

Additions and Corrections

This report includes additional information, and technical errors found between June 15, 2003, and April 21, 2006, in the inch-pound (I-P) editions of the 2003, 2004, and 2005 *ASHRAE Handbook* volumes. Occasional typographical errors and nonstandard symbol labels will be corrected in future volumes. The most current list of Handbook additions and corrections is on the ASHRAE Web site (www.ashrae.org).

The authors and editor encourage you to notify them if you find other technical errors. Please send corrections to: Handbook Editor, ASHRAE, 1791 Tullie Circle NE, Atlanta, GA 30329, or e-mail mowen@ashrae.org.

2003 HVAC Applications

p. 1.4, Evaporative Cooling. The reference to Chapter 50 should be to Chapter 51.

p. 8.2, Indoor Air Quality, 4th line. Delete “by a minimum of 3°F”

p. 13.6. Reverse the order of Figures 6 and 7.

p. 16.13, Temperature and Humidity, 3rd paragraph. If full-coverage smocks are not used, temperature set points can be higher, not lower.

Ch. 17. This chapter has been reassigned to TC 9.9, which recommends using ASHRAE’s *Thermal Guidelines for Data Processing Environments* (2004) as a primary source of information for data processing environment design.

p. 22.9, Recommendations for Laying Houses with Birds in Cages. The space recommendation should be 50 to 65 in².

p. 23.7, Fig. 8. The bottom part of the figure was cut off; please refer to the full version here.

p. 27.5, 2nd col. In the bulleted list, the realistic water loading in a cooling tower should be 6 to 18 gpm per square foot.

p. 27.6. Step 6 should read, “The enthalpy of air h_{ai} at 83°F saturated and 15.226 psia is 45.95 Btu/lb. $\Sigma_{ai} = 45.95 - (1)(0.0237)(83) = 43.98$ Btu/lb.

p. 27.10, 2nd col, 5th full paragraph. Change “calorific” to “heat.”

p. 27.11, Planning the Circuit section. In definitions for Equation (19), delete subscript t from R . Units for R should be in. of water-min/ft⁶. Units for d and standard air density should be lb_m/ft³. In definitions for Equation (20), units for k and the conversion factor should contain lb_f.

p. 27.12, Example 9 solution. For series operation, the solution should be 6.0×10^{-10} in. of water-min²/ft⁶. For parallel, the solution should be 1.92×10^{-11} in. of water-min²/ft⁶.

p. 31.5, Type II Hoods, Condensate hood list item. The second and third sentences should be, “The hood is designed to direct the condensate toward a perimeter gutter for collection and drainage, allowing none to drip onto the appliance below. Flow rates are typically based on 50 to 75 cfm per square foot of hood opening.”

p. 31.11, Traditional Registers. Terminal velocities should be kept less than or equal to 50 fpm.

p. 32.4, 2nd col., last paragraph. In the second sentence, velocity should be limited to a maximum of 0.1 fps.

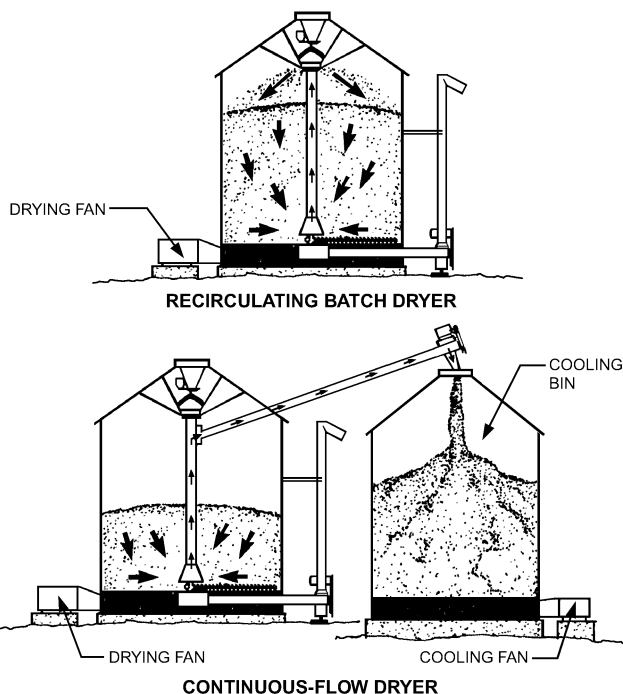


Fig. 8 Grain Recirculators Convert Bin Dryer to High-Speed Continuous-Flow Dryer
(2003 HVAC Applications, Chapter 23, p. 7)

p. 32.6, 2nd col., 4th full paragraph. Change “flashing” to “flushing.” The units for free residual chlorine content should be ppm.

p. 32.17, Eqs. (5a) to (5c). Replace R_{gA} , R_{gB} , and R_{gC} with R_{ga} , R_{gm} , and R_{gd} .

p. 32.19, Fig. 18. In Nevada, change “15” to “59.”

p. 36.3, Table 3. Add the following footnote:

3. For updated information on heat pump life, see Lovvorn and Hiller (2002).

p. 36.9, 1st col., 3rd line. The subscript for PWF should be “ser.”

p. 36.13, References. Add the following source after Lovvorn and Hiller (1985):

Lovvorn, N.C. and C.C. Hiller. 2002. Heat pump life revisited. *ASHRAE Transactions* 108(2):107-112.

p. 45.6, 1st col., end of last paragraph. The correct Research Project is RP-1134 (Tompkins 2002).

pp. 45.12-45.13, References section. Delete the Idem 2002 source, and insert the following after Sterling and Kabayashi 1981:

Tompkins, D. 2002. Evaluation of photocatalytic air cleaning capability. *ASHRAE Research Project* RP-1134.

p. 47.39, Equipment Vibration, 2nd paragraph. The second sentence should read, “Isolation efficiency is the percentage of vibratory force *not* transmitted to the support structure.”

p. 47.50, Resources. The URL for the Institute of Noise Control Engineers (INCE) should be www.inceusa.org.

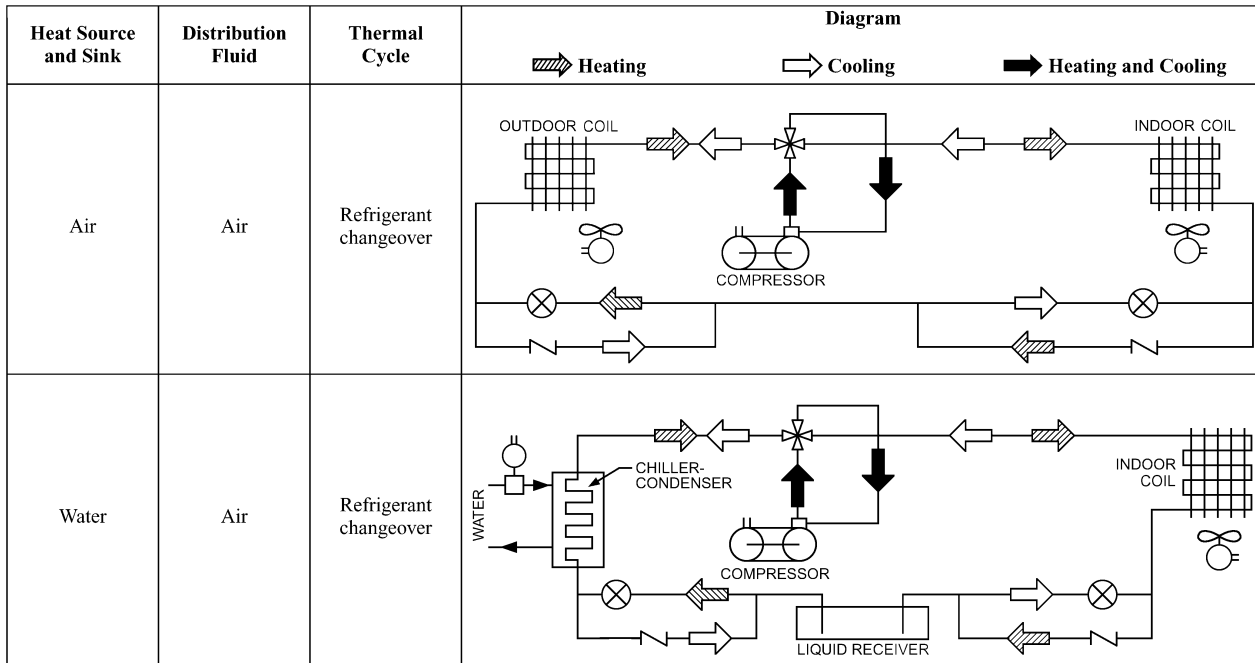


Fig. 5 Heat Pump Types (first two rows)
(2004 HVAC Systems and Equipment, Ch. 8, p. 5)

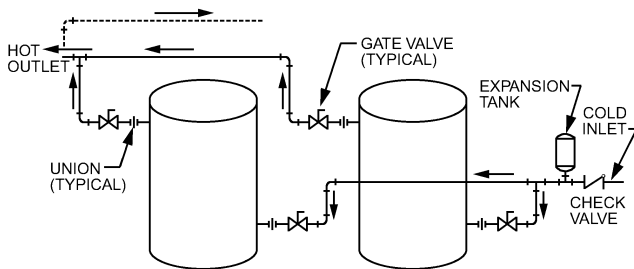


Fig. 7 Reverse/Return Manifold Systems
(2003 HVAC Applications, Ch. 49, p. 6)

p. 49.6, **Fig. 7.** The arrow for “Union (typical)” should point to the union symbol, not the gate valve symbol. The correct figure is presented here.

p. 50.1, **Snow-Melting Heat Flux Requirement.** The fourth list item should be “wind speed near the heated surface.”

p. 50.24, **Eq. (24).** K_1 and K_2 should be k_1 and k_2 .

p. 53.10, **Symbols.** The units for σ should be $\text{Btu/h}\cdot\text{ft}^2\cdot\text{R}^4$.

p. I.4, **Index.** Add “F15.12” to the entries for BAS and Building automation system.

2004 HVAC Systems and Equipment

p. 2.5, **Fig. 8.** The caption for Figure 9 should read “Chemical Dehumidification.”

p. 8.5, **Fig. 5.** The top two figures, for air/air and water/air refrigerant changeover, were cut off and are provided here.

p. 12.9, **Fig. 16.** The figure for reverse-return two-pipe systems was incorrect; the corrected version is provided here.

p. 20.4, Under Additional Moisture Losses, the reference should be to Chapter 12, not Chapter 11.

p. 25.4, **Eq. (5).** There should be an equals symbol after D_{pc} .

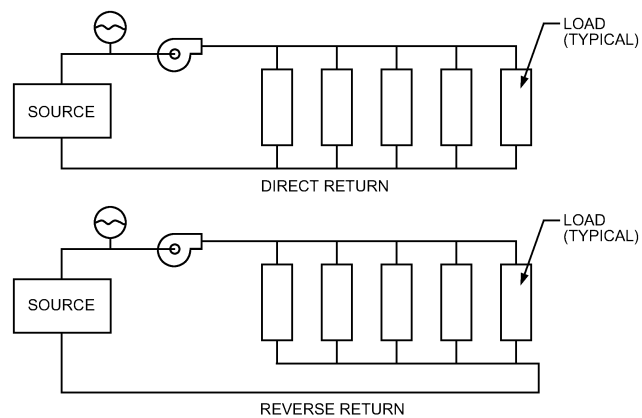


Fig. 16 Direct- and Reverse-Return Two-Pipe Systems
(2004 HVAC Systems and Equipment, Ch. 12, p. 9)

p. 35.19, **1st col., 4th line from bottom.** Change “Chapters 35 and 38 of this volume” to “Chapter 38 of this volume.”

p. 36.3, **Fig. 4.** The figure was partially cut off; it is supplied in complete form here.

p. 44.3-44.4, **Example 1, Solution.** Correct the following values: $h_1 = 30.6$, $h_3 = 28.15$, and $w_3 = 0.0093$. Thus, $w_2 = 0.0082$ lb/lb, $w_4 = 0.0082$ lb/lb, $q_L = -799$ Btu/min, and $q = 785$ Btu/min. In the last paragraph in the example, change 0.00795 to 0.0082, change 21.9 to 29.4, and change “to be” to “is.”

p. 44.10, **Fig. 5.** Replace with the correct figure, provided here.

p. 44.19, **Example 4, Step 7.** The reference to Figure 17 should be to Figure 19.

p. 44.19, **Example 5.** Correct the following values: $h_3 = 23.7$ and $w_3 = 0.0052$. Thus, $h_4 = 13.43$ Btu/lb, $t_4 = 35.7^\circ\text{F}$, $w_4 = 0.0044$ lb/lb, $m_w = 38.4$ lb/h, and $q_e = 505,900$ Btu/h.

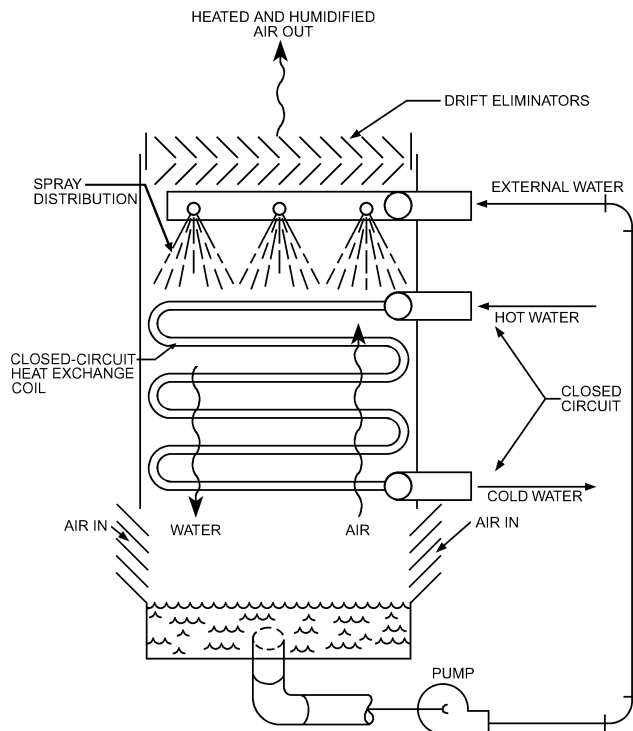


Fig. 4 Indirect-Contact or Closed-Circuit Evaporative Cooling Tower
(2004 HVAC Systems and Equipment, Chapter 36, p. 3)

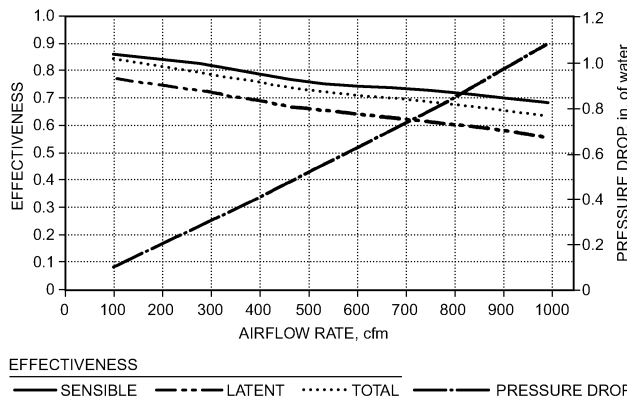


Fig. 5 Variation of Pressure Drop and Effectiveness with Air Flow Rates for a Membrane Plate Exchanger
(2004 HVAC Systems and Equipment, Ch. 44, p. 10)

pp. 44.19-44.20, Example 6. Correct the following values: $h_1 = 44.6$ Btu/lb, $w_1 = 0.0198$ lb/lb, $h_3 = 28.5$ Btu/lb, and $w_3 = 0.0096$ lb/lb. Thus, q_{max} (total) = 566,000 Btu/h, $q_t = 321,000$, $q_{lat} = 203,000$ Btu/h, $h_2 = 35.5$ Btu/lb, $t_{w2} = 71.6^\circ\text{F}$, $t_4 = 86.2^\circ\text{F}$, $h_4 = 35.4$ Btu/lb, $w_4 = 0.0134$, and $t_{w4} = 71.6^\circ\text{F}$. In step 6, second equation, $q_t = 319,000$ Btu/h.

pp. 44.20-44.21, Example 7, Solution. Correct the following values: $h_1 = 44.6$ Btu/lb, $w_1 = 0.0198$ lb/lb, $h_3 = 28.5$ Btu/lb, and $w_3 = 0.0096$ lb/lb. Thus, $h_2 = 33.16$ Btu/lb, $w_2 = 0.0129$, $t_{w2} = 69.2^\circ\text{F}$, $h_4 = 39.5$ Btu/lb, and $t_{w4} = 76.1^\circ\text{F}$. In step 6, second equation, $q_t = 41,460$ Btu/h.

pp. 44.22-44.23, Example 9, Solution. In step 5a, entering enthalpy should be 44.6 Btu/lb. Thus, $h_x = 38.6$ Btu/lb; two lines below this equation, change the wet-bulb temperature for saturated

air to 75°F. In step 5b, entering enthalpy is 21.3 Btu/lb; thus, $h_4 = 27.3$ Btu/lb.

p. 44.25, Bibliography. The correct entry for the ASHRAE (1974) source is as follows:

ASHRAE. 1974. Symposium on heat recovery. *ASHRAE Transactions* 80(1):302-332.

Index. The following chapter references are correct for these entries:

- Compressors**, heat pump systems, S8.6
- Control**, heat recovery systems, S8.18
- Defrosting**, air-source heat pump coils, S8.7, 8; S45.9
- Heat balance (HB)**, studies, S8.19
- Heat pumps** (all subentries with S1 should be S8)
- Heat recovery** (all subentries with S1 should be S8)
- Industrial applications**, heat pumps, S8.8
- Net positive suction**, S39.9
- Refrigerant control devices**, R45
- heat pumps, system, S8.7
- Solar energy**, heat pump systems, S8.4

2005 Fundamentals

p. 1.17, Eq. (63). \dot{Q}_{evap} should be \dot{Q}_{cond} .

p. 1.20, Symbols. Units for V should be ft/s.

p. 2.7, Table 2. Values for ϵ (right column) should be 60, 1800, 6000, and 10,200 μin .

p. 2.11, definitions for Eq. (38). In the definition for Δh , there should be parentheses around $p_1 - p_2$.

p. 3.2, Thermal Conduction, 2nd line from bottom. Change “steady” to “steady-state.”

p. 3.5, Eq. (10). The equation should be as follows:

$$c_1 = \frac{2 Bi}{(\mu_1^2 + Bi^2) J_0(\mu_1)}$$

p. 3.13, 1st col. Delete first repeated paragraph after Equation (30).

p. 3.21, 2nd col., last full sentence. Change to, “Depending on frequency and amplitude of vibration, forced convection from a wire to air is enhanced by up to 300% (Nesis et al. 1994).”

p. 3.28, Eq. (44). Delete second equals sign and second fraction.

p. 7.20, 1st col., last full paragraph. Change third sentence to read, “the resonance frequency of the system is maintained at 3.13 Hz, and the force transmitted to the structure remains at 12.5 lb_f.” Change sixth sentence to read, “where a is acceleration, the maximum dynamic displacement of the mounted equipment is reduced by a factor of (M_1/M_2) , where M_1 and M_2 are the masses before and after mass is added, respectively.”

p. 15.3, Eq. (3) and following text. Change K_d to K_d in the equation, definitions, and following paragraph (three places total).

p. 16.11, Symbols. Add the following definitions:

- h_s = exhaust stack height (typically above roof unless otherwise specified), ft (see Figure 3, and Chapter 44 in the 2003 ASHRAE Handbook—HVAC Applications)
- S = stretched-string distance; shortest distance from exhaust to intake over obstacles and along building surface, ft [see Figure 3, and Equation (22) in the 2003 ASHRAE Handbook—HVAC Applications]

p. 23.6, Fig. 1. Change caption from “Adsorption Isotherms” to “Typical Adsorption.”

p. 27.14, Figure 9. Air leakage should be at 0.2 in. of water.

p. 28.2, Table 1 (and all data tables), cols. 13a, c, and e. Because of a data processing error, the enthalpy values in these columns are systematically low by 7.687 Btu/lb. Thus, all enthalpy values in Table 1 and in all design climatic condition tables on the accompanying CD-ROM should be increased by that amount.

p. 29.8, Table 7. Units for OF_b should be °F.

p. 29.9, Table 9. The correct numbers for the last line of the table are as follows:

E_i 326 325 321 314 305 293 279 262 243

p. 29.9, Eq. (23). Units for CF_{slab} should be Btu/h·ft²; 0.51 is a constant with units of Btu/h·ft²; and 2.5 is a factor with units of °F.

p. 30.2, 2nd col., 6th paragraph, last line. Change “with” to “with-out.”

p. 30.4, bottom of 2nd col. The reference to Equation (3) should be to Equation (4).

p. 30.27, Table 19. Footnote 7 should refer to Table 3 in Chapter 39.

p. 31.6, Table 2. In the footnote for Winter Conditions, add the following: $h_i = h_{ic} + h_{iR} = 0.30(\Delta T/L)^{0.25} + \epsilon\Gamma(T_i^4 - T_g^4)/\Delta T$, where $\Delta T = T_i - T_g$, °R; L = glazing height, ft; T_g = glass temperature, °R.

p. 31.26, Table 13. For ID 1b, change the following values:

T	0.77	0.75	0.73	0.68	0.58	0.35	0.69
R^f	0.07	0.08	0.09	0.13	0.24	0.48	0.13
R^b	0.07	0.08	0.09	0.13	0.24	0.48	0.13

p. 32.5, 1st col. Cross references to the following equations in Chapter 30 should be as follows (the chapter number should stay the same; only the equation numbers should be updated):

Equation (36)	Equation (27)
Equation (35)	Equation (26)
Equation (34)	Equation (25)

p. 38.1, 1st col. The definition of an acre should be 43,560 ft². The conversion factor for ft of water to Pa should be 2989.

p. 40.26. The URL for CSA America should be csa-america.org.