

Declaration of Catherine Vassilkova

1. I, Catherine Vassilkova, am an employee of BEADOX LLC ("BEA").
2. I am over the age of 21 and have personal knowledge of the facts contained herein unless otherwise indicated.
3. I have worked in the field of information research and document retrieval for law firms since 2005.
4. I have been with BEA since I established the company in 2019.
5. BEA, based in Silver Spring, MD, conducts research at the District of Columbia federal and local courts, archives, government agencies, and libraries around the world. BEA's services include interlibrary loans, specialized research, article location and delivery, and other document retrieval. One of my responsibilities is to scan textbooks for requesters.
6. BEA specializes in the research and delivery of materials from the Library of Congress.
7. On September 26, 2025, I was asked by the requester Morrison and Foerster LLP to obtain a scan from the following book: HVAC : handbook of heating, ventilation and air conditioning for design and implementation (1st ed. 2007).
8. On September 30, 2025, I obtained HVAC : handbook of heating, ventilation and air conditioning for design and implementation (1st ed. 2007) from the Library of Congress, and scanned the requested excerpts including book cover, title page, copyright page date-stamped (February 28 2009), table of contents pages, and chapter sections 13-1, 13-2 from HVAC : handbook of heating, ventilation and air conditioning for design and implementation (1st ed. 2007). Those excerpts are included as Exhibit 1019.
9. I confirm that the copyright page of the scanned book has a stamped date of receipt of February 28 2009.
10. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code.
11. Executed on the 1st of October, 2025, in Silver Spring, MD 20910.

Signed:

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This Handbook provides comprehensive technical information in a modular form to heating, ventilating, and air conditioning (HVAC) designers and practitioners, namely plant and design engineers, architects, technicians, contractors, and building managers. It is also a very useful reference for students mastering the intricacies of the HVAC rudiments. Each chapter and topic is self-contained to the extent possible and emphasis is placed on graphical and tabular presentations of data that are useful for easy understanding of fundamentals and for solving problems of design, installation, and operation. It provides in-depth coverage of both HVAC fundamental concepts and design processes, and is suitable for single or multiple-topic continuing education studies and training.

This Handbook includes two very useful software packages. The first is Bell and Gossett's **ESP-PLUS** software that provides calculations for the selection of equipment such as hydraulic pumps, heat exchangers, and hydronic and steam system components. This program also helps select commercially available equipment and components. The second is **Trane's Load 700** heating and cooling load calculation software that allows the designer to use detailed geometric, weather, and exposure parameters to accurately estimate load during the heating and cooling cycles.

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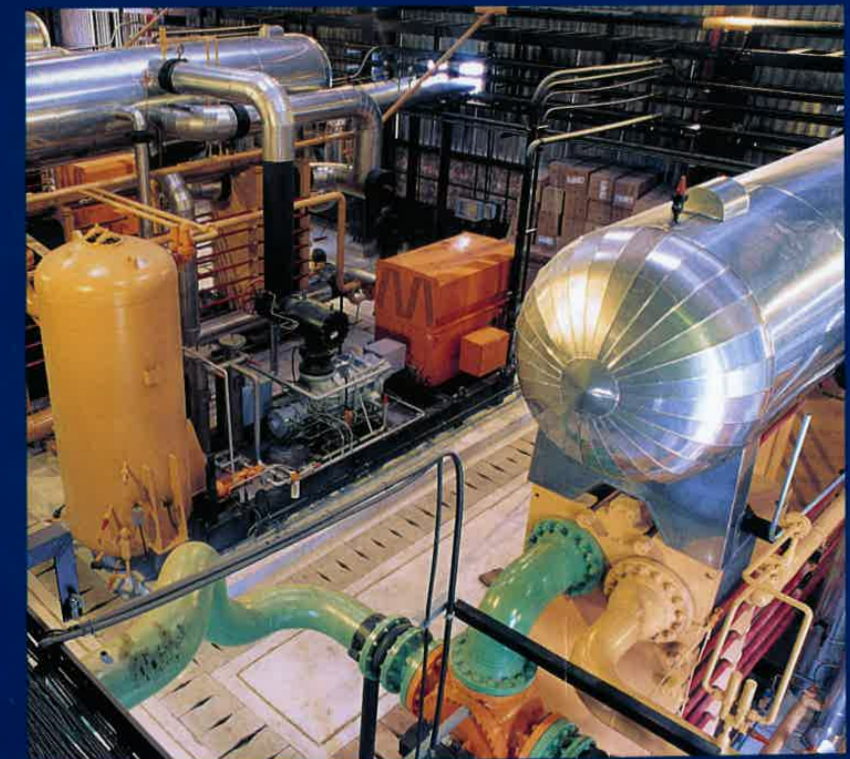
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for Design and Implementation

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THIS HANDBOOK PROVIDES COMPREHENSIVE
TECHNICAL INFORMATION TO HEATING,
VENTILATING, AND AIR CONDITIONING
ENGINEERS, DESIGNERS AND PRACTITIONERS

HVAC:

Handbook of Heating, Ventilation and Air Conditioning for Design and Implementation

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TABLE OF CONTENTS

1.	FUNDAMENTALS	5.	LOAD ESTIMATING FUNDAMENTALS
1-1	Fundamentals of Thermodynamics	(Continued)	
1-3	Conservation of Mass	5-17	Relative Thermal Resistances of Building Materials
1-3	First Law of Thermodynamics	5-18	Surface Conductances and Resistances
1-4	Second Law, Reversibility, and Possible Processes	5-18	Emittance Values of Various Surfaces
1-4	Thermodynamic Cycles	5-19	Thermal Resistances of Plane Airspaces
1-6	Fundamentals of Fluid Flow	5-21	Thermal Properties of Building and Insulating Materials
1-6	Flow in Pipes and Ducts	5-27	Coefficients of Heat Transmission of Various Fenestrations
1-11	Noise from Fluid Flow	5-28	Transmission Coefficients for Wood and Steel Doors
1-11	Fundamentals of Heat Transfer	5-29	Outdoor Air Load Components
1-14	Overall Heat Transfer		
1-15	Fins and Extended Surfaces	6.	HEATING LOAD CALCULATIONS
1-18	Some Details of Heat Exchange		
1-19	Augmentation of Heat Transfer	6-1	Introduction
		6-1	Calculating Design Heating Loads
2.	PSYCHROMETRY	6-2	Heat loss Through Walls, Roofs, and Glass Area
2-1	Psychrometrics	6-2	Heat Loss from Walls below Grade
2-1	Ideal Gas Approximation	6-3	Below-Grade Wall U-Factors
2-1	Equation of State	6-3	Heat Loss from Basement Floor Below Grade
2-2	Humidity Ratio	6-4	Heat Loss Coefficients
2-2	Relative Humidity	6-4	Heat Loss from Floor Slab On Grade
2-2	Degree of Saturation	6-6	Ventilation and Infiltration Heat Loss
2-2	Wet Bulb Temperature		
2-3	Partial Pressure of Water Vapor	7.	COOLING LOAD CALCULATIONS
2-4	Dew Point Temperature		
2-4	Saturation	7-1	Transfer Function Method (TFM)
2-4	Enthalpy	7-1	Heat Source in Conditioned Space
2-5	Wet Bulb Temperature	7-2	Heat Gain from Occupants
2-6	Properties of Moist Air	7-3	Heat Gain from Cooking Appliances
2-7	Psychrometric Chart Presentation	7-6	Heat Gain from Medical Equipments
2-12	Thermodynamic Properties of Water at Saturation	7-6	Heat Gain from Computer
2-18	Thermodynamic Properties of Moist Air	7-6	Heat Gain from Office Equipments
		7-6	CLTD/SCL/CLF Calculation Procedure
3.	AIR CONDITIONING PROCESSES	7-7	Cooling Load by CLTD/SCL/CLF Method
3-1	Introduction	7-8	Roof Numbers
3-1	Heating and Cooling Process	7-9	CLTD for Roofs
3-2	Cooling with Dehumidification	7-11	CLTD for Walls
3-3	Heating with Humidification	7-27	Code Number for Wall and Roof
3-3	Adiabatic Mixing of Two Air Streams	7-28	Wall Types
3-5	Evaporative Cooling	7-31	CLTD for Glass
3-5	Heating and Air Conditioning System Cycles	7-31	Zone Types for CLF Tables
		7-31	Zone Types for SCL and CLF Tables
4.	INDOOR AIR QUALITY AND VENTILATION	7-35	Residential Cooling Load Procedure
4-1	Indoor Air Quality	7-36	SCL for Glass
4-1	Ventilation Procedure	7-44	CLF for People and Unhooded Equipments
4-5	Concentration of Air Pollutants	7-46	CLF for Hooded Equipments
4-6	Indoor Air Quality Procedure	7-47	Window GLF for Residences
4-8	Filters	7-49	CLTD for Residences
4-10	Hepa Filters	7-50	SC for Windows
4-10	Carbon Media Filters	7-50	SLF for Windows
4-10	Fiber and Foam Filters	7-50	Air Exchange Rates
4-10	Ozone		
4-10	Ultraviolet Light	8.	DUCT DESIGN
5.	LOAD ESTIMATING FUNDAMENTALS	8-1	Introduction
5-1	Conduction	8-1	Pressure Head and Energy Equation
5-1	Thermal Conductivities of Materials	8-2	Friction Loss Analysis
5-2	Convection	8-7	Dynamic Losses
5-4	Thermal Radiation	8-7	Ductwork Sectional Losses
5-4	Emissivities of Some Materials	8-8	Fan System Interface
5-6	Overall Heat Transfer Coefficient	8-8	Pressure Changes System
5-8	Parallel Arrangement	8-9	Duct System Design
5-11	Coefficient of Transmission	8-9	Design Considerations
		8-12	Duct Design Methods
		8-13	Duct Design Procedures
		8-13	Automated Duct Design
		8-14	Duct Fitting Friction Loss Example
		8-14	Equal Friction Method Example
		8-15	Resistance in Low Pressure Duct System Example
		8-15	Static Regain Method Example
		8-17	Fitting Loss Coefficients

9. PIPE SIZING	10. HYDRONIC HEATING AND COOLING SYSTEM <i>(Continued)</i>
9-1 Pressure Drop Equations	10-8 Characteristics of Centrifugal Pumps
9-1 Valve and Fitting Losses	10-8 Operating Characteristics
9-3 Water Piping	10-9 Pump Laws
9-3 Flow Rate Limitations	10-9 Change of Performance
9-3 Noise Generation	10-10 Centrifugal Pump Selection
9-3 Erosion	10-10 Total Dynamic Head
9-3 Allowances for Aging	10-11 Net Positive Suction Head (NPSH)
9-4 Water Hammer	10-11 Pumping System
9-4 Hydronic System Piping	10-16 Parallel Pumping
9-6 Valve and Fitting Pressure Drop	10-17 Series Pumping
9-28 Service Water Piping	10-18 Design Procedures
9-29 Plastic Pipe	10-18 Preliminary Equipment Layout
9-29 Cold Water Pipe Sizing	10-19 Final Pipe Sizing and Pressure Drop Determination
9-31 Steam Flow in Pipes	10-19 Final Pressure Drop
9-31 Steam Flow Formulas	10-19 Final Pump Selection
9-32 Vertical Pipes	10-19 Freeze Prevention
9-32 Steam Piping	
9-59 Gas Piping For Buildings	11. ENERGY CALCULATION
9-59 Residential Piping	11-1 Degree Day
9-61 Commercial-Industrial Piping	11-1 65°F as the Base
9-72 Compressed Air Systems	11-2 Application of Degree Days
9-72 Compressed Air	11-4 Predicting Fuel Consumption
9-78 Viscosity of Liquids	11-5 Predicting Future Needs
9-80 Piping	11-7 Empirical Constants
9-80 Types of Materials	11-7 Load Factor and Operating Hours
9-91 Plastics Pipe	11-7 Limitations
9-91 Joining Techniques	11-8 Degree-Days Abroad
9-93 Standards for Specification and Identification	11-9 Degree Days for Various US Locations
9-93 Design Parameters	
9-96 Installation	12. COMBUSTION
9-97 Codes and Regulations	12-1 Combustion Basics
9-97 Pipe Fittings	12-3 Efficiency Calculations
9-97 Taper Pipe Thread	12-7 Saving Fuel with Combustion Controls
9-132 Laying Lengths of Pipe with Screwed Fittings	12-11 Combustion Considerations
9-134 Allowable Spaces for Pipes	12-11 Pressure and Flow Basic Principles
9-134 Expansion of Pipe	12-12 Atomizing Media Considerations
9-136 Corrosion Resistance	12-12 Combustion Air Considerations
9-136 Pipe Support Spacing	12-13 Flue Gas Considerations
9-139 Gate, Globe, and Check Valves	12-14 Gas Fuel Firing Considerations
9-139 Operation	12-14 Fuel Oil Firing Considerations
9-141 Maintenance Methods	12-15 Operational Rules of Thumb
9-142 Formulas for Sizing Control Valves	12-16 Common Application
9-142 To Determine Valve Size	12-20 Combustion Control Strategies
9-142 To Determine Valve Capacity	12-20 Control System Errors
9-142 For Vapors Other Than Steam	12-20 Combustion Control Strategies
9-143 Identification of Piping Systems	12-21 Parallel Positioning Systems
9-143 Dangerous Materials	12-22 Fully Metered Control
9-143 Fire Protection Materials and Equipment	12-23 Feedwater Control Systems
9-144 Safe Materials	12-24 Draft Control
9-144 Protective Materials	12-26 Oxygen Trim
9-144 Method of Identification	12-27 Combustion Air Flow Control Techniques
9-144 Heat Losses in Piping	12-28 Flue Gas Recirculation (FGR)
9-144 Heat Losses from Bare Pipe	12-33 Fuel Oil Handling System Design
9-145 Heat Losses from Steam Piping	12-33 Determination of Required Flow Rate
9-157 Heat Loss from Insulated Pipe	12-34 Stand by Generator Loop Systems
9-158 Cold Surface Temperature	12-34 Multiple Pumps
	12-34 Burner Loop Systems
10. HYDRONIC HEATING AND COOLING SYSTEM	12-36 Maximum Inlet Suction
10-1 Basic System	12-37 Pump Discharge Pressure
10-4 Temperature Classifications	12-37 Piping System Design
10-4 Closed Hydronic System Components Design	12-37 Pump Set Control System Strategies
10-4 Convectors or Terminal Units	
10-4 Boiler	
10-4 Air Eliminations Methods	
10-6 Pressure Increase Due to Change in Temperature	
10-6 Expansion Tank	
10-7 Expansion Tank Sizing	

13. AIR CONDITIONING SYSTEMS	13. AIR CONDITIONING SYSTEMS <i>(Continued)</i>
13-1 Air Conditioning Systems	13-91 Hot Water System Control
13-1 Single Package Units	13-94 Mixing Box Control
13-5 Single Package Installations	13-95 Rotary Air-to-Air Heat Exchanger Control
13-7 Installation of Split Systems	13-95 Automatic Control for Dual Duct System
13-8 Zoning Unitary Installations	13-97 Winterizing Chilled Water System
13-10 Selection Procedure	13-97 Water Circulation to Prevent Freeze-Up
13-14 Evaporative Air Conditioning	13-99 Mechanical Draft Cooling Towers
13-14 Permissible Air Motion	13-102 Atmospheric Cooling Towers
13-17 Variable Volume AC System	13-104 Quantity of Cooling Water Required
13-18 Initial Costs	13-105 Roof is a Location for AC Equipment
13-20 Cooling Considerations	13-105 Advantages of Roof
13-21 Overlapping	13-106 Disadvantages of Roof
13-22 Heat Recovery	13-107 Servicing Cooling Plant
13-22 Heating Cooling Systems	13-107 Servicing Cooling Plant for Summer Use
13-23 Air Systems	13-107 Water System
13-26 Controls	13-107 Air Handling System
13-27 Air Water Systems	13-107 Compressor Oil
13-30 Sources of Internal Heat	13-107 Condenser
13-31 Heat from Service Refrigeration	13-108 Refrigeration Unit
13-31 Exhaust Air Heat Recovery Systems	13-108 Check Oil
13-36 Heat Pumps	13-108 Compressor
13-36 Reverse-Cycle Principle	13-108 Air Conditioning Equipment Maintenance
13-36 Coefficient of Performance	13-108 Air Handling Equipment
13-37 Heating Season Performance Factor	13-108 Air Distribution Equipment
13-37 Types of Heat Pumps	13-108 Water-Using Equipment
13-38 Air-to-Air Heat Pumps	13-108 Cooling Equipment
13-39 Water-to-Water Heat Pumps	13-110 Air Conditioning Maintenance Schedule
13-40 Water-to-Air Heat Pumps	13-111 Unit Air Conditioners
13-40 Air-to-Water Heat Pumps	13-111 Central Systems
13-41 Ground Source Heat Pumps	13-111 Condensing Water Circuit
13-41 Special Heat Sources	13-112 Cooling Water System
13-42 Operating and Installation Factors	13-112 Filters and Ducts
13-42 Outdoor Temperature Effects	13-112 Air Conditioning Maintenance Procedure
13-43 Thermostats	13-112 Refrigerant Circuit and Controls
13-43 Heat Anticipators	13-113 Condensing Water Circuit
13-44 Equipment Arrangement	13-113 Cooling Water System
13-44 Electrohydraulic Heat Recovery	13-113 Filters and Ducts
13-45 Cooling Cycle	13-114 Rotating Apparatus
13-47 System Design	13-114 Unit Air Conditioners
13-47 Supplementary Heat	13-114 Checklist for Air Conditioning Surveys
13-47 Optimized Data for Heat Pump	
13-48 Development of Equations	14. AIR HANDLING AND VENTILATION
13-48 Development of Tables	14-1 Terminology, Abbreviations, and Definitions
13-49 Selecting Air Handling Units	14-3 Fan Laws
13-54 Well Water Air Conditioning	14-11 Fan Performance Curves
13-54 Heat Pump/Solar Energy Application	14-16 Class Limits for Fans
13-54 System Description and Operation	14-21 Fan Selection
13-60 High Velocity Dual Duct Systems	14-26 Fan Inlet Connections
13-60 Advantages and Disadvantages	14-27 Fan Discharge Conditions
13-60 Dual Duct Cycles	14-31 Useful Fan Formulas
13-65 Duct Sizing Technique	14-32 Nomographs for Fan Horsepower
13-65 Large vs. Small Ducts	14-32 Monographs for Fan Horsepower and Actual Capacity
13-66 Design Velocity	14-34 Fan Selection Questionnaire
13-66 Maximum Velocity	14-37 Air Flow in Ducts
13-67 Sizing High Pressure Ducts	14-40 Pitot Traverse
13-68 Return Air Ducts	14-40 Friction Losses
13-68 Low Pressure Ductwork	14-40 Correction for Roughness
13-69 Basic Arrangement	14-40 Rectangular Duct
13-69 Zoning	14-52 Air Balancing and Air Turning Hardware
13-70 Ceiling Plenum	14-56 Air Distribution
13-73 Modular Type Office Buildings	14-56 Fire Dampers and Fire Protection
13-76 Constant Volume Mixing Units	14-56 Duct System Design
13-77 Apparatus Floor Area	14-59 High Velocity System Design
13-80 Construction Details	14-68 Step by Step Design
13-81 Automatic Control Applications	14-68 Main Duct
13-81 Rooftop Multizone Units	14-70 Branch Trunk Ducts
13-84 Multizone Unit Control	14-71 Single Branch Lines
13-88 Damper Control	14-72 Duct Design by Computer
13-88 Economizer Control Cycle	14-73 Fibrous Glass Duct Construction
13-88 Unit Ventilator Control	

14. AIR HANDLING AND VENTILATION <i>(Continued)</i>	15. STEAM HEATING SYSTEM DESIGN <i>(Continued)</i>
14-75 Determining Required Air Volume	15-53 Sizing the Expansion Tank
14-75 Estimating Weight of Metal	15-54 Compressed Air to Reduce Tank Size
14-77 Apparatus Casing Construction	15-54 Piping Details
14-77 Condensate Drains for Air Conditioning Units	15-55 Design of Piping Systems
14-78 Air Filters and Dust Collectors	15-58 Design of Two Pipe Reversed Return System
14-78 Air Filters	15-58 Final Check of Pipe Sizes
14-79 Dust Collectors	15-58 Design of Two Pipe Direct Return System
14-82 Dry Centrifugal Collectors	15-59 Piping for One-Pipe Diversion System
14-82 Wet Collectors	15-59 Sizing Piping for Main
14-82 Fabric Collectors	15-59 Sizing Piping for Branches
14-83 Electrostatic Precipitators	15-59 Pipe Size Check
14-83 Breeching Design and Construction	15-60 Piping for One-pipe Series System
14-83 Expansion	15-60 Combination of Piping Systems
14-84 Aerodynamics	15-60 Sizing Hot Water Expansion Tanks
14-85 Access	15-60 Conditions Affecting Design
14-85 Round Breeching Construction	15-61 Sizing Hot Water Expansion Tanks
14-85 Rectangular Breeching Construction	15-61 High Temperature Water Systems
14-90 Chimney Draft and Velocities	15-63 High Temperature Drop
14-92 Forced Draft and Draft Control	15-63 Heat Storage
14-94 Sizing of Large Chimneys	15-63 Limitation of Corrosion
14-95 Chimney Design and Construction	15-63 Pressurization of HTW System
14-96 Balancing Small Air Conditioning Systems	15-63 Steam Pressurization
14-97 Balancing Medium and Large Systems	15-64 Gas Pressurization
14-98 Balancing Duct Distribution	15-64 Air Pressurization
14-98 Balancing Systems Using Booster Fans	15-64 Nitrogen Pressurization
14-99 Air Balancing by Balancing and Testing Engineers	15-65 Expansion Tanks
	15-65 Expansion Conditions
15. STEAM HEATING SYSTEM DESIGN	15-65 Determining Expansion Tank Size
15-1 Large Systems	15-65 Location of Steam Pressurizing Tank
15-1 Equivalent Direct Radiation	15-66 Nitrogen Pressurizing Tanks
15-1 Piping Connections to Boilers	15-66 Application of HTW for Process Steam
15-3 Direct Return Connection	15-66 Circulating Pumps
15-3 Common Return Header	15-67 Pumps for HTW Systems
15-3 Two Boilers with Common Return Header and Hartford Connection	15-67 Manufacturer's Information
15-4 Two Boilers with Separate Direct Return Connections from Below	15-67 Pump Specifications
15-4 Separate Direct Return Connections	15-68 Net Positive Suction Head
15-4 Connections to Steam Using Equipment	15-68 Effect of Cavitation Within Pump
15-26 Piping Application	15-68 Pump Construction for HTW Systems
15-30 Industrial and Commercial Steam Requirements	15-68 Circulating Pump Seals
15-39 Flash Steam Calculations	15-69 Boiler Recirculating Pump
15-40 Sizing of Vertical Flash Tanks	15-69 Boilers for HTW Systems
15-40 To Size Flash Tank	15-69 Boiler Emergency Protection
15-41 To Size Float Trap	15-69 Pipe, Valves, and Fittings for HTW Systems
15-41 Airbinding	15-69 Valve Installation
15-46 Estimating Friction in Hot Water Piping	15-70 Welded Joints
15-49 Hot Water Heating Systems	15-70 Venting of Piping
15-49 Service Water Heating	15-70 Effect of Load Variation on Operation
15-49 Operating Water Temperature	15-71 Pipe Sizing for HTW Systems
15-49 Air Removal from System	15-73 Ratings of Steel Boilers
15-49 Water Flow Velocity	15-73 Ratings
15-49 Prevention of Freezing	15-74 Ratings for Steel Boilers
15-49 Water Circulation below Mains	15-76 Stack Dimensions
15-49 Limitation of Pressure	15-81 Heating and Cooling Media
15-50 System Adaptability	15-81 Brine
15-50 Use of Waste Steam Heat	15-81 Glycerine
15-50 Heat from District Steam System	15-81 Glycol
15-50 Summer Cooling	15-81 Other Media
15-50 Types of Water Heating Systems	15-82 Warm Air Heating
15-52 Design Recommendations for Hot Water Systems	15-82 Early Types
15-52 Water Velocity	15-83 Current Types
15-52 Pump Location	15-85 Furnace Performance
15-52 Air Venting	15-85 Testing and Rating of Furnaces
15-53 Balancing Circuits	15-86 Acceptable Limits
15-53 Filling Pressure	15-87 Selection of Furnace
15-53 Preventing Backflow	15-87 Rule for Selection
15-53 Connecting Returns to Boiler	15-87 Blower Characteristics
15-53 Locating the Circulating Pump	15-88 Blower Sizes
	15-88 Duct System Characteristics
	15-88 Trends
	15-89 Warm Air Registers
	15-90 Return Air Intakes

15. STEAM HEATING SYSTEM DESIGN <i>(Continued)</i>	16. NOISE AND VIBRATION CONTROL <i>(Continued)</i>
15-91 Arrangement of Furnace and Ducts	16-45 Take-off Fittings
15-94 Basic Thermostatic Controls	16-45 Dual Duct Area Ratio
15-94 Continuous Air Circulation	16-46 Dampers as a Noise Generating Source
15-95 Continuous Blower Operation	16-46 Sound Barrier for High Velocity Ductwork
15-95 Intermittent Blower Operation	16-46 Sound Traps
15-109 Steam Supplied Unit Heater	16-46 Cross Over of Horizontal Dual Duct Mains
15-109 Gas Fired Radiant Heaters	16-47 Testing of High Pressure Ductwork
15-112 Sizing of Steam Traps	16-47 Terminal Devices
15-117 Unit Heaters	16-48 Radiation Protection at Wall Openings for Duct or Pipe
15-124 Checklist for Heating System Servicing	16-49 Medical Installations
16. NOISE AND VIBRATION CONTROL	17. MOTORS AND STARTERS
16-1 Noise and Vibration	17-1 NEMA Motor Classifications
16-1 Definitions and Terminology	17-1 Locked Rotor Torque
16-2 Noise Criteria	17-2 Classification of Single-Phase, Induction Motors by Design Letter
16-2 Speech Interference Criteria	17-2 Torque, Speed, and Horsepower Ratings for Single-Phase Induction Motors
16-2 Sound Levels of Sources	17-3 Classification by Environmental Protection and Method of Cooling
16-7 Ratings and Standards	17-3 Standard Voltages and Frequencies for Motors
16-7 Airborne Sound Transmission	17-6 The National Electrical Code
16-7 Vibration Isolation	17-6 Grounding
16-9 Isolation Mount Selection	17-8 Motor and Load Dynamics, and Motor Heating
16-13 Airborne Noise Through Ducts	17-8 Torque Speed Relationships
16-13 Regenerated Noise	17-9 Torque, Inertia, and Acceleration Time
16-13 Other Mechanical Noise Sources	17-10 Dynamics of the Motor and the Load
16-14 Calculation of Sound Levels from HVAC Systems	17-11 Motor Heating and Motor Life
16-14 Description of Decibels	17-12 Rotor Heating During Starting
16-14 Addition of Decibels	17-12 Single Phase Motors
16-15 The Sabin	17-12 Types of Motors
16-17 Determination of Sound Pressure Level	17-15 Repulsion-Induction
16-20 Noise in Ducted Systems	17-15 Large Single-Phase Motors
16-23 Fan Noise Generation	17-16 Application
16-23 Estimating Fan Noise	17-17 Loading
16-24 Distribution of Sound Power at Branch Takeoffs	17-18 Motor Protection
16-24 Attenuation of Untreated Duct	17-18 Motor Selection
16-24 Duct Lining Attenuation	17-18 Analysis of Application
16-25 Sound Attenuation of Plenums	17-19 Polyphase Motors
16-26 Duct Lining and Elbows	17-19 Enclosure
16-27 Open End Reflection Loss	17-20 Bearings
16-27 Air Flow Noise	17-20 Quietness
16-31 Flow Noise Generation of Silencers	17-20 Polyphase, Squirrel Cage Induction Motors
16-31 Sound Transmission Through Duct Walls	17-21 Speed Control
16-32 Calculation of Sound Levels in Ducted Systems	17-21 Two-Speed Polyphase, Squirrel Cage Induction Motors
16-36 Control of Cooling Tower Noise	17-21 Two Speed Motors Come in Two Types
16-36 Fan Noise	17-23 Wound-Rotor Polyphase Induction Motors
16-37 Water Noise	17-24 Variable Speed
16-37 Drive Components	17-24 Synchronous Motors
16-37 External Noise Sources	17-25 Hermetic Type Motor Compressors
16-38 Configuration Factors	17-25 Hermetic Compressors to 5 hp
16-39 Location	17-29 Starters
16-39 Reducing Sound Generated	17-29 Motor Controllers
16-39 Half-Speed Operation	17-29 Overcurrent Protection
16-39 Oversizing of the Tower	17-30 Overload Protection
16-39 Changing Leaving Conditions	17-31 Starters for Large AC Motors
16-40 Sound Absorbers	17-33 Winding and Reduced-voltage Starting
16-40 Obtaining Desired Sound Levels	17-33 Electric Utility Limitations
16-40 Acoustical Problems in High Velocity Air Distribution	17-33 Minimizing Mechanical Shocks
16-40 System Noise	17-33 Application
16-42 Air Handling Apparatus Rooms	17-36 Types of Starters
16-42 Selection of Fan Isolation Bases	17-36 Open Circuit Transition
16-42 Apparatus Casings	17-37 Advantages and Disadvantages
16-42 Dampers and Air Valves	17-39 Useful Formulas
16-43 Flexible Connectors	17-39 Electric Motor Maintenance
16-43 Air Distributing Systems	
16-43 Duct Velocities	
16-43 Choice of Duct Design Method	
16-43 Ductwork Adjacent to Apparatus Room	
16-44 Duct Connections to Apparatus Casings	
16-44 Type Duct Construction	
16-44 Fittings for High Velocity Ductwork	

18. DESIGN PROCEDURE, ABBREVIATIONS, SYMBOLS	20. UNITS AND CONVERSIONS
18-1 Design Procedure	(Continued)
18-1 Contract and Mechanical Drawings	20-4 U.S. System And Metric System Conversion
18-1 HVAC Drawings	20-4 Length and Area
18-1 Floor Plans	20-4 Mass and Density
18-5 Valve Symbols	20-5 Volume and Flow
18-6 Piping Symbols	20-6 Force, Energy, Work, Torque and Power Conversion
18-7 Pipe Fittings Symbols	20-7 Velocity and Acceleration
18-8 Abbreviations for Scientific and Engineering Terms	20-8 Metric Systems Of Measurement
18-9 Lists of Abbreviations and Symbols	20-8 Measures of Length
	20-8 Square Measure
	20-8 Surveyors Square Measure
	20-8 Cubic Measure
	20-8 Dry and Liquid Measure
	20-8 Measures of Weight
	20-10 Binary Multiples
	20-10 Terminology of Sheet Metal
19. CLIMATIC DESIGN INFORMATION	
19-1 Climatic Design Conditions	
19-1 Applicability and Characteristics of the Design Conditions	
19-27 Dry Bulb and Wet Bulb Temperature for US Locations	
20. UNITS AND CONVERSIONS	21. INDEX
20-1 U.S. Customary Unit System	
20-1 Linear Measures	
20-1 Surveyor's Measure	
20-1 Nautical Measure	
20-1 Square Measure	
20-1 Cubic Measure	
20-1 Shipping Measure	
20-2 Dry Measure	
20-2 Liquid Measure	
20-2 Old Liquid Measure	
20-2 Apothecaries' Fluid Measure	
20-2 Avoirdupois or Commercial Weight	
20-2 Troy Weight, Used for Weighing Gold and Silver	
20-2 Apothecaries' Weight	
20-2 Measures of Pressure	
20-3 Miscellaneous	

This Handbook provides comprehensive technical information in a modular form to heating, ventilating, and air conditioning (HVAC) designers and practitioners, namely engineers, architects, contractors, and plant engineers. It is also a handy reference for students mastering the intricacies of the HVAC rudiments. Each chapter is self-contained to the extent possible and emphasis is placed on graphical and tabular presentations of data that are useful for easy understanding of fundamentals and solving problems of design, installation, and operation.

This Handbook draws upon the material presented in the *Handbook of Air Conditioning, Heating, and Ventilating, Third Edition*, Industrial Press, which forms the basis of the presentation. New topics and chapters have been introduced and previous information updated or rewritten. Examples using software solution tools have been added alongside traditional solutions using formulae from the handbook. The organization, however, remains, in the literal sense, a handbook.

We gratefully acknowledge the contributors and editors of the aforementioned *Handbook of Air Conditioning, Heating, and Ventilating*, whose knowledge is embedded throughout the present book. We did not have the opportunity to meet any of them, but their written legacy has left an indelible imprint on the present work.

An important source of information is the ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) repertoire of publications. ASHRAE serves as the authoritative, and occasionally the sole, source of up-to-date HVAC related data and analysis. We acknowledge their permission to use material from various publications, especially the latest ASHRAE Handbook series.

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The Bell & Gossett corporation has graciously provided the ESP-PLUS software package to accompany the Handbook. This software, a \$100 value, permits users to select components based on design or operating conditions.

Bell & Gossett (ITT Fluid Handling)
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The Trane corporation has generously allowed us to include their Trace Load 700 load calculation limited capability demonstration version software with the Handbook.

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AIR CONDITIONING SYSTEMS

AIR CONDITIONING SYSTEMS

A unitary air conditioner is an apparatus consisting of one or more factory made assemblies that normally include an evaporator, a blower, a compressor, and a condenser, designed to be used together. The unit often performs heating as well as cooling functions.

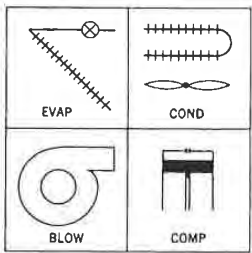


Fig 13-1. Self contained air conditioner

Air Conditioning Systems

Single Package Units.—The single package, or so-called *self-contained* air conditioner, is shown symbolically in Fig. 13-1. All four basic components of the refrigeration cycle are placed in a single *package* or housing. Vertical single-package equipment is usually designed for inside-the-building application. Units often are equipped with line voltage controls, including integral thermostat, all factory prewired. Return air filter and grille are standard with supply air duct flanges usually located at the top of the unit. Most AC units have water-cooled condensers, which can be used with either city water or cooling tower water. Fig. 13-2 is a typical unit of this type. When it is necessary to install a unit without ductwork, a plenum and grille may be fitted to the unit for free air delivery.

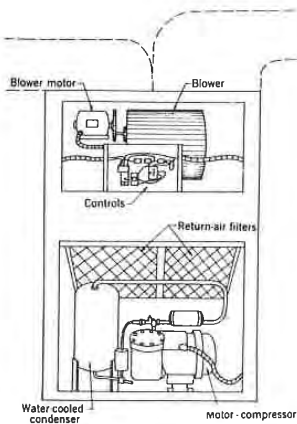


Fig 13-2. Vertical self contained air conditioned unit

Vertical units are available for installation in the space (the traditional *store cooler*) or with more utilitarian cabinets (sometimes designated *commercial*) for remote location; especially where space and noise factors assume extra importance. Commercial units are available in capacities to 50 tons and higher.

Horizontal single package units (Fig. 13-3) are designed for both indoor and outdoor installation, with the majority of units incorporating air cooled or evaporative-cooled condensers. The most common design has supply and return air connections located in the same face with horizontal air flow. Since horizontal units are designed for remote location, they are usually equipped with low voltage thermostat control. Filters are not usually supplied with the unit.

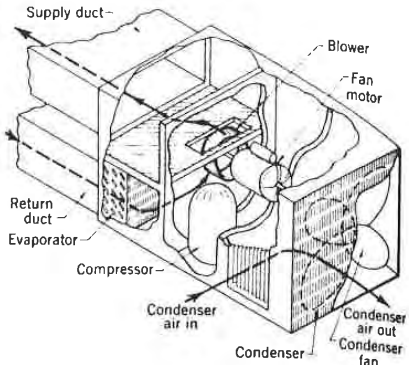


Fig 13-3. Horizontal self contained air conditioned unit

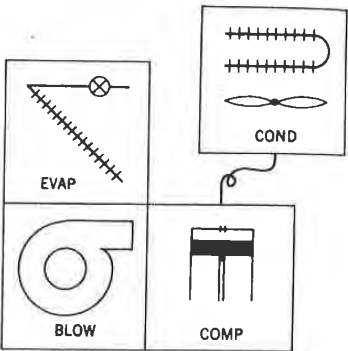


Fig 13-4. Vertical self contained air conditioned unit

Horizontal units are manufactured in capacities from 2 to 20 tons with many modifications for use in residential and light commercial applications. Their outstanding virtue is flexibility, as they can be installed, with ducted air for condensing; outdoors with ducted conditioned air supply and return; and through the wall. Indoors, they can be

floor, wall, or ceiling-mounted, and placed in the attic, basement, or in the conditioned space.

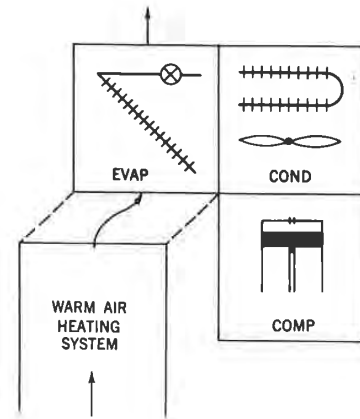


Fig 13-5. Warm air heating system

Units with Remote Condensers: Unitary air conditioners with remote condenser, piped and charged in the field, are basically the same as store coolers but with remote air cooled condensing substituted for integral water cooled condenser.

Refrigeration Chassis: Units in this category are designed to be used with a warm air heating system whose blower supplies the air for the units cooling coil (see Fig. 13-5).

In one version, the compressor-condenser is connected to the evaporator only by several feet of precharged refrigerant line for not too remote location, (see Figs. 13-6 and 13-7). These units are somewhat of a cross between single-package and split systems. Refrigeration chassis are available, also, with (truly) remote air-cooled condensers.

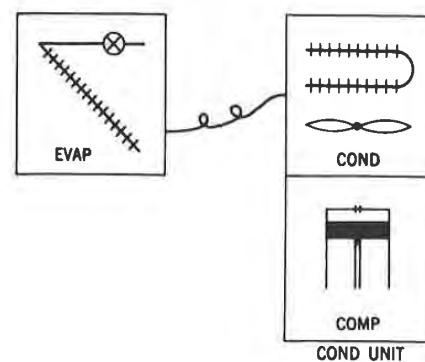


Fig 13-6. Split condenser and evaporator unit

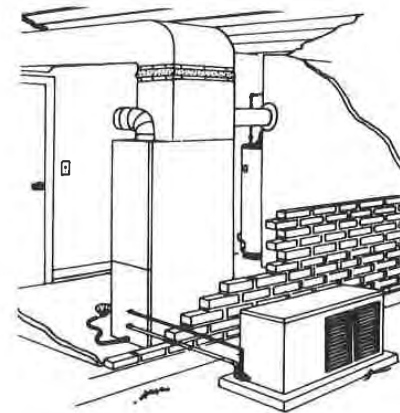


Fig 13-7. Warm air heating system

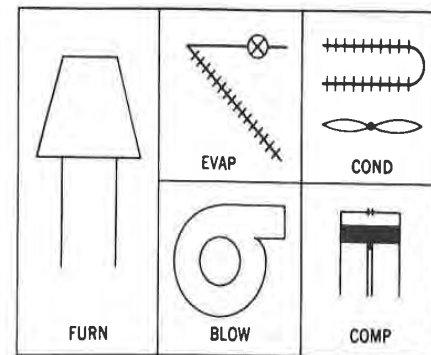


Fig 13-8. Single package year round unit

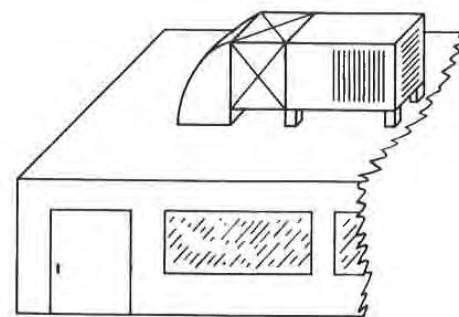


Fig 13-9. Roof mounted A-C unit

Single-Package Year-Round Units: Operated by a factory-wired, interconnected control system through a single heating-cooling thermostat, these units contain a fuel-fired heat exchanger and a factory-sealed and charged

refrigeration cycle, (see Fig. 13-8). There are water cooled models designed for installation indoors, but by far the majority are designed for roof mounting with air condensing (see Fig. 13-9). Units are available with natural gas engine compressor drive.

Year-Round Remote Units: These units are the single-package and single package with remote condenser units with heating units attached (see Fig. 13-10).

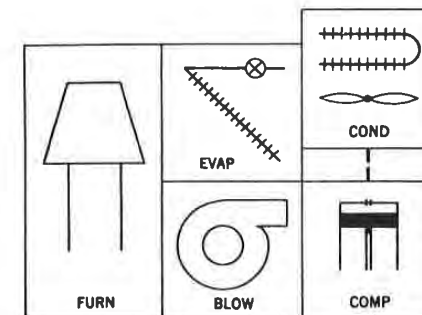


Fig 13-10. Year round air conditioner with remote air cooled conjurers

The round air unit, year-round air conditioner with remote condensing unit (Fig. 13-11) makes the real jump to the *split system*. In the case of both units, interconnecting refrigerant piping is usually field-supplied.

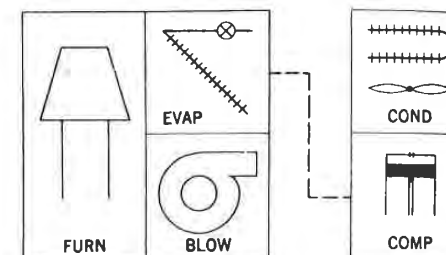


Fig 13-11. Split system year round air conditioner

Remote Condensing Units: A split system air conditioner is a unitary conditioner whose components are assembled in more than one factory made enclosure. The cooling coil is remote from the condensing unit. Because of its similarity to the single package air conditioner units whose condensers only are remote, and refrigeration chassis with or without remote condenser, have already been discussed in conjunction with single-package air conditioners, although they are not truly single package.

Split system components include electric and engine-driven condensing units, remote gas-fired water chillers, cooling coils (evaporators without blowers), and cooling coils with blowers. There is more split-system equipment available than any other type.

Condensing units contain compressor, condenser, and electrical controls. Air cooled and evaporative-cooled

condenser models also contain a fan and fan motor. Units are normally designed for outdoor installation, but some models are designed for indoor or through the wall installations (Figs. 13-12 and 13-13).

Evaporator coils (Fig. 13-14) come in a multitude of sizes and designs. Coils for use with warm air heating systems are available for upflow, downflow, and horizontal air patterns, that is, in bonnet units, under the furnace units, and duct units, respectively.



Fig 13-12. Remote condensing unit application

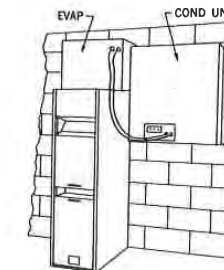


Fig 13-13. Split system, flush wall condensing unit

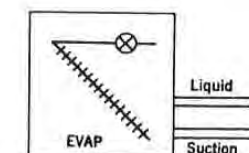


Fig 13-14. Evaporator coils in conjunction with warm air furnace

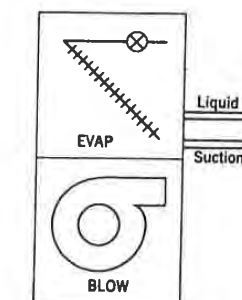


Fig 13-15. Coil with blower units