



**SMALL**

**COMMERCIAL**

**AIR SYSTEM DESIGN**

**MANUAL**

2010 Edition

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Heating, Refrigeration and Air Conditioning  
Institute of Canada

## FOREWORD

The Small Commercial Air System Design Manual has been developed and published by the Heating, Refrigeration and Air Conditioning Institute of Canada.

Careful use of this manual should result in satisfactory selection of heating and cooling equipment, system accessories and the design of air distribution systems for a designated commercial building. However, the end result is in no way warranted by either the Heating, Refrigeration and Air Conditioning Institute of Canada or any companies or any persons involved in the preparation or presentation of this manual.

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# TABLE OF CONTENTS

PURPOSE .....	ix
SCOPE.....	x
<b>1 BASICS</b>	
1.1 AIRFLOW AND PRESSURE.....	1
1.2 FANS .....	2
1.3 FAN SELECTION .....	4
1.4 FAN PERFORMANCE.....	5
1.5 FAN LAWS .....	6
<b>2 DUCTS</b>	
2.1 SHAPE, EFFICIENCY AND ASPECT RATIO.....	9
2.2 SEALING METHODS.....	10
2.3 VIBRATION CONTROL.....	11
2.4 SOUND ATTENUATION.....	12
2.5 INSULATION METHODS.....	12
<b>3 EQUIPMENT</b>	
3.1 TYPES AND APPLICATIONS .....	13
3.2 SELECTION .....	17
3.3 LOCATION.....	22
<b>4 AIR DISTRIBUTION</b>	
4.1 AIR QUANTITY .....	25
4.2 cfm/btu/h METHOD .....	25
4.3 cfm/sq ft METHOD.....	26
4.4 COVERAGE .....	27

4.5	DIFFUSER SELECTION.....	27
4.6	DIFFUSER TERMINOLOGY.....	27
4.7	GRID STYLES.....	28
4.8	MULTIPLE DIFFUSER GRID .....	29
4.9	RETURN AIR .....	30
4.10	RETURN AIR SYSTEM TYPES.....	31
4.11	RETURN AIR GRILLE LOCATION .....	32
4.12	RETURN AIR GRILLE SIZING .....	32
<b>5</b>	<b>LOW VELOCITY DUCT DESIGN .....</b>	
5.1	THEORY OF AIRFLOW .....	33
5.2	PRESSURE .....	33
5.3	DUCT SYSTEMS.....	34
5.4	DUCT SYSTEM STYLES .....	34
5.5	STYLE A.....	34
5.6	STYLE B .....	35
5.7	STYLE C.....	36
5.8	DUCT EFFICIENCY .....	37
5.9	FITTING EFFICIENCY.....	38
<b>6</b>	<b>DESIGN METHODS .....</b>	
6.1	EQUAL FRICTION METHOD.....	41
6.2	MODIFIED EQUAL FRICTION METHOD.....	42
<b>7</b>	<b>DESIGN VELOCITIES .....</b>	
7.1	SUPPLY TRUNK VELOCITIES .....	43
7.2	RETURN TRUNK VELOCITIES.....	43
7.3	BRANCH DUCT VELOCITIES.....	44

<b>8 AIR DELIVERY SYSTEMS.....</b>	
8.1 CONSTANT VOLUME/SINGLE ZONE.....	45
8.2 CONSTANT VOLUME/MULTI-ZONE.....	45
<b>9 CONTROLS.....</b>	
9.1 METHODS.....	47
9.2 DEVICES.....	48
9.3 STRATEGIES.....	50
<b>10 FIRE DAMPER PROTECTION.....</b>	
10.1 INSTALLATION.....	51
10.2 PRESSURE LOSS.....	51
10.3 TRUNK PROCEDURE.....	53
10.4 BRANCH PROCEDURE.....	53
<b>11 VENTILATION.....</b>	
11.1 COMMERCIAL VENTILATION DESIGN.....	55
11.2 VENTILATION SYSTEMS.....	55
11.3 PROCEDURE.....	56
11.4 HEATING WITH VENTILATION.....	58
11.5 COOLING WITH VENTILATION.....	59
11.6 VENTILATION EQUIPMENT.....	61
11.7 VENTILATION SYSTEM TYPES.....	62
<b>12 SMALL COMMERCIAL AIR SYSTEM DESIGN PROCEDURE.....</b>	
PART A DESIGN CONDITIONS.....	69
PART B EQUIPMENT SELECTION.....	71
PART C EQUIPMENT ACCESSORIES.....	75
PART D AIR SYSTEM DESIGN REQUIREMENTS.....	77
PART E ROOM OR AREA SUPPLY AIR FLOW REQUIREMENTS.....	81

PART F ROOM OR AREA RETURN AIR FLOW REQUIREMENTS .....	85
PART G SYSTEM AIR (SUPPLY).....	87
PART H SYSTEM AIR (RETURN).....	89
PART I EQUIPMENT PERFORMANCE.....	91
PART J SUPPLY AIR BRANCH SIZING.....	93
PART K SUPPLY AIR TRUCK SIZING .....	97
PART L RETURN AIR BRANCH SIZING.....	99
PART M RETURN AIR TRUNK SIZING .....	103
<b>13 SMALL COMMERCIAL SYSTEM ZONING .....</b>	
13.1 ZONING APPLICATIONS .....	105
13.2 ZONING METHODS.....	105
13.3 ZONING FEATURES.....	105
<b>14 DESIGN EXAMPLES .....</b>	
EXAMPLE A JONES LAW OFFICE.....	111
EXAMPLE B BIG BURGER RESTAURANT .....	125
EXAMPLE C MIKE'S FURNITURE WAREHOUSE .....	139
<b>15 APPENDIX A EQUIPMENT SPECIFICATIONS.....</b>	<b>153</b>
<b>16 APPENDIX B EQUIVALENT LENGTH OF FITTINGS AND ACCESSORIES .....</b>	<b>221</b>
<b>17 APPENDIX C CHARTS AND TABLES .....</b>	<b>233</b>
<b>18 APPENDIX D WORKSHEETS .....</b>	<b>249</b>
<b>19 GLOSSARY.....</b>	<b>261</b>

## PURPOSE

This manual is intended to instruct members of the heating, ventilating and air conditioning (HVAC) industry on the proper design method required to determine the correct size of HVAC equipment, accessories and size of ducted systems to adequately condition a commercial and or industrial building.

The manual is intended for industry personnel who have a good basic understanding of HVAC equipment and distribution systems. The content of this manual is generic in nature and based on good design principles and installation practices as referenced in ASHRAE/SMACNA standards and guidelines.

This manual is the reference document provided to participants who attend the HRAI Small Commercial Air System Design certification training program.



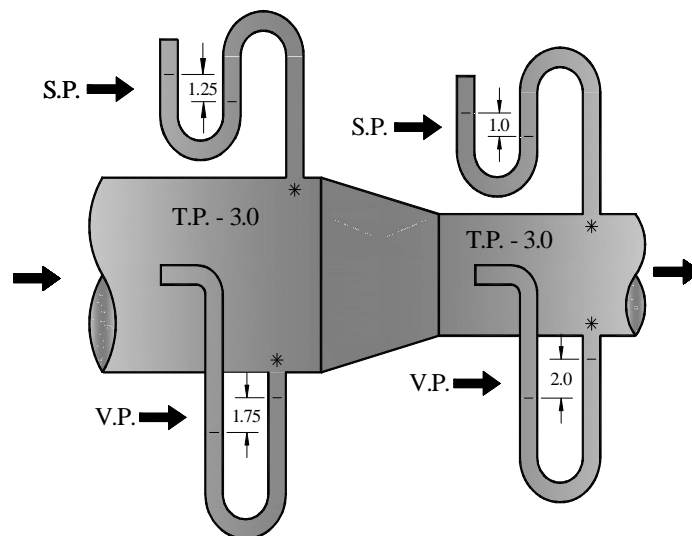
## SCOPE

- a) The materials in this manual are designed for Small Commercial Air Systems.
- b) The air distribution system sizing uses the modified equal friction method.
- c) "Small Commercial" refers to buildings that are used for commercial applications (non-residential only) that cover up to 3 stories and 600 square metres per storey.
- d) Duct system and accessories evaluation is used to accurately determine air system pressure losses for the purpose of establishing equipment external static pressure.
- e) Equipment motor horsepower, fan speed and required drive kits are determined by plotting system pressure against system airflow with manufacturers fan tables.
- f) Air system grills; diffusers and registers are sized and selected according to good engineering practice and at industry established face velocities.
- g) Air systems applies techniques to produce efficient air ducted systems and includes; streamlining, path of least resistance and proper duct fitting design.

# 1 BASICS

## 1.1 AIRFLOW AND PRESSURE

Within any duct that is part of a Heating, Air Conditioning or Ventilation system, there is airflow measure in cubic feet per minute (cfm) and two pressures exist. The first known as Static Pressure (SP), this pressure is measured in inches of water column (*in w.c.*). Static pressure is a pushing pressure on the walls of a duct or plenum. Static pressure may be converted to the pressure of flow, Velocity Pressure (VP).



Static pressure is largely responsible for directing airflow from trunks to branches. The second pressure, velocity pressure, (measured in (*in w.c.*)) is a measure of the force the moving air stream produced within the duct system. Velocity pressure can be converted directly to air speed that is measured in feet per minute (fpm) e.g. 4,000 fpm is equal to 1.0 *in w.c.* velocity pressure. These two pressures when combined (added) are known as total pressure (TP) and represents the entire pressure in the system ( $TP = VP + SP$ ).