

**2009  
ASHRAE HANDBOOK**

**FUNDAMENTALS**

**SI Edition**

**Supported by ASHRAE Research**

# **2009 ASHRAE® HANDBOOK**

# **FUNDAMENTALS**

**SI Edition**

**American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.**

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# CONTENTS

## Contributors

## ASHRAE Technical Committees, Task Groups, and Technical Resource Groups

## ASHRAE Research: Improving the Quality of Life

## Preface

## PRINCIPLES

- Chapter*
1. **Psychrometrics** (TC 1.1, Thermodynamics and Psychrometrics, TC 8.3, Absorption and Heat-Operated Machines)
  2. **Thermodynamics and Refrigeration Cycles** (TC 1.1)
  3. **Fluid Flow** (TC 1.3, Heat Transfer and Fluid Flow)
  4. **Heat Transfer** (TC 1.3)
  5. **Two-Phase Flow** (TC 1.3)
  6. **Mass Transfer** (TC 1.3)
  7. **Fundamentals of Control** (TC 1.4, Control Theory and Application)
  8. **Sound and Vibration** (TC 2.6, Sound and Vibration Control)

## INDOOR ENVIRONMENTAL QUALITY

- Chapter*
9. **Thermal Comfort** (TC 2.1, Physiology and Human Environment)
  10. **Indoor Environmental Health** (Environmental Health Committee)
  11. **Air Contaminants** (TC 2.3, Gaseous Air Contaminants and Gas Contaminant Removal Equipment)
  12. **Odors** (TC 2.3)
  13. **Indoor Environmental Modeling** (TC 4.10, Indoor Environmental Modeling)

## LOAD AND ENERGY CALCULATIONS

- Chapter*
14. **Climatic Design Information** (TC 4.2, Climatic Information)
  15. **Fenestration** (TC 4.5, Fenestration)
  16. **Ventilation and Infiltration** (TC 4.3, Ventilation Requirements and Infiltration)
  17. **Residential Cooling and Heating Load Calculations** (TC 4.1, Load Calculation Data and Procedures)
  18. **Nonresidential Cooling and Heating Load Calculations** (TC 4.1)
  19. **Energy Estimating and Modeling Methods** (TC 4.7, Energy Calculations)

## HVAC DESIGN

- Chapter*
20. **Space Air Diffusion** (TC 5.3, Room Air Distribution)
  21. **Duct Design** (TC 5.2, Duct Design)

- 22. **Pipe Sizing** (TC 6.1, Hydronic and Steam Equipment and Systems)
- 23. **Insulation for Mechanical Systems** (TC 1.8, Mechanical Systems Insulation)
- 24. **Airflow Around Buildings** (TC 4.3)

## **BUILDING ENVELOPE**

- Chapter* 25. **Heat, Air, and Moisture Control in Building Assemblies—Fundamentals**  
(TC 4.4, Building Materials and Building Envelope Performance)
- 26. **Heat, Air, and Moisture Control in Building Assemblies—Material Properties** (TC 4.4)
- 27. **Heat, Air, and Moisture Control in Insulated Assemblies—Examples** (TC 4.4)

## **MATERIALS**

- Chapter* 28. **Combustion and Fuels** (TC 6.10, Fuels and Combustion)
- 29. **Refrigerants** (TC 3.1, Refrigerants and Secondary Coolants)
- 30. **Thermophysical Properties of Refrigerants** (TC 3.1)
- 31. **Physical Properties of Secondary Coolants (Brines)** (TC 3.1)
- 32. **Sorbents and Desiccants** (TC 8.12, Desiccant Dehumidification Equipment and Components)
- 33. **Physical Properties of Materials** (TC 1.3)

## **GENERAL**

- Chapter* 34. **Energy Resources** (TC 2.8, Building Environmental Impacts and Sustainability)
- 35. **Sustainability** (TC 2.8)
- 36. **Measurement and Instruments** (TC 1.2, Instruments and Measurements)
- 37. **Abbreviations and Symbols** (TC 1.6, Terminology)
- 38. **Units and Conversions** (TC 1.6)
- 39. **Codes and Standards**

## **ADDITIONS AND CORRECTIONS**

## **INDEX**

Composite index to the 2006 Refrigeration, 2007 HVAC Applications, 2008 HVAC Systems and Equipment, and 2009 Fundamentals volumes

## **Comment Pages**

Table 2 Thermodynamic Properties of Moist Air at Standard Atmospheric Pressure, 101.325 kPa

Temp., °C <i>t</i>	Humidity Ratio <i>W<sub>s</sub></i> , kg <sub>m</sub> /kg <sub>da</sub>	Specific Volume, m <sup>3</sup> /kg <sub>da</sub>			Specific Enthalpy, kJ/kg <sub>da</sub>			Specific Entropy, kJ/(kg <sub>da</sub> ·K)		Temp., °C <i>t</i>
		<i>v<sub>da</sub></i>	<i>v<sub>as</sub></i>	<i>v<sub>s</sub></i>	<i>h<sub>da</sub></i>	<i>h<sub>as</sub></i>	<i>h<sub>s</sub></i>	<i>s<sub>da</sub></i>	<i>s<sub>s</sub></i>	
-60	0.000067	0.6027	0.0000	0.6027	-60.341	0.016	-60.325	-0.2494	-0.2494	-60
-59	0.000076	0.6055	0.0000	0.6055	-59.335	0.018	-59.317	-0.2447	-0.2446	-59
-58	0.000087	0.6084	0.0000	0.6084	-58.329	0.021	-58.308	-0.2400	-0.2399	-58
-57	0.000100	0.6112	0.0000	0.6112	-57.323	0.024	-57.299	-0.2354	-0.2353	-57
-56	0.000114	0.6141	0.0000	0.6141	-56.317	0.027	-56.289	-0.2307	-0.2306	-56
-55	0.000129	0.6169	0.0000	0.6169	-55.311	0.031	-55.280	-0.2261	-0.2260	-55
-54	0.000147	0.6198	0.0000	0.6198	-54.305	0.035	-54.269	-0.2215	-0.2213	-54
-53	0.000167	0.6226	0.0000	0.6226	-53.299	0.040	-53.258	-0.2169	-0.2167	-53
-52	0.000190	0.6255	0.0000	0.6255	-52.293	0.046	-52.247	-0.2124	-0.2121	-52
-51	0.000215	0.6283	0.0000	0.6283	-51.287	0.052	-51.235	-0.2078	-0.2076	-51
		0.6312	0.0000	0.6312	-50.281				-0.2030	-50
			0.0000	0.6340						-40

Table 3 Thermodynamic Properties of Water at Saturation

Temp., °C <i>t</i>	Absolute Pressure <i>p<sub>sat</sub></i> , kPa	Specific Volume, m <sup>3</sup> /kg <sub>w</sub>			Specific Enthalpy, kJ/kg <sub>w</sub>			Specific Entropy, kJ/(kg <sub>w</sub> ·K)			Temp., °C <i>t</i>
		Sat. Solid <i>v<sub>f</sub></i> / <i>v<sub>f</sub></i>	Evap. <i>v<sub>g</sub></i> / <i>v<sub>g</sub></i>	Sat. Vapor <i>v<sub>g</sub></i>	Sat. Solid <i>h<sub>f</sub></i> / <i>h<sub>f</sub></i>	Evap. <i>h<sub>g</sub></i> / <i>h<sub>g</sub></i>	Sat. Vapor <i>h<sub>g</sub></i>	Sat. Solid <i>s<sub>f</sub></i> / <i>s<sub>f</sub></i>	Evap. <i>s<sub>g</sub></i> / <i>s<sub>g</sub></i>	Sat. Vapor <i>s<sub>g</sub></i>	
-60	0.00108	0.001081	90971.58	90971.58	-446.12	2836.27	2390.14	-1.6842	13.3064	11.6222	-60
-59	0.00124	0.001082	79885.31	79885.31	-444.46	2836.45	2391.99	-1.6764	13.2452	11.5687	-59
-58	0.00141	0.001082	70235.77	70235.78	-442.79	2836.63	2393.85	-1.6687	13.1845	11.5158	-58
-57	0.00161	0.001082	61826.23	61826.24	-441.11	2836.81	2395.70	-1.6609	13.1243	11.4634	-57
-56	0.00184	0.001082	54488.28	54488.28	-439.42	2836.97	2397.55	-1.6531	13.0646	11.4115	-56
-55	0.00209	0.001082	48077.54	48077.54	-437.73	2837.13	2399.40	-1.6453	13.0054	11.3601	-55
-54	0.00238	0.001082	42470.11	42470.11	-436.03	2837.28	2401.25	-1.6375	12.9468	11.3092	-54
-53	0.00271	0.001082	37559.49	37559.50	-434.32	2837.42	2403.10	-1.6298	12.8886	11.2589	-53
-52	0.00307	0.001083	33254.07	33254.07	-432.61	2837.56	2404.95	-1.6220	12.8310	11.2090	-52
-51							2406.70				-51