DRAFT STANDARD C823 20XX
Performance standard for air handlers in residential space conditioning systems

Note: This draft is under development and subject to change; it should not be used for reference purposes.

Published by:
Canadian Standards Association
5060 Spectrum Way, Suite 100
Mississauga, Ontario
Canada L4W 5N6

Working draft revised December 22, 2009

Preface

This is the first edition of CSA C823, *Performance standard for air handlers in residential space conditioning systems*. This Standard measures both the air delivery and the electrical energy consumption of the space conditioning air handler over a range of static pressures and speed control settings. Based on those measurements, performance ratings are developed for the air handler for each of its operating control settings using a standardized system resistance curve. An annual electrical energy consumption rating is also calculated for the air handler. The actual performance and annual electricity use of the air handler may vary from the ratings because of differences in how it may be installed and used.

CSA acknowledges that the development of this standard was made possible, in part, by the financial support of Natural Resources Canada (NRCan) and others.
This Standard was prepared by the Subcommittee on C823, under the jurisdiction of the Technical Committee on HVACR

MMM YYYY

Notes:

(1) ***Use of the singular does not exclude the plural (and vice versa) when the sense allows.***

(2) ***Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.***

(3) ***This publication was developed by consensus, which is defined by*** **CSA Policy governing standardization — Code of good practice for standardization** ***as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this publication.***

(4) ***CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.***

(5) ***All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.***

Requests for interpretation should

(a) ***define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;***

(b) ***provide an explanation of circumstances surrounding the actual field condition; and***

(c) ***be phrased where possible to permit a specific "yes" or "no" answer.***

Committee interpretations are processed in accordance with the **CSA Directives and guidelines governing standardization** ***and are published in CSA's periodical*** **Info Update*****, which is available on the CSA Web site at www.csa.ca.***

Technical Committee on Heating Ventilating and Refrigeration Equipment

Insert List here

Subcommittee on C823

Insert List here

Table of Contents

CSA C823 Performance standard for air handlers in residential space conditioning systems

1 Scope

1.1
This Standard applies to ducted air handler units that are used to supply and/or circulate conditioned air in residential central space conditioning systems such as furnaces, heat pumps, combination airhandlers and fan coils.

1.2
This Standard describes test procedures, test setups and calculations required to determine performance ratings for air delivery and electrical energy consumption of air handlers. It does not address thermal performance ratings for the air handler system.

1.3
This standard does not apply to draft inducer fans, exhaust fans, or heat/energy recovery ventilators.

1.4
The values given in SI (metric) units are the standard. The values given in parentheses are for information.

1.5
In CSA Standards, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; “may” is used to express an option or that which is permissible within the limits of the standard; and “can” is used to express possibility or capability. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material. Notes to tables and figures are considered part of the table or figure and may be written as requirements. Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

2 Definitions and Abbreviations

2.1 Definitions
The following definitions apply in this Standard:

Air handler — a space conditioning package that is designed to supply heating and/or cooling through a system of ducts with air as the heat transfer medium. It may also circulate air without addition or removal of heat and it may be used to provide filtration, humidification, etc.

Rated voltage — the specified voltage of the unit under test, in Volts, as stated on the unit nameplate.

Standard air — air with a standard density of 1.2 kg/m^3 (0.075 lbm/ft^3)

Standard air has a ratio of specific heats of 1.4 and a viscosity of 1.8185*10-3 Pa.s (1.222*10-5 lbm/ft-s). Air at 20 °C (68 °F) temperature, 50% relative humidity, and standard barometric pressure has the properties of standard air, approximately.

Standard barometric pressure — 101.325 kPa (29.92 in. Hg)

Unit under test (UUT) — the specific unit sample used for all tests in this Standard

2.2 Abbreviations

AMCA:The Air Movement and Control Association International, Inc.
CSA: Canadian Standards Association
AHRI: Air-conditioning, Heating, and Refrigeration Institute
HRAI: Heating Refrigeration & Air Conditioning Institute of Canada
NRCan: Natural Resources Canada

3 Reference Publications.

ANSI/AMCA Standard 210-07 | ANSI/ASHRAE 51-07,
Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating

ANSI/ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) Std 37-2005
Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment

CAN/CSA C62301
***"Household electrical appliances – Measurement of standby power"*.**

4 Standardized Performance Ratings

Performance ratings shall be calculated based upon the results of tests carried out in accordance with this Standard.

4.1 Electrical Energy Consumption Ratings

The Electricity consumption rating for each HVAC function shall be reported as follows:

ECh **= Electrical energy consumption rating for operation in heating mode, (Refer to Clause 8.2)**

$ECh_{reduced}$ **= Electrical energy consumption rating for operation in reduced heating mode**

ECc = Electrical energy consumption rating for operation in cooling mode, (Refer to Clause 8.3)

$ECc_{reduced}$ **= Electrical energy consumption rating for operation in reduced cooling mode**

ECcirc **= Electrical energy consumption rating for operation in circulation mode, (Refer to Clause 8.3)**

ECstdby **= Electrical energy consumption rating for standby mode, (Refer to Clause 7.4)**

4.2 Annual Electrical Energy Consumption (AECR) rating

A standardized annual electrical energy consumption rating for the air handler shall be calculated as follows:

$$AECR = AHeatH * ECh + AHeatH_{reduced} * ECh_{reduced} + ACoolH * ECc + ACircH * ECcirc + AStbyH * ECstdby$$

Where

HCR = Heating capacity ratio (rated heat output in the lowesr capacity mode / rated full heat output). If HCR is ≤ 0.35, then use 0.35.

CCR=Cooling capacity ratio (rated cooling output in the lowest capacity mode / rated full cooling output) If CCR is ≤ 0.35, use 0.35.

AECR = **Annual electricity consumption rating for the air handler in kWh**

SNHHC = Standardized National Heating Hours for Canada = 2000 hours

AHeatH = Annual heating hours (air-handler operating)

$AHeatH_{reduced}$ = Annual reduced capacity heating hours (air-handler operating)

SNCHC = Standardized National Cooling Hours for Canada = 400 hours

ACoolH = Annual cooling hours (air-handler operating)

$ACoolH_{reduced}$ = Annual reduced capacity cooling hours (air-handler operating)

ACircH = Annual circulating hours (air-handler operating)

AStbyH = Annual standby hours (air-handler not operating)

Table 1 - Standardized Annual Operating Hours

NOTE: Applicable to Canada

	AHeatH high	AHeatH reduced	ACoolH high	ACoolH reduced	ACircH	AstbyH
Single-stage heating Without Constant Circulation	SNHHC	0	SNCHC	0	0	8760-AHeatHhigh-ACoolHhigh
Single-stage heating With Constant Circulation	SNHHC	0	SNCHC	0	8760-AHeatHhigh-ACoolHhigh	0
Multi-stage heating with single stage cooling Without Constant Circulation	0.1*SNHHC	0.9*SNHHC/HCR	SNCHC	0	0	8760-AHeatHhigh-$AHeatH_{reduced}$-ACoolHhigh
Multi-stage heating and single stage cooling With Constant Circulation	0.1*SNHHC	0.9*SNHHC/HCR	SNCHC	0	8760-AHeatHhigh-$AHeatH_{reduced}$-ACoolHhigh	0
Single stage heating and multi-stage cooling Without	SNHHC	0	0.1*SNCHC	0.9*SNCHC/CCR	0	8760-AHeatHhigh-ACoolHhigh-

Constant Circulation						**$ACoolH_{reduced}$**
Single stage heating and multi-stage cooling With Constant Circulation	**SNHHC**	**0**	**0.1*SNCHC**	**0.9*SNCHC/CCR**	**8760-AHeatHhigh-ACoolHhigh-$ACoolH_{reduced}$**	**0**
Multi-stage heating and cooling Without Constant Circulation	**0.1*SNHHC**	**0.9*SNHHC/HCR**	**0.1*SNCHC**	**0.9*SNCHC/CCR**	**0**	**8760-AHeatHhigh-$AHeatH_{reduced}$-ACoolHhigh-$ACoolH_{reduced}$**
Multi-stage heating and cooling With Constant Circulation	**0.1*SNHHC**	**0.9*SNHHC/HCR**	**0.1*SNCHC**	**0.9*SNCHC/CCR**	**8760-AHeatHhigh-$AHeatH_{reduced}$-ACoolHhigh-$ACoolH_{reduced}$**	

Editorial note: The annual hourly multipliers in the above formula will need to be developed by the C823 TSC

4.3 Air Delivery Performance Ratings

The air delivery performance rating in l/s per W (cfm per W) shall be reported for each control speed setting. For multi-stage systems that provide heating or cooling with different capacities and use different air delivery settings for each step of capacity, refer to clause 8.4.:

***AHRh*= Air delivery performance rating for operation in heating mode, (Refer to Clause 8.2)**

***AHRc*= Air delivery performance rating for operation in cooling mode, (Refer to Clause 8.3)**

***AHRcirc* = Air delivery performance rating for operation in circulation mode, (Refer to Clause 8.3)**

5 Test Setup

5.1 General

5.1.1

The air handler shall be installed in the test facility using the control settings and components supplied by or specified by the manufacturer.

***Note: There is no need to supply fuel or install venting components for any tests performed to this standard*.**

5.1.2

The unit under test shall not be modified during or between tests. Changes may be made to control settings as specified by the manufacturer to obtain different operating conditions for test purposes.

5.1.4

For testing, the outlet plenum of the air handler shall be connected to an air flow measuring apparatus using an outlet duct as specified in clause 5.2.

5.1.5

If the air handler is laid down for the test to obtain horizontal flow into the air measuring apparatus, inspect the air moving components to ensure that the test setup has not distorted or impaired the motor-to-blower connections, fan wheel-to-fan housing clearances or blower-to-chassis connection. The orientation of the blower wheel axis shall be maintained for the test.

5.1.6

Prepare the return air intake for the test. If the air handler is designed for multiple inlet configurations to provide installers with a choice in selecting the return air intake locations, the bottom inlet configuration shall be used. For air handlers with fixed return air inlet locations, a return air cutout that complies with the manufacturer's dimensional specifications shall be made.

5.1.7

An inlet duct with dimensions that match the return air inlet connection with a length of 2.5 equivalent duct diameters shall be secured to the return air connection of the air handler. A static pressure tap shall be installed on the inlet duct at a distance of 0.5 ± 0.25 equivalent diameters from the entry to the air handler. That static pressure tap shall be used to determine the inlet static pressure to the air handler which shall be used as the point of reference for determining differential static pressure across the air handler during all tests.

Note: Refer to Figure 1 for details regarding fabrication of the inlet static tap. and to clause 5.2 for identification of the location of the outlet pressure tap

5.1.8

A suitable electrical power supply shall be connected to the air handler as per clause 5.3.

5.1.9

Instrumentation to measure the electrical energy used by the air handler shall be connected in accordance with clause 5.4.

5.1.10

The air handler controls and/or wiring connections to “speed” taps shall be adjusted to select the operating condition to be tested.

Note: Blower “speed” taps may need to be altered to allow for testing of the air handler at all available settings.

5.1.11

No air filters shall be installed during tests performed to this Standard.

Note: An allowance for a representative air filter pressure drop is incorporated into the static pressure used for the performance ratings.

5.2 Outlet duct dimensions and static pressure tap

The air supply outlet from the air handler shall be connected to an air measuring apparatus using a duct that is fabricated in accordance with the dimensions shown in Figure 1 and secured to the air handler outlet connection. The static pressure taps illustrated in Figure 1 shall be used to measure the outlet static pressure from the air handler for all tests.

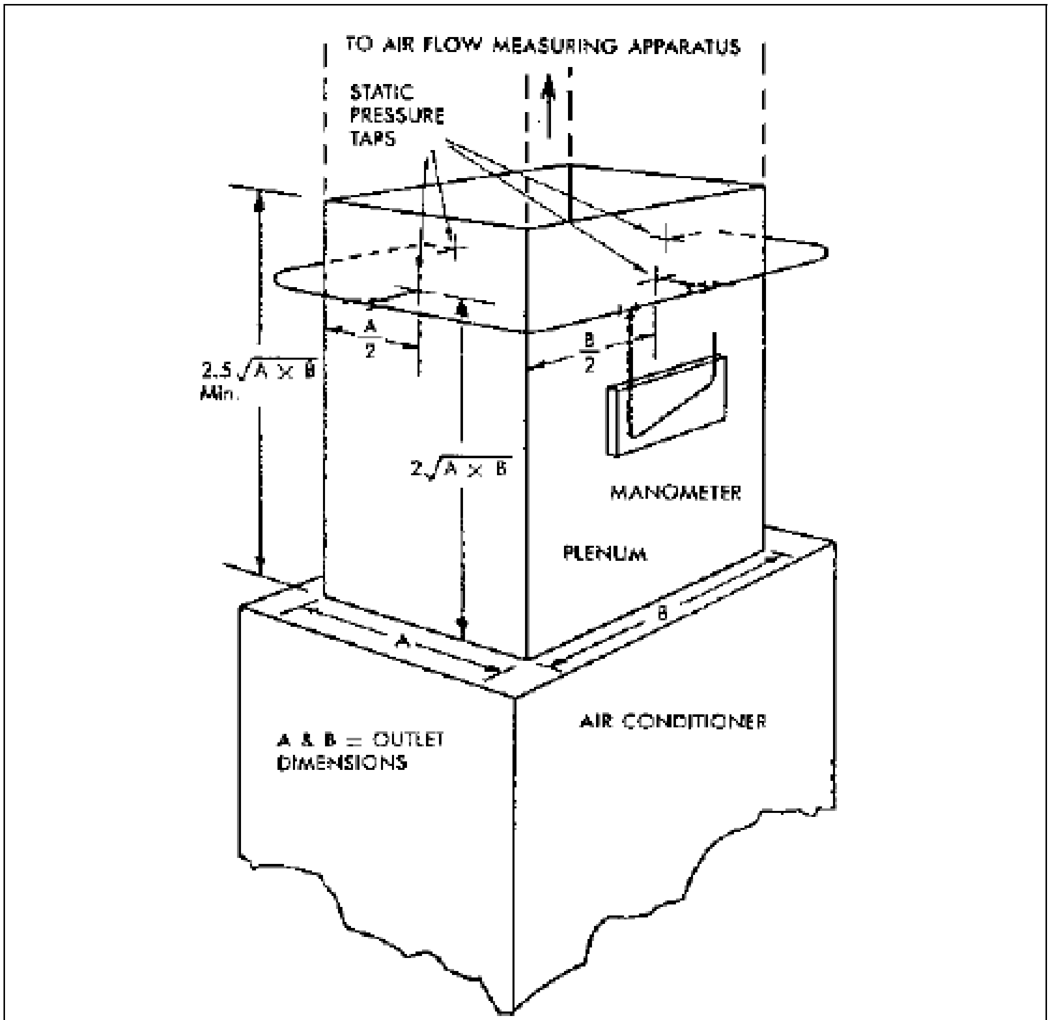


Figure 1 Outlet duct showing reference location for outlet static pressure tap (Source – ASHRAE 37)

Notes: Recommended Practices for Static Pressure Measurements using Figure 1
1 A tap should be located at the center of each face of the (each) plenum, if rectangular, or at four evenly distributed locations along the perimeter of an oval or round plenum.
2 The pressure taps should consist of 6.25 mm (0.25 in.) diameter nipples soldered to the outer plenum surfaces and centered over 1 mm (0.040 in.) diameter holes through the plenum. The edges of these holes should be free of burrs chamfers and other surface irregularities.

5.3 Electrical Supply

The electrical supply to all electric components of an air handler shall be maintained within ±1 percent of the nameplate voltage for all tests. If a voltage range is used for nameplate voltage, the electrical supply shall be maintained within ±1 percent of the mid-point of the nameplate voltage range. If a dual voltage is used for nameplate voltage, the electrical supply shall be maintained within ±1 percent of the higher voltage.

5.4 Power and Energy Consumption Measurement

Instruments shall be installed to measure the quantity of electrical energy supplied to the air handler. The electrical power and energy used by the circulation blower motor shall also be measured separately (sub-metered). Electrical power and energy consumption shall be expressed in units of kilowatts or kilowatt-hours as applicable. Electrical measurements shall be made in compliance with CAN/CSA C62301.

5.5 Test room temperature measurement

In the test room, a thermocouple or other temperature sensing device shall be installed with the junction or sensing element shielded from direct radiation from the air handler and positioned at the vertical midpoint of the air handler at a perpendicular distance of 600 mm (24 in) from any surface of the air handler.

5.5.1 Room Ambient Temperature

The ambient air temperature of the test room shall be maintained between 18°C and 27°C for all tests. During any test performed at a particular operating speed setting the room ambient temperature shall not vary by more than ± 3°C.

5.6 Equipment Precision and Accuracy

The level of accuracy and the precision of the measurement equipment to be used shall be in accordance with Table 1.

6 Performance Tests

6.1 Test Method — Overview

The basic approach in this standard is to develop performance curves for the air handler to characterize its air delivery and energy consumption for each available blower speed over the range of operation that may be encountered after it is installed. The principal reference standard method, ANSI/AMCA Standard 210-07 | ANSI/ASHRAE 51-07 has been widely using within the HVAC industry to determine the performance of fans and blowers. It provides detailed procedures and calculations that are used to produce full performance curves that characterize fan performance from free air flow to shutoff.
In this Standard, certain measurements specified in the reference standard (e.g. blower speed measurements) are not required and there is no need for full performance curves for all speed settings. The measurements are used to develop performance curves that describe the air handler performance over a narrower range of static pressures than a full performance curve. Once the air handler performance curves are known, a reference system load curve is superimposed. The intersection of the air handler performance curves and the reference system

load curve identifies the operating points that are used for performance ratings.

Notes:

1 Not requiring measurement of blower speed and only requiring performance curves within the region defined by the reference system curves simplifies the test setup and streamlines the testing.

2 This Standard identifies ANSI/AMCA Standard 210-07 | ANSI/ASHRAE 51-07as a reference Standard, but it allows for different air flow testing setups to be used provided that the accuracy specifications (Table 1) are satisfied. This recognizes that other airflow measurement techniques may be available.

6.2 Select speed setting for test

The controls of the air handler shall be adjusted and/or speed taps shall be changed to obtain the desired operating setting as described in 5.1.10

Note: tests do not need to be run at conditions that the appliance cannot operate at in the field.

6.3 Apply Power to the air handler

Apply power to the HVAC air handler as specified in 5.3

6.4 Adjust static pressure

Start the nozzle chamber balancing fan and adjust its controls to obtain the desired static pressure across the air handler for the test

6.5 Record test measurements

After all readings have stabilized, record nozzle differential pressure, static pressure, electrical measurements.

Stabilization is demonstrated by a change of no more than 2% in the measured electricity consumption, static pressure and calculated air flow over a minimum of three sets of readings approximately equally spaced over a period of at least 1 minute.

COMMENT: The committee is open to review this statement based on actual lab measurement data.

6.6 Adjust the balancing fan to obtain the next test pressure

After acceptable stabilized conditions have been achieved and recorded, adjust the chamber balancing fan to obtain a different test pressure, and repeat 6.5.

Note: It is recommended that the test pressures be varied in increments of not more than 25 Pa over the region of interest to adequately characterize the performance curve

6.7 Calculate standard air flow and static pressure from test data

Using the appropriate calculations (that will be different depending on the exact test configuration that is used), calculate the air flow and external static pressure for each test and correct the calculations to standard air density.

Note: Examples of two different variations of a nozzle test setup are shown in section 7. The calculations for an ANSI/AMCA Standard 210-07 | ANSI/ASHRAE 51-07 Figure 12 setup are provided in 7.1 of this Standard. For further detail, refer to section 7 of ANSI/AMCA Standard 210-07 | ANSI/ASHRAE 51-07. Calculations for other test setups will rely on the calibration report for that test setup that will be required to verify compliance with the accuracy requirements of Table 1.

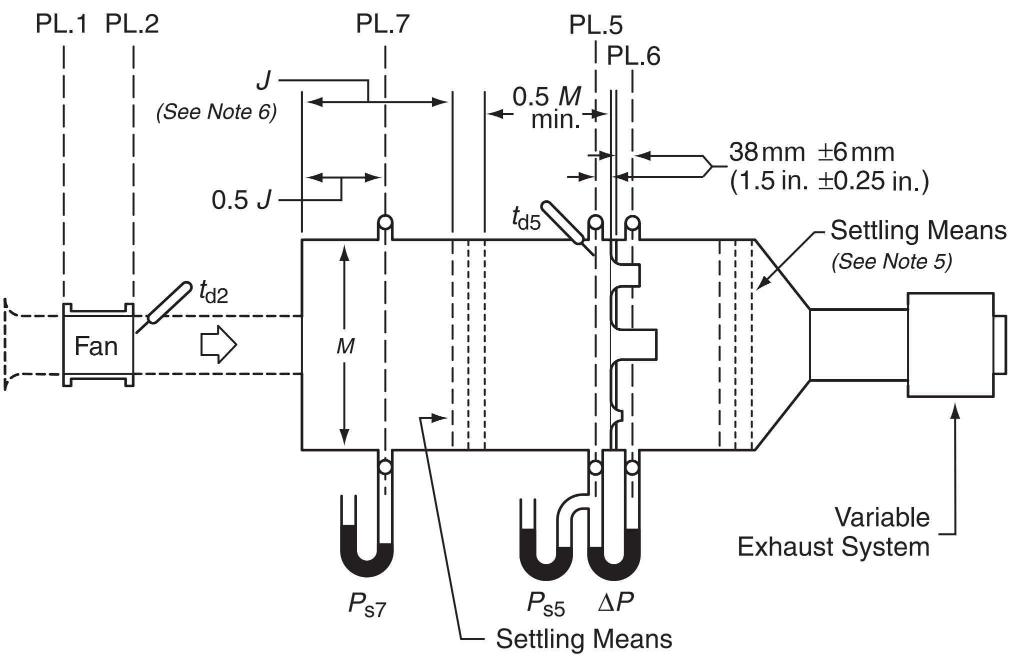
6.8 Plot performance curves for each test condition

Using the data from the tests, plot static pressure and power consumption versus flow for each control system speed setting. These will be used with the standard system curve to produce standard performance ratings (refer to section 8).

7 Air Flow measurement apparatus

Various airflow measurement methods may be used, provided that the calibrated airflow measurement accuracy is within the tolerance limits specified in Table 1. Two different examples of acceptable airflow measurement setups are provided in this section.

7.1 Nozzle chamber air flow measuring apparatus based on ANSI/AMCA Standard 210-07 | ANSI/ASHRAE 51-07 Figure 12 setup



__Notes for Figure__

1. **Dotted lines on fan inlet indicate an inlet bell and one equivalent duct diameter which may be used for inlet duct simulation. The duct friction shall not be considered.**
2. **Dotted lines on fan outlet indicate a uniform duct 2 to 3 equivalent diameters long and of an area within ±1% of the fan outlet area and a shape to fit the fan outlet. This may be used to simulate an outlet duct. The outlet duct friction shall not be considered.**
3. **The fan may be tested without an outlet duct in which case it shall be mounted on the end of the chamber.**
4. **The variable exhaust system may be an auxiliary fan or a throttling device.**
5. **The distance from the exit face of the largest nozzle to the downstream settling means shall be a minimum of 2.5 throat diameters of the largest nozzle.**
6. **Dimension *J* shall be at least 1.0 times the fan equivalent discharge diameter for fans with axis of rotation perpendicular to the discharge flow and at least 2.0 times the fan equivalent discharge diameter for fans with axis of rotation parallel to the discharge flow. Warning! A small dimension *J* may make it difficult to meet the criteria given in Annex A. By making dimension *J* at least 0.35*M* this condition is improved, as well as meeting the criteria given in section 5.3.1 for any fan.**
7. **Temperature t_{d2} may be considered equal to t_{d5}.**
8. **For the purpose of calculating the density at Plane 5 only, P_{s5} may be considered equal to P_{s7}.**

Figure 2: Nozzle chamber airflow apparatus (from Figure 12 of ANSI/AMCA Standard 210-07 - ANSI/ASHRAE 51-07)

Flow and Pressure Formulae for Figure 2

$$*Q_5 = \sqrt{2}\ Y\sqrt{\frac{\Delta P}{\rho_5}}\ \Sigma(CA_6)$$

$$P_v = P_{v2}$$

$$Q = Q_5\left(\frac{\rho_5}{\rho}\right)$$

$$P_{t1} = 0$$

$$V_2 = \left(\frac{Q}{A_2}\right)\left(\frac{\rho}{\rho_2}\right)$$

$$P_{t2} = P_{s7} + P_v$$

$$*P_{v2} = \left(\frac{V_2}{\sqrt{2}}\right)^2 \rho_2$$

$$P_t = P_{t2} - P_{t1}$$

$$P_s = P_t - P_v$$

***The formulae given above are the same in both the SI and the I-P systems, except for Q_5 and P_{v2}: In the I-P version, the constant $\sqrt{2}$ is replaced with the value 1097.8.**

7.2 Nozzle Airflow Measuring Apparatus based on ASHRAE 37 setup

As shown in Figure 3, this apparatus is a simplified version of the ANSI/AMCA ANSI/ASHRAE Figure 12 setup. It consists basically of a receiving chamber and a discharge chamber separated by a partition in which one or more nozzles are located. Air from the equipment under test is conveyed via a duct to the receiving chamber, passes through the nozzle or nozzles, and is then exhausted to the test room.

7.2.1

The nozzle air flow measuring apparatus and its connections to the equipment outlet shall be sealed so that air leakage does not exceed 1.0% of the air flow rate being measured.

7.2.2

The center-to-center distance between nozzles in use shall be not less than three times the throat diameter of the largest nozzle, and the distance from the center of any nozzle to the nearest discharge or receiving chamber side wall shall be not less than 1.5 times its throat diameter.

7.2.3

Diffusers shall be installed in the receiving chamber located at least 1.5 times the largest nozzle throat diameter upstream of the partition wall. Diffusers in the discharge chamber shall be located at least 2.5 times the largest nozzle throat diameter downstream of the exit plane of the largest nozzle.

7.2.4

An exhaust fan, capable of providing the desired static pressure at the equipment outlet, shall be installed in one wall of the discharge chamber, and a means shall be provided to vary the capacity of this fan.

7.2.5

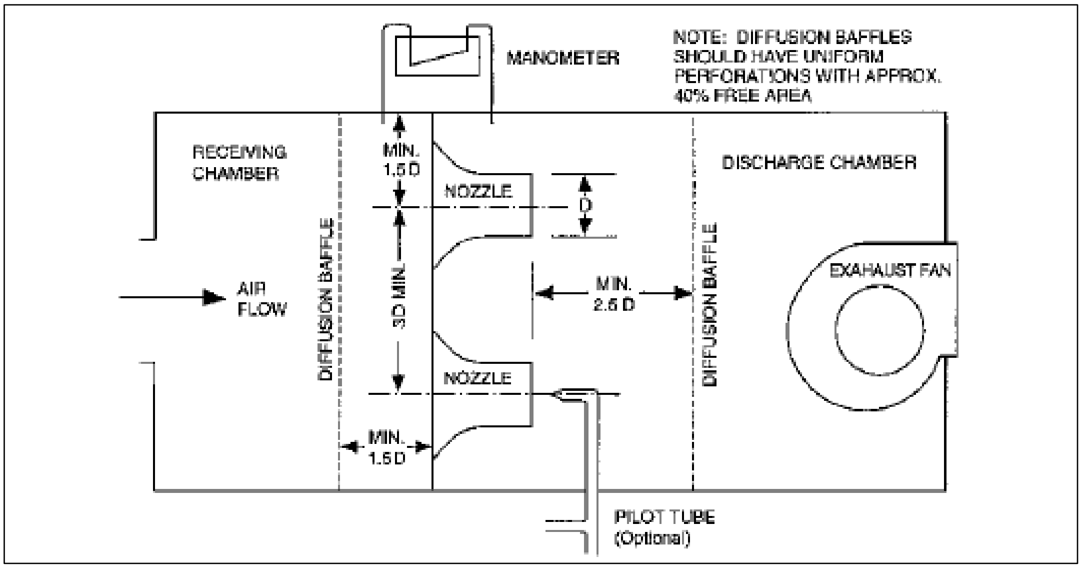
The static pressure drop across the nozzle or nozzles shall be measured with a manometer or an electronic pressure transducer. One side of the pressure measuring device shall be connected to four manifolded pressure taps installed within the receiving chamber. The other side of the pressure measuring device shall be connected to four manifolded pressure taps installed within the discharge chamber. Alternatively, the velocity head of the air stream leaving the nozzle or nozzles may be measured by a pitot tube as shown in Figure 2, but when more than one nozzle is in use, the pitot tube reading shall be determined for each nozzle.

Note: Recommendations on how to fabricate and manifold the static pressure taps, if used in measuring air volume rate, are provided in ANSI/AMCA Standard 210-07 | ANSI/ASHRAE 51-07.

***Guidance on the placement of the static pressure taps and the position of the diffusion baffle relative to the receiving chamber inlet is provided in Figure 12 of ANSI/AMCA Standard 210-07 | ANSI/ASHRAE 51-07*.**

7.2.6

Means shall be provided to determine the air density at the nozzle throat.



<u>Figure 3 Nozzle chamber air flow measurement apparatus used in ASHRAE 37</u>

7.3 Measurements and calculations with the air handler operating

Measurements and calculations shall be performed with the speed controls adjusted to the manufacturer's default settings that characterized the performance of the unit, including:

1. **Full-output heating mode,**
2. **Minimum output heating mode (if applicable)**
3. **Circulation mode**
4. **Full output cooling mode (each rated cooling capacity)**
5. **Reduced output cooling mode (if applicable, each rated cooling capacity)**

7.4 Standby Power Consumption Measurement

With the air handler installed and powered, but with the automatic controls adjusted to shut off the air flow, the total electric power consumption of the air handler unit shall be determined in accordance with CAN/CSA Standard C62301*"Household electrical appliances – measurement of standby power"*.

8 Reference System for Performance Ratings

8.1 General

The system static resistance for a simple distribution duct system is approximately proportional to the square of the air flow rate over the range of flows that is normally used in residential HVAC systems. Systems with higher capacities use higher air flows, but are intended for use with larger ducts.

8.2 Full load space heating mode

The reference system for performance ratings is characterized as one that presents a system pressure of 125 Pa (0.5 in) when operating at the full load space heating mode. Accordingly, the ratings of the air handler for the full output heating mode are taken from the intersection of the air flow performance curve for the default heating tap and a pressure differential of 125 Pa (0.5 in). For an air handler system such as a furnace that has a specified temperature rise, if there is no designated default space heating control setting or speed tap, the heating mode setting shall be deemed to be the lowest control setting that provides sufficient air flow at 125 Pa that would be needed to achieve the midpoint or lower of the specified air temperature rise.
The standard air flow required to achieve the midpoint of the specified temperature rise shall be calculated based on dry air at standard air conditions and the rated heating capacity of the unit.

8.3 Ratings for other operating modes

The ratings for all other operating mode settings shall be determined from the intersection of the rating system load curve and the performance curve for the specific operating mode or speed setting. The system load curve is as follows

$$Ps = K Q^2$$

Where
Ps = Pressure differential
K = A constant that characterizes the system
Q = Air flow in l/s (cfm)

For each air handler, the K and Q values will be different. In all cases, the system load curve will be determined from the rating point defined in clause 8.2

8.4 Adjustments for airhandlers with Multi-Stage Heating and/or Cooling Capacities

For air handlers that have multi-stage capacity for heating and/or cooling, performance curves and standardized performance ratings are required for each stage of air flow.
For air handlers that have variable capacity for heating and/or cooling, performance curves and standardized performance ratings are required at the minimum and maximum stage of air flow.

9 Minimum and Premium Performance Requirements

9.1 Minimum performance requirements for an air handler

Reserved

9.2 Minimum performance requirements for designation as an electrically efficient air handler

Reserved

Table 1
Equipment Precision and Accuracy Requirements
(See Clause 5.10 and 6.3)

Item	Instrument accuracy	Instrument Precision*
Atmospheric pressure	± 0.3 kPa (±0.1 in Hg)	± 0.17 kPa (± 0.005 in Hg)
External static pressure rise	± 2 Pa (± 0.01 in w.c.)	± 1 Pa (± 0.005 in w.c.)
Airflow	± 2% of reading	
Electrical Power	± 1% of reading or 0.5 W (whichever is greater)	± 0.5% of reading or 0.5 W (whichever is greater)
Time	± 0.5 s/h	± 0.25 s/h
Inlet and outlet air temperatures	± 0.1 °C (± 0.2°F)	± 0.06 °C (± 0.1°F)

The smallest scale division on an instrument used shall not be more than twice the specified precision.

Annex A
Reporting Template

Note: ***This Annex is not a mandatory part of this Standard.***

Draft Air Handler Specification Summary (Ref. CSA Standard C823)

Testing Agency:	____________	Product Identification:	____________
Date Issued:	____________	Serial Number:	____________
Manufacturer:	____________	Options Installed:	____________
	____________		____________
	____________	Nameplate Information	______ Volts ______ Amps
	____________	Rated Heating Capacity	______ kW ______ Btu/h
	____________	Rated Cooling Capacity	______ kW ______ Btu/h

Annual Electrical Energy Consumption Rating XXXX kWh

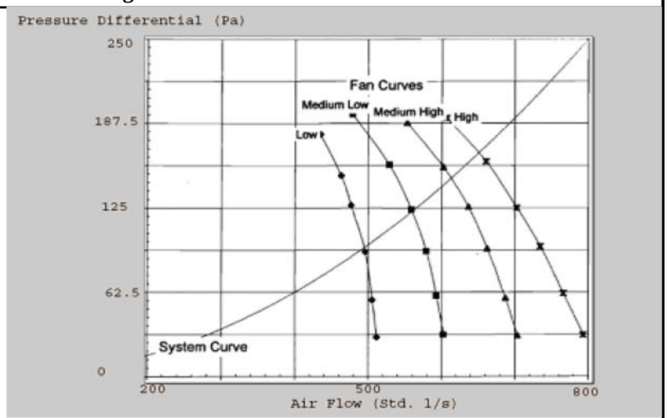
Performance Ratings

Electrical

ECh	W
ECc	W
ECcirc	W
ECstdby	W

Air Delivery

AHRh	l/s.w
AHRc	l/s.w
AHRcirc	l/s.w



Add second curve for the electrical curves, or add elect. scale as second axis

Description of key air handler components

Type of system
Fuel type
Blower/Motor:
Other:

Test Agency Comments:

Conversions: 249 Pascals = 1" of Water 1 kW = 3413 Btu/h	Reference Report: