

The four-volume ASHRAE Handbook is a reference for engineers working in HVAC&R and for professionals in allied fields. The print edition is revised on a four-year cycle, with one volume published each year. In addition to this book, ASHRAE offers subscriptions to ASHRAE Handbook Online containing all four volumes in searchable format. See the ASHRAE Bookstore (go to www.ashrae.org/bookstore) for information on other ASHRAE publications.

2021 FUNDAMENTALS

PRINCIPLES

- Chapter* 1. Psychrometrics
 2. Thermodynamics and Refrigeration Cycles
 3. Fluid Flow
 4. Heat Transfer
 5. Two-Phase Flow
 6. Mass Transfer
 7. Fundamentals of Control
 8. Sound and Vibration

INDOOR ENVIRONMENTAL QUALITY

- Chapter* 9. Thermal Comfort
 10. Indoor Environmental Health
 11. Air Contaminants
 12. Odors
 13. Indoor Environmental Modeling

LOAD AND ENERGY CALCULATIONS

- Chapter* 14. Climatic Design Information
 15. Fenestration
 16. Ventilation and Infiltration
 17. Residential Cooling and Heating Load Calculations
 18. Nonresidential Cooling and Heating Load Calculations
 19. Energy Estimating and Modeling Methods

HVAC DESIGN

- Chapter* 20. Space Air Diffusion

21. Duct Design
 22. Pipe Design
 23. Insulation for Mechanical Systems
 24. Airflow Around Buildings

BUILDING ENVELOPE

- Chapter* 25. Heat, Air, and Moisture Control in Building Assemblies—Fundamentals
 26. Heat, Air, and Moisture Control in Building Assemblies—Material Properties
 27. Heat, Air, and Moisture Control in Building Assemblies—Examples

MATERIALS

- Chapter* 28. Combustion and Fuels
 29. Refrigerants
 30. Thermophysical Properties of Refrigerants
 31. Physical Properties of Secondary Coolants (Brines)
 32. Sorbents and Desiccants
 33. Physical Properties of Materials

GENERAL

- Chapter* 34. Energy Resources
 35. Sustainability
 36. Global Climate Change
 36. Moisture Management in Buildings
 37. Measurement and Instruments
 38. Abbreviations and Symbols
 39. Units and Conversions
 40. Codes and Standards

2020 HVAC SYSTEMS AND EQUIPMENT

AIR-CONDITIONING AND HEATING SYSTEMS

- Chapter* 1. HVAC System Analysis and Selection
 2. Decentralized Cooling and Heating
 3. Central Cooling and Heating Plants
 4. Air Handling and Distribution
 5. In-Room Terminal Systems
 6. Radiant Heating and Cooling
 7. Combined Heat and Power Systems
 8. Combustion Turbine Inlet Cooling
 9. Applied Heat Pump and Heat Recovery Systems
 10. Small Forced-Air Heating and Cooling Systems
 11. Steam Systems
 12. District Heating and Cooling
 13. Hydronic Heating and Cooling
 14. Condenser Water Systems
 15. Medium- and High-Temperature Water Heating
 16. Infrared Radiant Heating
 17. Ultraviolet Lamp Systems
 18. Variable Refrigerant Flow

AIR-HANDLING EQUIPMENT AND COMPONENTS

- Chapter* 19. Duct Construction
 20. Room Air Distribution Equipment
 21. Fans
 22. Humidifiers
 23. Air-Cooling and Dehumidifying Coils
 24. Desiccant Dehumidification and Pressure-Drying Equipment
 25. Mechanical Dehumidifiers and Related Components
 26. Air-to-Air Energy Recovery Equipment
 27. Air-Heating Coils
 28. Unit Ventilators, Unit Heaters, and Makeup Air Units
 29. Air Cleaners for Particulate Contaminants
 30. Industrial Gas Cleaning and Air Pollution Control

HEATING EQUIPMENT AND COMPONENTS

- Chapter* 31. Automatic Fuel-Burning Systems

32. Boilers
 33. Furnaces
 34. Residential In-Space Heating Equipment
 35. Chimney, Vent, and Fireplace Systems
 36. Hydronic Heat-Distributing Units and Radiators
 37. Solar Energy Equipment

COOLING EQUIPMENT AND COMPONENTS

- Chapter* 38. Compressors
 39. Condensers
 40. Cooling Towers
 41. Evaporative Air-Cooling Equipment
 42. Liquid Coolers
 43. Liquid-Chilling Systems

GENERAL COMPONENTS

- Chapter* 44. Centrifugal Pumps
 45. Motors, Motor Controls, and Variable-Frequency Drives
 46. Valves
 47. Heat Exchangers

PACKAGED, UNITARY, AND SPLIT-SYSTEM EQUIPMENT

- Chapter* 48. Unitary Air Conditioners and Heat Pumps
 49. Room Air Conditioners and Packaged Terminal Air Conditioners

GENERAL

- Chapter* 50. Thermal Storage
 51. Dedicated Outdoor Air Systems
 52. Codes and Standards

2019 HVAC APPLICATIONS

COMFORT APPLICATIONS

- Chapter* 1. Residential Space Conditioning
2. Retail Facilities
3. Commercial and Public Buildings
4. Tall Buildings
5. Places of Assembly
6. Indoor Swimming Pools
7. Hospitality
8. Educational Facilities
9. Health Care Facilities
10. Justice Facilities
11. Automobiles
12. Mass Transit
13. Aircraft
14. Ships

INDUSTRIAL APPLICATIONS

- Chapter* 15. Industrial Air Conditioning
16. Enclosed Vehicular Facilities
17. Laboratories
18. Engine Test Facilities
19. Clean Spaces
20. Data Centers and Telecommunication Facilities
21. Printing Plants
22. Textile Processing Plants
23. Photographic Material Facilities
24. Museums, Galleries, Archives, and Libraries
25. Environmental Control for Animals and Plants
26. Drying and Storing Selected Farm Crops
27. Air Conditioning of Wood and Paper Product Facilities
28. Power Plants
29. Nuclear Facilities
30. Mine Ventilation and Air Conditioning
31. Industrial Drying
32. Ventilation of the Industrial Environment
33. Industrial Local Exhaust
34. Kitchen Ventilation

ENERGY-RELATED APPLICATIONS

- Chapter* 35. Geothermal Energy
36. Solar Energy Use

BUILDING OPERATIONS AND MANAGEMENT

- Chapter* 37. Energy Use and Management
38. Owning and Operating Costs
39. Testing, Adjusting, and Balancing
40. Operation and Maintenance Management
41. Computer Applications
42. Building Energy and Water Monitoring
43. Supervisory Control Strategies and Optimization
44. HVAC Commissioning

GENERAL APPLICATIONS

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46. Building Air Intake and Exhaust Design
47. Air Cleaners for Gaseous Contaminants
48. Design and Application of Controls
49. Noise and Vibration Control
50. Water Treatment: Deposition, Corrosion, and Biological Control
51. Service Water Heating
52. Snow Melting and Freeze Protection
53. Evaporative Cooling
54. Fire and Smoke Control
55. Radiant Heating and Cooling
56. Seismic- and Wind-Resistant Design
57. Electrical Considerations
58. Room Air Distribution
59. Indoor Airflow Modeling
60. Integrated Project Delivery and Building Design
61. HVAC Security
62. Ultraviolet Air and Surface Treatment
63. Smart Building Systems
64. Moisture and Mold
65. Occupant-Centric Sensing and Controls
66. Codes and Standards

2018 REFRIGERATION

SYSTEMS AND PRACTICES

- Chapter* 1. Halocarbon Refrigeration Systems
2. Ammonia Refrigeration Systems
3. Carbon Dioxide Refrigeration Systems
4. Liquid Overfeed Systems
5. Component Balancing in Refrigeration Systems
6. Refrigerant System Chemistry
7. Control of Moisture and Other Contaminants in Refrigerant Systems
8. Equipment and System Dehydrating, Charging, and Testing
9. Refrigerant Containment, Recovery, Recycling, and Reclamation

COMPONENTS AND EQUIPMENT

- Chapter* 10. Insulation Systems for Refrigerant Piping
11. Refrigerant Control Devices
12. Lubricants in Refrigerant Systems
13. Secondary Coolants in Refrigeration Systems
14. Forced-Circulation Air Coolers
15. Retail Food Store Refrigeration and Equipment
16. Food Service and General Commercial Refrigeration Equipment
17. Household Refrigerators and Freezers
18. Absorption Equipment

FOOD COOLING AND STORAGE

- Chapter* 19. Thermal Properties of Foods
20. Cooling and Freezing Times of Foods
21. Commodity Storage Requirements
22. Food Microbiology and Refrigeration
23. Refrigerated-Facility Design
24. Refrigerated-Facility Loads

REFRIGERATED TRANSPORT

- Chapter* 25. Cargo Containers, Rail Cars, Trailers, and Trucks

26. Marine Refrigeration
27. Air Transport

FOOD, BEVERAGE, AND FLORAL APPLICATIONS

- Chapter* 28. Methods of Precooling Fruits, Vegetables, and Cut Flowers
29. Industrial Food-Freezing Systems
30. Meat Products
31. Poultry Products
32. Fishery Products
33. Dairy Products
34. Eggs and Egg Products
35. Deciduous Tree and Vine Fruit
36. Citrus Fruit, Bananas, and Subtropical Fruit
37. Vegetables
38. Fruit Juice Concentrates and Chilled Juice Products
39. Beverages
40. Processed, Precooked, and Prepared Foods
41. Bakery Products
42. Chocolates, Candies, Nuts, Dried Fruits, and Dried Vegetables

INDUSTRIAL APPLICATIONS

- Chapter* 43. Ice Manufacture
44. Ice Rinks
45. Concrete Dams and Subsurface Soils
46. Refrigeration in the Chemical Industry

LOW-TEMPERATURE APPLICATIONS

- Chapter* 47. Cryogenics
48. Ultralow-Temperature Refrigeration
49. Biomedical Applications of Cryogenic Refrigeration

GENERAL

- Chapter* 50. Terminology of Refrigeration
51. Codes and Standards