 12,000 BTUH	
	1 WATT = 3.412 BTUH	