

Worksheet for Small Commercial Air System Design



Wallet card
photocopy

Inspection Authority: _____
 Signature: _____
 Date: ____/____/____

Designer Signature: _____
 Phone () _____ Fax () _____
 Date: ____/____/____

Submitted For: (Owner)
 Name: _____
 Address _____
 City _____ Province _____
 Postal code _____
 Phone () _____ Fax () _____

By: (Contractor)
 Name: _____
 Address _____
 City _____ Province _____
 Postal code _____
 Phone () _____ Fax () _____

Designed Equipment: (Heating)

Single zone gas unit	
Single zone electric unit	
Single Zone gas/electric unit	
Indoor self contained unit	
Single zone heat pump	
Other	

Designed Equipment: (Accessories)

Electronic air cleaner	
Mechanical air filter	
Hepa Filter	
Dry media filter (thickness) _____"	
Energy recovery ventilator	
Economizer	

Designed Equipment: (Cooling)

Condensing unit, air cooled	
Chilled water coil	
Air handler	
Other	

Electric heating coil	
Other	
Ventilation system (Integrated)	
System type:	
Mixed air temperature _____°F	

Forms available from: HRAI * 2350 Matheson Blvd. East * Suite 101 * Mississauga, Ontario * L4W 5G9

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WORKSHEET 1



PART A EQUIPMENT PERFORMANCE (Design Conditions)

- A.1 Sensible Cooling Load Btu/h (Kwh)
- A.2 Total Heating Load Btu/h (Kwh)
- A.3 Total Cooling Load Btu/h (Kwh)
- A.4 Entering Dry Bulb Temperature °F (°C)
- A.5 Entering Wet Bulb Temperature °F (°C)
- A.6 Ambient Air Temperature at Condenser °F (°C)
- A.7 Heating Load – Fuel Type
- A.8 Electrical Power Supply / /

PART B EQUIPMENT SELECTION

MAKE _____ MODEL _____

- B.1 Net Total Cooling Capacity Btu/h (Kwh)
- B.2 Net Sensible Cooling Capacity Btu/h (Kwh)
- B.3 Air Flow at Design Conditions cfm
- B.4 Heating Output Btu/h (Kwh)
- B.5 Heating Temperature Rise (Range) °F (°C)
- B.6 External Static Pressure Range in, w.c.
- B.7 Ampacity Amps.
- B.8 Motor Horse Power HP.
- B.9 Motor Efficiency
- B.10 Drive Range & Number..... Rpm _____ # _____.

WORKSHEET 2



PART C ACCESSORY RESISTANCE

C.1 Accessory Equipment

- a) Economizer *in. w.c.*
- b) Resistance Heaters Btuh / *in w.c.*
- c) Filters *in. w.c.*
- d) Hrv/Erv..... *in. w.c.*
- e) Wet Coil *in. w.c.*
- f) Other *in. w.c.*

C.2 Accessory Resistance Total *in w.c.*

PART D AIR SYSTEM DESIGN REQUIREMENTS

- D.1 System Air Flow cfm (l/s)
- D.2 Supply Air Design (TRUNK) fpm (m/s)
- D.3 Supply Air Design (BRANCH) fpm (m/s)
- D.4 Return Air Design (TRUNK) fpm (m/s)
- D.5 Return Air Design (BRANCH) fpm (m/s)
- D.6 Initial Design Friction Rate (SUPPLY AIR) /100 FT.
- D.7 Initial Design Friction Rate (RETURN AIR) /100 FT.
- D.8 Air Flow Distribution Factor
 - a) Cooling cfm/Btu/h
 - b) Heating cfm/Btu/h
 - c) (sq. ft.) cfm/sq ft

WORKSHEET 3



**PART E ROOM OR AREA AIR FLOW REQUIREMENTS
SUPPLY AIR**

ROOM									
COOLING LOAD (Btu/h)									
COOLING FLOW RATE (cfm)									
HEATING LOAD (Btu/h)									
HEATING FLOW RATE (cfm)									
DESIGN FLOW RATE (cfm)									
DESIGN OUTLET (fpm) OR NC									
NO. OF OUTLETS									
OUTLET FLOW RATE (cfm)									
OUTLET SIZE (inches)									
OUTLET THROW (feet)									
OUTLET PRESSURE DROP inches) w.c.									

PART F RETURN AIR

ROOM									
ROOM FLOW RATE (cfm)									
INLET (fpm) OR NC									
INLET PRESSURE DROP (inches) w.c.									
NO. OF INLETS									
INLET FLOW RATE (cfm)									
INLET SIZE (inches)									

WORKSHEET 4



PART G

SYSTEM AIR (SUPPLY)

**CALCULATION OF EFFECTIVE LENGTH AND
SUMMARY OF EQUIVALENT LENGTHS (feet)**

AVERAGE F.P.M. _____

$$\frac{D.2 + D.3}{2}$$

BRANCH #	MEASURED LENGTH	EQUIPMENT CONN.	GROUP 1 ELBOWS	GROUP 2 TEESWYES	GROUP 3 TAPERS	GROUP 4 DIFFUSER DROP	FLEXIBLE DUCT	TOTAL EFFECTIVE LENGTH

WORKSHEET 5



PART H

SYSTEM AIR (RETURN)

**CALCULATION OF EFFECTIVE LENGTH AND
SUMMARY OF EQUIVALENT LENGTHS (feet)**

AVERAGE F.P.M. _____

$$\frac{D.4 + D.5}{2}$$

BRANCH #	MEASURED LENGTH	EQUIPMENT CONN.	GROUP 1 ELBOWS	GROUP 5 TEESWYES	GROUP 3 TAPERS	GROUP 6 DIFFUSER DROP	FLEXIBLE DUCT	TOTAL EFFECTIVE LENGTH
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WORKSHEET 6



PART I EQUIPMENT PERFORMANCE

1.1 SUPPLY

- a) Required Supply Air (S/A) External Static Pressure
= Longest Length of S/A Branch x Design Friction Rate

= Length _____ x _____/100Ft. = *in.w.c.*
- b) Diffuser Loss *in.w.c.*
- c) Damper Loss *in.w.c.*
- TOTAL SUPPLY AIR EXTERNAL STATIC PRESSURE..... *in.w.c.***

1.2 RETURN

- a) Required Return Air (R/A) External Static Pressure
= Longest Length of R/A Branch x Design Friction Rate

= Length _____ x _____/100Ft. = *in.w.c.*
- b) Grille Loss *in.w.c.*
- c) Damper Loss *in.w.c.*
- TOTAL RETURN AIR EXTERNAL STATIC PRESSURE..... *in.w.c.***

1.3 NET SYSTEM E.S.P.

Net System External Static Pressure

= Total S/A E.S.P. + TOTAL R/A E.S.P.

= _____ S/A E.S.P. + _____ R/A E.S.P. = *in.w.c.*

1.4 NET EQUIPMENT E.S.P.

Net Equipment External Static Pressure

= Net System E.S.P. + Accessory E.S.P.

= _____ Net System E.S.P. + _____ Acc. E.S.P. = *in.w.c.*

1.5 EQUIPMENT PERFORMANCE

- a) Selected External Static Pressure *in.w.c.*
- b) Airflow at Selected External Static Pressure *cfm*
- c) R.P.M. or Speed at Selected *cfm*

WORKSHEET 7



PART J SUPPLY AIR BRANCH SIZING

OUTLET ID									
OUTLET LOCATION									
OUTLET FLOW RATE (cfm)									
TOTAL EFF. LENGTH (ft)									
DUCT DESIGN PRESSURE (in.w.c.)									
ADJUSTED PRESSURE (Per/100Ft.)									
BRANCH DIAMETER (in.)									
BRANCH RECT EQUIV. (in.)									
BRANCH fpm									

PART K SUPPLY AIR TRUNK SIZING

TRUNK ID									
ACCUMULATED TRUNK (cfm)									
LOWEST UPSTREAM LOSS/100 Ft									
TRUNK DIAMETER (in.)									
TRUNK RECTANGULAR EQUIV. (in.)									
RECTANGULAR TAPERS (in.)									
TRUNK fpm									

WORKSHEET 8



PART J (Continued) SUPPLY AIR BRANCH SIZING

OUTLET ID									
OUTLET LOCATION									
OUTLET FLOW RATE (cfm)									
TOTAL EFF. LENGTH (ft)									
DUCT DESIGN PRESSURE (in.w.c.)									
ADJUSTED PRESSURE (Per/100Ft.)									
BRANCH DIAMETER (in.)									
BRANCH RECT EQUIV. (in.)									
BRANCH fpm									

PART K (Continued) SUPPLY AIR TRUNK SIZING

TRUNK ID									
ACCUMULATED TRUNK (cfm)									
LOWEST UPSTREAM LOSS/100 Ft									
TRUNK DIAMETER (in.)									
TRUNK RECTANGULAR EQUIV. (in.)									
RECTANGULAR TAPERS (in.)									
TRUNK fpm									

WORKSHEET 9



PART L RETURN AIR BRANCH SIZING

INLET ID									
INLET LOCATION									
INLET FLOW RATE (cfm)									
TOTAL EFF. LENGTH (ft)									
DUCT DESIGN PRESSURE (in.w.c.)									
ADJUSTED PRESSURE (Per/100Ft.)									
BRANCH DIAMETER (in.)									
BRANCH RECT EQUIV. (in.)									
BRANCH fpm									

PART M RETURN AIR TRUNK SIZING

TRUNK ID									
ACCUMULATED TRUNK (cfm)									
LOWEST UPSTREAM LOSS/100 Ft									
TRUNK DIAMETER (in.)									
TRUNK RECTANGULAR EQUIV. (in.)									
RECTANGULAR TAPERS (in.)									
TRUNK fpm									