

TABLE OF CONTENTS

FOREWORD	iii
TASK FORCE	v
NOTICE TO USERS OF THIS PUBLICATION	vi
TABLE OF CONTENTS	vii
CHAPTER 1 INTRODUCTION	1.1
1.1 PURPOSE	1.1
1.2 FORCED AIR SYSTEMS	1.1
1.3 HEATING AND COOLING EQUIPMENT	1.1
1.4 ACCESSORY EQUIPMENT	1.3
1.5 DUCTWORK	1.3
1.6 AIR TERMINAL DEVICES	1.4
1.7 AUTOMATIC CONTROLS	1.4
1.8 CODES AND ORDINANCES	1.4
CHAPTER 2 BUILDING HEAT TRANSMISSION LOADS	2.1
2.1 GENERAL	2.1
2.2 HEAT LOADS	2.1
2.3 HEAT LOSS CALCULATIONS	2.3
2.4 COOLING LOADS	2.8
2.5 HEAT GAIN CALCULATIONS	2.11
CHAPTER 3 RESIDENTIAL HVAC SYSTEMS	3.1
3.1 INTRODUCTION	3.1
3.2 HEATING SYSTEMS	3.1
3.3 TYPES AND LOCATIONS	3.1
3.4 HYDRONIC HEATING SYSTEMS	3.3
3.5 AIR SYSTEMS FOR COOLING	3.4
3.6 HEAT PUMP SYSTEMS	3.5
CHAPTER 4 HVAC EQUIPMENT	4.1
4.1 EQUIPMENT SELECTION	4.1
4.2 HEATING EQUIPMENT SIZING	4.1
4.3 COOLING EQUIPMENT SIZING	4.2
4.4 AIR SYSTEM ACCESSORY EQUIPMENT	4.4
4.5 HYDRONIC SYSTEM EQUIPMENT	4.6
4.6 EQUIPMENT INSTALLATION	4.8
CHAPTER 5 SOUND AND VIBRATION	5.1
5.1 GENERAL	5.1
5.2 OUTDOOR EQUIPMENT	5.1
5.3 INDOOR EQUIPMENT AND SYSTEMS	5.1
5.4 PIPING AND CONDUIT	5.2
CHAPTER 6 DUCT DESIGN	6.1
6.1 INTRODUCTION	6.1
6.2 RESIDENTIAL DUCT DESIGN	6.1
6.3 RESIDENTIAL SYSTEM AIRFLOW REQUIREMENTS	6.2
6.4 RESIDENTIAL SYSTEM DUCT SIZING	6.3
6.5 RESIDENTIAL DUCT DESIGN PROCEDURES	6.4
CHAPTER 7 DUCT CONSTRUCTION AND INSTALLATION	7.1
7.1 DUCTWORK SYSTEMS	7.1
7.2 RESIDENTIAL DUCTWORK	7.1



7.3	DAMPERS	7.4
7.4	DUCT INSULATION AND LINING	7.4
7.5	DUCT LEAKAGE AND SEALING	7.6
CHAPTER 8	AIR TERMINAL DEVICES	8.1
8.1	GENERAL	8.1
8.2	SUPPLY AIR OUTLETS	8.1
8.3	RETURN AIR INLETS	8.2
CHAPTER 9	CONTROL AND WIRING SYSTEMS	9.1
9.1	GENERAL	9.1
9.2	CONTROL COMPONENTS	9.1
9.3	SPACE HEATING AND COOLING CONTROLS	9.1
9.4	FACTORY INSTALLED CONTROLS	9.2
9.5	ENERGY MANAGEMENT SYSTEMS	9.2
9.6	CONTROL AND POWER WIRING	9.2
CHAPTER 10	FLUES, VENTING, AND COMBUSTION AIR	10.1
10.1	EQUIPMENT VENTING	10.1
10.2	CHIMNEYS	10.1
10.3	VENT CONNECTORS	10.3
10.4	VENTING SYSTEMS	10.3
10.5	COMBUSTION AIR	10.3
10.6	EXHAUST FANS AND DUCTS	10.5
10.7	MAKE-UP AIR EQUIPMENT	10.5
10.8	DRYER VENTING SYSTEMS	10.5
10.9	SAFETY ISSUES	10.5
10.10	FIRE STOPPING AND CAULKING	10.6
CHAPTER 11	PIPING SYSTEMS DESIGN AND INSTALLATION	11.1
11.1	HYDRONIC PIPING	11.1
11.2	REFRIGERATION PIPING	11.5
11.3	GAS PIPE SIZING	11.7
11.4	OIL PIPE SIZING	11.8
11.5	LIQUEFIED PETROLEUM (LP) GAS STORAGE TANKS	11.8
11.6	OIL STORAGE TANKS	11.9
CHAPTER 12	SPECIFICATIONS	12.1
12.1	GENERAL	12.1
12.2	SPECIFICATION TYPES	12.1
12.3	SAMPLE MECHANICAL SPECIFICATION	12.1
	PART I - GENERAL	12.2
	SCOPE OF WORK	12.2
	PART II - PRODUCTS	12.2
	POST BID REQUIREMENTS	12.3
	ALTERNATES	12.3
	SUBMITTAL PACKAGE	12.3
APPENDIX A	SYSTEM DESIGN TABLES AND CHARTS	A.1
APPENDIX B	ACCA "MANUAL J" TABLES	B.1
APPENDIX C	REFERENCES	C.1
APPENDIX D	GLOSSARY	D.1
	INDEX	I.1



TABLES

Table 2-1	Recommended Duct Insulation Values	2.13
Table 7-1	Metal Gauges for Rectangular Ducts (Not Enclosed in Partition Wall)	7.1
Table 7-2	Metal Gauges for Rectangular Ducts (Enclosed in Partition Wall)	7.1
Table 7-3	Metal Gauges for Round Ducts	7.2
Table 7-4	Galvanized Sheet Thickness	7.3
Table 7-5	Aluminum Sheet Thicknesses Equivalent to Galvanized Steel Gauges	7.3
Table 7-6	Duct Insulation	7.6
Table 7-7	Duct Lining	7.6
Table 8-1	General Characteristics of Supply Outlets	8.1
Table 10-1	Clearance for Connectors	10.2
Table 11-1	Increased Flow Requirements for 50% Glycol	11.4
Table 11-2	Pressure Drop Correction Factors for 50% Glycol	11.4
Table 11-3	Minimum Pipe Insulation	11.5
Table 11-4	Storage Tank Venting	11.9
Table A-1	Velocities vs. Velocity Pressures	A.4
Table A-2	Loss Coefficients for Straight-Through Flow	A.4
Table A-3	Equivalent Length of Pipe for 90-Degree Elbows	A.16
Table A-4	Recommended Nominal Size for Fuel Oil Suction Lines from Tank to Pump (Residual Grades No. 5 and No. 6)	A.17
Table A-5	Maximum Capacity of Gas Pipe in Cubic Feet per Hour	A.17
Table A-6	Suction, Discharge, and Liquid Line Capacities in Kilowatts for Refrigerant 22 (Single- or High- Stage Applications)	A.18
Table A-7	Suction Line Capacities in Kilowatts for Refrigerant 22 (Single- or High- Stage Applications) for Pressure Drops of 0.02 and 0.01 K/m Equivalent	A.19
Table B-1	Outdoor Design Conditions for United States and Canada Design Grains Based on an Inside Design Temperature of 75°F	B.1
Table B-2	Heat Transfer Multipliers (Heating)	B.15
Table B-3	Glass Heat Transfers Multipliers (Cooling)	B.22
Table B-4	Heat Transfer Multipliers (Cooling)	B.29
Table B-5	Infiltration Evaluation	B.33
Table B-6	Rating and Temperature Swing Multiplier (RSM)	B.34
Table B-7A	Duct Loss Multipliers	B.35



Table B-7B Duct Gain Multipliers B.36
Table B-8 Shaded Glass Area B.37
Table B-9 Requirements for Mechanical Ventilation B.39
Table B-10 R-Values of Common Building Material B.40



FIGURES

Figure 1–1	Typical Residential Installation	1.1
Figure 1–2	Schematic of An Air-to-Air Heat Pump System	1.2
Figure 1–3	Extended Plenum System (Reprinted from ACCA “Manual D”)	1.5
Figure 2–1	Winter Heating Loads (Reprinted from ACCA “Manual J”)	2.2
Figure 2–2	Above Grade Exposed Walls (Reprinted from ACCA “Manual J”)	2.4
Figure 2–3	Cold Partition (Reprinted from ACCA “Manual J”)	2.5
Figure 2–4	Knee Wall Partition (Reprinted from ACCA “Manual J”)	2.5
Figure 2–5	Below Grade Wall (Reprinted from ACCA “Manual J”)	2.6
Figure 2–6	Exposed Ceiling (Reprinted from ACCA “Manual J”)	2.6
Figure 2–7	Exposed Floor (Reprinted from ACCA “Manual J”)	2.7
Figure 2–8	Summer Cooling Loads (Reprinted from ACCA “Manual J”)	2.10
Figure 3–1	ASHRAE Effective Temperature and “Comfort Zone”	3.2
Figure 3–2	Operating Characteristics of a Single-Stage Heat Pump	3.7
Figure 4–1	Cross Section View of Air-to-Air Exchanger	4.6
Figure 4–2	Attic Mounted Air-to-Air Exchanger	4.6
Figure 4–3	Crawl Space Installation of Air-to-Air Exchanger	4.6
Figure 4–4	Correct Expansion Tank Connection	4.7
Figure 4–5	Incorrect Expansion Tank Connection	4.7
Figure 5–1	Typical Sound Sources	5.1
Figure 7–1	Volume Dampers	7.5
Figure 10–1	Venting Outside (Reprinted from NFPA 54)	10.4
Figure 10–2	Venting to Attic and Crawl Space (Reprinted from NFPA 54)	10.4
Figure A–1	Friction of Air in Straight Ducts	A.1
Figure A–2	Duct Friction Loss Correction Factors	A.2
Figure A–3	Circular Equivalents of Rectangular Ducts for Equal Friction and Capacity	A.3
Figure A–4	Duct Leakage Classification	A.5
Figure A–5	Loss Coefficients, Elbows	A.6
Figure A–6	Loss Coefficients, Converging Junctions	A.8
Figure A–7	Loss Coefficients, Diverging Junctions	A.10
Figure A–8	Equivalent Length of Boot Fittings	A.11
Figure A–9	Rectangular Elbows	A.11



Figure A-10 Transverse (Girth) Joints A.13
Figure A-11 Extended Plenum Duct System A.14
Figure A-12 Friction Loss Due to Flow of Water in Iron Pipe A.15
Figure A-13 Friction Loss Due to Flow of Water in Type L Copper Tube A.16

