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CONSOLIDATED REPORT ON THE 1989 SURVEY OF AIRTIGHTNESS OF NEW MERCHANT-BUILT HOUSES

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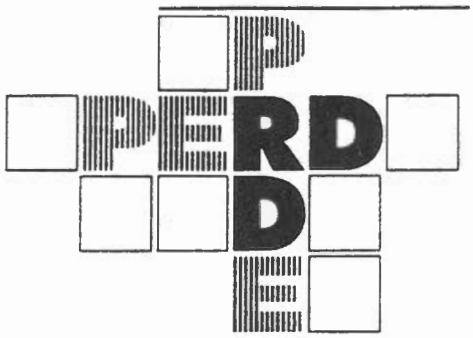

CONSOLIDATED REPORT ON THE 1989 SURVEY OF AIRTIGHTNESS OF NEW MERCHANT-BUILT HOUSES

PREPARED FOR:

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SUMMARY

Due to the concern that indoor air quality in Canadian homes might not be adequate for human comfort and safety (e.g., levels of relative humidity, formaldehyde, and carbon dioxide might be too high), the Canadian Standards Association (CSA) developed the F326 standard, which defines the minimum ventilation requirements for houses. The 1990 National Building Code of Canada (NBC) requires an air change rate in homes that is "approximately equal to the rate called for in the preliminary CSA Standard F326.1 (Residential Mechanical Ventilation Requirements) and is about equal to the rate that would be achieved using ASHRAE Standard 62, "Ventilation for Acceptable Indoor Air Quality", which relates ventilation rate to occupant load."* The NBC requires that mechanical ventilation be capable of providing 0.3 air changes per hour over a 24 hour period.

In 1989, as a result of the growing concern regarding indoor air quality, *Energy, Mines and Resources Canada, Canada Mortgage and Housing Corporation*, the *National Research Council of Canada* and the *Canadian Home Builders' Association* sponsored a project to measure the airtightness of 194 new, merchant-built houses in an attempt to determine whether mechanical ventilation is required in new homes to achieve the air change rates required by the 1990 National Building Code of Canada or whether air leakage is sufficient. This report summarizes the test procedures used in this study and the resulting findings.

Houses in 12 Canadian cities were tested using three different sealing conditions. Test condition A follows the sealing schedule as prescribed in the Canadian General Standards Board standard CAN/CGSB-149.10-M86, "Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method". The intent of these tests was to determine the airtightness of houses with all intentional openings sealed, thereby measuring the unintentional openings only. Test condition B follows virtually the same sealing schedule as condition A, except that obvious unintentional openings that are not suitable for make-up air are also sealed. Test condition C was designed to measure the airtightness of a house in its normal, or lived-in, state.

The data collected at the houses included building envelope area, volume, location of the neutral pressure plane, number of exhaust devices, the presence of other openings, and the air leakage measurements themselves. Air leakage was measured following the procedure set out in the CGSB standard. This involved sealing the house and depressurizing it. The pressure differences across

* "National Building Code of Canada 1990", Issued by the Associate Committee on the National Building Code, National Research Council Canada, Ottawa. A.9.32.3, P. 396.

the building envelope were varied between 50 and 15 Pa in increments of 5 Pa. The air flows necessary to maintain these pressure differences were recorded.

Equivalent leakage areas were determined using the flow data and a computer program developed by Scanada Consultants Limited called "AIRTEST". AIRTEST determines the air flow characteristics using the method described in the CGSB standard. Another program, LEAKAES, developed at the National Research Council, was used to predict, for each house, hourly air leakage rates based on the air flow characteristics of the house and records of hourly exterior environmental conditions for the house's location.

It was found that the air leakage rates in 1989 Canadian homes did not provide the required ventilation as per the National Building Code without mechanical assistance.

- Running 24 hour average: only 1 home in Vancouver always met the required ventilation rate when tested under sealing schedules A and C and no homes achieved this under sealing schedule B.
- Heating season (October to March) average: the average hourly air change rates by location varied between:
    - 0.14 ach in Saskatoon and 0.35 ach in Vancouver for test condition A
    - 0.15 ach in Saskatoon and 0.30 ach in Vancouver for test condition B
    - 0.19 ach in Saskatoon and Fredericton and 0.38 ach in Vancouver for test condition C.

Vancouver homes experienced the greatest number of natural air changes per hour. Saskatoon homes appear to be the tightest. However, in every region of the country there were large ranges of values of expected air change rates. This indicates that the air tightness of homes varies from house to house and, probably more significantly, between homes constructed by different builders.

Dividing the country into five regions (Atlantic Canada including St. John's, Halifax and Fredericton), Quebec including Quebec City and Montreal, Ontario including Ottawa and Richmond Hill, the Prairies including Winnipeg, Regina, Saskatoon and Edmonton, and the West including Vancouver), it was found that the normalized air leakage areas were highest in the West under all test conditions, followed by Ontario, Atlantic Canada, and Quebec. The lowest normalized air leakage rates were in homes in the Prairies.

This type of survey ought to be repeated regularly in order to determine the effects of changing technology and building practices on the airtightness of homes, and thereby help to define the type of ventilation equipment needed. A new survey should: ensure that all contractors receive the same training, determine the air change rates in the individual rooms, and follow the same method as the 1989 survey.

RÉSUMÉ

Dans les foyers canadiens, l'air intérieur peut devenir une source d'inconfort et de danger pour les occupants si, par exemple, le taux d'humidité relative ou la teneur en formaldéhyde ou en dioxyde de carbone sont trop élevés. L'Association canadienne de normalisation (CSA) a donc élaboré la norme F326 qui fixe les exigences minimales applicables aux habitations en matière de ventilation. Dans le Code national du bâtiment du Canada 1990, on prescrit un taux de renouvellement d'air à peu près égal au taux exigé dans la version préliminaire de la norme de la CSA (F326.1), « Ventilation mécanique dans les habitations », ainsi qu'au taux que l'on obtiendrait en appliquant les exigences de la norme 62 de l'ASHRAE, « Ventilation for Acceptable Indoor Air Quality », qui établit une corrélation entre le débit de ventilation et la charge imposée par les occupants. Selon le CNB, un système de ventilation mécanique doit pouvoir réaliser 0,3 renouvellement d'air par heure sur une période de 24 heures.*

En 1989, comme on se préoccupait de plus en plus de la qualité de l'air à l'intérieur des habitations, *Énergie, Mines et Ressources Canada*, la *Société canadienne d'hypothèques et de logement*, le *Conseil national de recherches du Canada* et l'*Association canadienne des constructeurs d'habitations* ont parrainé un projet visant à mesurer l'étanchéité à l'air de 194 maisons commerciales neuves en vue de déterminer s'il était nécessaire de prévoir un système de ventilation mécanique pour obtenir le taux de renouvellement d'air exigé aux termes du Code national du bâtiment 1990 ou si le taux de fuite d'air suffisait à assurer le débit de ventilation prescrit. Le présent rapport résume les méthodes d'essai employées dans le cadre de cette étude et les résultats obtenus.

Les essais, menés dans différentes conditions d'étanchéité, ont porté sur des maisons situées dans 12 villes canadiennes. Dans le scénario A, on a reproduit les conditions d'essai prescrites dans la norme CAN/CGSB-149.10-M86 de l'Office des normes générales du Canada, « Détermination de l'étanchéité à l'air des enveloppes de bâtiment par la méthode de dépressurisation au moyen d'un ventilateur ». Ces essais visaient à mesurer l'étanchéité à l'air des maisons dont on avait scellé toutes les ouvertures normales, ce qui permettait d'évaluer uniquement les fuites d'air provenant d'ouvertures accidentelles. Dans le scénario B, on a essentiellement reproduit les conditions du scénario A, mais on a également scellé les ouvertures accidentelles visibles, non

1 Code national du bâtiment du Canada 1990, publié par le Comité associé du Code national du bâtiment, Conseil national de recherches du Canada, Ottawa, A.9.32.3, p. 396.

destinées à fournir de l'air d'appoint. Dans le scénario C, on a mesuré l'étanchéité des maisons dans des conditions normales d'occupation.

Les données recueillies sur ces habitations portaient sur la superficie de l'enveloppe, le volume du bâtiment, l'emplacement du plan de pression neutre, le nombre de dispositifs d'extraction, la présence d'autres ouvertures et la mesure proprement dite des fuites d'air. Pour mesurer les fuites d'air, on a adopté la méthode prescrite dans la norme de l'ONGC, ce qui exigeait l'obturation des ouvertures et la dépressurisation de la maison. On a soumis l'enveloppe à des différences de pression de 50 à 15 Pa, que l'on a fait varier par incréments de 5 Pa. Les débits d'air nécessaires pour maintenir ces différences de pression ont été enregistrés.

Les aires équivalentes de fuite ont été calculées à partir des données d'écoulement, au moyen du programme informatique « AIRTEST » mis au point par Scanada Consultants Limited. AIRTEST permet de déterminer les caractéristiques d'écoulement d'air par la méthode décrite dans la norme de l'ONGC. On s'est également servi du programme LEAKAES, élaboré par le Conseil national de recherches du Canada, pour prédire le taux horaire de fuite d'air à partir des caractéristiques d'écoulement d'air de la maison évaluée et des données climatiques horaires pour la localité considérée.

L'étude a révélé qu'en 1989, les fuites d'air mesurées dans les habitations canadiennes ne pouvaient à elles seules fournir le débit de ventilation exigé aux termes du Code national du bâtiment.

- Période moyenne de 24 heures : une seule maison à Vancouver présentait le débit de ventilation exigé lors des essais menés dans les conditions A et C, et aucune maison n'était conforme selon le scénario B.

- Moyenne pour la saison de chauffage (d'octobre à mars) : le taux de renouvellement d'air moyen par heure variait entre :
  - 0,14, à Saskatoon, et 0,35, à Vancouver, dans les conditions d'essai A;
  - 0,15, à Saskatoon, et 0,30, à Vancouver, dans les conditions d'essai B;
  - 0,19, à Saskatoon et à Fredericton, et 0,38, à Vancouver, dans les conditions d'essai C.

Dans les maisons étudiées à Vancouver, le taux horaire de renouvellement d'air était plus élevé que dans les autres localités. Il semble que les maisons de Saskatoon soient les plus étanches. Cependant, dans toutes les régions du pays, on a obtenu une plage

extrêmement étendue de valeurs pour les taux prévus de renouvellement d'air, ce qui indique que l'étanchéité à l'air des habitations varie selon la maison étudiée et, de façon probablement plus significative, selon le constructeur.

Si l'on divise le pays en cinq régions (la région de l'Atlantique étant représentée par St.John's, Halifax et Fredericton, celle du Québec, par Québec et Montréal, celle de l'Ontario, par Ottawa et Richmond Hill, celle des Prairies, par Winnipeg, Regina, Saskatoon et Edmonton et la région de l'Ouest, par Vancouver), on s'aperçoit que l'Ouest affiche les aires normalisées de fuite d'air les plus importantes, quelles que soient les conditions d'essai, suivi de l'Ontario, de l'Atlantique et du Québec, les taux normalisés de fuite d'air les plus faibles ayant été enregistrés dans les Prairies.

Il faudrait refaire ce type d'étude à intervalles réguliers afin de déterminer les effets des dernières technologies et des nouvelles méthodes de construction sur l'étanchéité à l'air des habitations, ce qui permettrait de mieux définir l'équipement de ventilation nécessaire. Si l'on mène une nouvelle étude, il faudra s'assurer que tous les entrepreneurs ont reçu la même formation, mesurer le taux de renouvellement d'air dans chaque pièce et reprendre la méthode qui a été employée pour l'étude de 1989.

ACKNOWLEDGEMENTS

The 1989 study that resulted in the "Consolidated Report on the 1989 Survey of Airtightness of New, Merchant-Built Houses" was conducted with the cooperation and financing from a number of organizations including Energy, Mines and Resources Canada (EMR), Canada Mortgage and Housing Corporation (CMHC), the National Research Council of Canada (NRCC), the Canadian Home Builders' Association (CHBA), and the Canadian Solar Industries Association. Members of the staff from these organizations were extremely helpful in the preparation of this report. In particular, the following deserve special mention.

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CONSOLIDATED REPORT ON THE 1989 SURVEY OF AIRTIGHTNESS OF NEW, MERCHANT-BUILT HOUSES

1.0 INTRODUCTION

Ventilation in residential construction is an important issue as it affects occupant health and comfort, as well as the integrity of the building components (e.g., high indoor humidity levels can lead to mould, mildew, rot, etc.). It has historically been provided by leakage through unintentional openings (cracks and holes) in the building envelope. Due to changes in the available materials and construction practices, and with an increasing emphasis on energy conservation, residential (as well as commercial) construction has become much tighter. That is to say, the airtightness of the enclosure has been increased so there are fewer cracks and openings through which air can move. Increased airtightness of homes has led to increased energy savings, but at the same time, it has led to increased levels of relative humidity, formaldehyde (released from materials within the house), carbon dioxide and other contaminants.

Due to the concern that levels of these contaminants might be too high for human comfort and health, the Canadian Standards Association (CSA) developed the F326 standard, which defines the minimum ventilation requirements for houses based on the above considerations. The 1989 study of new, merchant-built houses, sponsored by Energy, Mines and Resources Canada (EMR), Canada Mortgage and Housing Corporation (CMHC), the National Research Council of Canada (NRCC) and the Canadian Home Builders' Association (CHBA), measured the airtightness of 194 houses in an attempt to determine whether mechanical ventilation is required in new homes to maintain the air change rates required by the 1990 National Building Code of Canada (NBC) or whether air leakage is sufficient. It should be noted that the air change requirement in the National Building Code is "approximately equal to the rate called for in the preliminary CSA Standard F326.1 (Residential Mechanical Ventilation Requirements) and is about equal to the rate that would be achieved using ASHRAE Standard 62, "Ventilation for Acceptable Indoor Air Quality", which relates ventilation rate to occupant load."[1] Section 9.32.3.1 of the 1990 NBC states that "Every dwelling unit shall be provided with a mechanical ventilation system having a capacity to exhaust inside air or to introduce outside air at the rate of not less than 0.3 air changes per hour averaged over any 24-hour period."

The air leakage data were collected during the 1989 survey by physically performing fan depressurization tests on each of the houses. Additional information related to the houses (e.g., size) was also collected. The air leakage characteristics were established for each house (i.e., C and n values where the equivalent

leakage area (ELA) is equal to $C(\Delta P)^n$), and these data were used in the analysis and preparation of this report. The equivalent leakage areas (ELA) for each house were used along with hourly weather data to calculate the air leakage rates that can be expected for each house. From these results the necessity for mechanical ventilation was established.

This report summarizes the test procedures and the findings of the 1989 airtightness survey, presents the results and discusses the analyses of the data.

1.1 OBJECTIVES

The objective of the 1989 airtightness survey of new, merchant-built houses was, as stated in the Terms of Reference, "to determine the airtightness of houses built using current standard construction practices in various regions of Canada."[Appendix 1] Airtightness tests were performed on 194 houses in various parts of Canada.

This report includes an analysis of the airtightness data collected in the 1989 study in an attempt to determine whether the natural air change rates likely to be experienced by these "new" homes meet the guidelines established by the 1990 Canadian Housing Code, and the 1990 National Building Code. The main objective in analyzing the airtightness data was to establish whether mechanical ventilation should be incorporated in new homes.

1.2 APPROACH AND STRUCTURE OF THE REPORT

This report is structured in the following sections:

Section 2 of this report describes the testing procedures and method used to collect the airtightness data. This includes the criteria for house selection, a list of the local investigators, a description of the airtightness testing method, and information about additional data that was collected.

Section 3 presents the results of the field tests including house descriptions and airtightness characteristics. Graphs representing the predicted air leakage rate as a percentage of the 1990 National Building Code of Canada requirements versus the percentage of houses surveyed are presented along with the relationship between normal air change rates and air change rates at 50 Pa pressure difference..

Section 4 includes a discussion of the results presented in Section 3, based on such aspects as regional differences in the results, and the compliance of these houses with the 1990 NBC. Summary tables of the values presented in Section 3 are also included.

Section 5 provides conclusions and recommendations regarding the test methods, the results of the air leakage tests, and requirements for mechanical ventilation in homes. A comparison is made between these results and the results of a similar study conducted in 1982/83.

2.0 AIRTIGHTNESS TEST METHOD

2.1 PROCEDURE

Three different test conditions were used, and are described in detail in Appendix 1 "1989 Survey of Airtightness of New, Merchant Builder Houses - Terms of Reference". A brief description of each test condition follows, with a summary of the sealing schedules in Table 1.

Condition A: This test condition follows the sealing schedule as prescribed in the Canadian General Standards Board (CGSB) Standard CAN/CGSB-149.10-M86, "Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method". The intent of these tests was to determine the airtightness of houses with all the intentional openings sealed, thereby measuring the unintentional openings only. Intentional openings that are sealed in this test condition include, for example, fuel fired furnace and/or stove flues and window air conditioners.

Condition B: This test condition follows virtually the same sealing schedule as condition A, except that obvious unintentional openings that are not suitable for make-up air are also sealed. Additional openings that are sealed in this test condition include, for example, fireplace flues. The only openings that are not sealed but that were previously sealed in test condition A are the ventilation air intake openings. Otherwise, test condition B results should indicate a tighter house than test condition A results. The intent of test condition B was to collect data for a future evaluation of the need for make-up air in houses.

Condition C: This test condition was designed to measure the airtightness of a house in its normal state. That is, the house is tested in the state in which it is normally used. Openings such as fuel fired furnace and/or stove flues are left with no preparation instead of being sealed as required in the other two test conditions.

Preparation of Intentional Openings	Condition A	Condition B	Condition C
Fireplace flue	no preparation	seal	no preparation
Fireplace - with damper	close	seal	close
Fireplace - with doors	close	seal	close
Fireplace - without damper	see par. 6.1.15*	seal	see par. 6.1.15*
Doors on enclosed furnace room	close	seal	close
Fireplace combustion air intake damper	close	seal	close
Fuel fired furnace and/or stove flues	seal	seal	no preparation
Fuel fired furnace and/or stove flues in enclosed furnace room	no preparation	seal	no preparation
Furnace combustion air intake with damper	close	seal	close
Furnace combustion air intake without damper	seal	seal	no preparation
Ventilation air intake with damper	close	no preparation	close
Ventilation air intake without damper	seal	no preparation	no preparation
Fuel fired hot water system flues	seal	seal	no preparation
Floor drains	fill	fill	fill
Plumbing traps	fill	fill	fill
Exhaust fans with motorized damper	close	seal	close
Exhaust fans without motorized damper	no preparation	seal	no preparation
Air to air heat exchangers designed to operate continuously - intake and exhaust openings	seal	seal	no preparation
Other air to air heat exchangers - intake and exhaust openings with motorized dampers	close	seal	close
Other air to air heat exchangers - intake and exhaust openings without motorized dampers	no preparation	seal	no preparation
Dryer vents with exhaust divertor	winter position	seal	winter position
Dryer vents with motorized damper	close	seal	close
Dryer vents without motorized damper	no preparation	seal	no preparation
Windows and doors	latch	latch	latch
Exhaust systems common to more than one unit	seal	seal	no preparation
Window air conditioners	seal	seal	sealed with plastic sheet
Attic hatch	close	close	close

Table 1: Sealing Schedule for Conditions A, B and C

*paragraph 6.1.15 refers to CAN/CGSB-149.10-M86 which states "For fireplace chimneys without a damper, perform the test with no sealing unless the leakage is so large that the test cannot be performed. In this case, seal the fireplace at the opening and report this matter as a deviation from the usual test procedure in the test report."

All the above tests were conducted using the procedure outlined in the CGSB standard. Essentially, they involved sealing the openings as previously described, depressurizing the house, and measuring the air flow necessary to maintain a given pressure. The pressure difference across the building envelope was varied between 50 and 15 Pa in increments of 5 Pa for each test condition, and these results were used to predict the equivalent leakage area (ELA) of the house.

The equivalent leakage areas were determined using a computer program developed by Scanada Consultants Limited called "AIRTEST". AIRTEST determines the ELA using the method shown in the CGSB standard. The program calculates the ELA, as well as the C and n values that describe the air leakage characteristics for the descriptive equation $Q = C(\Delta P)^n$, where Q is air flow, ΔP is the pressure difference across the enclosure and C and n are constants. An example of the output from AIRTEST is given in Figure 1.

The equivalent leakage areas and air flow characteristics were used in a computer program, developed at the National Research Council of Canada, called LEAKAES, which predicts hourly air leakage rates using records of hourly exterior environmental conditions. These results are discussed in Sections 3 and 4.

2.2 SELECTION OF HOUSES

194 houses from across the country were chosen to be tested. The houses were located in St. John's, Halifax, Fredericton, Quebec City, Montreal, Ottawa, Richmond Hill (near Toronto), Winnipeg, Regina, Saskatoon, Edmonton, and Vancouver. The number of houses selected in each city was determined based on the number of housing starts during 1989. More houses were selected for the study in the cities with more development.

The houses were chosen by the air testing contractor in each city, with the help and guidance of the local homebuilders' association and the Canadian Home Builders Association (CHBA). The houses were all required to be single, detached homes, completed between 6 and 18 months previously. The houses were to represent standard construction practices of the region, and were not to incorporate any above-normal efforts to air seal the envelope (e.g., no R-2000 homes were to be selected).

The number of houses chosen from each region, or center, is as follows:

St. John's	10	Richmond Hill	30
Halifax	14	Winnipeg	20
Fredericton	10	Regina	10
Quebec City	20	Saskatoon	10
Montreal	20	Edmonton	10
Ottawa	20	Vancouver	20

FIGURE 1

AIRTIGHTNESS TEST RESULTS
(AS PER CAN/CGSB - 149.10 - M86)

OTT R IC — MAR.3.89
Ext.Temp. =-7 C — Wind Speed = 11 E km/h
Envelope Area = 648.4 m^2 — Volume = 918.6 m^3
Pressure With Fan Sealed - Start: 2 Pa Finish: 2 Pa

PRESS.(Pa) MEAS'D.	ADJ'D.	TI (C)	FLOW(L/S) MEAS'D.	ADJ'D.	FITTED	RELATIVE ERROR(%)
43.0	41.0	20.0	742.00	707.00	709.79	0.39
40.0	38.0	20.0	709.00	675.56	674.98	0.09
35.0	33.0	20.0	652.00	621.25	614.83	1.03
30.0	28.0	20.0	574.00	546.93	551.49	0.83
25.0	23.0	20.0	513.00	488.81	484.19	0.95
23.0	21.0	20.0	474.00	451.64	455.90	0.94
20.0	18.0	20.0	428.00	407.81	411.69	0.95
17.0	15.0	20.0	386.00	367.79	364.91	0.79
15.0	13.0	20.0	349.00	332.54	331.94	0.18

C = 60.81321 — n = .6616697

E.L.A. =1120.70 cm^2 — N.L.A. = 1.728 cm^2/m^2

Q @ 10Pa = 279.04 L/S — Q @ 50Pa = 809.38 L/S

Air Change per Hour @ 50Pa = 3.172

SXX= 7.520807E+11 — SXY= 4.97629E+11

SYY= 3.296052E+11 — SYX= 4.405438

Correlation Coefficient= .9994854

Relative Standard Error = 0.89%

2.3 INVESTIGATORS

The airtightness investigations were performed by the following firms:

St. John's - Heat Seal Limited

Halifax - CBCL Limited

Fredericton - ADI Limited

Quebec City and Montreal - Techni Construction Inc.

Ottawa - Scanada Consultants Limited

Richmond Hill - Buchan Lawton Parent Ltd.

Winnipeg - Unies Limited

Regina - Institute for Research in Construction/NRC

Saskatoon - Institute for Research in Construction/NRC

Edmonton - Howell-Mayhew Engineering, Inc.

Vancouver - Sheltair Scientific Ltd.

2.3.1 Quality Control and Calibration

Although all the contractors were provided with the same sealing schedule and procedure, there were some discrepancies in interpretation. Techni Construction Inc. misinterpreted the intent of test condition B and did not perform this set of tests. Heat Seal Limited did not get results for test condition B either. In addition, there were some differences in the airtightness data due to the interpretation of the sealing schedules. For example, the crawl space and basement areas were sealed in the homes in some cities and not in others. Unfortunately, this was not documented and therefore could not be considered in the analysis and interpretation.

When the data were originally submitted in early 1990 they was checked and some errors were found in some of the data. Each of the contractors was asked to check on some inconsistencies discovered by the IRC staff. This was completed and errors found by the contractors were corrected.

2.4 OTHER INFORMATION

In addition to the air pressure measurements, other house data were collected including volume, building envelope area, location of the neutral pressure plane, number of exhaust devices and the presence of other openings. The collection procedure for this information is included in the Terms of Reference which can be found in Appendix 1. Some of this information (for example, location of the neutral pressure plane, volume, building envelope area) is needed when running the NRC computer model LEAKAES [2] which is used to predict the hourly air leakage rates, and the other information, such as number of exhaust devices, was collected for future reference and use in the interpretation of the airtightness test results.

More data were collected from the homes than is needed for this analysis. For example, data were collected from 174 of the 194 homes that can be used with the HOT2000 energy analysis program. This information was used in the preparation of CMHC's report entitled "Ventilation & Airtightness of New Detached Canadian Houses"[4] to estimate the energy impact of mechanical ventilation. The data were also included in CMHC's STAR-HOUSING database. Additional information was collected for use later at virtually the same cost.

3.0 RESULTS

This section presents the results of the 1989 Survey of Airtightness of New Merchant-Built Homes.

3.1 AIRTIGHTNESS CHARACTERISTICS (AIRTEST)

As described in Section 2.1, the results from the airtightness tests are used in the AIRTEST program which then calculates the equivalent air leakage area (ELA) and the nature of the air flow, given by C and n values. These are used in the equation $Q = C (\Delta P)^n$ where Q is the air flow, C and n are constants and ΔP is the pressure difference. "The flow exponent, n, describes the type of flow that exists and should be between 0.5 and 1.0. For streamline flow through an orifice n=0.5 (which indicates turbulent flow); values of n=1 are indicative of laminar flow."[3] The results from AIRTEST are tabulated in Appendix 2 and observed house characteristics are tabulated in Appendix 3 for each house that was involved in the study. The tabulated results include airtightness characteristics (ELA, C and n) and information about the house (volume, envelope area, height, shielding conditions, and the presence of active flues).

It should be noted that some data are missing:

1. The information regarding active flues and ducts for house F9002001 in St. John's is missing.
2. The results for test condition A are listed as the results for conditions A and B for all the St. John's homes. Only two houses have data for test condition C.
3. The results for test conditions A and B are the same for houses 7, 10, 11, 12, and 13 in Halifax.
4. The data for houses 2, 5, 8 and 10 in Fredericton have the results for test condition A listed as the results for A and C.
5. The homes in Quebec and Montreal were not tested under test condition B. This was due to a misinterpretation of the requirements by the local contractor.
6. 11 houses in Quebec City have the results for test condition A listed as the results for A and C.
7. 9 houses in Montreal have the results for test condition A listed as the results for A and C.

The results (ELAs) for tests completed under sealing schedule B would be the same as those from sealing schedule A if the house was electrically heated and there were:

- no fireplace,
- no heat exchanger,

- no exhaust fan,
- no clothes dryer, and
- no ventilation air intake.

The results (ELAs) for tests completed under sealing schedule C would be the same as those from sealing schedule A if the house was electrically heated and:

- there was no air to air heat exchanger,
- the hot water system was not fuel fired,
- there was no air conditioner, and
- the ventilation air intakes had dampers, or there weren't any.

In cases where the air leakage rates for test conditions A, B and C were the same, the house would have to have had the following characteristics:

- electric,
- no fireplace,
- no exhaust fan,
- no dryer,
- no ventilation air intake,
- non-fuel-fired hot water system,
- no heat exchanger, and
- no air conditioner.

In general, one would expect the results of the air leakage tests to yield a greater leakage area under test condition A than B. Similarly, test condition C could be expected to yield the greatest air leakage area of all. This is due to the sealing schedules: under test condition A the house is sealed according to the CGSB standard; the purpose of test condition B is to test for the amount of air leakage that is useful as make-up air, therefore items like flues are sealed as these would result in poor quality air; the purpose of test condition C is to test the house for air leakage as a lived-in situation. The reason that the air leakage measurements from test condition A are not always greater than those from test condition B is because, in following the guidelines set out in the Terms of Reference [Appendix 1], the makeup air duct was not blocked for condition B as it was for condition A.

In most cities, only some houses had ELAs for condition B that were less than for condition A. However, all houses in Ottawa, and all but 1 house in Fredericton, had larger condition A ELAs than condition B, and all but 1 house in each of Edmonton, Saskatoon and Regina had smaller condition A ELAs than condition B. Similarly, in most cities only a few houses had ELAs for condition C that were greater than for conditions A and B. However, all houses in Montreal, St. John's, Saskatoon and Regina and all but 1

house in each of Ottawa and Edmonton had condition C ELAs larger than those for conditions A and B. Since the ELAs are extrapolated based on the values determined for C and n (house airtightness characteristics), some errors in these ELA values might occur.

3.2 RATES OF AIR LEAKAGE

The airtightness characteristics of the houses (ELA, C and n) are used in another program, developed at the National Research Council, entitled LEAKAES, which is used to predict air leakage rates based on records of hourly wind speed and exterior temperature data for a typical weather year. The results from this computer program are discussed, in Section 4. The tables containing the values calculated for each house can be found in Appendix 4, along with the average values for each city.

The 0.3 ach required by the NBC 1990 in section 9.32.3 is the mechanical ventilation requirement. It is important to realize that this ventilation rate is not always necessary, but should be available. As stated in Appendix A of the NBC "It should be emphasized that this air change rate refers to the installed capacity of the system, not the rate of ventilation that is actually used in the house. In many households, ventilating at 0.3 ach would provide more ventilation than required..." However, this ventilation rate should be available, and is therefore used as a base measure for the natural ventilation in these homes.

Figures 2 to 6 present the predicted air leakage rate as a percentage of the 1990 National Building Code of Canada requirements for mechanical ventilation (0.3 air changes per hour (ach)) versus the percentage of houses surveyed. The following averages are calculated and plotted:

Figure 2 The predicted average heating season leakage rates (heating season between October and March) for test condition C. It can be seen in the figure that 66 % of the houses tested had predicted average heating season leakage rates less than 0.3 ach. The predicted average heating season leakage rates for test conditions A and B plot a similar pattern, but had 72 % and 81 % of houses respectively with results less than 0.3 ach.

Figure 3 The predicted maximum and minimum monthly average leakage rates (between October and March) for test condition C. It can be seen in the figure that 53 % of the houses tested had predicted maximum monthly average leakage rates less than 0.3 ach, and 86 % of the predicted minimum monthly average leakage rates were less than that. The predicted monthly average leakage rates for test conditions A and B plot similar patterns, but had 59 % and 71 % of houses respectively with maximums less than 0.3 ach and 90 % of houses under both test conditions with minimums less than that.

Figure 4 The predicted maximum and minimum 24 hour running average leakage rates (between October and March) for test condition C. It can be seen in the figure that 20 % of the houses tested had predicted maximum 24 hour running average leakage rates less than 0.3 ach, and 98 % of the predicted minimum 24 hour running average leakage rates were less than that. The predicted 24 hour running average leakage rates for test conditions A and B plot similar patterns, but had 27 % and 40 % of houses respectively with maximums less than 0.3 ach and 98 % and 99% of houses respectively with minimums less than that.

Figure 5 The predicted maximum and minimum 8 hour running average leakage rates (between October and March) for test condition C. It can be seen in the figure that 15 % of the houses tested had predicted maximum 8 hour running average leakage rates less than 0.3 ach, and 99.5 % of the predicted minimum 8 hour running average leakage rates were less than that. The predicted 8 hour running average leakage rates for test Conditions A and B plot similar patterns, but had 23 % and 34 % of houses respectively with maximums less than 0.3 ach and 99.5 % and 100% of houses respectively with minimums less than that.

Figure 6 The predicted maximum and minimum hourly leakage rates (between October and March) for test condition C. It can be seen in the figure that 11 % of the houses tested had predicted maximum hourly leakage rates less than 0.3 ach, and 100 % of the predicted minimum hourly leakage rates were less than that. The predicted hourly leakage rates for test conditions A and B plot similar patterns, but had 20 % and 27 % of houses respectively with maximums less than 0.3 ach and 100 % of houses under both test conditions with minimums less than that.

As mentioned above, these calculated averages can be found in Appendix 4.

FIGURE 2: Heating Season Average Leakage Rate

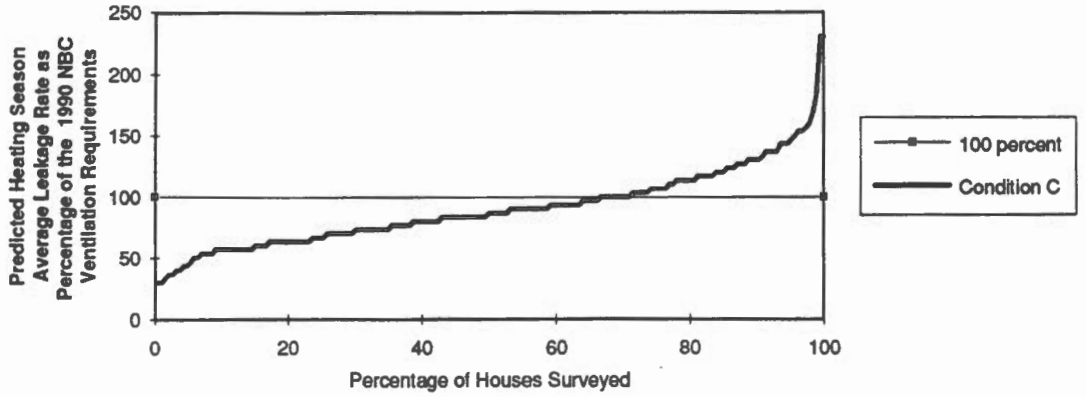


FIGURE 3: Monthly Average Leakage Rate

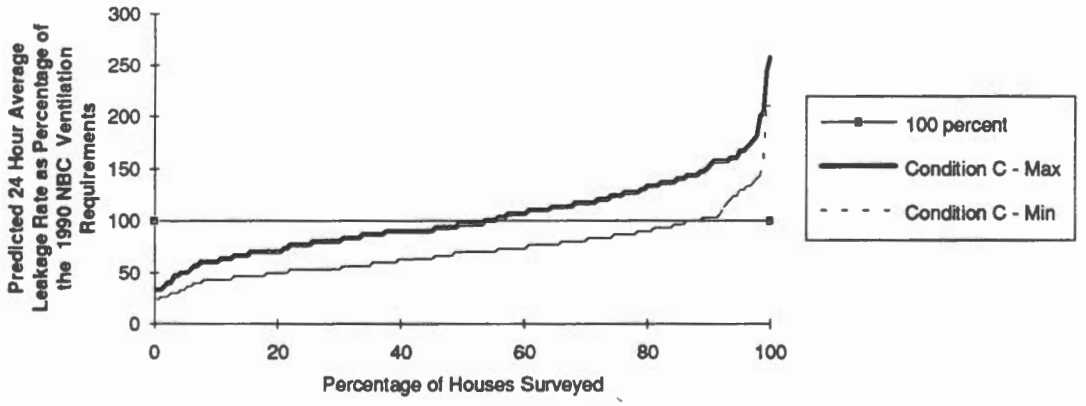


FIGURE 4: Maximum 24 Hour Running Average Leakage Rates

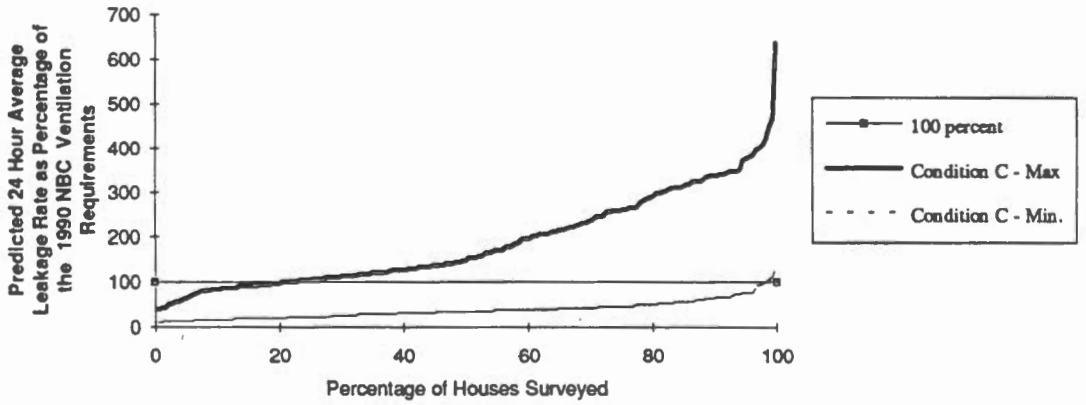


FIGURE 5: 8 Hour Running Average Leakage Rate

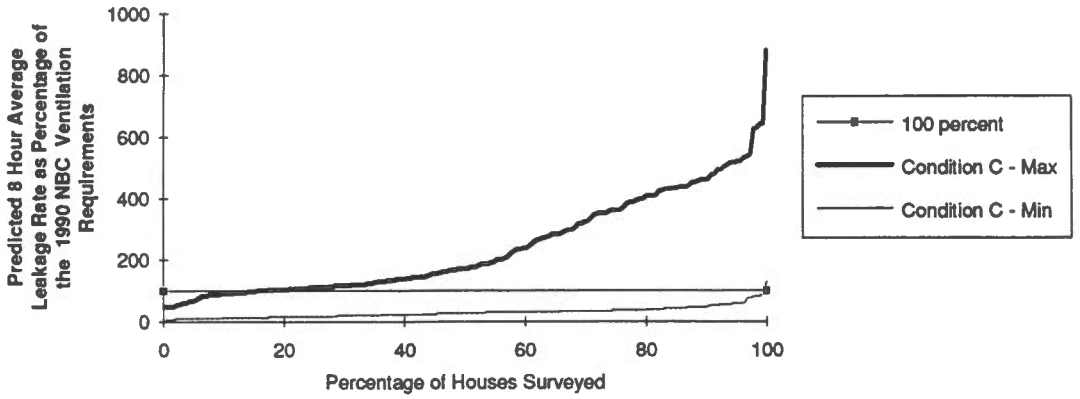
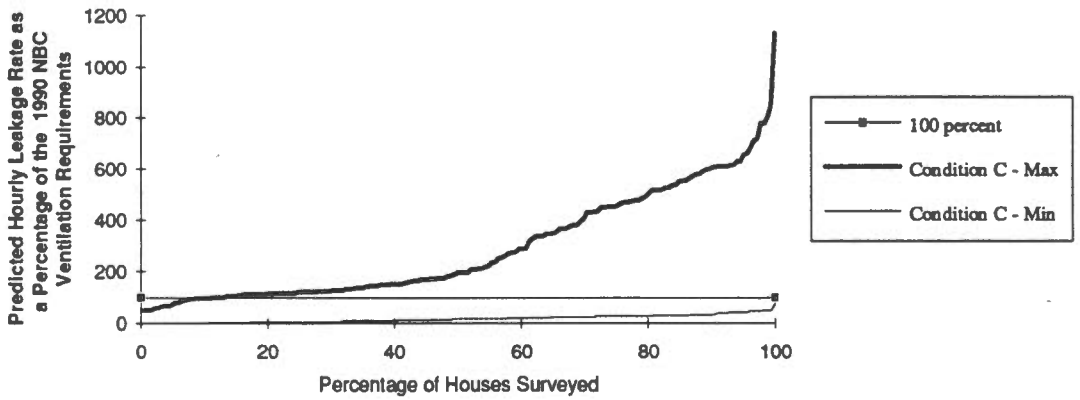


FIGURE 6: Hourly Leakage Rate



These 9 different averages will be discussed since they provide valuable information regarding the frequency with which the air leakage rates do not meet required ventilation rates. It is perhaps not surprising to find minimum hourly leakage rates that do not meet the required 0.3 air changes per hour. However, there were also maximum 24 hour rates that do not meet this required ventilation rate. The averages over the heating season give a good indication of the tightness of the homes during the winter months when the windows are not opened and people are often indoors for extended periods of time.

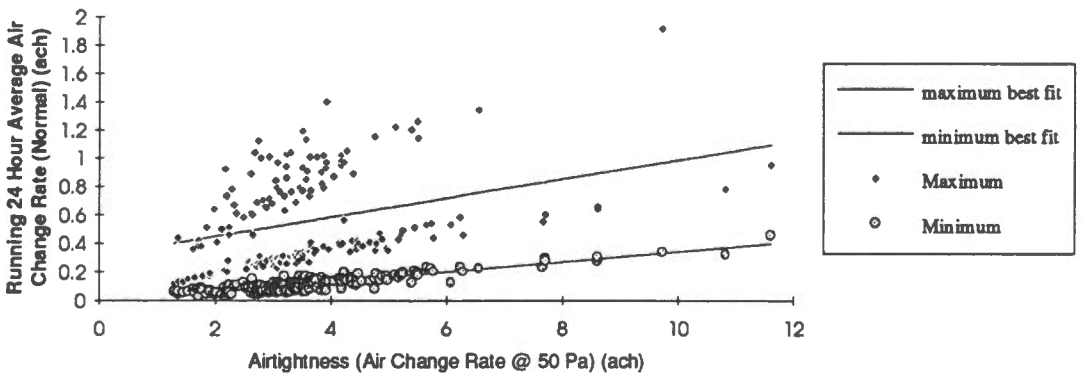
It should be noted that the heating season used in the calculations, tables and graphs is considered to be from October to March. The predicted maximum and minimum monthly average leakage rates are based on average leakage rates for each calendar month during the heating season. The maximum and

minimum 24 hour and 8 hour running average leakage rates are calculated averages based on running 24 hour and 8 hour averages during the heating season. The maximum and minimum hourly leakage rates are also from the heating season.

3.3 RELATIONSHIP OF NORMAL AIR CHANGE RATE AND AIRTIGHTNESS

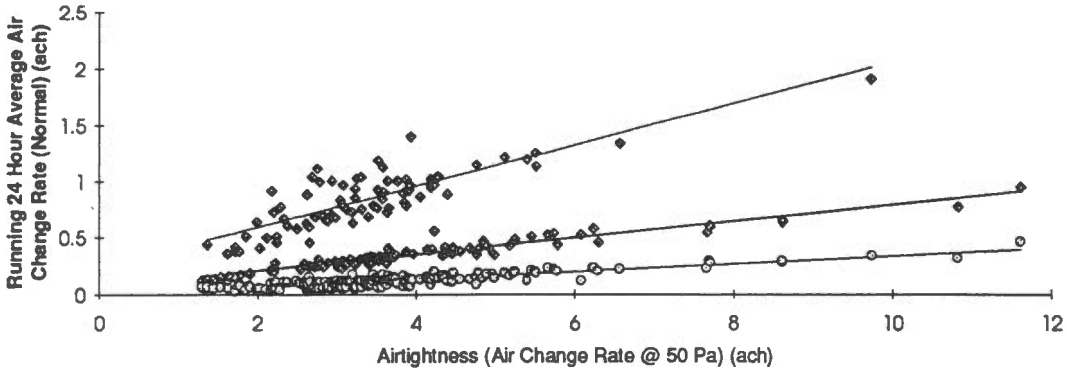
A common measure of airtightness is the calculated or measured air change rate at 50 Pa. These values (airtightness (ach @ 50 Pa)) have been calculated and plotted in Figure 7 for the "lived in" condition, test condition C, against the running 24 hour maximum and minimum air change rates for the same test condition (normal air change rate (ach)). The data from all the cities has been used in order to establish a relationship between normal air change rate and airtightness.

FIGURE 7 - Relationship between Normal Air Change Rate and Airtightness -- 2 Lines of Best Fit



In Figure 7, it can be seen that the relationship between normal air change rates and airtightness using maximum 24 hour running averages would be better estimated with two lines of best fit as shown in Figure 8.

FIGURE 8 - Relationship between Normal Air Change Rate and Airtightness -- 3 Lines of Best Fit



The following observations can be made:

1. There are three distinct lines relating air change rates at 50 Pa with normal 24 hour running average air change rates: one uses the minimum 24 hour running average air change rates and two use the maximum running average air change rates.
2. The percentage of houses that use each of the relationships are listed below:

CITY	Percentage of homes using upper line of best fit in Figure 8	Percentage of homes using lower line of best fit in Figure 8
St. John's	50	50
Halifax	29	71
Fredericton	10	90
Quebec City	100	0
Montreal	100	0
Ottawa	0	100
Richmond Hill	53	47
Winnipeg	65	35
Regina	0	100
Saskatoon	0	100
Edmonton	10	90
Vancouver	20	80

3. It appears that homes in Fredericton, Ottawa, Regina and Saskatoon, Edmonton and Vancouver can use the lower line when establishing a relationship between air change rates

@ 50 Pa and normal 24 running average air change rates, and Quebec City and Montreal can clearly use the upper line of best fit.

4. There does not appear to be a clear relationship between air change rates @ 50 Pa and normal 24 running average air change rates for the other cities. More data will have to be collected.

4.0 DISCUSSION

4.1 GENERAL

Air leakage rates change throughout the year. The buoyancy of warm air is much greater than cold air, thereby driving the warm indoor air up and out of the building and the colder outdoor air down and into the building. During the summer, in air conditioned buildings (houses), the buoyancy drives the air in the opposite direction, but the thermal gradients causing the buoyancy are not as great as those during the winter. If the building is not air conditioned, windows are often opened, increasing the ventilation of the house; during the spring and fall months, there is virtually no driving buoyancy force, and the weather is often too cold to permit the opening of windows. Therefore, the lowest leakage/ventilation rates generally occur during the spring and fall. Wind is another great driving force causing air movement through the building envelope.

Since the 1990 National Building Code recognizes that even ventilation equipment that is designed to run continuously will be shut down at times (e.g., the heat recovery ventilator that shuts down periodically for a defrost cycle), it requires that the ventilation equipment be capable of providing 0.3 air changes per hour when the ventilation rate is averaged over a 24 hour period. Therefore, the 24 hour running average leakage rates are important values to be evaluated. The testing completed for this study did not consider the air change rate with exhaust fans on.

4.2 EQUIVALENT LEAKAGE AREA

The average equivalent leakage areas of all the houses are tabulated in Appendix 2. There appears to be no correlation between the presence of ducts and flues and the difference between the ELAs for test conditions A and B. That is to say, the ELA for condition B is not always less than for condition A, and this phenomenon does not correspond to the noted presence of ducts and active flues. As discussed in section 3.1, one would expect the results of the air leakage tests to yield a greater leakage area under test condition A than B since sealing schedule B requires that items such as flues be sealed in order to measure the leakage area suitable for make-up air only. The presence of makeup air ducts connected to the return side of the forced warm air heating system is recorded, however, there are no data on other types of makeup air ducts.

98 of 154 homes (there are no data for homes in Montreal and Quebec for test condition B) had larger ELAs when tested under condition A than B. The average ELAs for conditions A and B were 0.09098 m^2 and 0.08823 m^2 respectively, for a difference of 0.00275 m^2.

As discussed in Section 3, the equivalent leakage areas obtained from tests conducted using sealing schedule A are expected to be less than those from tests conducted using sealing schedule C (the "lived-in" condition). 25 of the 186 homes (there are no data for the C test condition in 8 of the St. John's homes) exhibited results contrary to this prediction. An additional 26 of the 186 homes had identical results for tests conducted under test conditions A and C. The average ELAs for conditions A and C were 0.08253 m^2 and 0.0908 m^2 respectively, for a difference of 0.00827 m^2. There is no way of knowing whether the airtightness test conditions complied with the listed requirements for such a situation as listed in Section 3.1.

Examining the normalized leakage area (NLA), which is the ratio of ELA (cm^2) to envelope area (m^2), provides a means of roughly comparing the air leakage potential of the homes. This is similar to evaluating the leakage rate based on house volume (air changes per hour for example), but establishes the actual leakage area per unit area of wall. The NLAs (see Table 2 and Appendix 5) are between 0.41 and 4.79 for test condition A, with the lowest values (tightest homes) occurring in Winnipeg and the highest (loosest homes) occurring in Vancouver; the NLA is between 0.38 and 4.29 for test condition B, with the lowest values occurring in Montreal and the highest occurring in Vancouver; the NLA is between 0.65 and 5.12 for test condition C, with the lowest values occurring in Montreal and the highest occurring in Vancouver. In all three test conditions, Vancouver homes are the leakiest based on leakage area per envelope area. This is due in large part to the recognized need for tighter construction in colder climates.

4.3 AIR CHANGE RATE (ach)

The graphs, Figures 2 to 6, indicate the expected number of air changes per hour (ach) as a percentage of the 1990 National Building Code requirement versus the total number of houses surveyed. These values are based on the LEAKAES-predicted air change rate (ach) and the volume of the house. The NBC requires that every house have the capability of providing an air change rate of at least 0.3 air changes per hour (ach) when averaged over a 24 hour period.

It should be noted that there is a wide range of air change rates recorded within each city (see Appendix 4). This could be due to different builders or inconsistent air sealing methods which results in different air change rates for houses constructed by the same builder.

TABLE 2: NORMALIZED LEAKAGE AREAS (NLA) (cm2/m2)

ST. JOHN'S	
MIN A	1.254
MAXA	2.157
AVERAGE A	**1.68**
MINB	1.254
MAXB	2.157
AVERAGE B	**1.68**
MINC	1.889
MAXC	1.949
AVERAGE C	**1.919**

HALIFAX	
MIN A	0.701
MAXA	2.324
AVERAGE A	**1.364**
MINB	0.673
MAXB	2.299
AVERAGE B	**1.344**
MINC	0.995
MAXC	2.263
AVERAGE C	**1.491**

FREDERICTON	
MIN A	0.783
MAXA	2.997
AVERAGE A	**1.429**
MINB	0.715
MAXB	2.793
AVERAGE B	**1.330**
MINC	0.836
MAXC	3.123
AVERAGE C	**1.523**

QUEBEC CITY	
MIN A	0.779
MAXA	1.933
AVERAGE A	**1.189**
MINB	-
MAXB	-
AVERAGE B	-
MINC	0.779
MAXC	2.033
AVERAGE C	**1.174**

MONTREAL	
MIN A	0.597
MAXA	2.330
AVERAGE A	**1.291**
MINB	-
MAXB	-
AVERAGE B	-
MINC	0.647
MAXC	2.330
AVERAGE C	**1.348**

OTTAWA	
MIN A	1.409
MAXA	2.790
AVERAGE A	**2.084**
MINB	1.358
MAXB	2.748
AVERAGE B	**1.990**
MINC	1.646
MAXC	3.241
AVERAGE C	**2.285**

RICHMOND HILL	
MIN A	1.179
MAXA	2.693
AVERAGE A	**1.919**
MINB	1.112
MAXB	2.890
AVERAGE B	**1.834**
MINC	1.366
MAXC	2.619
AVERAGE C	**2.017**

WINNIPEG	
MIN A	0.413
MAXA	1.437
AVERAGE A	**0.890**
MINB	0.432
MAXB	1.733
AVERAGE B	**0.909**
MINC	0.731
MAXC	1.827
AVERAGE C	**1.123**

REGINA	
MIN A	0.553
MAXA	1.691
AVERAGE A	**1.05**
MINB	0.589
MAXB	1.626
AVERAGE B	**1.135**
MINC	0.795
MAXC	1.946
AVERAGE C	**1.408**

SASKATOON	
MIN A	0.674
MAXA	2.062
AVERAGE A	**1.2**
MINB	0.804
MAXB	2.129
AVERAGE B	**1.337**
MINC	1.080
MAXC	2.822
AVERAGE C	**1.702**

EDMONTON	
MIN A	0.468
MAXA	2.333
AVERAGE A	**1.321**
MINB	0.757
MAXB	2.850
AVERAGE B	**1.568**
MINC	0.878
MAXC	2.091
AVERAGE C	**1.686**

VANCOUVER	
MIN A	1.269
MAXA	4.794
AVERAGE A	**2.819**
MINB	1.283
MAXB	4.286
AVERAGE B	**2.567**
MINC	1.458
MAXC	5.121
AVERAGE C	**3.030**

In the following sections, leakage rates are discussed based on heating season averages, monthly averages, 24 hour running averages, 8 hour running averages, and hourly averages. The predicted maximum and minimum monthly average leakage rates are based on average leakage rates for each calendar month during the heating season. The maximum and minimum 24 hour and 8 hour running average leakage rates are calculated averages based on running 24 hour and 8 hour averages during the heating season. The maximum and minimum hourly leakage rates are also from the heating season. In all cases, the percentage of houses per city with leakage rates less than the 0.3 ach required are tabulated. These values are tabulated regionally for the heating season average leakage rates and the 24 hour running average leakage rates. In addition, the months during which the maximum and minimum monthly average leakage rates and the 24 hour running average leakage rates occur are tabulated. These two scenarios indicate which months are the most important with respect to providing air leakage.

4.3.1 Heating Season Average Leakage Rate

The following table lists the percentage of tested houses, per city, that did not meet the required air leakage rate of 0.3 air changes per hour when the air change rate is averaged over the heating season (October to March):

	Condition A		Condition B		Condition C		**Average**
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	6/10	60	6/10	60	1/2	50	59
Halifax	12/14	86	12/14	86	12/14	86	86
Fredericton	9/10	90	10/10	100	8/10	80	90
Quebec City	13/20	65	-	-	13/20	65	65
Montreal	11/20	55	-	-	9/20	45	50
Ottawa	15/20	75	16/20	80	12/20	60	72
Richmond Hill	18/30	60	24/30	80	17/30	57	66
Winnipeg	18/20	90	18/20	90	17/20	85	88
Regina	9/10	90	9/10	90	9/10	90	90
Saskatoon	10/10	100	10/10	100	10/10	100	100
Edmonton	9/10	90	9/10	90	7/10	70	83
Vancouver	9/20	45	11/20	55	8/20	40	47
Average	139/194	72	125/154	81	123/186	66	72

Table 3: Heating Season Average Leakage Rates That Do Not Meet The Required

It is obvious from Table 3 that the majority of houses do not meet the required ventilation rate, under any of the test conditions. Vancouver homes are "looser" than homes in the other cities in this regard. On the other hand, none of the homes tested in Saskatoon have the required air leakage rate without mechanical assistance.

In looking at Figure 2, as well as the table above, it can be seen that 72% of the houses tested in this survey did not have an average air change rate over the heating season that was at least the required 0.3 air changes per hour when condition A was used for the testing criteria. Similarly, 81% of the houses tested under the B condition, and 66% of the houses tested under the C condition did not meet the required 0.3 air changes per hour.

The difference between the results of the A, B and C test conditions for each city indicate that, although test condition C (the "lived-in" condition) results in the most houses meeting the required ventilation rate, the percentage of those homes is still small. Slightly more homes have 0.3 ach when tested under the A condition as compared to the B.

The following table presents the percentage of homes per region that do not have heating season average leakage rates greater than or equal to the required 0.3 air changes per hour. The table is a summary of Table 3, with the cities divided into the following regions: Atlantic Canada (Fredericton, Halifax and St. John's), Quebec (Montreal and Quebec City), Ontario (Ottawa and Richmond Hill), the Prairies (Edmonton, Regina, Saskatoon and Winnipeg) and British Columbia (Vancouver).

REGION	CONDITION A	CONDITION B	CONDITION C	AVERAGE
Atlantic Canada	79	82	81	81
Quebec	60	-	55	58
Ontario	66	80	58	68
Prairies	92	92	86	90
British Columbia	45	55	40	47
CANADA	72	81	66	72

Table 4: Regional Heating Season Average Leakage Rates That Do Not Meet The Required (%)

Table 5 lists the months, during the heating season (October to March), in which the maximum and minimum monthly leakage rates generally occurred for each city, combining the three test condition scenarios.

CITY	Maximum	Minimum
St. John's	February	October
Halifax	February	October
Fredericton	January	October
Quebec City	December	October
Montreal	March	October
Ottawa	December	October
Richmond Hill	Dec. and Feb.	October
Winnipeg	January	October
Regina	January	October
Saskatoon	Jan. and Dec.	October
Edmonton	January	October
Vancouver	December	October

Table 5: Months of Maximum and Minimum Monthly Average Leakage Rates

The maximum leakage rate is dependent on the coldest months and varies from city to city; the minimum is dependent on the warmest months during the heating season, which in all cases is October. October is the month during the heating season when there are very few driving forces due to temperature differentials. The interior/exterior temperature difference is not large, yet few windows will likely be opened during this month.

4.3.2 Average Monthly Leakage Rate

Table 6 lists the percentage of tested houses, per city, that did not have predicted monthly maximum air change rates during the heating season that meet the required air leakage rate of 0.3 air changes per hour:

	Condition A		Condition B		Condition C		**Average**
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	6/10	60	6/10	60	1/2	50	59
Halifax	12/14	86	11/14	79	11/14	79	81
Fredericton	8/10	80	8/10	80	7/10	70	77
Quebec City	6/20	30	-	-	6/20	30	30
Montreal	5/20	25	-	-	4/20	20	23
Ottawa	12/20	60	13/20	65	10/20	50	58
Richmond Hill	13/30	43	18/30	60	12/30	60	54
Winnipeg	18/20	90	17/20	85	17/20	85	87
Regina	9/10	90	9/10	90	9/10	90	90
Saskatoon	10/10	100	10/10	100	10/10	100	100
Edmonton	8/10	80	7/10	70	6/10	60	70
Vancouver	6/20	30	11/20	55	6/20	30	38
Average	113/194	58	110/154	71	99/186	53	60

Table 6: Maximum Monthly Average Leakage Rates That Do Not Meet The Required

Table 6 shows that more than one half of the homes tested cannot maintain, during the heating season (October to March), a monthly average air change rate greater than 0.3 ach. There are more homes (between 87% and 100% of the homes) in Saskatoon, Regina and Winnipeg that do not meet this required ventilation rate than in other cities. On the other hand, more than 60% of the homes in Vancouver, Montreal and Quebec City do meet it.

Overall, it can be seen in Figure 3 and in the table above that 58% of the houses tested in Canada did not have a monthly average air change rate during the heating season greater than or equal to the required 0.3 air changes per hour when condition A was used for the sealing criteria. Similarly, approximately 71% of the houses tested under condition B criteria, and 53% of the houses tested under condition C criteria did not meet the required 0.3 air changes per hour.

Table 7 indicates the number of houses per city with predicted minimum monthly average air change rates during the heating season below the required:

	Condition A		Condition B		Condition C		**Average**
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	7/10	70	7/10	70	1/2	50	68
Halifax	14/14	100	14/14	100	14/14	100	100
Fredericton	10/10	100	10/10	100	10/10	100	100
Quebec City	20/20	100	-	-	18/20	90	95
Montreal	18/20	90	-	-	17/20	85	88
Ottawa	20/20	100	20/20	100	17/20	85	95
Richmond Hill	26/30	87	28/30	93	25/30	83	88
Winnipeg	19/20	95	19/20	95	18/20	90	93
Regina	10/10	100	10/10	100	10/10	100	100
Saskatoon	10/10	100	10/10	100	10/10	100	100
Edmonton	10/10	100	9/10	90	10/10	100	97
Vancouver	10/20	50	12/20	60	10/20	50	53
Average	174/194	90	139/154	90	160/186	86	89

Table 7: Minimum Monthly Average Leakage Rates That Do Not Meet The Required

Approximately one half of the homes tested in Vancouver are capable of achieving a minimum monthly average air change rate greater than the required 0.3 ach. However, each of the houses tested in Saskatoon, Regina, Halifax and Fredericton are predicted to have at least one month where the average leakage rate is less than the required. This is true of 90% of the homes tested using both conditions A and B sealing criteria, and 86% of the homes tested using condition C criteria.

4.3.3 24 Hour Running Average Leakage Rate

The following table indicates the number of houses per city with predicted maximum 24 hour running average air change rates during the heating season below the required:

	Condition A		Condition B		Condition C		Average
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	0/10	0	0/10	0	0/2	0	0
Halifax	6/14	43	7/14	50	5/14	36	43
Fredericton	7/10	70	7/10	70	7/10	70	70
Quebec City	0/20	0	-	-	0/20	0	0
Montreal	0/20	0	-	-	0/20	0	0
Ottawa	9/20	45	10/20	50	3/20	15	37
Richmond Hill	2/30	7	7/30	23	2/30	7	12
Winnipeg	7/20	35	8/20	40	6/20	30	35
Regina	7/10	70	7/10	70	4/10	40	60
Saskatoon	8/10	80	8/10	800	5/10	50	70
Edmonton	5/10	50	5/10	50	3/10	30	43
Vancouver	1/20	5	3/20	15	2/20	10	10
Average	52/194	27	62/154	40	37/186	20	28

Table 8: Maximum 24 Hour Running Average Leakage Rates That Do Not Meet The Required

Table 8 shows that some homes cannot maintain, during the heating season (October to March), a running 24 hour average air change rate greater than 0.3 ach. There are more homes in Saskatoon, Regina and Fredericton that do not meet this required ventilation rate than in the other cities.

Overall, it can be seen in Figure 4 and in the table above that 27% of the houses tested in Canada did not have a 24 hour running average air change rate during the heating season greater than or equal to the required 0.3 air changes per hour when condition A was used for the sealing criteria. Similarly, approximately 40% of the houses tested under condition B criteria, and 20% of the houses tested under condition C criteria did not meet the required 0.3 air changes per hour.

Table 9 presents the percentage of homes per region that do not have a maximum 24 hour running average leakage rate during the heating season greater than or equal to the required 0.3 air changes per hour. It is a summary of Table 8, with the cities divided into the following regions: Atlantic Canada (Fredericton, Halifax and St. John's), Quebec (Montreal and Quebec City), Ontario (Ottawa and Richmond Hill), the Prairies (Edmonton, Regina, Saskatoon and Winnipeg) and British Columbia (Vancouver).

REGION	CONDITION A	CONDITION B	CONDITION C	AVERAGE
Atlantic Canada	38	41	46	41
Quebec	0	-	0	0
Ontario	22	34	10	22
Prairies	54	56	36	49
British Columbia	5	15	10	10
CANADA	27	40	20	28

Table 9: Regional Maximum 24 Hour Running Average Leakage Rates That Do Not Meet The Required (%)

Table 10 indicates the number of houses per city with predicted minimum 24 hour running average air change rates during the heating season below the required:

	Condition A		Condition B		Condition C		Average
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	10/10	100	10/10	100	2/2	100	100
Halifax	14/14	100	14/14	100	14/14	100	100
Fredericton	10/10	100	10/10	100	10/10	100	100
Quebec City	20/20	100	-	-	20/20	100	100
Montreal	20/20	100	-	-	20/20	100	100
Ottawa	20/20	100	20/20	100	20/20	100	100
Richmond Hill	30/30	100	30/30	100	30/30	100	100
Winnipeg	20/20	100	20/20	100	20/20	100	100
Regina	10/10	100	10/10	100	10/10	100	100
Saskatoon	10/10	100	10/10	100	10/10	100	100
Edmonton	10/10	100	10/10	100	10/10	100	100
Vancouver	16/20	80	19/20	95	16/20	80	85
Average	190/194	98	153/154	99	182/186	98	98

Table 10: Minimum 24 Hour Running Average Leakage Rates That Do Not Meet The Required

While each of the homes in Quebec City, Montreal and St. John's is predicted to have a *maximum* 24 hour running average, under all test conditions, greater than that required by the NBC, it is shown in the above table that each of these houses is predicted to have a 24 hour running average that is less than the required. In fact, every house in every city involved in this study has at least one 24 hour period during which the average leakage rate is less than 0.3 ach, except for a small number houses in Vancouver.

Table 11 lists the months, during the heating season (October to March), in which the maximum and minimum 24 hour running average leakage rates generally occurred for each city, combining the three test condition scenarios.

CITY	Maximum	Minimum
St. John's	February	October
Halifax	February	October
Fredericton	March	October
Quebec City	February	October
Montreal	December	October
Ottawa	Dec. and Jan.	Oct. and Nov.
Richmond Hill	Feb. and Mar.	October
Winnipeg	March	October
Regina	February	October
Saskatoon	November	October
Edmonton	January	October
Vancouver	Jan. and Oct.	October

Table 11: Months of Maximum and Minimum 24 Hour Running Average Leakage Rates

The maximum leakage rate is dependent on the coldest 24 hour period during the heating season; the minimum is dependent on the warmest 24 hour period. The maximum and minimum months listed in Table 11 are similar to those listed in Table 5. The most striking similarity is that the minimum leakage rates are again during October.

4.3.4 8 Hour Running Average Leakage Rate

Table 12 indicates the number of houses per city with predicted maximum 8 hour running average air change rates during the heating season below the required:

	Condition A		Condition B		Condition C		Average
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	0/10	0	0/10	0	0/2	0	0
Halifax	6/14	43	7/14	50	5/14	36	43
Fredericton	6/10	60	7/10	70	5/10	50	60
Quebec City	0/20	0	-	-	0/20	0	0
Montreal	0/20	0	-	-	0/20	0	0
Ottawa	7/20	35	7/20	35	2/20	10	27
Richmond Hill	2/30	7	6/30	20	2/30	7	11
Winnipeg	6/20	30	7/20	35	5/20	25	30
Regina	7/10	70	7/10	70	4/10	40	62
Saskatoon	7/10	70	7/10	70	3/10	30	60
Edmonton	3/10	30	3/10	30	1/10	10	23
Vancouver	1/20	5	1/20	5	1/20	5	5
Average	45/194	23	52/154	34	28/186	15	23

Table 12: Maximum 8 Hour Running Average Leakage Rates That Do Not Meet The Required

Table 12 shows that some homes cannot maintain, at any time during the heating season, a running 8 hour average air change rate greater than 0.3 ach. There are more homes in Fredericton, Halifax, Regina and Saskatoon that do not meet this required ventilation rate than in the other cities. On the other hand, all homes in Montreal, Quebec City, and St. John's have maximum 8 hour running average air change rates greater than 0.3 ach.

Overall, it can be seen in Figure 5 that 23% of the houses tested in Canada did not have an 8 hour running average air change rate during the heating season greater than or equal to the required 0.3 air changes per hour when condition A was used for the sealing criteria. Similarly, approximately 34% of the houses tested under condition B criteria, and 15% of the houses tested under condition C criteria did not meet the required 0.3 air changes per hour.

Table 13 indicates the number of houses per city with predicted minimum 8 hour running average air changes rates during the heating season below the required:

	Condition A		Condition B		Condition C		**Average**
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	10/10	100	10/10	100	2/2	100	100
Halifax	14/14	100	14/14	100	14/14	100	100
Fredericton	10/10	100	10/10	100	10/10	100	100
Quebec City	20/20	100	-	-	20/20	100	100
Montreal	20/20	100	-	-	20/20	100	100
Ottawa	20/20	100	20/20	100	20/20	100	100
Richmond Hill	30/30	100	30/30	100	30/30	100	100
Winnipeg	20/20	100	20/20	100	20/20	100	100
Regina	10/10	100	10/10	100	10/10	100	100
Saskatoon	10/10	100	10/10	100	10/10	100	100
Edmonton	10/10	100	10/10	100	10/10	100	100
Vancouver	19/20	95	20/20	100	19/20	95	97
Average	193/194	99	154/154	100	185/186	99	100

Table 13: Minimum 8 Hour Running Average Leakage Rates That Do Not Meet The Required

While each of the homes in Quebec City, Montreal and St. John's is predicted to have a *minimum* 8 hour running average, under all test conditions, greater than that required by the NBC, it is shown in the above table that each of these houses is predicted to have a 24 hour running average that is less than the required. In fact, every house in every city involved in this study has at least one 8 hour period during which the average leakage rate is less than the required, except for one house in Vancouver.

4.3.5 Hourly Leakage Rate

Table 14 indicates the number of houses per city with predicted maximum hourly air change rates during the heating season below the required:

	Condition A		Condition B		Condition C		**Average**
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	0/10	0	0/10	0	0/2	0	0
Halifax	3/14	21	4/14	29	2/14	14	21
Fredericton	6/10	60	7/10	70	5/10	50	59
Quebec City	0/20	0	-	-	0/20	0	0
Montreal	0/20	0	-	-	0/20	0	0
Ottawa	5/20	20	7/20	35	1/20	5	20
Richmond Hill	2/30	7	2/30	7	1/30	3	6
Winnipeg	6/20	30	7/20	35	4/20	20	28
Regina	6/10	60	6/10	60	3/10	30	52
Saskatoon	7/10	70	5/10	50	2/10	20	47
Edmonton	3/10	30	3/10	30	1/10	10	23
Vancouver	1/20	5	1/20	5	1/20	5	5
Average	39/194	20	42/154	27	20/186	11	19

Table 14: Maximum Hourly Leakage Rates That Do Not Meet The Required

The above table shows that some homes cannot maintain, at any time during the heating season, an hourly air change rate greater than 0.3 ach. There are more homes in Fredericton, Regina and Saskatoon that do not meet this required ventilation rate than in the other cities.

Overall, it can be seen in Figure 6 that 20% of the houses tested in Canada did not have an hourly air change rate over the period of a year greater than or equal to the required 0.3 air changes per hour when condition A was used for the sealing criteria. Similarly, approximately 27% of the houses tested under condition B criteria, and 11% of the houses tested under condition C criteria did not meet the required 0.3 air changes per hour.

Table 15 indicates the number of houses per city with predicted minimum hourly air change rates during the heating season below the required:

	Condition A		Condition B		Condition C		Average
	(fraction)	(percent)	(fraction)	(percent)	(fraction)	(percent)	(percent)
St. John's	10/10	100	10/10	100	2/2	100	100
Halifax	14/14	100	14/14	100	14/14	100	100
Fredericton	10/10	100	10/10	100	10/10	100	100
Quebec City	20/20	100	-	-	20/20	100	100
Montreal	20/20	100	-	-	20/20	100	100
Ottawa	20/20	100	20/20	100	20/20	100	100
Richmond Hill	30/30	100	30/30	100	30/30	100	100
Winnipeg	20/20	100	20/20	100	20/20	100	100
Regina	10/10	100	10/10	100	10/10	100	100
Saskatoon	10/10	100	10/10	100	10/10	100	100
Edmonton	10/10	100	10/10	100	10/10	100	100
Vancouver	20/20	100	20/20	100	20/20	100	100
Average	194/194	100	154/154	100	186/186	100	100

Table 15: Minimum Hourly Leakage Rates That Do Not Meet The Required

While each of the homes in Quebec City, Montreal and St. John's is predicted to have a *maximum* hourly air change rate, under all test conditions, greater than that required by the NBC, it is shown in the above table that each of these houses is predicted to have an hourly air change rate during the heating season that is less than the required. In fact, every house in every city involved in this study has an hourly average leakage rate that is less than the required.

4.3.6 Summary of Air Change Rates

Based on results of average air change rates per city presented in the previous sections:

1. Saskatoon appears to have the lowest air change rate when all the averages (i.e., year, heating season, max. running 24 hour, etc.) are considered for test condition A.
2. Vancouver and St. John's appear to have the highest air change rates when all the averages are considered for test condition A.
3. Saskatoon, followed by Regina and Fredericton, appears to have the lowest air changes rates when all the averages are considered for test condition B.
4. St. John's appears to have the highest air change rates when all the averages are considered for test condition B.

5. Fredericton, Regina and Saskatoon appear to have the lowest air change rates when all the averages are considered for test condition C.
6. Vancouver, St. John's, Montreal and Quebec appear to have the highest air changes rates when all the averages are considered for test condition C.

Table 16 presents the overall performance of the houses within each city. * indicates that most of the houses in the city (i.e., more than 66%) did not meet the required 0.3 air changes per hour for the condition and average specified. ** indicates that some of the houses performed satisfactorily (i.e., between 33% and 66% of the homes). *** indicates that most of the homes met the required 0.3 air changes per hour. 8 hr and 24 hr refers to the maximum 8 hour and 24 hour running average leakage rates respectively, as indicated in Tables 8 and 12. Minimum running averages have not been evaluated in this table since all the houses tested in this study, except for a few in Vancouver, have both 8 hour and 24 hour running average leakage rates less than that required and therefore a comparison between cities is redundant. h.s. refers to the heating season average leakage rates, as indicated in Table 3.

	Condition A			Condition B			Condition C		
	8 hr	24 hr	h.s.	8 hr	24 hr	h.s.	8 hr	24 hr	h.s.
St. John's	***	***	**	***	***	**	***	***	**
Halifax	**	**	*	**	**	*	**	**	*
Fredericton	**	*	*	*	*	*	**	*	*
Quebec City	***	***	**	-	-	-	***	***	**
Montreal	***	***	**	-	-	-	***	***	**
Ottawa	**	**	*	**	**	*	***	***	**
Richmond Hill	***	***	**	***	***	*	***	***	**
Winnipeg	***	**	*	**	**	*	***	***	*
Regina	*	*	*	*	*	*	**	**	*
Saskatoon	*	*	*	*	*	*	***	**	*
Edmonton	***	**	*	***	**	*	***	***	*
Vancouver	***	***	**	***	***	**	***	***	**

Table 16: Summary of House Performance

4.4 AIR CHANGE RATES (L/s)

The CSA Standard F326.1, in addition to specifying a required air change rate in terms of air changes per hour, also specifies air change rates in terms of liters per second (L/s) for each room in the house. Table 17 lists the required air change rates for each room.

A detailed comparison of predicted air change rates and required air change rates is not made in this section for two reasons:

1. the results support the conclusions of Section 4.3, and
2. only a total for each house is available and not the air change rates for each room.

The predicted air change rates in terms of liters per second are listed in Appendix 6, along with the required air change rates based on the values in Table 17. The required air change rates listed in the Appendix are totals for the house, based on the number and types of rooms in that house. Measurements were not made during the course of this study to determine the air change rates in the individual rooms.

Room	Required Ventilation (L/s)
Double/Master Bedroom	10
Basement	10
Single Bedrooms	5
Living Room	5
Dining Room	5
Family Room	5
Recreation Room	5
Kitchen	5
Bathroom	5
Laundry	5
Utility Room	5
Other	5

Table 17: CSA Standard F326.1 Residential Mechanical Ventilation Requirements

4.5 COMPARISON WITH 1982/1983 RESULTS

In 1982/1983, similar airtightness tests were conducted on merchant-built homes built during that year using the CGSB standard that was being developed at that time (the test method was the same as used in this study). These results are published in the report entitled "Airtightness Tests on 200 New Houses Across Canada: Summary of Results" [5], sponsored by the Energy Conservation and Oil Substitution Branch, Energy Mines and Resources Canada under the Buildings Energy Technology Transfer Program (BETT).

The results from the 1982/1983 study indicate that the "tightest houses are located in the provinces of Manitoba and Saskatchewan."[5] Based on the airtightness tests and calculated air change rates, as discussed in Section 4.3, Saskatoon, Regina and Fredericton (Saskatchewan and New Brunswick) had the tightest homes in the 1989 survey.

The results from the 1982/1983 study indicate that the leakier homes are located in British Columbia, Alberta, Ontario and Prince Edward Island. The leakier houses in the 1989 study, based on the calculated air change rates occurred in Montreal, Quebec City, St. John's and Vancouver, or Quebec, Newfoundland and British Columbia.

ELAs ranged from 0.073 m^2 in New Brunswick to 0.132 m^2 in Newfoundland in the 1982/83 study while in the 1989 study, the values ranged from 0.043 m^2 in Winnipeg to 0.157 m^2 in Vancouver when the homes were sealed according to the CGSB standard (condition A) discussed previously. The range of ELAs is greater in the 1989 study. These values are summarized in the following table, along with NLAs.

Province	ELA - A (m^2)		%	NLA - A (cm^2/m^2)		%
	1982/83	1989	Difference	1982/83	1989	Difference
Newfoundland	0.132	0.076	42.4	3.64	1.68	53.8
PEI	0.101	na	na	3.85	na	na
Nova Scotia	0.129	0.076	41.1	3.46	1.36	60.7
New Brunswick	0.073	0.070	4.1	3.23	1.43	55.7
Quebec	0.080	0.048	40	2.87	1.24	56.8
Ontario A	0.092	0.117	-27.2	3.28	1.99	39.3
Ontario B	0.129	0.117	9.3	4.20	1.99	52.6
Manitoba	0.038	0.043	-13.2	1.58	0.89	43.7
Saskatchewan	0.055	0.050	9.1	1.96	1.13	42.3
Alberta	0.119	0.064	46.2	3.92	1.32	66.3
British Columbia	0.157	0.157	0	4.32	2.82	34.7

Table 18: Comparison of ELA and NLA Provincial Averages between the 1982/83 Study and the 1989 Study (test condition A)

The leakier houses in the 1989 study, based on NLAs, were located in British Columbia (Vancouver), Ontario (Ottawa and Richmond Hill) and Newfoundland (St. John's). The average NLAs were between 34.7% and 66.3% lower in the 1989 study than the 1982/83, as can be seen in Table 18.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The main objective of this project was to consolidate the data collected from the 1989 airtightness survey. These data were verified and anomalies were recorded. The data can be used to perform several types of analysis. Hard-copies and electronic copies (i.e., stored on IBM-compatible computer disks) of the data, both raw and manipulated, have been submitted with this report. This includes all the input for and output from the program LEAKAES as well as all the tables and graphs found in this report (including appendices).

The air change rates in 1989 Canadian homes do not meet the 0.3 ach required ventilation rate as per the 1990 National Building Code without mechanical assistance. The 0.3 ach required by the NBC 1990 in section 9.32.3 is the mechanical ventilation requirement. It is important to realize that this ventilation rate is not always necessary, but should be available. As stated in Appendix A of the NBC "It should be emphasized that this air change rate refers to the installed capacity of the system, not the rate of ventilation that is actually used in the house. In many households, ventilating at 0.3 ach would provide more ventilation than required..." However, this ventilation rate should be available. Only 1 home in Vancouver *always* meets the required ventilation rate for a running 24 hour average with no mechanical ventilation when tested under sealing schedules A and C and no homes achieve this under sealing schedule B.

Regardless of the sealing schedule, the homes do not have a great enough air change rate without mechanical ventilation. Over the heating season (October to March) the average air change rates vary between 0.14 ach in Saskatoon and 0.35 ach in Vancouver for test condition A; between 0.15 in Saskatoon and 0.30 in Vancouver for test condition B; and 0.19 in Saskatoon and Fredericton and 0.38 in Vancouver.

Although air leakage rates under sealing condition C are generally the greatest as compared to the other two sealing schedules, this is not always the case. Condition C is supposed to represent the "lived-in" condition, and even then the required ventilation is not usually met. Those cases where the leakage rate under condition B is greater than that under condition C appear to be anomalies and might be due to experimental error.

Vancouver homes permit the greatest number of natural air changes per hour. Saskatoon homes appear to be the tightest. However, in every region of the country there are large ranges of values of expected air change rates. Although Vancouver homes in general provide the most air changes per hour, there are homes in Vancouver that are reasonably tight, and many do require mechanical ventilation.

New homes are becoming more and more airtight with the introduction of new building components and materials, and with more attention paid to the detailing of the air barrier. It is recognized that the data presented in this report are now out-of-date, but they do provide some useful information. Mechanical ventilation is required in most 1989 homes in order that these homes may be capable of providing 0.3 ach as required by the 1990 NBC, and since homes today are likely tighter still, provisions should be made to incorporate mechanical ventilation in homes. These data can be used as a basis for defining the type and amount of ventilation required. This may not be the same in all regions of the country.

This type of survey ought to be repeated regularly in order to determine the effects of changing technology and building practices on the airtightness of homes. A new survey should:

1. Ensure that all contractors/surveyors receive the same training. Training sessions should be conducted and all contractors should attend so that there is no confusion as to the purpose, meaning or intent of any part of the project. This includes clarifying sealing conditions so that sealing is uniform across the country, and clarifying the intent of the conditions so that all the data are correctly collected.
2. Determine the air change rates in the individual rooms. The CSA F326 Standard requires, for example, the master bedroom to have an air change rate of 10 L/s. The required air change rates were determined by each contractor based on the number of rooms, but there are insufficient data to determine whether these required rates were met on a room-to-room basis.
3. Follow the same method as the 1989 survey. It should, however, be determined whether all three test conditions are needed. It is recommended that only two (A and C) be used.

6.0 REFERENCES

1. "National Building Code of Canada 1990", Issued by the Associate Committee on the National Building Code, National Research Council Canada, Ottawa. A.9.32.3, P.396.

2. LEAKAES4, Version 4; Author: Cathy McLarnon, SOFTWORKS, April 1988; Last modification by James T. Reardon, IRC/NRCC, February 13, 1989.

3. Burnett, E.F.P. and Reynolds, A.J., "The Ontario Wall Drying Project", Building Engineering Group, University of Waterloo, Waterloo, Ontario, July 1991.

4. "Ventilation & Airtightness of New Detached Canadian Houses", Tom Hamlin, John Forman and Mike Lubun, Canada Mortgage and Housing Research Division, May 1990.

5. "Airtightness Tests on 200 New Houses Across Canada: Summary of Results", sponsored by the Energy Conservation and Oil Substitution Branch, Energy Mines and Resources Canada under the Buildings Energy Technology Transfer Program (BETT), No. 84.01; prepared by Michael Sulatisky, Saskatchewan Research Council, Saskatoon, Saskatchewan, January 1984.

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APPENDIX 1

TERMS OF REFERENCE

1989 SURVEY OF AIRTIGHTNESS OF NEW, MERCHANT BUILDER HOUSES

TERMS OF REFERENCE

INTRODUCTION - NEED FOR SURVEY

There is currently considerable effort being put into the development of mechanical ventilation technology and standards for houses. This is predicated on the premise that even normal merchant builder houses (as opposed to special energy-efficient houses) are becoming more nearly airtight and less able to rely on accidental air leakage to provide the amount of air change required to assure adequate indoor air quality. However, there are many in the building industry who are not convinced that this premise is correct. Their concern could hinder the adoption of this technology and especially the adoption of mandatory mechanical ventilation requirements in building codes. The premise that houses are becoming too tight is not based on conjecture; however, there is a need for considerably more hard technical evidence on which to base decisions.

Some of the evidence that does exist comes from an airtightness survey, not unlike that described below, which was conducted in 1980 to 1982 for Energy Mines and Resources Canada. However, the results of that survey have many shortcomings:

- They are now at least 6 years out of date.
- The survey method was suspect in terms of accuracy of test results and comparability of test results from different parts of the country.
- The degree to which the tested houses were representative of normal merchant builder houses is also suspect since the survey was done at a time of low volume in the housing industry and it was difficult to find representative houses.

Reliable data on the airtightness of houses as currently being built is also a key element of the knowledge base which the housing industry and the building research committee need as they attempt to deal with the issue of indoor air quality in houses.

OBJECTIVE

The objective of this study is to determine the airtightness of houses built using current standard construction practices in various regions of Canada. This will be achieved by measuring the airtightness of 210 houses in various parts of Canada. The airtightness results will be analyzed to estimate the air change rate that each house is likely to experience over a typical heating season, which, in turn, will be compared to air change rates recommended by various authorities.

TEST METHODS

Airtightness

The houses will be tested in accordance with CGSB Standard CAN/CGSB-149.10-M87, "Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method" with the following exceptions:

- Three sets of results will be produced for each house - one with the intentional openings sealed as per the CGSB standard, one as per CGSB but with certain additional openings sealed and another with certain openings left unsealed. Appendix A lists the sealing protocols.

- To the greatest extent possible, all tests will be conducted with the wind speed less than 12 km/h (see "A Word on Testing in Windy Conditions" below).

As many houses as possible will also be tested using the Sheltair Scientific "ELA Tester", the only limit being the availablility of sufficient ELA Testers. The contractor should assume the following:

- There will be sufficient ELA Testers to allow its use in all houses; however, no house test will be held up waiting for an ELA Tester.

- The ELA tester will only be used to test the house in the sealed (as per CGSB) condition (Test Condition A in Appendix A).

- No more than an extra half hour will be required at each house for use of the ELA Tester since the house preparation will already be done.

- The cost of leasing ELA Testers from Sheltair Scientific for a period of two months will be $200 each.

Neutral Pressure Location

The neutral pressure location of each house will be determined using a draft procedure developed by the Building Performance Section of the Institute for Research in Construction of the National Research Council of Canada. This procedure is described in Appendix B.

Additional Information

The following additional information will be gathered for each house:

- number of exhaust devices (including clothes dryers) and their labelled capacity or, if the lattter is unavailable or inaccessable, such other information as might allow the capacity to be determined (e.g. manufacturer and model number)

- number of fireplaces as well as front opening, flue area, presence of glass doors and size of outdoor air intake of each

- the presence and size of any other intake openings, including air-cooled chimneys

- the presence of flue dampers

- type and capacity of space and water heating equipment (including wood stoves)

- whether occupants (if any) would be willing to participate in possible further studies such as long term air change rate (by tracer gas) and indoor air quality

- the builder's perception of whether the houses tested represent good airtightness practice

Quality Control

In order to ensure that there are no major variations in the calibration of the equipment and in testing procedures used in the various locations, an NRC technician will visit each region to calibrate the local crew's equipment and observe its testing procedures. The calibration may be done by testing a room within a building using both the local equipment and the NRC equipment, thus avoiding weather interuptions. Observing the procedures can take place at one of the sample houses or any other convenient house. This can be done even under unfavourable weather conditions since it is the procedures rather than the particular results that are of concern.

This quality control procedure will be implemented at an early stage in the project so that any required corrections can be identified and applied before very many houses have been tested.

In addition to the above, a conference call, involving all testing personnel and the technical administrator, will be held at the start of the project to ensure that all field crews understand what the objectives are and the procedures to be used.

A Word on Testing in Windy Conditions

If at all possible, the testing should be carried out under low wind conditions as described in the CGSB standard. It is recognized that the difficulties of arranging and scheduling access often militate against this. Therefore the contractor should endeavor to have more than the minimum number of houses available for testing so that houses for which the scheduled testing day turns out to be too windy can be discarded if rescheduling is not possible.

SELECTION OF HOUSES

A minimum of 20 houses will be tested in each of the following centres:*

Vancouver
Winnipeg
Ottawa
Montreal
Quebec City
Fredericton
Halifax

10 houses will be tested in each of Edmonton and St. John's and 30 houses will be tested in the greater Toronto area.

The houses must be single detached houses representative of current standard construction in the area where they are located with no special efforts, beyond the norm for the area, to air seal the envelope. They must be complete in all details that have a bearing on airtightness. Ideally they will have been completed more than 6 months but less than 18 months prior to testing.

* Additional Alberta houses may be tested by the same contractor under separate contract to the Canadian Home Builders' Association. 20 Saskatchewan houses will be tested by IRC.

CONTRACTOR'S RESPONSIBILITY

The contractor will be responsible for the following tasks:

- selection of houses (with assistance of local HBA and the CHBA TRC members listed in Appendix C)
- liaison with builders and occupants
- conducting tests in accordance with specified test protocol
- reporting of test result raw data (ELA, NLA, $Q = C \Delta p^n$ .and neutral pressure location) along with descriptive data on each house
- contacting EMR regional offices regarding any additional testing on the sample houses that EMR may wish to conduct
- processing the data using the Scanada "AIRTEST" program (supplied at no charge)

All data will be forwarded to NRC in hard copy as well as in MS-DOS-computer-readable form according to a template provided by NRC.

ANALYSIS OF DATA AND REPORT PREPARATION

The data will be analysed and the report prepared by the Institute for Research in Construction, National Research Council of Canada.

PROJECT MANAGEMENT

Financial and administrative management of the project will be the responsibility of -

Mr. Mark Riley
Chief, Residential Technology & Industrial Development
Energy Mines and Resources Canada
Room 1126
460 O'Connor Street
Ottawa, Ontario
K1A 0E4

Technical management of the project will be the responsibility of -

Mr. John Haysom, P. Eng
Senior Technical Advisor
Codes Section
Institute for Research in Construction
National Research Council of Canada
Montreal Road
Ottawa, Ontario
K1A 0R6

The project will be steered by a committee made up of representatives of -

Canadian Home Builders' Association
Canada Mortgage and Housing Corporation
Energy Mines and Resources Canada
Institute for Research in Construction

TIMING

The following are the proposed milestones of the project:

contract awarded	January 3, 1989
testing completed	February 28, 1989

APPENDIX A

SEALING PROTOCOLS

PREPARATION OF INTENTIONAL OPENINGS
TEST CONDITION A (FULL CGSB)

fireplace flue	no preparation
fireplace	
— with damper	CLOSE
— with doors	CLOSE
— without damper	see par. 6.1.15
doors on enclosed furnace room*	CLOSE
fireplace combustion air intake damper	CLOSE
fuel fired furnace and/or stove flues	SEAL
fuel fired furnace and/or stove flues in enclosed furnace room*	no preparation
furnace combustion air intake	
— with damper	CLOSE
— without damper	SEAL
ventilation air intake	
— with damper	CLOSE
— without damper	SEAL
fuel fired hot water system flues	SEAL
floor drains	FILL
plumbing traps	FILL
exhaust fans	
— with motorized damper	CLOSE
— without motorized damper	no preparation
air to air heat exchangers designed to operate continuously	
— intake and exhaust openings	SEAL
other air to air heat exchangers	
— intake and exhaust openings, with motorized damper	CLOSE
— intake and exhaust openings, without motorized damper	no preparation
dryer vents	
— with exhaust divertor	WINTER POSITION
— with motorized damper	CLOSE
— without motorized damper	no preparation
windows and doors	LATCH
exhaust systems common to more than one unit	SEAL
window air conditioners	SEAL
attic hatch	CLOSE

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* *An enclosed furnace room is a room expressly built to contain a furnace and/or stove, with a combustion air intake to the outside of the building, and to prevent air flow to and from the remainder of the building.*

PREPARATION OF INTENTIONAL OPENINGS
TEST CONDITION B (ELA FOR MAKE-UP AIR)

fireplace flue	+ sealed
fireplace	OR
— with damper	+ sealed
— with doors	+ sealed
— without damper	+ sealed
doors on enclosed furnace room*	CLOSE
fireplace combustion air intake damper	+ sealed
fuel fired furnace and/or stove flues	SEAL
fuel fired furnace and/or stove flues in enclosed furnace room*	+ sealed
furnace combustion air intake	
— with damper	+ sealed
— without damper	SEAL
ventilation air intake	
— with damper	+ no preparation
— without damper	+ no preparation
fuel fired hot water system flues	SEAL
floor drains	FILL
plumbing traps	FILL
exhaust fans	
— with motorized damper	+ sealed
— without motorized damper	+ sealed
air to air heat exchangers designed to operate continuously	
— intake and exhaust openings	SEAL
other air to air heat exchangers	
— intake and exhaust openings, with motorized damper	+ sealed
— intake and exhaust openings, without motorized damper	+ sealed
dryer vents	
— with exhaust diverter	+ sealed
— with motorized damper	+ sealed
— without motorized damper	+ sealed
windows and doors	LATCH
exhaust systems common to more than one unit	SEAL
window air conditioners	SEAL
attic hatch	CLOSE

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* *An enclosed furnace room is a room expressly built to contain a furnace and/or stove, with a combustion air intake to the outside of the building, and to prevent air flow to and from the remainder of the building.*

\+ *indicates change from Test Condition A*

PREPARATION OF INTENTIONAL OPENINGS
TEST CONDITION C (PARTIALLY SEALED)

fireplace flue		no preparation
fireplace		
– with damper		CLOSE
– with doors		CLOSE
– without damper		see par. 6.1.15
doors on enclosed furnace room*		CLOSE
fireplace combustion air intake damper		CLOSE
fuel fired furnace and/or stove flues	+	no preparation
fuel fired furnace and/or stove flues in enclosed furnace room*		no preparation
furnace combustion air intake		
– with damper		CLOSE
– without damper	+	no preparation
ventilation air intake		
– with damper		CLOSE
– without damper	+	no preparation
fuel fired hot water system flues	+	no preparation
floor drains		FILL
plumbing traps		FILL
exhaust fans		
– with motorized damper		CLOSE
– without motorized damper		no preparation
air to air heat exchangers designed to operate continuously		
– intake and exhaust openings	+	no preparation
other air to air heat exchangers		
– intake and exhaust openings, with motorized damper		CLOSE
– intake and exhaust openings, without motorized damper		no preparation
dryer vents		
– with exhaust divertor		WINTER POSITION
– with motorized damper		CLOSE
– without motorized damper		no preparation
windows and doors		LATCH
exhaust systems common to more than one unit	+	no preparation
window air conditioners	+	sealed with plastic sheet
attic hatch		CLOSE

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* *An enclosed furnace room is a room expressly built to contain a furnace and/or stove, with a combustion air intake to the outside of the building, and to prevent air flow to and from the remainder of the building.*

\+ *indicates change from Test Condition A*

APPENDIX B

IRC/NRC NEUTRAL PRESSURE LEVEL TEST PROCEDURE

PROCEDURE for MEASURING NEUTRAL PRESSURE LEVELS

PURPOSE

This appendix describes the procedure to be used in determining the neutral pressure level of the test houses. The procedure described here is a subset of a more general procedure described in the document "LABORATORY MANUAL for MEASURING NEUTRAL PRESSURE LEVELS in DETACHED SINGLE FAMILY HOUSES", which is enclosed. Described here in summary form is a procedure which can be carried out by one person using a liquid-filled manometer. It is recommended that the larger document be studied to ensure a complete understanding of the principles and methods.

OUTLINE OF PROCEDURE

- Must be carried out in cold, calm weather.
- With the house closed up, measurements of inside/outside air pressure difference are made at at least two elevations as close to simultaneously as possible.
- The two pressure difference measurements are made at points separated vertically as much as possible; e.g. at the bottom of a first storey door and at the top of a second storey window, or, in the case of a bungalow, at the top and bottom of a door.
- The measurements can be made using a single manometer located on any floor level and connected to the outside pressure measurement points by flexible tubing strung inside the house.
- The elevations of the outside measurement points as well as the general vertical dimensions of the house are measured relative to the exterior grade.
- On a plot of pressure difference versus elevation above grade, the elevation at which the pressure difference switches from positive to negative is the neutral pressure level.
- The measurements are made with the furnace and/or water heater turned off and their flue(s) cooled to equilibrium and again with the flues warmed up.

Figure 1 shows a typical set-up.

TYPICAL SET-UP FOR ONE PERSON
NEUTRAL PRESSURE LEVEL TEST
USING MANOMETER

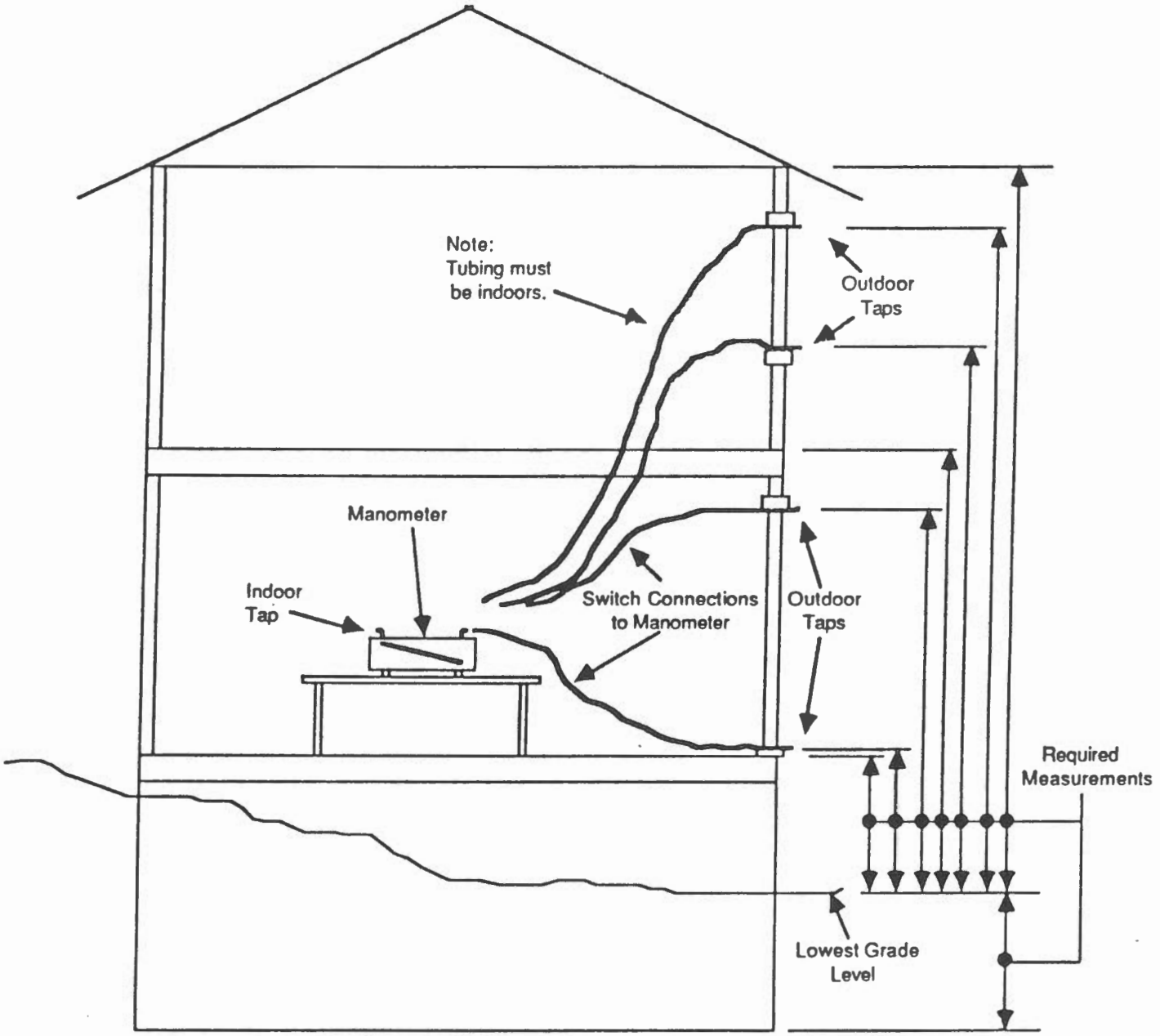

Figure 1

EQUIPMENT

- fluid-filled manometer(s) capable of measuring pressure differences as low as 0.5 Pa with a resolution of 0.25 Pa
- pressure probes, designed to fit under doors and through window cracks, with which to measure outside pressures (These may be made from flattened 0.125 in.O.D. or 0.25 in.O.D.copper tubing, or 0.126 in.O.D. stainless steel tubing,formed as needed. Blow through the tubing after forming to ensure there is still an air passage.)
- flexible tubing of appropriate dimensions to connect pressure probes to manometer(s)
- 10 m tape measure, metre stick, step ladder (1 m +/-)
- two laboratory grade thermometers (with 1°C or 1°F scale marking)
- 50 mm wide masking tape

TEST CONDITIONS

The ideal weather conditions for neutral pressure level measurements are completely calm wind conditions and outdoor temperatures as cold as possible (in the range -10°C to -30°C). The calm wind conditions enable steady pressure differences to be recorded. The large indoor-outdoor temperature differences maximize the stack effect and thereby the slope of the indoor-outdoor pressure difference profile. This increases the resolution with which the neutral pressure level can be measured.

Neutral pressure level measurements should not be attempted for wind speeds in excess of 10 km/hr. For tests during light wind conditions, the pressure differences should be measured on the leeward side of the house for maximum accuracy. The gustiness inherent in all winds makes measurements on the windward face of the building subject to fluctuations that are much larger than measurements on the leeward face.

PROCEDURE IN MORE DETAIL

Preparation

- Determine the weather conditions by calling the local office of Environment Canada. This information must include the barometric pressure: be sure to ask for the "station pressure", otherwise the value you are given will be corrected to sea level. Record these conditions and note any local variation.

- On the basis of this information select the leeward face of the house as the location of the outside pressure probes, bearing in mind the need to use widely vertically separated windows and doors. Select the windows and/or doors to be used. Points at more than two elevations should be chosen if possible; however, all pressure measurement points should be on one face of the house.

- Set up the two thermometers to measure indoor and outdoor temperatures. Neither thermometer should be positioned where direct sunlight can strike it. It is helpful if the outdoor thermometer can be positioned where it can be read through a window by an observer inside the house.

- Turn the house thermostat down so that the furnace will not operate during the test. Similarly, turn down the thermostat of any fuel-fired water heater. (Note the original settings so that the thermostats can be returned to these settings when the test is completed.)

- Prepare pressure taps to fit around the selected doors and/or windows, then close and lock the doors and/or windows with the taps in place.

- Connect flexible tubing leads from the inside ends of the pressure taps to the manometer(s). Ensure these are long enough to reach the manometers' input connections without undue strain. These tubes should not be suspended in such a way that they can sway or vibrate (which can make a steady pressure reading impossible). If necessary gently tape the tube to a solid surface to prevent unwanted motion.

- Tour the house and ensure that:

  i) all doors leading outside not directly involved in pressure difference measurement are closed tightly and locked
  ii) all windows not directly involved in pressure difference measurement are closed tightly and locked
  iii) all interior doors are opened wide to permit free flow of air between rooms
  iv) all chimney dampers are closed tightly

v) no air handling device is operating (e.g. supply or exhaust fans, clothes dryers, central vacuum systems, furnace outside air heat exchangers
vi) the furnace fan is not operating
vii) no flued combustion appliance (furnace, hot water heater, fireplace or stove) is firing

- Allow at least five minutes after installation for all test equipment to come to thermal equilibrium with it surroundings.

Cool Flue Measurements

- Measure the indoor and outdoor air temperatures.

- Allow at least 30 minutes from the time the furnace and/or water heater was turned off in order for the flue(s) to come to equilibrium.

- Measure the indoor/outdoor pressure differences at all locations. Make the measurements with as little time between as possible. If one manometer is used for each outside pressure tap, this can be virtually simultaneous. If one manometer is used the outdoor pressure connections will have to be switched in between readings. If there is any wind-induced fluctuation in the readings, judgement must be used to determine the best representative reading, which is not necessarily the average of the minimum and maximum readings.

Warm Flue Measurements

- Reset the thermostat, and allow 30 minutes for the furnace to re-establish the newly reset indoor temperature, and its normal cycling on and off.

- Obtain and record, with the time, the current weather readings by telephone from the local weather office of Environment Canada, again noting any local variation. Also, measure and record the on-site indoor and outdoor air temperatures using the two thermometers.

- While waiting for the indoor temperature to rise, the vertical dimensions can be measured as described below.

- Again measure the inside/outside pressure differences as described above.

Dimensional Measurements
Measure, to the nearest cm, the vertical distance from the lowest exterior grade level to -

- the lower outdoor pressure tap
- the upper outdoor pressure tap
- the top storey ceiling
- each floor level, including the basement floor

Most measurements can best be made on the interior by measuring relative to a reference floor level, which, in turn, can be related to the lowest grade level with one outdoor measurement.

Wrap-up
All equipment should be dismantled and packed up for transportation.

All conditions found in the house before the test, and recorded in the logbook, should be restored, including interior doors opened or closed (for pets or small children) and electric lights on or off.

Ensure that the water heater and furnace controls are restored to their pre-test settings and that the pilot lights of these appliances are lit (re-light as necessary strictly following the manufacturers' instructions).

After removing all equipment from the house, ensure that all doors and windows are locked securely, as appropriate.

Neutral Pressure Level (NPL) Determination
Plot a graph of pressure difference versus height using the datum grade level as the origin of the elevation axis, and then pass a straight line through the plotted data points. The elevation at which the line crosses zero pressure difference is the NPL. In the ideal case, the data should fit a perfectly straight line. If a particular data point is obviously in error, it can be eliminated from the straight line fit. This is the reason why more than two pressure tap locations should be used. If normal experimental scatter is found with the data, some form of linear regression can be applied to find the best straight line fit to the data. Once a line has been fitted to the data, the elevation value where it crosses the zero pressure difference axis is the NPL.

The graphical attempt to determine the NPL should be made on-site before the test set-up is dismantled, in case problems with measurements or equipment become apparent. As a further check, the total absolute sum (i.e.

inside/outside pressure differences at any two points can be calculated using the following formula:

$$(p_{in2} - p_{out2}) - (p_{in1} - p_{out1}) = 0.0342 \cdot h \cdot P_{bar} \cdot \left(\frac{1}{T_o+273.15} - \frac{1}{T_i+273.15}\right)$$

where p_{inx}, p_{outx} are the inside and outside pressures measured at point x, Pa

h is the vertical distance between the two points, m

P_{bar} is the barometric pressure Pa

T_o is the outside temperature, °C

T_i is the inside temperature, °C

An example of the graphical technique is found in Figure 2.

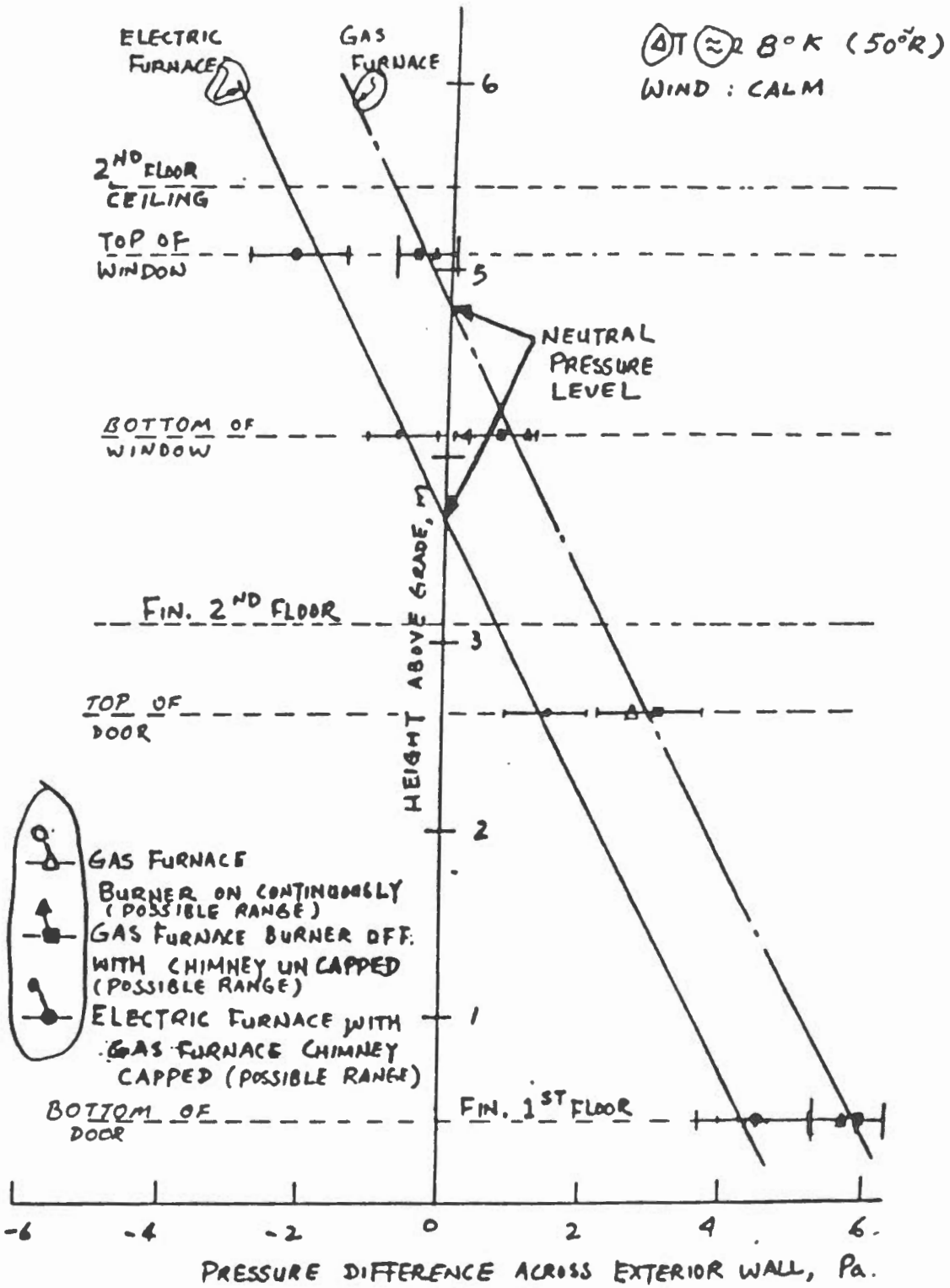

Figure 2: Example of the graphical determination of NPL

APPENDIX 2

RESULTS FROM "AIRTEST"

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
St. John's	F9001001	0.0672	39.8328	0.623	0.0672	39.8328	0.623	0.0749	54.814	0.5319
St. John's	F9002001	0.0489	28.6422	0.6281	0.0489	28.6422	0.6281	-	-	-
St. John's	F9002002	0.0849	40.4696	0.7178	0.0849	40.4696	0.7178	-	-	-
St. John's	F9003001	0.0452	23.3059	0.684	0.0452	23.3059	0.684	-	-	-
St. John's	F9003002	0.0565	26.6905	0.7219	0.0565	26.6905	0.7219	-	-	-
St. John's	F9004001	0.1073	57.0509	0.6707	0.1073	57.0509	0.6707	0.1096	58	0.6724
St. John's	F9004002	0.1109	56.8521	0.6868	0.1109	56.8521	0.6868	-	-	-
St. John's	F9005001	0.1125	87.8555	0.5036	0.1125	87.8555	0.5036	-	-	-
St. John's	F9005002	0.074	32.8904	0.7485	0.074	32.8904	0.7485	-	-	-
St. John's	F9006001	0.0537	32.9431	0.6085	0.0537	32.9431	0.6085	-	-	-
average		0.07611			0.07611			0.0923		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Halifax	N900101	0.0698	30.7692	0.7522	0.0675	26.3821	0.8044	0.0698	30.769	0.7522
Halifax	N900201	0.0464	18.8693	0.7872	0.0478	20.1897	0.7705	0.0563	27.076	0.7145
Halifax	N900102	0.0619	24.3069	0.8021	0.0619	26.1143	0.7711	0.0687	30.915	0.7432
Halifax	N900302	0.0279	12.1967	0.7559	0.0268	11.4108	0.7666	0.0396	22.401	0.6435
Halifax	N900202	0.0465	23.3794	0.6949	0.0421	18.7933	0.7462	0.0498	23.955	0.7141
Halifax	N900203	0.0709	38.9428	0.6566	0.0709	38.9428	0.6566	0.0705	34.832	0.7026
Halifax	N900301	0.0334	12.0957	0.8379	0.0334	12.0957	0.8379	0.0525	29.499	0.6469
Halifax	N900401	0.0483	23.7066	0.7055	0.0474	24.0896	0.6901	0.0536	27.159	0.6911
Halifax	N900501	0.0686	34.3462	0.6964	0.0625	27.4203	0.7537	0.0698	31.952	0.7353
Halifax	N900601	0.137	57.3813	0.7743	0.137	57.3813	0.7743	0.1726	91.599	0.6714
Halifax	N900602	0.0639	25.5891	0.7935	0.0639	25.5891	0.7935	0.0687	29.304	0.7663
Halifax	N900603	0.1226	52.9889	0.7606	0.1226	52.9889	0.7606	0.1205	49.145	0.7856
Halifax	N900604	0.0949	58.3886	0.6071	0.0949	58.3886	0.6071	0.099	64.006	0.5855
Halifax	N900605	0.1687	85.7083	0.6902	0.1669	83.7103	0.6958	0.1495	62.022	0.7783
average		0.07577			0.07469			0.0815		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Fredericton	FRE-01	0.0534	24.7042	0.731	0.0541	27.0684	0.6973	0.0709	43.31	0.6104
Fredericton	FRE-02	0.0502	29.6447	0.6249	0.0461	24.729	0.6669	0.0502	29.645	0.6249
Fredericton	FRE-03	0.0696	40.5463	0.6307	0.0648	36.6104	0.6438	0.0743	41.587	0.6483
Fredericton	FRE-04	0.0908	45.3312	0.698	0.0875	41.3861	0.7216	0.0978	51.187	0.6772
Fredericton	FRE-05	0.0529	33.622	0.5933	0.0381	19.3033	0.6911	0.0529	33.622	0.5933
Fredericton	FRE-06	0.0386	19.0866	0.7021	0.0366	19.146	0.6773	0.0465	24.536	0.6739
Fredericton	FRE-07	0.0857	46.9943	0.6572	0.0799	42.1444	0.6741	0.0933	52.979	0.642
Fredericton	FRE-08	0.1091	50.3436	0.7319	0.1048	49.1271	0.7252	0.1091	50.344	0.7319
Fredericton	FRE-09	0.0926	51.6357	0.6496	0.0863	48.0854	0.6502	0.0965	51.481	0.669
Fredericton	FRE-10	0.0538	24.957	0.7301	0.0502	22.6853	0.7409	0.0538	24.957	0.7301
average		0.06967			0.06484			0.0745		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Quebec	Q9005001	0.0345	11.2391	0.8837	-	-	-	0.0345	11.239	0.8837
Quebec	Q9005002	0.038	17.3147	0.7465	-	-	-	0.038	17.315	0.7465
Quebec	Q9006001	0.0369	19.9116	0.6648	-	-	-	0.0369	19.912	0.6648
Quebec	Q9006002	0.033	15.0449	0.7385	-	-	-	0.033	15.045	0.7385
Quebec	Q9007001	0.0315	11.0678	0.8507	-	-	-	0.033	11.29	0.857
Quebec	Q9008001	0.0493	26.4242	0.6677	-	-	-	0.0493	26.424	0.6677
Quebec	Q9008002	0.0325	10.4145	0.8904	-	-	-	0.036	14.33	0.79
Quebec	Q9009001	0.0362	11.1755	0.9062	-	-	-	0.0362	11.175	0.9062
Quebec	Q9009002	0.0432	18.4453	0.7654	-	-	-	0.043	17.38	0.786
Quebec	Q9009003	0.056	21.4617	0.8124	-	-	-	0.058	22.59	0.806
Quebec	Q9009004	0.0798	10.1193	0.8662	-	-	-	0.038	15.957	0.7833
Quebec	Q9010001	0.0655	37.0832	0.6438	-	-	-	0.067	33.72	0.696
Quebec	Q9011001	0.0286	11.002	0.8116	-	-	-	0.0286	11.002	0.8116
Quebec	Q9011002	0.0301	12.3874	0.7818	-	-	-	0.0301	12.387	0.7818
Quebec	Q9012001	0.1046	60.1162	0.6368	-	-	-	0.11	58.91	0.65
Quebec	Q9013001	0.0509	21.918	0.7623	-	-	-	0.052	20.78	0.782
Quebec	Q9013002	0.0383	16.3575	0.766	-	-	-	0.0383	16.358	0.766
Quebec	Q9014001	0.0299	13.1865	0.752	-	-	-	0.0299	13.187	0.752
Quebec	Q9014002	0.0321	17.331	0.6647	-	-	-	0.0321	17.331	0.6647
Quebec	Q9015001	0.0397	13.8829	0.853	-	-	-	0.052	22.91	0.739
average		0.04453			-			0.0438		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Montreal	Q9001001	0.033	14.1059	0.7647	-	-	-	0.035	14.89	0.758
Montreal	Q9001002	0.0445	19.4488	0.7558	-	-	-	0.049	20.95	0.744
Montreal	Q9001003	0.0394	16.66	0.7696	-	-	-	0.041	15.55	0.808
Montreal	Q9001004	0.0418	17.9643	0.7625	-	-	-	0.0421	15.16	0.84
Montreal	Q9001005	0.0321	12.0751	0.8212	-	-	-	0.0321	12.075	0.8212
Montreal	Q9001006	0.0393	16.1884	0.7812	-	-	-	0.04	16.16	0.792
Montreal	Q9001007	0.0231	9.10072	0.8	-	-	-	0.0231	9.1007	0.8
Montreal	Q9001008	0.0309	14.1701	0.735	-	-	-	0.0309	14.17	0.735
Montreal	Q9002001	0.0665	29.8062	0.7445	-	-	-	0.069	28.63	0.767
Montreal	Q9002002	0.0652	27.4096	0.7724	-	-	-	0.0652	27.41	0.7724
Montreal	Q9003001	0.0876	41.2721	0.723	-	-	-	0.0876	41.272	0.723
Montreal	Q9003002	0.0496	20.4913	0.7804	-	-	-	0.0496	20.491	0.7804
Montreal	Q9003003	0.0431	14.6906	0.8634	-	-	-	0.0431	14.691	0.8634
Montreal	Q9003004	0.0628	24.4957	0.8051	-	-	-	0.077	32.56	0.741
Montreal	Q9004001	0.0244	8.40164	0.8599	-	-	-	0.036	14.11	0.776
Montreal	Q9004002	0.0748	33.5956	0.7437	-	-	-	0.084	31.32	0.789
Montreal	Q9004003	0.0918	50.3823	0.6569	-	-	-	0.0918	50.382	0.6569
Montreal	Q9004004	0.0418	20.4911	0.706	-	-	-	0.043	16.81	0.783
Montreal	Q9016001	0.0621	28.3851	0.7362	-	-	-	0.0621	28.385	0.7362
Montreal	Q9016002	0.0824	44.6763	0.6622	-	-	-	0.0824	44.676	0.6622
average		0.05181			-			0.0542		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Ottawa	OTTCOS9	0.0897	39.33	0.7541	0.0872	38.1192	0.7556	0.1027	50.489	0.7046
Ottawa	OTTCOS2	0.0997	51.145	0.6859	0.0927	46.8379	0.6924	0.1099	56.77	0.6831
Ottawa	OTTCOS3	0.1369	71.0543	0.6779	0.1284	74.6726	0.6316	0.1318	71.054	0.6644
Ottawa	OTTCOS1	0.0938	49.2586	0.6758	0.0915	47.3594	0.6823	0.1047	53.709	0.6861
Ottawa	OTTCOS4	0.1056	60.0017	0.6418	0.0988	52.4326	0.6714	0.119	69.309	0.6311
Ottawa	OTTCOS8	0.089	39.7591	0.7461	0.0851	37.1538	0.7563	0.1094	56.991	0.6792
Ottawa	OTTCOS7	0.0604	26.6719	0.7514	0.058	26.0027	0.7447	0.0703	32.446	0.7321
Ottawa	OTTCOS5	0.1269	69.6784	0.6565	0.122	62.9805	0.6834	0.1369	73.049	0.6692
Ottawa	OTTCOS6	0.1039	55.4826	0.6686	0.0988	51.445	0.6794	0.1119	57.811	0.683
Ottawa	OTTURB7	0.1488	73.8824	0.7002	0.1466	80.4353	0.657	0.1729	106.73	0.6057
Ottawa	OTTURB2	0.1368	67.9202	0.7003	0.1285	60.9847	0.7199	0.1428	80.455	0.6454
Ottawa	OTTURB3	0.1242	63.0275	0.6908	0.1202	60.9952	0.6911	0.1381	75.746	0.6569
Ottawa	OTTURB4	0.1148	61.186	0.6695	0.1128	64.9952	0.6363	0.1321	74.654	0.6442
Ottawa	OTTURB5	0.1072	60.7377	0.6428	0.0948	45.8053	0.712	0.1179	68.215	0.6337
Ottawa	OTTURB6	0.1229	73.2497	0.621	0.1203	69.4926	0.6345	0.1359	85.044	0.5999
Ottawa	OTTMON2	0.1451	81.9228	0.6446	0.1399	78.4352	0.6474	0.148	80.343	0.6614
Ottawa	OTTMON1	0.1094	59.4042	0.6614	0.1058	59.4344	0.6466	0.1193	66.751	0.6482
Ottawa	OTCOS10	0.1031	52.7689	0.6871	0.0993	49.1728	0.7012	0.1068	54.841	0.6858
Ottawa	OTCOS11	0.0906	46.4143	0.6869	0.0889	44.1271	0.7002	0.1084	61.177	0.6445
Ottawa	OTTURB1	0.1108	65.9637	0.6214	0.0996	51.4427	0.6831	0.1121	60.813	0.6617
average		0.11098			0.10596			0.1215		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Richmond Hill	901427	0.1723	99.6578	0.634	0.1644	91.9737	0.6484	0.1751	101.3	0.6337
Richmond Hill	900814	0.1213	68.2907	0.6455	0.1196	68.1694	0.6403	0.1207	62.466	0.6822
Richmond Hill	900815	0.1275	69.2605	0.661	0.1172	60.2384	0.6851	0.1252	63.765	0.6893
Richmond Hill	900918	0.1251	72.8727	0.6308	0.1079	58.5612	0.6617	0.1123	67.873	0.6567
Richmond Hill	901019	0.0645	25.3641	0.8017	0.0608	23.2001	0.8148	0.0804	39.377	0.7062
Richmond Hill	901020	0.0903	37.538	0.7773	0.088	37.8421	0.7629	0.0866	32.86	0.8171
Richmond Hill	901121	0.1301	63.9697	0.7046	0.1305	65.3181	0.6968	0.1483	81.113	0.6582
Richmond Hill	901122	0.1279	83.278	0.5825	0.1307	89.7253	0.5596	0.125	77.841	0.6017
Richmond Hill	901529	0.1187	69.4169	0.6292	0.1046	57.404	0.6568	0.1196	67.76	0.6429
Richmond Hill	901326	0.0844	36.8204	0.7564	0.0879	41.7543	0.7195	0.1102	65.269	0.6237
Richmond Hill	901325	0.1246	75.5136	0.6137	0.1034	48.9063	0.7215	0.1255	73.338	0.6295
Richmond Hill	901530	0.1381	66.0912	0.7162	0.1373	66.405	0.7117	0.1438	66.671	0.73
Richmond Hill	901428	0.173	101.133	0.6293	0.1492	76.1593	0.6883	0.1527	73.449	0.714
Richmond Hill	901631	0.0727	32.6098	0.7446	0.0597	20.5579	0.8589	0.0901	47.555	0.6739
Richmond Hill	900101	0.1582	78.1154	0.7027	0.1592	85.621	0.6656	0.1647	81.961	0.6993
Richmond Hill	900102	0.1579	83.6245	0.6724	0.1873	127.794	0.5622	0.1697	85.975	0.6915
Richmond Hill	900203	0.0978	56.1206	0.6375	0.0874	45.0459	0.6842	0.0964	51.873	0.6653
Richmond Hill	900204	0.108	45.1987	0.7745	0.1134	54.161	0.717	0.1233	60.426	0.7061
Richmond Hill	900305	0.0978	46.951	0.7149	0.1036	56.1193	0.6625	0.1109	59.863	0.6638
Richmond Hill	900306	0.1002	42.0392	0.7733	0.1235	73.3387	0.6226	0.1066	46.09	0.7603
Richmond Hill	900407	0.1087	53.8777	0.7009	0.0985	45.1173	0.7355	0.1085	52.138	0.7146
Richmond Hill	900408	0.1017	50.6561	0.699	0.0959	43.8781	0.7357	0.113	57.53	0.6892
Richmond Hill	900509	0.1551	89.7479	0.6338	0.1452	77.5186	0.6688	0.1377	59.794	0.7584
Richmond Hill	900510	0.1088	53.2018	0.7067	0.0989	45.7118	0.7317	0.1149	57.462	0.6972
Richmond Hill	900611	0.0697	33.4032	0.7159	0.0701	34.4644	0.7048	0.0935	62.229	0.5731
Richmond Hill	900612	0.0982	52.7236	0.6664	0.0891	42.9131	0.7135	0.1113	64.272	0.6345
Richmond Hill	900916	0.1125	55.4322	0.7035	0.091	36.7963	0.7892	0.1147	55.542	0.7112
Richmond Hill	900917	0.1408	72.06	0.687	0.1574	98.4374	0.5999	0.1508	81.715	0.6622
Richmond Hill	901223	0.0967	48.7402	0.6939	0.0947	49.1192	0.6814	0.1127	60.435	0.6668
Richmond Hill	901224	0.2443	144.147	0.6254	0.176	76.39	0.7586	0.2349	115.31	0.7052
average		0.1209			0.11508			0.126		

City	House ID	ela -A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Winnipeg	M901001	0.0217	10.5331	0.7103	0.0227	14.4346	0.6796	0.039	24.894	0.5912
Winnipeg	M902001	0.0606	25.9689	0.7643	0.0508	18.0199	0.8464	0.0596	20.241	0.8649
Winnipeg	M903001	0.0223	8.8696	0.7967	0.0249	10.9785	0.7514	0.0334	17.423	0.6784
Winnipeg	M904001	0.035	15.5389	0.7493	0.0407	18.808	0.7312	0.046	23.515	0.6872
Winnipeg	M904002	0.0385	18.161	0.7226	0.0447	22.31	0.6981	0.0491	23.904	0.7087
Winnipeg	M905001	0.0644	32.6611	0.691	0.0572	25.2669	0.7507	0.0638	29.521	0.731
Winnipeg	M905002	0.0246	12.8815	0.6768	0.0258	13.3142	0.6842	0.0325	17.485	0.6653
Winnipeg	M905003	0.0603	33.507	0.6513	0.0645	37.186	0.6354	0.0732	37.304	0.6891
Winnipeg	M905004	0.0201	9.7756	0.7084	0.0206	11.1191	0.6647	0.0336	22.378	0.5729
Winnipeg	M905005	0.0208	11.679	0.6479	0.0193	9.7022	0.6957	0.032	21.557	0.5677
Winnipeg	M905006	0.0382	18.5339	0.7102	0.0357	17.8321	0.6973	0.0713	43.579	0.61
Winnipeg	M906001	0.0773	29.9248	0.8085	0.0628	18.4472	0.928	0.1368	107.3	0.5016
Winnipeg	M907001	0.0271	14.5635	0.6661	0.0235	11.499	0.7061	0.0318	17.691	0.6507
Winnipeg	M907002	0.067	36.8297	0.6561	0.0602	31.4825	0.6775	0.0685	35.16	0.6857
Winnipeg	M907003	0.0664	28.1121	0.7693	0.0884	45.7651	0.6819	0.0932	46.29	0.6999
Winnipeg	M907004	0.0406	26.5981	0.5801	0.044	32.5723	0.5269	0.0447	29.007	0.5839
Winnipeg	M907005	0.0306	17.4815	0.6389	0.0304	17.5676	0.6345	0.0359	21.064	0.6274
Winnipeg	M907006	0.024	13.6531	0.6414	0.0248	14.6488	0.6251	0.0227	9.4077	0.7785
Winnipeg	M908001	0.0265	11.8788	0.7448	0.0248	12.3906	0.6967	0.0376	19.957	0.6707
Winnipeg	M909001	0.0845	40.2982	0.7176	0.0955	54.2329	0.6418	0.0804	30.182	0.8215
average		0.04253			0.04307			0.0543		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Regina	SA1001	0.0725	29.8201	0.7818	0.0841	45.1351	0.6664	0.1017	58.157	0.6388
Regina	SA1002	0.0242	11.9506	0.7031	0.0258	13.2292	0.6861	0.0348	18.8	0.664
Regina	SA3005	0.0228	10.8528	0.7184	0.0252	12.6666	0.6944	0.0339	17.374	0.6859
Regina	SA3006	0.0724	35.2504	0.7085	0.0776	40.9267	0.6742	0.0893	47.122	0.6738
Regina	SA3007	0.0259	12.852	0.7008	0.0288	15.6614	0.6605	0.0368	19.991	0.6612
Regina	SA3008	0.0834	32.8836	0.8004	0.0802	25.0336	0.9019	0.096	40.919	0.7665
Regina	SA4003	0.0242	10.7968	0.7461	0.0271	13.2054	0.7076	0.0354	16.421	0.7305
Regina	SA4004	0.0542	25.4954	0.7234	0.0601	28.4261	0.7215	0.072	34.869	0.7111
Regina	SA6001	0.0561	26.3224	0.7245	0.0639	32.8283	0.6856	0.0744	35.986	0.7116
Regina	SA6002	0.0504	21.2221	0.7722	0.0525	21.0773	0.7925	0.0731	37.798	0.6827
average		0.04861			0.05253			0.0647		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Saskatoon	SA2001	0.0749	34.5349	0.7334	0.0819	38.8954	0.7193	0.0992	48.019	0.7115
Saskatoon	SA2002	0.0451	22.7706	0.6928	0.0559	31.3014	0.648	0.063	32.306	0.6862
Saskatoon	SA3001	0.0893	42.8061	0.7154	0.0922	46.1169	0.697	0.1222	72.24	0.6245
Saskatoon	SA3002	0.0464	23.4886	0.6914	0.0585	33.5104	0.6383	0.0777	47.591	0.6089
Saskatoon	SA3003	0.0345	17.9199	0.6807	0.0411	22.3082	0.6621	0.0487	27.369	0.6462
Saskatoon	SA3004	0.0353	19.0883	0.6634	0.0426	24.4801	0.6369	0.0541	30.369	0.647
Saskatoon	SA4001	0.0295	13.0507	0.7502	0.0352	16.5988	0.7226	0.0473	24.264	0.6863
Saskatoon	SA4002	0.0357	18.7311	0.6768	0.041	21.8432	0.6696	0.0563	32.653	0.633
Saskatoon	SA5001	0.041	19.4517	0.72	0.039	18.4445	0.7213	0.0521	26.29	0.6933
Saskatoon	SA5002	0.091	39.7731	0.7556	0.0916	43.3886	0.7208	0.116	60.304	0.6802
average		0.05227			0.0579			0.0737		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Edmonton	EDM-01	0.0481	24.4401	0.69	0.0673	38.1425	0.6425	0.0819	39.419	0.7136
Edmonton	EDM-02	0.101	56.708	0.6467	0.1234	90.861	0.529	0.0867	37.098	0.7648
Edmonton	EDM-03	0.0407	23.0761	0.6427	0.0519	29.9103	0.6355	0.0678	40.587	0.619
Edmonton	EDM-04	0.0844	42.6868	0.6923	0.0869	44.8845	0.683	0.1023	57.522	0.6464
Edmonton	EDM-05	0.0801	41.8267	0.6785	0.0875	47.7187	0.6596	0.0972	54.947	0.6439
Edmonton	EDM-06	0.0723	35.9667	0.6994	0.0814	43.2128	0.6712	0.1033	67.256	0.5826
Edmonton	EDM-07	0.0254	7.31906	0.9358	0.0411	18.5963	0.741	0.0477	20.752	0.758
Edmonton	EDM-08	0.0613	28.0508	0.7359	0.078	39.2605	0.6944	0.0957	50.963	0.6699
Edmonton	EDM-09	0.0865	38.8099	0.7442	0.0921	41.4369	0.7431	0.095	40.816	0.7629
Edmonton	EDM-10	0.0402	12.9601	0.8878	0.0487	17.9598	0.8293	0.0575	23.649	0.7819
average		0.064			0.07583			0.0835		

City	House ID	ela-A m2	C - A	n - A	ela-B m2	C - B	n - B	ela-C m2	C - C	n - C
Vancouver	BC-01	0.261	143.357	0.6564	0.2242	102.771	0.7349	0.2797	155.56	0.651
Vancouver	BC-02	0.1441	76.4501	0.6716	0.1153	55.5245	0.7137	0.1524	82.83	0.6609
Vancouver	BC-03	0.2172	129.147	0.622	0.2083	125.635	0.6158	0.2489	169.32	0.5636
Vancouver	BC-04	0.1333	0.27379	0.6561	0.1341	77.9598	0.6319	0.1339	56.854	0.7685
Vancouver	BC-05	0.1368	58.266	0.7669	0.1144	50.2417	0.7536	0.156	79.205	0.6906
Vancouver	BC-06	0.1475	85.0386	0.6354	0.1288	68.1742	0.6726	0.1614	111.26	0.5577
Vancouver	BC-07	0.2243	133.874	0.6203	0.1966	110.588	0.646	0.2234	128.23	0.6372
Vancouver	BC-08	0.1521	82.7949	0.6604	0.1594	92.9526	0.6304	0.1632	86.12	0.6737
Vancouver	BC-09	0.221	169.256	0.5121	0.1589	77.3903	0.7087	0.223	128	0.6371
Vancouver	BC-10	0.0632	31.5204	0.6984	0.0639	31.3233	0.7057	0.0861	47.662	0.6531
Vancouver	BC-11	0.1134	68.9242	0.6829	0.1158	53.9634	0.7278	0.1699	78.368	0.7323
Vancouver	BC-12	0.1312	73.3236	0.6489	0.1266	82.5251	0.582	0.086	47.596	0.653
Vancouver	BC-13	0.1332	68.8156	0.6829	0.1295	63.4997	0.7058	0.1716	102.03	0.6219
Vancouver	BC-14	0.131	73.2053	0.6489	0.1645	97.0733	0.6253	0.1473	90.867	0.6061
Vancouver	BC-15	0.1764	83.6925	0.7201	0.1616	86.5505	0.6675	0.1887	92.63	0.7053
Vancouver	BC-16	0.2704	211.857	0.5021	0.172	111.79	0.5832	0.2519	157.5	0.6001
Vancouver	BC-17	0.1364	73.6111	0.664	0.1204	55.2754	0.7341	0.1202	55.19	0.7341
Vancouver	BC-18	0.1423	79.9685	0.6466	0.1214	55.2928	0.7377	0.1414	71.29	0.6936
Vancouver	BC-19	0.1053	48.0037	0.7371	0.0993	43.6037	0.7535	0.1147	54.471	0.7195
Vancouver	BC-20	0.106	46.7397	0.752	0.1213	61.1217	0.6938	0.1323	68.084	0.6846
average		0.15731			0.14182			0.1676		

APPENDIX 3

HOUSE CHARACTERISTICS

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
St. John's	F9001001	n	65	n	441.8	396.5	4.27	.6/.6	2
St. John's	F9002001	?	?	?	464	384.1	4.59	0.6	2
St. John's	F9002002	n	60	n	470	396.3	4.27	0.6	2
St. John's	F9003001	n	50	n	423.3	360.4	3.96	0.6	1
St. John's	F9003002	n	65	n	499.9	403.7	4.27	0.6	1
St. John's	F9004001	y	85	n	793.3	562.4	5.8	.6/.7	1
St. John's	F9004002	y	85	n	741.7	514.1	5.79	0.6	1
St. John's	F9005001	n	70	n	680	537.4	4.28	0.6	1
St. John's	F9005002	y	75	n	701.1	549.4	6.4	0.6	2
St. John's	F9006001	n	50	n	398.4	351.6	4.28	0.6	1

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Halifax	N900101	y	80	n	799	611.7	6.4	.6/.6/.7	2
Halifax	N900201	n	65	n	493	378	5.2	.6/.6/.6	1
Halifax	N900102	y	80	n	749	572	6.4	.6/.6/.7	1
Halifax	N900302	y	50	n	493	398	3.7	.6/.6/.7	2
Halifax	N900202	y	55	n	413	352	3.8	.6/.6/.7	1
Halifax	N900203	n	55	n	440	358	6.49	.6/.6/.6	1
Halifax	N900301	y	50	n	344	354	3.7	.6/.6/.7	2
Halifax	N900401	n	65	n	484	489	4.6	.6/.6/.6	1
Halifax	N900501	y	85	n	912	643	5.2	.6/.6/.7	2
Halifax	N900601	y	80	n	1022.7	762.6	5.56	.6/.6/.7	1
Halifax	N900602	y	80	n	746.2	615.7	5.3	.6/.6/.7	1
Halifax	N900603	y	95	n	1254.3	887.2	5.2	.6/.6/.7	1
Halifax	N900604	y	70	n	617.7	449.9	5.6	.6/.6/.7	1
Halifax	N900605	y	85	n	771	726	5.8	.6/.6/.7	1

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Fredericton	FRE-01	n	60	n	542	529	5.5	.6/.6/.6	1
Fredericton	FRE-02	n	60	n	484	375	4	.6/.6	1
Fredericton	FRE-03	y	85	n	1056	889	5.5	.6/.6/.7	1
Fredericton	FRE-04	n	70	n	713	535	5.5	.6/.6/.6	2
Fredericton	FRE-05	n	75	n	850	533	5.5	.6/.6	1
Fredericton	FRE-06	y	65	n	651	454	5.5	.6/.6/.7	1
Fredericton	FRE-07	y	80	n	881	622	6.4	.6/.6/.7	1
Fredericton	FRE-08	n	65	n	613	495	8.2	.6/.6	1
Fredericton	FRE-09	y	80	n	613	309	6.1	.6/.6/.7	1
Fredericton	FRE-10	y	65	n	525	518	5.2	.7/.6	1

*NPL - Neutral Pressure Plane, expressed relative to house height for conditions A, B and C

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Quebec	Q9005001	n	55	n	466	345	3.8	0.6	2
Quebec	Q9005002	n	45	n	356	298	3.78	0.6	2
Quebec	Q9006001	n	50	n	317	290	3.43	0.6	2
Quebec	Q9006002	n	45	n	294	274	3.29	0.6	2
Quebec	Q9007001	n	60	n	432	337	6.22	.6/.6	2
Quebec	Q9008001	n	45	n	356	313	3.58	0.6	2
Quebec	Q9008002	n	45	n	386	332	3.25	.6/.6	2
Quebec	Q9009001	n	60	n	640	404	6.25	0.6	2
Quebec	Q9009002	n	60	n	592	436	6.22	.6/.6	2
Quebec	Q9009003	y	55	n	484	402	6.35	.6/.7	2
Quebec	Q9009004	n	50	n	540	426	3.3	.6/.6	2
Quebec	Q9010001	n	60	n	572	467	6.27	.6/.6	2
Quebec	Q9011001	n	45	n	340	307	3.56	0.6	2
Quebec	Q9011002	n	45	n	362	311	3.99	0.6	2
Quebec	Q9012001	y	60	n	717	541	6.27	.6/.7	2
Quebec	Q9013001	n	55	n	453	357	6.3	.6/.6	2
Quebec	Q9013002	n	55	n	535	380	6.37	0.6	2
Quebec	Q9014001	n	40	n	453	384	3.28	0.6	2
Quebec	Q9014002	n	40	n	453	384	3.28	0.6	2
Quebec	Q9015001	n	55	n	482	363	6.5	.6/.6	2

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Montreal	Q9001001	n	40	n	395	364	3.08	.6/.6	2
Montreal	Q9001002	n	40	n	464	378	3.33	.6/.6	2
Montreal	Q9001003	n	40	n	467	378	3.33	.6/.6	2
Montreal	Q9001004	n	45	n	476	385	3.4	.6/.6	2
Montreal	Q9001005	n	45	n	396	345	3.91	0.6	2
Montreal	Q9001006	y	45	-	413	326	3.4	.6/.7	2
Montreal	Q9001007	n	45	n	437	357	3.5	0.6	2
Montreal	Q9001008	n	40	n	664	378	3.33	0.6	2
Montreal	Q9002001	n	50	n	494	404	3.43	.6/.6	2
Montreal	Q9002002	n	50	n	527	384	3.4	0.6	2
Montreal	Q9003001	y	55	n	465	376	3.86	0.7	2
Montreal	Q9003002	n	50	n	400	339	4.09	0.6	2
Montreal	Q9003003	n	55	n	479	363	6.73	0.6	2
Montreal	Q9003004	y	55	n	508	439	4.83	.6/.7	2
Montreal	Q9004001	n	60	n	501	409	3.6	.6/.6	2
Montreal	Q9004002	n	60	n	518	483	4.82	.6/.6	2
Montreal	Q9004003	y	65	n	539	489	6.17	0.7	2
Montreal	Q9004004	n	45	n	362	325	3.9	.6/.6	2
Montreal	Q9016001	y	65	n	631	490	6.1	0.7	2
Montreal	Q9016002	y	65	n	631	490	6.1	0.7	2

*NPL - Neutral Pressure Plane, expressed relative to house height for conditions A, B and C

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Ottawa	OTTCOS9	y	70	n	786.1	545	5.6	.6/.6/.7	1
Ottawa	OTTCOS2	y	70	n	709.9	499.6	5.3	.6/.6/.7	1
Ottawa	OTTCOS3	y	70	n	788.8	501.4	5.3	.6/.6/.7	1
Ottawa	OTTCOS1	y	70	n	858	570.3	5.7	.6/.6/.7	1
Ottawa	OTTCOS4	y	65	n	660	477.5	5.3	.6/.6/.7	1
Ottawa	OTTCOS8	y	70	n	822.2	538.3	5.7	.6/.6/.7	1
Ottawa	OTTCOS7	y	55	n	567.5	427	5.1	.6/.6/.7	1
Ottawa	OTTCOS5	y	55	n	577.5	458.1	5.1	.6/.6/.7	1
Ottawa	OTTCOS6	y	60	n	573.7	437.3	5.1	.6/.6/.7	1
Ottawa	OTTURB7	y	65	n	725.6	533.4	5.1	.6/.6/.7	1
Ottawa	OTTURB2	y	55	n	630.2	497.3	5.1	.6/.6/.7	1
Ottawa	OTTURB3	y	55	n	571.2	488.4	5.1	.6/.6/.7	1
Ottawa	OTTURB4	y	55	n	612.4	452.1	5.1	.6/.6/.7	1
Ottawa	OTTURB5	y	65	n	973.2	626.6	5.1	.6/.6/.7	1
Ottawa	OTTURB6	y	65	n	929.3	628.5	5.2	.6/.6/.7	1
Ottawa	OTTMON2	y	65	n	732.8	672.1	5.2	.6/.6/.7	1
Ottawa	OTTMON1	y	65	n	810.3	540.8	5.2	.6/.6/.7	1
Ottawa	OTCOS10	y	65	n	943.5	627.3	5.64	.6/.6/.7	1
Ottawa	OTCOS11	y	70	n	981.4	643.1	5.64	.6/.6/.7	1
Ottawa	OTTURB1	y	60	n	918.6	648.4	5.4	.6/.6/.7	1

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Richmond Hill	901427	y	80	n	1196	820	5.4	.7/.6/.7	1
Richmond Hill	900814	y	85	n	772	554	5.5	.7/.6/.7	1
Richmond Hill	900815	y	80	n	921	592	5.5	.7/.6/.7	1
Richmond Hill	900918	y	80	n	921	670	5.3	.7/.6/.7	1
Richmond Hill	901019	y	75	n	851	547	5.8	.7/.6/.7	1
Richmond Hill	901020	y	75	n	1000	634	5.5	.7/.6/.7	1
Richmond Hill	901121	y	80	n	878	645	5.5	.7/.6/.7	1
Richmond Hill	901122	y	80	n	878	645	5.5	.7/.7/.7	1
Richmond Hill	901529	y	75	n	812	544	5.5	.7/.6/.7	1
Richmond Hill	901326	y	75	n	762	538	5.4	.7/.6/.7	1
Richmond Hill	901325	y	75	n	900	637	5.4	.7/.6/.7	1
Richmond Hill	901530	y	85	n	1161	722	5.5	.7/.6/.7	2
Richmond Hill	901428	y	80	n	1287	823	5.5	.7/.6/.7	1
Richmond Hill	901631	y	75	n	511	433	5.5	.7/.6/.6	1
Richmond Hill	900101	y	75	n	938	701	5.1	.7/.6/.7	1
Richmond Hill	900102	y	80	n	904	648	5.54	.7/.6/.7	2
Richmond Hill	900203	y	75	n	760	549	5.5	.7/.6/.7	2
Richmond Hill	900204	y	80	n	822	628	5.5	.7/.6/.7	2
Richmond Hill	900305	y	75	n	906	616	5.5	.7/.6/.7	2
Richmond Hill	900306	y	75	n	924	594	5.5	.7/.6/.7	2
Richmond Hill	900407	y	75	n	784	532	5.3	.7/.6/.7	2
Richmond Hill	900408	y	75	n	784	532	5.4	.7/.6/.7	2
Richmond Hill	900509	y	80	n	1079	678	5.5	.7/.6/.7	2
Richmond Hill	900510	y	95	n	1077	679	5.5	.7/.6/.7	2
Richmond Hill	900611	y	70	n	580	467	5.2	.7/.6/.7	2
Richmond Hill	900612	y	75	n	789	530	5.4	.7/.6/.7	2
Richmond Hill	900916	y	75	n	755	522	5.5	.7/.6/.7	2
Richmond Hill	900917	y	75	n	712	578	5.9	.7/.6/.7	2
Richmond Hill	901223	y	80	n	1032	739	5.4	.7/.6/.7	2
Richmond Hill	901224	y	85	n	1532	907	5.5-7.9	.7/.6/.6	2

*NPL - Neutral Pressure Plane, expressed relative to house height for conditions A, B and C

City	House ID	Active Flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Winnipeg	M901001	y	55	y	418.1	525	3	.6/.6/.6	1
Winnipeg	M902001	y	80	y	920.7	634	5.7	.6/.6/.6	2
Winnipeg	M903001	y	55	n	551.6	439.9	3	.6/.6/.7	2
Winnipeg	M904001	y	60	y	470	394	5.7	.6/.6/.6	2
Winnipeg	M904002	y	55	y	552	443	3	.6/.6/.6	2
Winnipeg	M905001	y	65	y	710	530	6	.6/.6/.6	2
Winnipeg	M905002	y	55	y	555	439	4.1	.6/.6/.6	1
Winnipeg	M905003	y	70	y	726	551	6	.6/.6/.6	1
Winnipeg	M905004	y	55	y	555	439	4.2	.6/.6/.6	1
Winnipeg	M905005	y	55	y	553	438	4.2	.6/.6/.6	1
Winnipeg	M905006	y	65	y	553	437	3.6	.6/.6/.6	1
Winnipeg	M906001	y	85	y	1035	770.9	5.7	.6/.6/.6	2
Winnipeg	M907001	y	50	n	460	373	3	.6/.6/.7	2
Winnipeg	M907002	y	70	n	534	479	5.5	.6/.6/.7	2
Winnipeg	M907003	y	65	y	609	510	5.9	.6/.6/.6	2
Winnipeg	M907004	y	50	n	320	295	3.2	.6/.6/.7	2
Winnipeg	M907005	y	50	y	394	358	3.8	.6/.6/.6	2
Winnipeg	M907006	y	55	n	300	290	4	.6/.6/.7	2
Winnipeg	M908001	y	55	y	576	473	3.9	.6/.6/.6	2
Winnipeg	M909001	y	75	y	789	588	5.8	.6/.6/.6	0

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Regina	SA1001	y	70	y	694.6	537.4	5.8	0.641	1
Regina	SA1002	y	60	y	553.2	438	3.24	0.6	1
Regina	SA3005	y	45	y	411.4	351.1	4.01	0.818	1
Regina	SA3006	y	70	y	698.8	493.3	5.97	0.548	1
Regina	SA3007	y	55	y	500.9	403.7	3.22	0.6	1
Regina	SA3008	y	70	y	698.8	493.3	6.11	0.843	1
Regina	SA4003	y	45	y	372.5	324	3.65	0.712	1
Regina	SA4004	y	60	y	638.6	532.6	3.04	0.6	1
Regina	SA6001	y	70	y	615.4	464.7	5.75	0.216	1
Regina	SA6002	y	55	y	507.7	427.6	5.23	0.6	1

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Saskatoon	SA2001	y	65	y	614.2	486.7	5.47	0.42	1
Saskatoon	SA2002	y	60	y	494.3	413.4	3.22	0.274	1
Saskatoon	SA3001	y	70	y	671.8	433	5.93	0.422	1
Saskatoon	SA3002	y	65	y	595	446.7	5.81	0.361	1
Saskatoon	SA3003	y	75	y	445.9	374.9	4.08	0.485	1
Saskatoon	SA3004	y	55	y	407.5	355.7	4.2	0.455	1
Saskatoon	SA4001	y	75	y	494.3	438	4.89	0.673	1
Saskatoon	SA4002	y	60	y	396.8	351.3	5.03	0.376	1
Saskatoon	SA5001	y	70	n	644.5	421	5.83	0.532	1
Saskatoon	SA5002	y	70	n	783.9	537.2	5.86	52/.352/.5	1

*NPL - Neutral Pressure Plane, expressed relative to house height for conditions A, B and C

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Edmonton	EDM-01	y	70	y	744	612	3.04	0.6	1
Edmonton	EDM-02	y	70	y	508	433	4.12	0.6	1
Edmonton	EDM-03	y	45	y	427	370	4.27	0.6	2
Edmonton	EDM-04	y	75	y	697	534	5.72	0.6	1
Edmonton	EDM-05	y	70	y	703	-	4.15	0.6	1
Edmonton	EDM-06	y	50	y	528	494	3.56	0.6	1
Edmonton	EDM-07	y	75	y	760	543	5.84	0.6	1
Edmonton	EDM-08	y	80	y	815	-	5.18	0.6	1
Edmonton	EDM-09	y	70	y	594	455	5.45	0.6	1
Edmonton	EDM-10	y	55	y	536	428	3.96	.7/.6/.6	1

City	House ID	Active flue	req. v.r. (L/s)	duct	Volume (m3)	Env. Area (m2)	Height (m)	NPP* (A/B/C)	Shield
Vancouver	BC-01	y	70	n	734	651	8.4	.7/.6/.7	2
Vancouver	BC-02	y	70	y	797	711	5.8	.7/.6/.7	1
Vancouver	BC-03	y	55	y	476	486	6.6	.7/.6/.7	1
Vancouver	BC-04	y	60	n	829	768	3	.7/.6/.7	1
Vancouver	BC-05	y	75	y	892	651	6.5	.7/.6/.7	1
Vancouver	BC-06	y	65	y	741	583	5.8	.7/.6/.7	1
Vancouver	BC-07	y	75	y	648	556	5.6	.7/.6/.7	1
Vancouver	BC-08	y	65	y	502	447	5.6	.7/.6/.7	1
Vancouver	BC-09	y	85	n	963	743	5.4	.7/.6/.7	1
Vancouver	BC-10	y	75	n	609	498	5.8	.7/.6/.7	1
Vancouver	BC-11	y	55	y	457	411	5.2	.7/.6/.7	1
Vancouver	BC-12	y	65	y	718	590	5.8	.7/.6/.7	1
Vancouver	BC-13	y	65	y	543	465	8.4	.7/.6/.7	1
Vancouver	BC-14	y	60	y	808	594	6.5	.7/.6/.7	1
Vancouver	BC-15	y	75	y	836	607	6.9	.7/.6/.7	1
Vancouver	BC-16	y	65	y	770	564	6.5	.7/.6/.7	1
Vancouver	BC-17	y	55	y	458	411	5.8	.7/.6/.7	1
Vancouver	BC-18	y	70	y	702	526	6	.7/.6/.7	2
Vancouver	BC-19	y	75	y	808	594	6.8	.7/.6/.7	2
Vancouver	BC-20	y	65	y	543	465	5.5	.7/.6/.7	2

*NPL - Neutral Pressure Plane, expressed relative to house height for conditions A, B and C

APPENDIX 4

HOUSE LEAKAGE RATES (ach)

AVERAGE LEAKAGE RATES PER CITY FOR TEST CONDITION A (air changes per hour)

City	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
St. John's	0.29	0.33	0.38	0.28	0.88	0.14	1.18	0.12	1.44	0.10
Halifax	0.17	0.20	0.23	0.16	0.37	0.07	0.45	0.06	0.63	0.02
Fredericton	0.15	0.18	0.20	0.14	0.29	0.09	0.35	0.08	0.38	0.06
Quebec	0.21	0.27	0.32	0.21	0.94	0.05	1.27	0.04	1.70	0.00
Montreal	0.23	0.29	0.36	0.21	0.75	0.06	1.23	0.04	1.49	0.03
Ottawa	0.19	0.24	0.27	0.18	0.35	0.13	0.37	0.10	0.39	0.09
Richmond Hill	0.23	0.28	0.31	0.23	0.62	0.12	0.75	0.08	0.86	0.06
Winnipeg	0.16	0.19	0.20	0.16	0.39	0.09	0.52	0.06	0.67	0.02
Regina	0.14	0.17	0.19	0.13	0.26	0.07	0.27	0.05	0.28	0.02
Saskatoon	0.12	0.14	0.15	0.11	0.22	0.07	0.24	0.05	0.28	0.01
Edmonton	0.16	0.19	0.23	0.16	0.30	0.11	0.35	0.09	0.39	0.07
Vancouver	0.30	0.35	0.39	0.32	0.62	0.21	0.77	0.17	0.92	0.10

AVERAGE LEAKAGE RATES PER CITY FOR TEST CONDITION B (air changes per hour)

City	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
St. John's	0.29	0.33	0.38	0.28	0.88	0.14	1.18	0.12	1.44	0.10
Halifax	0.16	0.20	0.23	0.15	0.36	0.06	0.45	0.05	0.64	0.01
Fredericton	0.14	0.17	0.19	0.13	0.28	0.09	0.34	0.07	0.37	0.06
Quebec										
Montreal										
Ottawa	0.19	0.23	0.26	0.18	0.34	0.13	0.36	0.09	0.37	0.08
Richmond Hill	0.21	0.25	0.28	0.21	0.59	0.11	0.71	0.07	0.82	0.06
Winnipeg	0.15	0.18	0.20	0.16	0.39	0.09	0.52	0.05	0.67	0.02
Regina	0.15	0.18	0.20	0.14	0.27	0.08	0.28	0.06	0.30	0.03
Saskatoon	0.14	0.15	0.17	0.12	0.24	0.08	0.26	0.06	0.30	0.01
Edmonton	0.18	0.21	0.25	0.18	0.33	0.13	0.40	0.10	0.44	0.08
Vancouver	0.26	0.30	0.33	0.27	0.59	0.17	0.75	0.14	0.90	0.07

AVERAGE LEAKAGE RATES PER CITY FOR TEST CONDITION C (air changes per hour)

City	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
St. John's	0.31	0.34	0.38	0.29	0.77	0.17	0.98	0.14	1.16	0.13
Halifax	0.19	0.23	0.26	0.17	0.39	0.08	0.46	0.07	0.62	0.02
Fredericton	0.16	0.19	0.22	0.15	0.31	0.10	0.37	0.09	0.40	0.07
Quebec	0.22	0.28	0.33	0.22	0.94	0.05	1.26	0.04	1.69	0.00
Montreal	0.24	0.31	0.38	0.22	0.78	0.07	1.29	0.04	1.57	0.03
Ottawa	0.23	0.29	0.32	0.21	0.40	0.16	0.42	0.12	0.43	0.10
Richmond Hill	0.24	0.29	0.32	0.23	0.66	0.12	0.78	0.09	0.90	0.07
Winnipeg	0.19	0.23	0.24	0.20	0.45	0.11	0.59	0.07	0.75	0.03
Regina	0.18	0.21	0.24	0.16	0.32	0.10	0.33	0.07	0.35	0.04
Saskatoon	0.17	0.20	0.21	0.16	0.30	0.11	0.32	0.08	0.37	0.02
Edmonton	0.20	0.24	0.28	0.20	0.38	0.14	0.45	0.11	0.50	0.09
Vancouver	0.32	0.38	0.41	0.34	0.66	0.22	0.83	0.18	0.98	0.10

City: St. John's
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
F9001001	0.42	0.46	0.54	0.39	1.45	0.16	1.99	0.13	2.44	0.11
F9002001	0.29	0.32	0.38	0.28	1.03	0.11	1.41	0.09	1.73	0.08
F9002002	0.61	0.69	0.83	0.58	2.5	0.21	3.52	0.16	4.43	0.13
F9003001	0.17	0.19	0.21	0.16	0.31	0.11	0.36	0.09	0.4	0.08
F9003002	0.18	0.21	0.23	0.17	0.34	0.12	0.4	0.1	0.45	0.08
F9004001	0.21	0.23	0.26	0.2	0.39	0.14	0.45	0.12	0.49	0.1
F9004002	0.24	0.26	0.29	0.23	0.43	0.16	0.51	0.13	0.56	0.11
F9005001	0.24	0.25	0.27	0.23	0.38	0.16	0.43	0.14	0.47	0.12
F9005002	0.38	0.44	0.53	0.36	1.65	0.12	2.34	0.09	2.97	0.08
F9006001	0.2	0.22	0.24	0.19	0.35	0.14	0.41	0.12	0.45	0.1
average	0.29	0.33	0.38	0.28	0.88	0.14	1.18	0.12	1.44	0.10

City: Halifax
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
N900101	0.2	0.24	0.28	0.18	0.62	0.06	0.85	0.04	1.34	0.01
N900201	0.13	0.16	0.18	0.12	0.23	0.05	0.25	0.05	0.3	0.01
N900102	0.12	0.14	0.16	0.1	0.21	0.05	0.22	0.04	0.27	0.01
N900302	0.13	0.15	0.18	0.12	0.4	0.04	0.55	0.03	0.88	0.01
N900202	0.15	0.17	0.2	0.13	0.25	0.07	0.27	0.06	0.32	0.02
N900203	0.21	0.24	0.27	0.19	0.34	0.1	0.36	0.09	0.44	0.03
N900301	0.26	0.31	0.37	0.23	0.88	0.06	1.25	0.05	2.04	0.01
N900401	0.13	0.16	0.18	0.12	0.22	0.06	0.24	0.05	0.29	0.01
N900501	0.16	0.18	0.21	0.14	0.45	0.05	0.61	0.04	0.94	0.01
N900601	0.18	0.22	0.26	0.17	0.32	0.08	0.34	0.07	0.42	0.02
N900602	0.12	0.15	0.17	0.11	0.21	0.05	0.23	0.04	0.27	0.01
N900603	0.13	0.16	0.19	0.12	0.23	0.06	0.25	0.05	0.3	0.01
N900604	0.19	0.22	0.25	0.18	0.31	0.1	0.33	0.09	0.4	0.03
N900605	0.29	0.34	0.38	0.26	0.48	0.13	0.51	0.12	0.62	0.03
average	0.17	0.20	0.23	0.16	0.37	0.07	0.45	0.06	0.63	0.02

City: Fredericton
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
FRE-01	0.14	0.17	0.19	0.13	0.24	0.09	0.27	0.07	0.29	0.06
FRE-02	0.13	0.16	0.18	0.13	0.22	0.09	0.25	0.08	0.26	0.06
FRE-03	0.08	0.1	0.11	0.08	0.14	0.06	0.16	0.05	0.17	0.04
FRE-04	0.25	0.29	0.33	0.23	0.76	0.12	1.08	0.09	1.3	0.07
FRE-05	0.08	0.09	0.1	0.07	0.13	0.05	0.14	0.05	0.15	0.04
FRE-06	0.08	0.1	0.11	0.08	0.14	0.05	0.16	0.04	0.17	0.03
FRE-07	0.13	0.15	0.17	0.12	0.21	0.09	0.24	0.07	0.26	0.06
FRE-08	0.24	0.3	0.35	0.23	0.43	0.16	0.49	0.13	0.52	0.1
FRE-09	0.2	0.23	0.26	0.19	0.33	0.13	0.37	0.11	0.4	0.09
FRE-10	0.15	0.19	0.23	0.14	0.29	0.1	0.31	0.08	0.32	0.07
average	0.15	0.18	0.20	0.14	0.29	0.09	0.35	0.08	0.38	0.06

City: Quebec
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
Q9005001	0.21	0.28	0.34	0.21	1.12	0.04	1.56	0.03	2.13	0
Q9005002	0.24	0.31	0.37	0.25	1.03	0.06	1.38	0.04	1.83	0
Q9006001	0.23	0.28	0.33	0.23	0.84	0.07	1.09	0.05	1.4	0
Q9006002	0.25	0.32	0.37	0.25	1.04	0.06	1.38	0.05	1.83	0
Q9007001	0.2	0.26	0.31	0.2	0.98	0.04	1.36	0.03	1.85	0
Q9008001	0.27	0.34	0.39	0.27	1.01	0.08	1.31	0.06	1.69	0
Q9008002	0.24	0.32	0.39	0.25	1.3	0.05	1.81	0.03	2.48	0
Q9009001	0.17	0.22	0.27	0.17	0.92	0.03	1.29	0.02	1.77	0
Q9009002	0.17	0.22	0.26	0.17	0.74	0.04	0.99	0.03	1.32	0
Q9009003	0.29	0.38	0.45	0.29	1.37	0.06	1.87	0.04	2.54	0
Q9009004	0.15	0.2	0.24	0.15	0.79	0.03	1.09	0.02	1.49	0
Q9010001	0.21	0.27	0.31	0.22	0.77	0.06	0.99	0.05	1.27	0
Q9011001	0.21	0.27	0.33	0.21	1	0.05	1.36	0.03	1.84	0
Q9011002	0.2	0.25	0.3	0.2	0.89	0.05	1.2	0.03	1.61	0
Q9012001	0.27	0.33	0.39	0.27	0.96	0.08	1.23	0.06	1.57	0
Q9013001	0.26	0.33	0.39	0.26	1.12	0.06	1.51	0.04	2.01	0
Q9013002	0.16	0.21	0.25	0.17	0.73	0.04	0.97	0.03	1.3	0
Q9014001	0.15	0.19	0.23	0.15	0.64	0.04	0.85	0.03	1.13	0
Q9014002	0.14	0.17	0.2	0.14	0.51	0.04	0.66	0.03	0.86	0
Q9015001	0.22	0.29	0.35	0.22	1.12	0.04	1.55	0.03	2.11	0
average	0.21	0.27	0.32	0.21	0.94	0.05	1.27	0.04	1.70	0

City: Montreal
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
Q9001001	0.18	0.23	0.28	0.16	0.6	0.05	0.99	0.03	1.2	0.02
Q9001002	0.21	0.26	0.32	0.19	0.67	0.05	1.1	0.04	1.34	0.02
Q9001003	0.19	0.24	0.29	0.17	0.61	0.05	1.02	0.03	1.24	0.02
Q9001004	0.19	0.24	0.3	0.17	0.62	0.05	1.03	0.03	1.25	0.02
Q9001005	0.2	0.25	0.31	0.17	0.69	0.05	1.16	0.03	1.43	0.02
Q9001006	0.21	0.27	0.34	0.19	0.71	0.05	1.19	0.03	1.45	0.02
Q9001007	0.12	0.16	0.19	0.11	0.42	0.03	0.71	0.02	0.86	0.01
Q9001008	0.14	0.17	0.21	0.13	0.44	0.04	0.71	0.03	0.86	0.02
Q9002001	0.28	0.36	0.44	0.26	0.9	0.08	1.49	0.05	1.81	0.03
Q9002002	0.27	0.35	0.43	0.25	0.9	0.07	1.51	0.05	1.83	0.03
Q9003001	0.4	0.51	0.61	0.37	1.2	0.12	1.93	0.08	2.34	0.06
Q9003002	0.28	0.35	0.44	0.25	0.93	0.07	1.55	0.05	1.89	0.03
Q9003003	0.23	0.3	0.38	0.21	0.86	0.05	1.48	0.03	1.83	0.02
Q9003004	0.29	0.37	0.46	0.26	1	0.07	1.68	0.04	2.05	0.03
Q9004001	0.13	0.16	0.2	0.11	0.46	0.03	0.79	0.02	0.98	0.01
Q9004002	0.31	0.38	0.47	0.28	0.97	0.08	1.6	0.05	1.93	0.04
Q9004003	0.33	0.4	0.48	0.3	0.89	0.11	1.38	0.08	1.65	0.06
Q9004004	0.23	0.28	0.35	0.21	0.69	0.07	1.12	0.04	1.36	0.03
Q9016001	0.22	0.27	0.33	0.19	0.65	0.06	1.05	0.04	1.29	0.03
Q9016002	0.25	0.31	0.37	0.23	0.69	0.09	1.08	0.06	1.29	0.04
average	0.23	0.29	0.36	0.21	0.75	0.06	1.23	0.04	1.49	0.03

City: Ottawa
Leakage Rate Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
OTTCOS9	0.15	0.19	0.22	0.14	0.29	0.1	0.31	0.07	0.32	0.06
OTTCOS2	0.18	0.22	0.25	0.17	0.33	0.12	0.35	0.09	0.36	0.08
OTTCOS3	0.22	0.27	0.31	0.21	0.4	0.15	0.42	0.11	0.44	0.1
OTTCOS1	0.14	0.17	0.2	0.13	0.25	0.09	0.27	0.07	0.28	0.06
OTTCOS4	0.2	0.24	0.27	0.19	0.35	0.14	0.37	0.1	0.39	0.09
OTTCOS8	0.14	0.18	0.21	0.13	0.27	0.1	0.29	0.07	0.3	0.06
OTTCOS7	0.14	0.18	0.21	0.13	0.27	0.09	0.28	0.07	0.3	0.06
OTTCOS5	0.28	0.34	0.38	0.26	0.5	0.19	0.52	0.14	0.54	0.12
OTTCOS6	0.23	0.28	0.32	0.22	0.41	0.16	0.44	0.12	0.45	0.1
OTTURB7	0.27	0.33	0.38	0.25	0.49	0.18	0.51	0.13	0.53	0.11
OTTURB2	0.28	0.35	0.4	0.26	0.51	0.19	0.54	0.14	0.57	0.12
OTTURB3	0.28	0.35	0.4	0.26	0.51	0.19	0.54	0.14	0.56	0.12
OTTURB4	0.24	0.29	0.33	0.22	0.43	0.16	0.45	0.12	0.47	0.11
OTTURB5	0.14	0.17	0.19	0.13	0.24	0.1	0.26	0.07	0.27	0.06
OTTURB6	0.16	0.2	0.22	0.16	0.29	0.11	0.3	0.09	0.31	0.08
OTTMON2	0.25	0.3	0.34	0.23	0.44	0.17	0.47	0.13	0.48	0.11
OTTMON1	0.17	0.21	0.24	0.16	0.31	0.12	0.32	0.09	0.34	0.08
OTCOS10	0.14	0.17	0.2	0.13	0.25	0.1	0.27	0.07	0.28	0.06
OTCOS11	0.12	0.15	0.17	0.11	0.22	0.08	0.23	0.06	0.24	0.05
OTTURB1	0.15	0.18	0.2	0.14	0.26	0.1	0.28	0.08	0.29	0.07
average	0.19	0.24	0.27	0.18	0.35	0.13	0.37	0.10	0.39	0.09

City: Richmond Hill
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
901427	0.2	0.23	0.26	0.19	0.34	0.12	0.35	0.09	0.37	0.08
900814	0.22	0.26	0.29	0.21	0.38	0.13	0.39	0.1	0.41	0.09
900815	0.19	0.23	0.26	0.18	0.35	0.11	0.35	0.09	0.37	0.07
900918	0.18	0.22	0.25	0.18	0.32	0.11	0.33	0.09	0.35	0.07
901019	0.12	0.15	0.17	0.11	0.24	0.06	0.24	0.05	0.26	0.03
901020	0.14	0.17	0.2	0.13	0.27	0.07	0.28	0.05	0.29	0.04
901121	0.2	0.25	0.29	0.19	0.4	0.11	0.41	0.08	0.43	0.06
901122	0.19	0.23	0.25	0.19	0.32	0.12	0.33	0.1	0.35	0.08
901529	0.2	0.24	0.26	0.19	0.35	0.12	0.35	0.09	0.38	0.08
901326	0.16	0.21	0.24	0.15	0.32	0.09	0.33	0.07	0.35	0.05
901325	0.19	0.22	0.25	0.18	0.32	0.11	0.33	0.09	0.35	0.08
901530	0.25	0.3	0.33	0.24	0.83	0.11	1.05	0.07	1.24	0.05
901428	0.18	0.22	0.24	0.18	0.32	0.11	0.33	0.09	0.34	0.07
901631	0.21	0.26	0.3	0.2	0.41	0.11	0.42	0.09	0.44	0.07
900101	0.24	0.3	0.34	0.23	0.45	0.13	0.46	0.11	0.49	0.08
900102	0.35	0.4	0.45	0.34	1.07	0.16	1.33	0.1	1.56	0.07
900203	0.24	0.28	0.31	0.24	0.71	0.12	0.87	0.08	1.01	0.06
900204	0.31	0.36	0.41	0.3	1.11	0.13	1.42	0.08	1.69	0.05
900305	0.23	0.27	0.3	0.22	0.75	0.1	0.95	0.06	1.12	0.04
900306	0.25	0.3	0.34	0.24	0.91	0.11	1.16	0.06	1.39	0.04
900407	0.29	0.34	0.37	0.28	0.93	0.13	1.17	0.08	1.37	0.06
900408	0.27	0.31	0.35	0.26	0.86	0.12	1.08	0.08	1.27	0.05
900509	0.27	0.31	0.34	0.26	0.78	0.13	0.96	0.09	1.12	0.06
900510	0.21	0.25	0.28	0.2	0.69	0.1	0.87	0.06	1.02	0.04
900611	0.26	0.3	0.33	0.25	0.84	0.11	1.06	0.07	1.25	0.05
900612	0.24	0.28	0.31	0.24	0.75	0.12	0.93	0.07	1.09	0.05
900916	0.31	0.36	0.4	0.3	1	0.14	1.26	0.09	1.48	0.06
900917	0.4	0.47	0.52	0.39	1.27	0.19	1.59	0.12	1.86	0.08
901223	0.19	0.22	0.25	0.19	0.61	0.09	0.77	0.06	0.9	0.04
901224	0.29	0.34	0.37	0.29	0.84	0.15	1.04	0.1	1.2	0.07
average	0.23	0.28	0.31	0.23	0.62	0.12	0.75	0.08	0.86	0.06

City: Winnipeg
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
M901001	0.08	0.1	0.11	0.08	0.14	0.05	0.15	0.03	0.16	0.02
M902001	0.18	0.21	0.22	0.19	0.51	0.09	0.7	0.05	0.95	0.02
M903001	0.12	0.14	0.15	0.12	0.34	0.06	0.48	0.03	0.66	0.01
M904001	0.2	0.23	0.25	0.21	0.55	0.1	0.76	0.06	1.01	0.02
M904002	0.17	0.21	0.22	0.18	0.47	0.09	0.65	0.05	0.86	0.02
M905001	0.21	0.25	0.26	0.23	0.56	0.12	0.75	0.07	0.99	0.02
M905002	0.07	0.08	0.09	0.06	0.11	0.04	0.12	0.03	0.13	0.02
M905003	0.12	0.15	0.17	0.12	0.2	0.08	0.22	0.06	0.23	0.03
M905004	0.06	0.07	0.08	0.05	0.1	0.03	0.11	0.02	0.11	0.01
M905005	0.06	0.07	0.07	0.05	0.09	0.04	0.1	0.03	0.11	0.01
M905006	0.11	0.13	0.15	0.1	0.19	0.07	0.2	0.05	0.21	0.02
M906001	0.22	0.26	0.28	0.23	0.66	0.11	0.93	0.06	1.27	0.02
M907001	0.13	0.15	0.16	0.14	0.34	0.07	0.45	0.05	0.59	0.02
M907002	0.28	0.32	0.34	0.29	0.7	0.16	0.93	0.1	1.2	0.04
M907003	0.3	0.35	0.38	0.31	0.85	0.15	1.19	0.09	1.6	0.03
M907004	0.24	0.28	0.29	0.26	0.56	0.15	0.72	0.1	0.91	0.04
M907005	0.17	0.19	0.2	0.18	0.41	0.1	0.54	0.06	0.7	0.02
M907006	0.17	0.2	0.21	0.18	0.43	0.1	0.56	0.06	0.73	0.02
M908001	0.12	0.14	0.15	0.13	0.33	0.06	0.46	0.04	0.62	0.01
M909001	0.17	0.21	0.24	0.16	0.29	0.1	0.32	0.07	0.33	0.04
average	0.16	0.19	0.20	0.16	0.39	0.09	0.52	0.06	0.67	0.02

City: Regina
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
SA1001	0.18	0.22	0.26	0.17	0.35	0.09	0.36	0.07	0.37	0.03
SA1002	0.07	0.08	0.09	0.06	0.12	0.04	0.12	0.03	0.13	0.01
SA3005	0.11	0.13	0.15	0.1	0.2	0.06	0.2	0.04	0.21	0.02
SA3006	0.16	0.18	0.21	0.14	0.27	0.08	0.29	0.07	0.3	0.03
SA3007	0.08	0.1	0.11	0.07	0.14	0.04	0.15	0.04	0.15	0.02
SA3008	0.25	0.33	0.38	0.23	0.52	0.13	0.53	0.08	0.54	0.04
SA4003	0.12	0.14	0.16	0.11	0.22	0.06	0.22	0.05	0.23	0.02
SA4004	0.14	0.16	0.18	0.12	0.24	0.07	0.25	0.06	0.26	0.03
SA6001	0.11	0.11	0.12	0.1	0.19	0.05	0.21	0.03	0.25	0.01
SA6002	0.17	0.2	0.23	0.15	0.31	0.08	0.32	0.07	0.33	0.03
average	0.14	0.17	0.19	0.13	0.26	0.07	0.27	0.05	0.28	0.02

City: Saskatoon
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
SA2001	0.16	0.19	0.21	0.15	0.3	0.09	0.32	0.07	0.38	0.01
SA2002	0.11	0.11	0.12	0.09	0.2	0.06	0.23	0.05	0.27	0.01
SA3001	0.18	0.2	0.22	0.16	0.32	0.1	0.34	0.07	0.4	0.01
SA3002	0.1	0.11	0.11	0.09	0.18	0.06	0.19	0.04	0.23	0.01
SA3003	0.11	0.12	0.14	0.1	0.18	0.06	0.19	0.05	0.23	0.01
SA3004	0.12	0.13	0.14	0.1	0.2	0.07	0.21	0.05	0.25	0.01
SA4001	0.1	0.13	0.15	0.09	0.19	0.06	0.2	0.04	0.2	0.01
SA4002	0.11	0.12	0.13	0.1	0.2	0.07	0.22	0.05	0.26	0.01
SA5001	0.09	0.11	0.13	0.08	0.16	0.05	0.17	0.04	0.2	0.01
SA5002	0.15	0.17	0.18	0.13	0.28	0.09	0.31	0.06	0.36	0.01
average	0.12	0.14	0.15	0.11	0.22	0.07	0.24	0.05	0.28	0.01

City: Edmonton
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
EDM-01	0.09	0.11	0.13	0.09	0.16	0.07	0.17	0.05	0.19	0.04
EDM-02	0.27	0.32	0.37	0.27	0.45	0.2	0.5	0.17	0.54	0.13
EDM-03	0.17	0.19	0.23	0.17	0.53	0.1	0.8	0.08	0.97	0.06
EDM-04	0.17	0.21	0.24	0.17	0.29	0.12	0.32	0.1	0.35	0.08
EDM-05	0.16	0.19	0.22	0.16	0.27	0.12	0.3	0.09	0.32	0.07
EDM-06	0.2	0.24	0.28	0.19	0.33	0.14	0.37	0.11	0.4	0.09
EDM-07	0.06	0.08	0.1	0.06	0.12	0.04	0.13	0.03	0.14	0.02
EDM-08	0.11	0.14	0.16	0.11	0.19	0.08	0.21	0.06	0.23	0.05
EDM-09	0.22	0.27	0.32	0.21	0.38	0.15	0.41	0.12	0.45	0.09
EDM-10	0.14	0.19	0.23	0.14	0.3	0.09	0.32	0.06	0.33	0.05
average	0.16	0.19	0.23	0.16	0.30	0.11	0.35	0.09	0.39	0.07

City: Vancouver
Leakage Rate, Condition A - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
BC-01	0.56	0.65	0.73	0.59	1.81	0.31	2.5	0.25	3.2	0.14
BC-02	0.22	0.25	0.28	0.23	0.36	0.16	0.41	0.13	0.45	0.07
BC-03	0.54	0.62	0.67	0.56	0.87	0.4	0.99	0.33	1.08	0.19
BC-04	0.19	0.22	0.24	0.2	0.31	0.14	0.36	0.11	0.39	0.06
BC-05	0.19	0.23	0.26	0.2	0.33	0.13	0.38	0.1	0.42	0.05
BC-06	0.24	0.27	0.3	0.25	0.38	0.17	0.44	0.14	0.48	0.08
BC-07	0.41	0.47	0.51	0.42	0.66	0.3	0.75	0.25	0.82	0.14
BC-08	0.36	0.42	0.46	0.38	0.59	0.27	0.68	0.21	0.75	0.12
BC-09	0.26	0.29	0.31	0.27	0.4	0.2	0.45	0.17	0.49	0.11
BC-10	0.13	0.15	0.16	0.13	0.21	0.09	0.24	0.07	0.27	0.04
BC-11	0.35	0.41	0.45	0.37	0.58	0.25	0.67	0.2	0.74	0.11
BC-12	0.22	0.25	0.27	0.23	0.35	0.16	0.41	0.13	0.44	0.07
BC-13	0.3	0.35	0.38	0.31	0.49	0.21	0.56	0.17	0.62	0.09
BC-14	0.19	0.22	0.24	0.2	0.31	0.14	0.36	0.12	0.39	0.06
BC-15	0.26	0.31	0.34	0.27	0.44	0.18	0.5	0.14	0.55	0.08
BC-16	0.4	0.44	0.47	0.41	0.62	0.31	0.69	0.27	0.75	0.17
BC-17	0.36	0.42	0.45	0.37	0.58	0.26	0.67	0.21	0.74	0.12
BC-18	0.31	0.36	0.41	0.33	1	0.18	1.38	0.14	1.78	0.08
BC-19	0.23	0.27	0.3	0.24	0.84	0.12	1.18	0.09	1.54	0.05
BC-20	0.35	0.41	0.47	0.37	1.31	0.18	1.86	0.13	2.42	0.07
average	0.30	0.35	0.39	0.32	0.62	0.21	0.77	0.17	0.92	0.10

City: St. John's
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
F9001001	0.42	0.46	0.54	0.39	1.45	0.16	1.99	0.13	2.44	0.11
F9002001	0.29	0.32	0.38	0.28	1.03	0.11	1.41	0.09	1.73	0.08
F9002002	0.61	0.69	0.83	0.58	2.5	0.21	3.52	0.16	4.43	0.13
F9003001	0.17	0.19	0.21	0.16	0.31	0.11	0.36	0.09	0.4	0.08
F9003002	0.18	0.21	0.23	0.17	0.34	0.12	0.4	0.1	0.45	0.08
F9004001	0.21	0.23	0.26	0.2	0.39	0.14	0.45	0.12	0.49	0.1
F9004002	0.24	0.26	0.29	0.23	0.43	0.16	0.51	0.13	0.56	0.11
F9005001	0.24	0.25	0.27	0.23	0.38	0.16	0.43	0.14	0.47	0.12
F9005002	0.38	0.44	0.53	0.36	1.65	0.12	2.34	0.09	2.97	0.08
F9006001	0.2	0.22	0.24	0.19	0.35	0.14	0.41	0.12	0.45	0.1
average	0.29	0.33	0.38	0.28	0.88	0.14	1.18	0.12	1.44	0.10

City: Halifax
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
N900101	0.21	0.25	0.3	0.19	0.7	0.05	0.97	0.04	1.57	0.01
N900201	0.13	0.16	0.19	0.12	0.23	0.06	0.25	0.05	0.3	0.01
N900102	0.11	0.14	0.16	0.1	0.2	0.05	0.21	0.04	0.26	0.01
N900302	0.13	0.15	0.18	0.11	0.4	0.03	0.55	0.03	0.88	0.01
N900202	0.14	0.17	0.19	0.12	0.24	0.06	0.25	0.05	0.31	0.01
N900203	0.21	0.24	0.27	0.19	0.34	0.1	0.36	0.09	0.44	0.03
N900301	0.26	0.31	0.37	0.23	0.88	0.06	1.25	0.05	2.04	0.01
N900401	0.13	0.15	0.17	0.12	0.21	0.06	0.23	0.05	0.28	0.01
N900501	0.16	0.18	0.22	0.14	0.49	0.04	0.67	0.03	1.06	0.01
N900601	0.09	0.11	0.12	0.08	0.15	0.04	0.17	0.03	0.2	0.01
N900602	0.12	0.15	0.17	0.11	0.21	0.05	0.23	0.04	0.27	0.01
N900603	0.13	0.16	0.19	0.12	0.23	0.06	0.25	0.05	0.3	0.01
N900604	0.19	0.22	0.25	0.18	0.31	0.1	0.33	0.09	0.4	0.03
N900605	0.28	0.34	0.38	0.26	0.48	0.13	0.51	0.12	0.62	0.03
average	0.16	0.20	0.23	0.15	0.36	0.06	0.45	0.05	0.64	0.01

City: Fredericton
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
FRE-01	0.13	0.16	0.19	0.13	0.23	0.09	0.26	0.07	0.28	0.06
FRE-02	0.13	0.15	0.17	0.12	0.21	0.08	0.24	0.07	0.26	0.06
FRE-03	0.08	0.09	0.11	0.08	0.13	0.05	0.15	0.05	0.16	0.04
FRE-04	0.25	0.29	0.33	0.23	0.79	0.12	1.13	0.09	1.37	0.06
FRE-05	0.06	0.07	0.08	0.06	0.1	0.04	0.12	0.03	0.12	0.03
FRE-06	0.07	0.09	0.1	0.07	0.13	0.05	0.14	0.04	0.15	0.03
FRE-07	0.12	0.14	0.16	0.11	0.2	0.08	0.23	0.07	0.25	0.05
FRE-08	0.23	0.29	0.33	0.22	0.41	0.15	0.47	0.13	0.5	0.1
FRE-09	0.18	0.22	0.25	0.17	0.31	0.12	0.35	0.1	0.37	0.08
FRE-10	0.13	0.16	0.19	0.12	0.24	0.08	0.27	0.07	0.28	0.05
average	0.14	0.17	0.19	0.13	0.28	0.09	0.34	0.07	0.37	0.06

City: Quebec
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
Q9005001										
Q9005002										
Q9006001										
Q9006002										
Q9007001										
Q9008001										
Q9008002										
Q9009001										
Q9009002										
Q9009003										
Q9009004										
Q9010001										
Q9011001										
Q9011002										
Q9012001										
Q9013001										
Q9013002										
Q9014001										
Q9014002										
Q9015001										
average										

City: Montreal
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
Q9001001										
Q9001002										
Q9001003										
Q9001004										
Q9001005										
Q9001006										
Q9001007										
Q9001008										
Q9002001										
Q9002002										
Q9003001										
Q9003002										
Q9003003										
Q9003004										
Q9004001										
Q9004002										
Q9004003										
Q9004004										
Q9016001										
Q9016002										
average										

City: Ottawa
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
OTTCOS9	0.15	0.19	0.22	0.14	0.28	0.1	0.3	0.07	0.31	0.06
OTTCOS2	0.17	0.21	0.24	0.16	0.31	0.11	0.32	0.08	0.34	0.07
OTTCOS3	0.2	0.24	0.28	0.19	0.36	0.14	0.38	0.1	0.39	0.09
OTTCOS1	0.14	0.17	0.19	0.13	0.25	0.09	0.26	0.07	0.27	0.06
OTTCOS4	0.19	0.23	0.27	0.18	0.34	0.13	0.36	0.1	0.38	0.08
OTTCOS8	0.14	0.18	0.2	0.13	0.26	0.09	0.28	0.06	0.29	0.05
OTTCOS7	0.14	0.17	0.2	0.13	0.25	0.09	0.27	0.06	0.28	0.05
OTTCOS5	0.27	0.33	0.38	0.25	0.49	0.18	0.52	0.13	0.54	0.12
OTTCOS6	0.22	0.27	0.31	0.21	0.4	0.15	0.42	0.11	0.44	0.1
OTTURB7	0.26	0.31	0.35	0.24	0.46	0.17	0.48	0.13	0.5	0.11
OTTURB2	0.27	0.33	0.38	0.25	0.49	0.18	0.52	0.13	0.54	0.11
OTTURB3	0.27	0.34	0.38	0.25	0.49	0.18	0.52	0.13	0.54	0.12
OTTURB4	0.23	0.28	0.31	0.22	0.41	0.16	0.43	0.12	0.44	0.11
OTTURB5	0.13	0.16	0.18	0.12	0.23	0.09	0.25	0.06	0.26	0.05
OTTURB6	0.16	0.19	0.22	0.15	0.28	0.11	0.3	0.08	0.31	0.08
OTTMON2	0.24	0.29	0.33	0.23	0.43	0.16	0.45	0.12	0.47	0.11
OTTMON1	0.16	0.2	0.22	0.15	0.29	0.11	0.31	0.08	0.32	0.07
OTCOS10	0.14	0.17	0.19	0.13	0.25	0.09	0.26	0.07	0.27	0.06
OTCOS11	0.12	0.15	0.17	0.11	0.21	0.08	0.23	0.06	0.24	0.05
OTTURB1	0.14	0.17	0.2	0.13	0.25	0.09	0.27	0.07	0.28	0.06
average	0.19	0.23	0.26	0.18	0.34	0.13	0.36	0.09	0.37	0.08

City: Richmond Hill
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
901427	0.17	0.21	0.23	0.17	0.3	0.11	0.32	0.08	0.34	0.07
900814	0.2	0.23	0.26	0.19	0.34	0.12	0.36	0.09	0.38	0.07
900815	0.17	0.2	0.22	0.16	0.3	0.1	0.31	0.07	0.33	0.06
900918	0.15	0.18	0.2	0.14	0.26	0.09	0.28	0.07	0.3	0.06
901019	0.1	0.13	0.15	0.09	0.21	0.05	0.21	0.04	0.23	0.03
901020	0.12	0.15	0.17	0.11	0.23	0.06	0.24	0.05	0.26	0.04
901121	0.19	0.23	0.26	0.19	0.35	0.11	0.37	0.08	0.4	0.07
901122	0.19	0.23	0.25	0.19	0.32	0.13	0.33	0.1	0.35	0.09
901529	0.16	0.19	0.22	0.16	0.29	0.1	0.3	0.07	0.32	0.06
901326	0.15	0.18	0.21	0.15	0.29	0.09	0.29	0.06	0.32	0.05
901325	0.15	0.18	0.21	0.15	0.29	0.09	0.29	0.06	0.32	0.05
901530	0.24	0.28	0.31	0.23	0.82	0.11	1.04	0.06	1.22	0.05
901428	0.15	0.18	0.2	0.14	0.27	0.09	0.28	0.07	0.3	0.05
901631	0.17	0.22	0.25	0.16	0.36	0.08	0.37	0.06	0.4	0.04
900101	0.22	0.26	0.29	0.21	0.39	0.13	0.4	0.1	0.43	0.08
900102	0.33	0.37	0.41	0.33	0.9	0.18	1.1	0.11	1.25	0.09
900203	0.22	0.26	0.29	0.22	0.73	0.1	0.92	0.06	1.08	0.05
900204	0.28	0.33	0.37	0.27	0.97	0.12	1.23	0.07	1.45	0.05
900305	0.21	0.24	0.27	0.21	0.68	0.1	0.85	0.06	0.99	0.05
900306	0.23	0.27	0.3	0.23	0.7	0.12	0.87	0.07	1	0.06
900407	0.26	0.31	0.34	0.26	0.94	0.11	1.19	0.07	1.41	0.05
900408	0.26	0.3	0.34	0.25	0.91	0.11	1.16	0.06	1.38	0.05
900509	0.25	0.29	0.32	0.25	0.82	0.12	1.02	0.07	1.19	0.06
900510	0.19	0.22	0.25	0.19	0.68	0.08	0.86	0.05	1.02	0.04
900611	0.24	0.28	0.31	0.23	0.82	0.11	1.03	0.06	1.22	0.05
900612	0.23	0.26	0.3	0.22	0.79	0.1	0.99	0.06	1.17	0.05
900916	0.28	0.32	0.37	0.27	1.06	0.11	1.37	0.06	1.64	0.04
900917	0.37	0.42	0.47	0.37	1.08	0.19	1.33	0.12	1.53	0.1
901223	0.18	0.2	0.23	0.17	0.58	0.08	0.73	0.05	0.85	0.04
901224	0.25	0.29	0.33	0.24	0.92	0.11	1.18	0.06	1.4	0.04
average	0.21	0.25	0.28	0.21	0.59	0.11	0.71	0.07	0.82	0.06

City: Winnipeg
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
M901001	0.1	0.12	0.14	0.1	0.17	0.06	0.18	0.04	0.19	0.03
M902001	0.17	0.21	0.22	0.18	0.54	0.08	0.78	0.04	1.08	0.01
M903001	0.12	0.14	0.15	0.13	0.33	0.06	0.46	0.04	0.62	0.01
M904001	0.22	0.26	0.27	0.23	0.6	0.12	0.83	0.07	1.1	0.02
M904002	0.19	0.23	0.24	0.2	0.51	0.11	0.69	0.06	0.91	0.02
M905001	0.21	0.25	0.27	0.22	0.59	0.11	0.82	0.06	1.1	0.02
M905002	0.07	0.09	0.1	0.07	0.12	0.04	0.13	0.03	0.14	0.02
M905003	0.13	0.16	0.17	0.12	0.21	0.08	0.23	0.06	0.24	0.04
M905004	0.06	0.07	0.08	0.05	0.09	0.04	0.1	0.03	0.11	0.01
M905005	0.05	0.07	0.07	0.05	0.09	0.03	0.1	0.02	0.11	0.01
M905006	0.1	0.12	0.14	0.09	0.17	0.06	0.19	0.04	0.19	0.02
M906001	0.22	0.27	0.3	0.24	0.76	0.1	1.14	0.05	1.61	0.01
M907001	0.12	0.15	0.15	0.13	0.33	0.07	0.45	0.04	0.59	0.01
M907002	0.26	0.3	0.32	0.27	0.67	0.14	0.9	0.09	1.17	0.03
M907003	0.34	0.39	0.41	0.36	0.87	0.19	1.17	0.11	1.53	0.04
M907004	0.24	0.27	0.28	0.25	0.52	0.15	0.65	0.1	0.81	0.05
M907005	0.16	0.19	0.2	0.17	0.4	0.1	0.53	0.06	0.68	0.02
M907006	0.17	0.2	0.21	0.18	0.42	0.1	0.55	0.06	0.7	0.02
M908001	0.1	0.12	0.13	0.11	0.27	0.06	0.36	0.03	0.48	0.01
M909001	0.05	0.06	0.07	0.05	0.08	0.03	0.09	0.02	0.09	0.01
average	0.15	0.18	0.20	0.16	0.39	0.09	0.52	0.05	0.67	0.02

City: Regina
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
SA1001	0.19	0.23	0.25	0.18	0.33	0.11	0.33	0.09	0.35	0.04
SA1002	0.07	0.09	0.1	0.07	0.12	0.04	0.13	0.03	0.14	0.02
SA3005	0.11	0.14	0.16	0.11	0.21	0.06	0.21	0.05	0.22	0.03
SA3006	0.16	0.19	0.21	0.15	0.28	0.09	0.29	0.07	0.31	0.03
SA3007	0.09	0.1	0.11	0.08	0.15	0.05	0.15	0.04	0.16	0.02
SA3008	0.27	0.36	0.43	0.24	0.61	0.13	0.62	0.07	0.63	0.03
SA4003	0.13	0.15	0.17	0.12	0.23	0.07	0.23	0.05	0.24	0.03
SA4004	0.15	0.18	0.2	0.14	0.27	0.08	0.27	0.06	0.29	0.03
SA6001	0.12	0.13	0.14	0.11	0.21	0.06	0.24	0.04	0.27	0.01
SA6002	0.18	0.22	0.25	0.16	0.33	0.09	0.34	0.07	0.36	0.03
average	0.15	0.18	0.20	0.14	0.27	0.08	0.28	0.06	0.30	0.03

City: Saskatoon
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
SA2001	0.18	0.2	0.22	0.16	0.32	0.1	0.34	0.07	0.4	0.01
SA2002	0.13	0.14	0.15	0.12	0.24	0.07	0.27	0.06	0.32	0.01
SA3001	0.18	0.2	0.22	0.16	0.32	0.11	0.35	0.08	0.41	0.01
SA3002	0.12	0.13	0.14	0.11	0.21	0.07	0.23	0.06	0.27	0.01
SA3003	0.13	0.14	0.16	0.11	0.21	0.08	0.23	0.06	0.26	0.01
SA3004	0.14	0.15	0.16	0.12	0.23	0.08	0.25	0.06	0.29	0.01
SA4001	0.12	0.15	0.17	0.11	0.22	0.07	0.22	0.05	0.23	0.01
SA4002	0.13	0.14	0.15	0.12	0.23	0.08	0.25	0.06	0.3	0.01
SA5001	0.09	0.11	0.12	0.08	0.15	0.05	0.16	0.04	0.19	0.01
SA5002	0.15	0.16	0.18	0.13	0.27	0.09	0.3	0.06	0.35	0.01
average	0.14	0.15	0.17	0.12	0.24	0.08	0.26	0.06	0.30	0.01

City: Edmonton
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
EDM-01	0.12	0.15	0.17	0.12	0.2	0.09	0.23	0.08	0.25	0.06
EDM-02	0.31	0.34	0.38	0.3	0.47	0.23	0.54	0.21	0.58	0.17
EDM-03	0.22	0.24	0.28	0.21	0.66	0.12	0.99	0.1	1.2	0.07
EDM-04	0.18	0.21	0.25	0.17	0.3	0.13	0.33	0.1	0.36	0.08
EDM-05	0.17	0.2	0.24	0.17	0.28	0.13	0.32	0.1	0.35	0.08
EDM-06	0.22	0.26	0.3	0.21	0.36	0.16	0.4	0.13	0.44	0.1
EDM-07	0.08	0.1	0.12	0.08	0.14	0.06	0.15	0.04	0.17	0.03
EDM-08	0.14	0.16	0.19	0.13	0.23	0.1	0.26	0.08	0.28	0.06
EDM-09	0.23	0.28	0.34	0.23	0.41	0.16	0.44	0.13	0.48	0.09
EDM-10	0.15	0.18	0.22	0.14	0.28	0.1	0.3	0.07	0.31	0.05
average	0.18	0.21	0.25	0.18	0.33	0.13	0.40	0.10	0.44	0.08

City: Vancouver
Leakage Rate, Condition B - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
BC-01	0.51	0.59	0.68	0.53	1.95	0.25	2.75	0.19	3.56	0.09
BC-02	0.16	0.19	0.21	0.17	0.29	0.11	0.33	0.09	0.37	0.05
BC-03	0.48	0.54	0.58	0.5	0.81	0.35	0.92	0.28	1.02	0.16
BC-04	0.18	0.2	0.22	0.18	0.3	0.13	0.35	0.1	0.38	0.06
BC-05	0.15	0.17	0.19	0.15	0.26	0.1	0.3	0.08	0.34	0.04
BC-06	0.19	0.22	0.24	0.2	0.33	0.14	0.39	0.11	0.43	0.06
BC-07	0.33	0.38	0.41	0.35	0.57	0.24	0.66	0.19	0.73	0.1
BC-08	0.35	0.4	0.42	0.36	0.59	0.25	0.68	0.2	0.75	0.11
BC-09	0.19	0.22	0.23	0.19	0.32	0.13	0.38	0.1	0.42	0.05
BC-10	0.12	0.14	0.15	0.12	0.21	0.08	0.24	0.07	0.27	0.03
BC-11	0.29	0.34	0.37	0.3	0.51	0.2	0.59	0.16	0.66	0.08
BC-12	0.19	0.21	0.23	0.2	0.32	0.14	0.36	0.12	0.4	0.07
BC-13	0.27	0.31	0.34	0.28	0.47	0.19	0.54	0.15	0.61	0.08
BC-14	0.22	0.25	0.27	0.23	0.38	0.16	0.43	0.13	0.48	0.07
BC-15	0.21	0.25	0.27	0.22	0.37	0.15	0.43	0.12	0.47	0.06
BC-16	0.24	0.27	0.29	0.25	0.4	0.18	0.46	0.15	0.51	0.08
BC-17	0.3	0.35	0.38	0.31	0.53	0.21	0.61	0.16	0.68	0.08
BC-18	0.29	0.34	0.39	0.3	1.11	0.14	1.57	0.11	2.04	0.05
BC-19	0.21	0.24	0.28	0.22	0.83	0.1	1.17	0.08	1.53	0.04
BC-20	0.35	0.41	0.47	0.37	1.27	0.18	1.77	0.14	2.27	0.07
average	0.26	0.30	0.33	0.27	0.59	0.17	0.75	0.14	0.90	0.07

City: St. John's
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
F9001001	0.38	0.41	0.47	0.36	1.13	0.17	1.48	0.14	1.8	0.13
F9002001										
F9002002										
F9003001										
F9003002										
F9004001	0.23	0.26	0.29	0.22	0.41	0.16	0.47	0.14	0.51	0.12
F9004002										
F9005001										
F9005002										
F9006001										
average	0.31	0.34	0.38	0.29	0.77	0.17	0.98	0.14	1.16	0.13

City: Halifax
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
N900101	0.21	0.25	0.29	0.19	0.62	0.06	0.85	0.05	1.35	0.01
N900201	0.15	0.18	0.21	0.14	0.26	0.07	0.27	0.06	0.33	0.02
N900102	0.14	0.16	0.19	0.12	0.24	0.06	0.25	0.05	0.28	0.01
N900302	0.16	0.18	0.21	0.14	0.41	0.05	0.54	0.05	0.82	0.02
N900202	0.17	0.21	0.24	0.16	0.3	0.08	0.31	0.07	0.36	0.02
N900203	0.21	0.25	0.28	0.19	0.36	0.1	0.38	0.09	0.46	0.02
N900301	0.3	0.35	0.41	0.28	0.79	0.1	1.04	0.09	1.58	0.03
N900401	0.15	0.17	0.19	0.13	0.24	0.07	0.26	0.06	0.31	0.02
N900501	0.18	0.21	0.24	0.16	0.51	0.05	0.7	0.04	1.11	0.01
N900601	0.24	0.28	0.32	0.22	0.39	0.11	0.41	0.1	0.48	0.03
N900602	0.14	0.17	0.2	0.12	0.24	0.06	0.26	0.05	0.29	0.01
N900603	0.15	0.18	0.21	0.13	0.26	0.06	0.28	0.05	0.31	0.01
N900604	0.21	0.25	0.28	0.2	0.33	0.11	0.35	0.1	0.41	0.04
N900605	0.29	0.36	0.42	0.26	0.53	0.12	0.56	0.11	0.63	0.03
average	0.19	0.23	0.26	0.17	0.39	0.08	0.46	0.07	0.62	0.02

City: Fredericton
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
FRE-01	0.17	0.19	0.22	0.16	0.27	0.11	0.31	0.1	0.33	0.08
FRE-02	0.13	0.16	0.18	0.13	0.22	0.09	0.25	0.08	0.26	0.06
FRE-03	0.1	0.12	0.14	0.09	0.17	0.07	0.18	0.06	0.19	0.05
FRE-04	0.26	0.3	0.34	0.24	0.77	0.13	1.08	0.1	1.3	0.07
FRE-05	0.08	0.09	0.1	0.07	0.13	0.05	0.14	0.05	0.15	0.04
FRE-06	0.1	0.13	0.15	0.1	0.18	0.07	0.2	0.06	0.2	0.05
FRE-07	0.15	0.18	0.21	0.14	0.25	0.1	0.27	0.09	0.29	0.07
FRE-08	0.24	0.3	0.35	0.23	0.43	0.16	0.49	0.13	0.52	0.1
FRE-09	0.23	0.28	0.32	0.21	0.4	0.15	0.43	0.13	0.44	0.1
FRE-10	0.15	0.19	0.23	0.14	0.29	0.1	0.31	0.08	0.32	0.07
average	0.16	0.19	0.22	0.15	0.31	0.10	0.37	0.09	0.40	0.07

City: Quebec
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
Q9005001	0.21	0.28	0.34	0.21	1.12	0.04	1.56	0.03	2.13	0
Q9005002	0.24	0.31	0.37	0.25	1.03	0.06	1.38	0.04	1.83	0
Q9006001	0.23	0.28	0.33	0.23	0.84	0.07	1.09	0.05	1.4	0
Q9006002	0.25	0.32	0.37	0.25	1.04	0.06	1.38	0.05	1.83	0
Q9007001	0.2	0.27	0.33	0.21	1.04	0.04	1.44	0.03	1.96	0
Q9008001	0.27	0.34	0.39	0.27	1.01	0.08	1.31	0.06	1.69	0
Q9008002	0.22	0.29	0.34	0.22	1.01	0.05	1.37	0.04	1.84	0
Q9009001	0.17	0.22	0.27	0.17	0.92	0.03	1.29	0.02	1.77	0
Q9009002	0.17	0.22	0.27	0.17	0.78	0.04	1.06	0.03	1.42	0
Q9009003	0.31	0.41	0.48	0.31	1.4	0.07	1.89	0.05	2.55	0
Q9009004	0.17	0.22	0.26	0.17	0.77	0.04	1.05	0.03	1.41	0
Q9010001	0.24	0.3	0.36	0.24	0.94	0.07	1.23	0.05	1.61	0
Q9011001	0.21	0.27	0.33	0.21	1	0.05	1.36	0.03	1.84	0
Q9011002	0.2	0.25	0.3	0.2	0.89	0.05	1.2	0.03	1.61	0
Q9012001	0.29	0.37	0.42	0.3	1.01	0.09	1.3	0.07	1.66	0
Q9013001	0.26	0.34	0.41	0.27	1.19	0.06	1.61	0.04	2.16	0
Q9013002	0.16	0.21	0.25	0.17	0.73	0.04	0.97	0.03	1.3	0
Q9014001	0.15	0.19	0.23	0.15	0.64	0.04	0.85	0.03	1.13	0
Q9014002	0.14	0.17	0.2	0.14	0.51	0.04	0.66	0.03	0.86	0
Q9015001	0.23	0.29	0.35	0.23	0.97	0.06	1.29	0.04	1.71	0
average	0.22	0.28	0.33	0.22	0.94	0.05	1.26	0.04	1.69	0.00

City: Montreal
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
Q9001001	0.19	0.24	0.29	0.17	0.61	0.05	1.01	0.03	1.22	0.02
Q9001002	0.21	0.27	0.33	0.19	0.68	0.06	1.11	0.04	1.35	0.03
Q9001003	0.2	0.26	0.32	0.18	0.7	0.05	1.19	0.03	1.45	0.02
Q9001004	0.22	0.28	0.35	0.2	0.79	0.05	1.35	0.03	1.66	0.02
Q9001005	0.2	0.25	0.31	0.17	0.69	0.05	1.16	0.03	1.43	0.02
Q9001006	0.23	0.3	0.37	0.21	0.76	0.06	1.27	0.04	1.55	0.03
Q9001007	0.12	0.16	0.19	0.11	0.42	0.03	0.71	0.02	0.86	0.01
Q9001008	0.14	0.17	0.21	0.13	0.44	0.04	0.71	0.03	0.86	0.02
Q9002001	0.3	0.38	0.47	0.27	0.98	0.08	1.63	0.05	1.98	0.03
Q9002002	0.27	0.35	0.43	0.25	0.9	0.07	1.51	0.05	1.83	0.03
Q9003001	0.4	0.51	0.61	0.37	1.2	0.12	1.93	0.08	2.34	0.06
Q9003002	0.28	0.35	0.44	0.25	0.93	0.07	1.55	0.05	1.89	0.03
Q9003003	0.23	0.3	0.38	0.21	0.86	0.05	1.48	0.03	1.83	0.02
Q9003004	0.31	0.39	0.48	0.28	0.95	0.09	1.55	0.06	1.89	0.04
Q9004001	0.15	0.19	0.24	0.14	0.5	0.04	0.83	0.02	1.01	0.02
Q9004002	0.34	0.43	0.54	0.31	1.15	0.08	1.93	0.05	2.34	0.04
Q9004003	0.33	0.4	0.48	0.3	0.89	0.11	1.38	0.08	1.65	0.06
Q9004004	0.26	0.32	0.4	0.23	0.85	0.06	1.43	0.04	1.74	0.03
Q9016001	0.22	0.27	0.33	0.19	0.65	0.06	1.05	0.04	1.29	0.03
Q9016002	0.25	0.31	0.37	0.23	0.69	0.09	1.08	0.06	1.29	0.04
average	0.24	0.31	0.38	0.22	0.78	0.07	1.29	0.04	1.57	0.03

City: Ottawa
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
OTTCOS9	0.19	0.24	0.27	0.17	0.34	0.13	0.35	0.1	0.36	0.08
OTTCOS2	0.22	0.27	0.31	0.2	0.39	0.15	0.4	0.11	0.41	0.09
OTTCOS3	0.23	0.29	0.33	0.22	0.41	0.16	0.42	0.12	0.43	0.1
OTTCOS1	0.17	0.22	0.25	0.16	0.31	0.12	0.32	0.09	0.33	0.07
OTTCOS4	0.24	0.3	0.34	0.23	0.42	0.17	0.44	0.14	0.45	0.11
OTTCOS8	0.19	0.23	0.27	0.17	0.33	0.13	0.34	0.1	0.35	0.08
OTTCOS7	0.18	0.23	0.27	0.16	0.34	0.12	0.35	0.09	0.36	0.07
OTTCOS5	0.33	0.41	0.47	0.31	0.58	0.23	0.6	0.18	0.62	0.14
OTTCOS6	0.27	0.34	0.39	0.25	0.49	0.19	0.51	0.14	0.52	0.12
OTTURB7	0.32	0.39	0.43	0.3	0.53	0.23	0.56	0.18	0.58	0.15
OTTURB2	0.31	0.38	0.43	0.29	0.54	0.22	0.56	0.17	0.58	0.14
OTTURB3	0.33	0.41	0.47	0.31	0.58	0.23	0.6	0.18	0.62	0.15
OTTURB4	0.29	0.36	0.41	0.28	0.51	0.21	0.53	0.16	0.55	0.13
OTTURB5	0.16	0.2	0.23	0.15	0.28	0.12	0.29	0.09	0.3	0.07
OTTURB6	0.19	0.24	0.26	0.18	0.32	0.14	0.34	0.11	0.35	0.09
OTTMON2	0.28	0.35	0.4	0.26	0.49	0.2	0.51	0.15	0.52	0.12
OTTMON1	0.2	0.25	0.28	0.19	0.35	0.14	0.36	0.11	0.38	0.09
OTCOS10	0.16	0.2	0.23	0.15	0.29	0.11	0.3	0.08	0.3	0.07
OTCOS11	0.15	0.19	0.21	0.14	0.26	0.11	0.27	0.08	0.28	0.07
OTTURB1	0.17	0.21	0.24	0.16	0.3	0.12	0.31	0.09	0.32	0.07
average	0.23	0.29	0.32	0.21	0.40	0.16	0.42	0.12	0.43	0.10

City: Richmond Hill
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
901427	0.2	0.24	0.27	0.19	0.35	0.12	0.36	0.09	0.38	0.08
900814	0.22	0.27	0.3	0.21	0.4	0.13	0.41	0.1	0.44	0.08
900815	0.19	0.23	0.27	0.18	0.36	0.11	0.36	0.09	0.38	0.07
900918	0.19	0.22	0.25	0.18	0.33	0.11	0.34	0.09	0.36	0.07
901019	0.14	0.17	0.19	0.13	0.25	0.08	0.26	0.06	0.27	0.05
901020	0.13	0.17	0.2	0.12	0.28	0.07	0.29	0.05	0.3	0.03
901121	0.23	0.28	0.32	0.22	0.42	0.14	0.43	0.11	0.45	0.09
901122	0.19	0.22	0.25	0.18	0.32	0.12	0.33	0.09	0.35	0.08
901529	0.2	0.24	0.27	0.19	0.36	0.12	0.36	0.09	0.39	0.08
901326	0.2	0.23	0.26	0.19	0.34	0.12	0.35	0.09	0.37	0.08
901325	0.19	0.23	0.25	0.18	0.33	0.11	0.34	0.09	0.36	0.08
901530	0.27	0.32	0.35	0.26	0.91	0.12	1.15	0.07	1.36	0.05
901428	0.17	0.21	0.24	0.16	0.32	0.09	0.33	0.07	0.35	0.06
901631	0.23	0.27	0.3	0.22	0.41	0.13	0.42	0.1	0.45	0.08
900101	0.25	0.31	0.35	0.24	0.47	0.14	0.48	0.11	0.5	0.09
900102	0.38	0.45	0.5	0.37	1.22	0.18	1.53	0.11	1.79	0.08
900203	0.25	0.29	0.32	0.24	0.76	0.12	0.95	0.08	1.1	0.05
900204	0.31	0.37	0.41	0.3	1.02	0.14	1.28	0.09	1.51	0.06
900305	0.24	0.28	0.31	0.23	0.73	0.11	0.91	0.07	1.06	0.05
900306	0.26	0.31	0.35	0.25	0.93	0.11	1.18	0.07	1.41	0.04
900407	0.29	0.34	0.38	0.28	0.97	0.13	1.22	0.08	1.43	0.06
900408	0.29	0.34	0.38	0.28	0.93	0.14	1.16	0.09	1.36	0.06
900509	0.29	0.34	0.38	0.28	1.02	0.12	1.3	0.07	1.55	0.05
900510	0.22	0.26	0.29	0.21	0.71	0.1	0.89	0.06	1.04	0.04
900611	0.27	0.31	0.34	0.27	0.73	0.14	0.88	0.1	1.01	0.08
900612	0.26	0.3	0.34	0.26	0.77	0.13	0.95	0.09	1.1	0.06
900916	0.32	0.38	0.42	0.31	1.05	0.14	1.32	0.09	1.56	0.06
900917	0.41	0.48	0.53	0.4	1.26	0.2	1.56	0.13	1.82	0.09
901223	0.21	0.25	0.28	0.21	0.66	0.1	0.82	0.07	0.95	0.05
901224	0.31	0.35	0.4	0.3	1.04	0.14	1.31	0.08	1.55	0.06
average	0.24	0.29	0.32	0.23	0.66	0.12	0.78	0.09	0.90	0.07

City: Winnipeg
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
M901001	0.13	0.15	0.17	0.13	0.21	0.09	0.23	0.07	0.24	0.04
M902001	0.21	0.26	0.27	0.22	0.67	0.1	0.98	0.05	1.36	0.01
M903001	0.15	0.17	0.18	0.15	0.36	0.08	0.48	0.05	0.63	0.02
M904001	0.23	0.27	0.28	0.24	0.6	0.13	0.8	0.08	1.05	0.03
M904002	0.22	0.25	0.27	0.23	0.58	0.12	0.79	0.07	1.04	0.02
M905001	0.23	0.27	0.28	0.24	0.63	0.12	0.86	0.07	1.14	0.02
M905002	0.09	0.11	0.12	0.08	0.15	0.06	0.16	0.04	0.17	0.02
M905003	0.15	0.19	0.21	0.15	0.26	0.1	0.29	0.07	0.3	0.04
M905004	0.08	0.1	0.11	0.08	0.13	0.06	0.14	0.04	0.15	0.03
M905005	0.08	0.09	0.1	0.08	0.12	0.06	0.14	0.04	0.15	0.03
M905006	0.18	0.22	0.24	0.18	0.29	0.12	0.32	0.09	0.34	0.05
M906001	0.22	0.25	0.26	0.23	0.46	0.15	0.58	0.1	0.71	0.05
M907001	0.16	0.19	0.2	0.16	0.38	0.09	0.5	0.06	0.65	0.02
M907002	0.31	0.37	0.4	0.32	0.79	0.17	1.05	0.1	1.37	0.04
M907003	0.37	0.43	0.45	0.39	0.97	0.2	1.31	0.12	1.73	0.04
M907004	0.28	0.33	0.35	0.29	0.63	0.17	0.81	0.11	1.01	0.05
M907005	0.19	0.22	0.23	0.2	0.46	0.11	0.61	0.07	0.78	0.03
M907006	0.22	0.27	0.29	0.23	0.61	0.11	0.85	0.06	1.14	0.02
M908001	0.15	0.17	0.18	0.16	0.38	0.08	0.51	0.05	0.66	0.02
M909001	0.18	0.23	0.26	0.16	0.34	0.09	0.36	0.06	0.37	0.03
average	0.19	0.23	0.24	0.20	0.45	0.11	0.59	0.07	0.75	0.03

City: Regina
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
SA1001	0.23	0.26	0.29	0.21	0.38	0.13	0.39	0.11	0.41	0.05
SA1002	0.1	0.11	0.12	0.09	0.16	0.05	0.17	0.04	0.18	0.02
SA3005	0.15	0.19	0.21	0.14	0.28	0.09	0.28	0.06	0.29	0.04
SA3006	0.19	0.22	0.24	0.17	0.32	0.1	0.34	0.08	0.36	0.04
SA3007	0.11	0.13	0.15	0.1	0.19	0.06	0.2	0.05	0.21	0.02
SA3008	0.28	0.36	0.41	0.26	0.56	0.15	0.57	0.1	0.58	0.05
SA4003	0.17	0.21	0.24	0.15	0.31	0.09	0.32	0.07	0.33	0.04
SA4004	0.18	0.21	0.24	0.16	0.31	0.1	0.32	0.08	0.34	0.04
SA6001	0.14	0.15	0.16	0.13	0.26	0.07	0.28	0.04	0.33	0.01
SA6002	0.22	0.26	0.29	0.21	0.38	0.12	0.39	0.1	0.42	0.05
average	0.177	0.21	0.235	0.162	0.315	0.096	0.326	0.073	0.345	0.036

City: Saskatoon
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
SA2001	0.21	0.24	0.27	0.19	0.38	0.13	0.41	0.09	0.49	0.02
SA2002	0.15	0.16	0.17	0.13	0.28	0.08	0.31	0.06	0.37	0.01
SA3001	0.23	0.25	0.27	0.21	0.39	0.15	0.43	0.11	0.5	0.02
SA3002	0.16	0.17	0.18	0.14	0.27	0.1	0.3	0.07	0.35	0.01
SA3003	0.15	0.17	0.18	0.13	0.25	0.09	0.26	0.07	0.31	0.01
SA3004	0.17	0.19	0.21	0.16	0.3	0.11	0.32	0.08	0.37	0.02
SA4001	0.16	0.19	0.22	0.14	0.27	0.09	0.28	0.07	0.29	0.02
SA4002	0.17	0.19	0.2	0.16	0.3	0.11	0.34	0.08	0.39	0.02
SA5001	0.12	0.14	0.15	0.11	0.2	0.07	0.21	0.05	0.24	0.01
SA5002	0.21	0.25	0.28	0.19	0.36	0.13	0.37	0.09	0.43	0.02
average	0.17	0.20	0.21	0.16	0.30	0.11	0.32	0.08	0.37	0.02

City: Edmonton
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
EDM-01	0.16	0.19	0.23	0.16	0.27	0.11	0.3	0.09	0.33	0.07
EDM-02	0.26	0.32	0.38	0.25	0.47	0.18	0.5	0.14	0.54	0.1
EDM-03	0.28	0.3	0.36	0.27	0.82	0.16	1.22	0.13	1.47	0.09
EDM-04	0.2	0.24	0.27	0.2	0.33	0.15	0.37	0.12	0.4	0.1
EDM-05	0.19	0.22	0.26	0.19	0.31	0.14	0.35	0.12	0.38	0.09
EDM-06	0.26	0.29	0.33	0.25	0.4	0.19	0.46	0.17	0.5	0.13
EDM-07	0.09	0.12	0.14	0.09	0.17	0.07	0.18	0.05	0.2	0.04
EDM-08	0.16	0.2	0.23	0.16	0.27	0.12	0.31	0.1	0.33	0.08
EDM-09	0.24	0.3	0.36	0.24	0.43	0.17	0.46	0.13	0.51	0.1
EDM-10	0.17	0.21	0.25	0.16	0.3	0.11	0.32	0.09	0.35	0.06
average	0.20	0.24	0.28	0.20	0.38	0.14	0.45	0.11	0.50	0.09

City: Vancouver
Leakage Rate, Condition C - ach

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly
BC-01	0.59	0.69	0.77	0.63	1.91	0.34	2.64	0.27	3.39	0.15
BC-02	0.23	0.27	0.29	0.24	0.37	0.17	0.43	0.13	0.47	0.08
BC-03	0.61	0.69	0.73	0.63	0.95	0.46	1.08	0.39	1.18	0.23
BC-04	0.2	0.24	0.27	0.21	0.35	0.14	0.4	0.11	0.45	0.06
BC-05	0.21	0.25	0.27	0.22	0.35	0.15	0.4	0.12	0.44	0.07
BC-06	0.25	0.28	0.3	0.26	0.4	0.19	0.45	0.16	0.49	0.1
BC-07	0.41	0.47	0.51	0.43	0.66	0.3	0.76	0.25	0.83	0.14
BC-08	0.39	0.46	0.5	0.41	0.64	0.28	0.74	0.23	0.81	0.13
BC-09	0.27	0.32	0.34	0.29	0.44	0.2	0.51	0.17	0.56	0.09
BC-10	0.17	0.2	0.21	0.18	0.27	0.12	0.31	0.1	0.35	0.06
BC-11	0.46	0.55	0.6	0.48	0.78	0.32	0.89	0.25	0.99	0.13
BC-12	0.14	0.17	0.18	0.15	0.23	0.1	0.27	0.08	0.29	0.05
BC-13	0.37	0.43	0.46	0.39	0.6	0.28	0.68	0.23	0.75	0.13
BC-14	0.21	0.25	0.26	0.22	0.34	0.16	0.39	0.13	0.43	0.08
BC-15	0.27	0.33	0.36	0.29	0.46	0.2	0.53	0.16	0.58	0.08
BC-16	0.38	0.44	0.47	0.4	0.61	0.29	0.7	0.24	0.76	0.14
BC-17	0.32	0.39	0.43	0.34	0.55	0.23	0.63	0.18	0.7	0.09
BC-18	0.33	0.39	0.44	0.35	1.14	0.18	1.6	0.14	2.05	0.08
BC-19	0.24	0.28	0.32	0.26	0.87	0.13	1.22	0.1	1.58	0.05
BC-20	0.4	0.46	0.52	0.42	1.34	0.22	1.88	0.17	2.41	0.09
average	0.3225	0.378	0.4115	0.34	0.663	0.223	0.8255	0.1805	0.9755	0.1015

APPENDIX 5

NORMALIZED LEAKAGE AREAS

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
St. John's	F9001001	1.695	1.695	1.889
St. John's	F9002001	1.273	1.273	
St. John's	F9002002	2.142	2.142	
St. John's	F9003001	1.254	1.254	
St. John's	F9003002	1.400	1.400	
St. John's	F9004001	1.908	1.908	1.949
St. John's	F9004002	2.157	2.157	
St. John's	F9005001	2.093	2.093	
St. John's	F9005002	1.347	1.347	
St. John's	F9006001	1.527	1.527	
average		1.680	1.680	1.919

ST. JOHN'S	
MIN A	1.254
MAXA	2.157
MINB	1.254
MAXB	2.157
MINC	1.889
MAXC	1.949

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Halifax	N900101	1.141	1.103	1.141
Halifax	N900201	1.228	1.265	1.489
Halifax	N900102	1.082	1.082	1.201
Halifax	N900302	0.701	0.673	0.995
Halifax	N900202	1.321	1.196	1.415
Halifax	N900203	1.980	1.980	1.969
Halifax	N900301	0.944	0.944	1.483
Halifax	N900401	0.988	0.969	1.096
Halifax	N900501	1.067	0.972	1.086
Halifax	N900601	1.796	1.796	2.263
Halifax	N900602	1.038	1.038	1.116
Halifax	N900603	1.382	1.382	1.358
Halifax	N900604	2.109	2.109	2.200
Halifax	N900605	2.324	2.299	2.059
average		1.364	1.344	1.491

HALIFAX	
MIN A	0.701
MAXA	2.324
MINB	0.673
MAXB	2.299
MINC	0.995
MAXC	2.263

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Fredericton	FRE-01	1.009	1.023	1.340
Fredericton	FRE-02	1.339	1.229	1.339
Fredericton	FRE-03	0.783	0.729	0.836
Fredericton	FRE-04	1.697	1.636	1.828
Fredericton	FRE-05	0.992	0.715	0.992
Fredericton	FRE-06	0.850	0.806	1.024
Fredericton	FRE-07	1.378	1.285	1.500
Fredericton	FRE-08	2.204	2.117	2.204
Fredericton	FRE-09	2.997	2.793	3.123
Fredericton	FRE-10	1.039	0.969	1.039
average		1.429	1.330	1.523

FREDERICTON	
MIN A	0.783
MAXA	2.997
MINB	0.715
MAXB	2.793
MINC	0.836
MAXC	3.123

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Quebec	Q9005001	1.000		1.000
Quebec	Q9005002	1.275		1.275
Quebec	Q9006001	1.272		1.272
Quebec	Q9006002	1.204		1.204
Quebec	Q9007001	0.935		0.979
Quebec	Q9008001	1.575		1.575
Quebec	Q9008002	0.979		1.084
Quebec	Q9009001	0.896		0.896
Quebec	Q9009002	0.991		0.986
Quebec	Q9009003	1.393		1.443
Quebec	Q9009004	1.873		0.892
Quebec	Q9010001	1.403		1.435
Quebec	Q9011001	0.932		0.932
Quebec	Q9011002	0.968		0.968
Quebec	Q9012001	1.933		2.033
Quebec	Q9013001	1.426		1.457
Quebec	Q9013002	1.008		1.008
Quebec	Q9014001	0.779		0.779
Quebec	Q9014002	0.836		0.836
Quebec	Q9015001	1.094		1.433
average		1.189		1.174

QUEBEC CITY	
MIN A	0.779
MAXA	1.933
MINB	
MAXB	
MINC	0.779
MAXC	2.033

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Montreal	Q9001001	0.907		0.962
Montreal	Q9001002	1.177		1.296
Montreal	Q9001003	1.042		1.085
Montreal	Q9001004	1.086		1.094
Montreal	Q9001005	0.930		0.930
Montreal	Q9001006	1.206		1.227
Montreal	Q9001007	0.647		0.647
Montreal	Q9001008	0.817		0.817
Montreal	Q9002001	1.646		1.708
Montreal	Q9002002	1.698		1.698
Montreal	Q9003001	2.330		2.330
Montreal	Q9003002	1.463		1.463
Montreal	Q9003003	1.187		1.187
Montreal	Q9003004	1.431		1.754
Montreal	Q9004001	0.597		0.880
Montreal	Q9004002	1.549		1.739
Montreal	Q9004003	1.877		1.877
Montreal	Q9004004	1.286		1.323
Montreal	Q9016001	1.267		1.267
Montreal	Q9016002	1.682		1.682
average		1.291		1.348

MONTREAL	
MIN A	0.597
MAXA	2.330
MINB	
MAXB	
MINC	0.647
MAXC	2.330

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Ottawa	OTTCOS9	1.646	1.600	1.884
Ottawa	OTTCOS2	1.996	1.855	2.200
Ottawa	OTTCOS3	2.730	2.561	2.629
Ottawa	OTTCOS1	1.645	1.604	1.836
Ottawa	OTTCOS4	2.212	2.069	2.492
Ottawa	OTTCOS8	1.653	1.581	2.032
Ottawa	OTTCOS7	1.415	1.358	1.646
Ottawa	OTTCOS5	2.770	2.663	2.988
Ottawa	OTTCOS6	2.376	2.259	2.559
Ottawa	OTTURB7	2.790	2.748	3.241
Ottawa	OTTURB2	2.751	2.584	2.872
Ottawa	OTTURB3	2.543	2.461	2.828
Ottawa	OTTURB4	2.539	2.495	2.922
Ottawa	OTTURB5	1.711	1.513	1.882
Ottawa	OTTURB6	1.955	1.914	2.162
Ottawa	OTTMON2	2.159	2.082	2.202
Ottawa	OTTMON1	2.023	1.956	2.206
Ottawa	OTCOS10	1.644	1.583	1.703
Ottawa	OTCOS11	1.409	1.382	1.686
Ottawa	OTTURB1	1.709	1.536	1.729
average		2.084	1.990	2.285

OTTAWA	
MIN A	1.409
MAXA	2.790
MINB	1.358
MAXB	2.748
MINC	1.646
MAXC	3.241

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Richmond Hill	901427	2.101	2.005	2.135
Richmond Hill	900814	2.190	2.159	2.179
Richmond Hill	900815	2.154	1.980	2.115
Richmond Hill	900918	1.867	1.610	1.676
Richmond Hill	901019	1.179	1.112	1.470
Richmond Hill	901020	1.424	1.388	1.366
Richmond Hill	901121	2.017	2.023	2.299
Richmond Hill	901122	1.983	2.026	1.938
Richmond Hill	901529	2.182	1.923	2.199
Richmond Hill	901326	1.569	1.634	2.048
Richmond Hill	901325	1.956	1.623	1.970
Richmond Hill	901530	1.913	1.902	1.992
Richmond Hill	901428	2.102	1.813	1.855
Richmond Hill	901631	1.679	1.379	2.081
Richmond Hill	900101	2.257	2.271	2.350
Richmond Hill	900102	2.437	2.890	2.619
Richmond Hill	900203	1.781	1.592	1.756
Richmond Hill	900204	1.720	1.806	1.963
Richmond Hill	900305	1.588	1.682	1.800
Richmond Hill	900306	1.687	2.079	1.795
Richmond Hill	900407	2.043	1.852	2.039
Richmond Hill	900408	1.912	1.803	2.124
Richmond Hill	900509	2.288	2.142	2.031
Richmond Hill	900510	1.602	1.457	1.692
Richmond Hill	900611	1.493	1.501	2.002
Richmond Hill	900612	1.853	1.681	2.100
Richmond Hill	900916	2.155	1.743	2.197
Richmond Hill	900917	2.436	2.723	2.609
Richmond Hill	901223	1.309	1.281	1.525
Richmond Hill	901224	2.693	1.940	2.590
average		1.919	1.834	2.017

RICHMOND HILL	
MIN A	1.179
MAXA	2.693
MINB	1.112
MAXB	2.890
MINC	1.366
MAXC	2.619

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Winnipeg	M901001	0.413	0.432	0.743
Winnipeg	M902001	0.956	0.801	0.940
Winnipeg	M903001	0.507	0.566	0.759
Winnipeg	M904001	0.888	1.033	1.168
Winnipeg	M904002	0.869	1.009	1.108
Winnipeg	M905001	1.215	1.079	1.204
Winnipeg	M905002	0.560	0.588	0.740
Winnipeg	M905003	1.094	1.171	1.328
Winnipeg	M905004	0.458	0.469	0.765
Winnipeg	M905005	0.475	0.441	0.731
Winnipeg	M905006	0.874	0.817	1.632
Winnipeg	M906001	1.003	0.815	1.775
Winnipeg	M907001	0.727	0.630	0.853
Winnipeg	M907002	1.399	1.257	1.430
Winnipeg	M907003	1.302	1.733	1.827
Winnipeg	M907004	1.376	1.492	1.515
Winnipeg	M907005	0.855	0.849	1.003
Winnipeg	M907006	0.828	0.855	0.783
Winnipeg	M908001	0.560	0.524	0.795
Winnipeg	M909001	1.437	1.624	1.367
average		0.890	0.909	1.123

WINNIPEG	
MIN A	0.413
MAXA	1.437
MINB	0.432
MAXB	1.733
MINC	0.731
MAXC	1.827

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Regina	SA1001	1.349	1.565	1.892
Regina	SA1002	0.553	0.589	0.795
Regina	SA3005	0.649	0.718	0.966
Regina	SA3006	1.468	1.573	1.810
Regina	SA3007	0.642	0.713	0.912
Regina	SA3008	1.691	1.626	1.946
Regina	SA4003	0.747	0.836	1.093
Regina	SA4004	1.018	1.128	1.352
Regina	SA6001	1.207	1.375	1.601
Regina	SA6002	1.179	1.228	1.710
average		1.050	1.135	1.408

REGINA	
MIN A	0.553
MAXA	1.691
MINB	0.589
MAXB	1.626
MINC	0.795
MAXC	1.946

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Saskatoon	SA2001	1.539	1.683	2.038
Saskatoon	SA2002	1.091	1.352	1.524
Saskatoon	SA3001	2.062	2.129	2.822
Saskatoon	SA3002	1.039	1.310	1.739
Saskatoon	SA3003	0.920	1.096	1.299
Saskatoon	SA3004	0.992	1.198	1.521
Saskatoon	SA4001	0.674	0.804	1.080
Saskatoon	SA4002	1.016	1.167	1.603
Saskatoon	SA5001	0.974	0.926	1.238
Saskatoon	SA5002	1.694	1.705	2.159
average		1.200	1.337	1.702

SASKATOON	
MIN A	0.674
MAXA	2.062
MINB	0.804
MAXB	2.129
MINC	1.080
MAXC	2.822

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Edmonton	EDM-01	0.786	1.100	1.338
Edmonton	EDM-02	2.333	2.850	2.002
Edmonton	EDM-03	1.100	1.403	1.832
Edmonton	EDM-04	1.581	1.627	1.916
Edmonton	EDM-05			
Edmonton	EDM-06	1.464	1.648	2.091
Edmonton	EDM-07	0.468	0.757	0.878
Edmonton	EDM-08			
Edmonton	EDM-09	1.901	2.024	2.088
Edmonton	EDM-10	0.939	1.138	1.343
average		1.321	1.568	1.686

EDMONTON	
MIN A	0.468
MAXA	2.333
MINB	0.757
MAXB	2.850
MINC	0.878
MAXC	2.091

City	House ID	NLA-A cm2/m2	NLA-B cm2/m2	NLA-C cm2/m2
Vancouver	BC-01	4.009	3.444	4.296
Vancouver	BC-02	2.027	1.622	2.143
Vancouver	BC-03	4.469	4.286	5.121
Vancouver	BC-04	1.736	1.746	1.743
Vancouver	BC-05	2.101	1.757	2.396
Vancouver	BC-06	2.530	2.209	2.768
Vancouver	BC-07	4.034	3.536	4.018
Vancouver	BC-08	3.403	3.566	3.651
Vancouver	BC-09	2.974	2.139	3.001
Vancouver	BC-10	1.269	1.283	1.729
Vancouver	BC-11	2.759	2.818	4.134
Vancouver	BC-12	2.224	2.146	1.458
Vancouver	BC-13	2.865	2.785	3.690
Vancouver	BC-14	2.205	2.769	2.480
Vancouver	BC-15	2.906	2.662	3.109
Vancouver	BC-16	4.794	3.050	4.466
Vancouver	BC-17	3.319	2.929	2.925
Vancouver	BC-18	2.705	2.308	2.688
Vancouver	BC-19	1.773	1.672	1.931
Vancouver	BC-20	2.280	2.609	2.845
average		2.819	2.567	3.030

VANCOUVER	
MIN A	1.269
MAXA	4.794
MINB	1.283
MAXB	4.286
MINC	1.458
MAXC	5.121

APPENDIX 6

HOUSE LEAKAGE RATES (L/s)

City: St. John's
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
F9001001	51.14	56.67	66.41	48.46	178.51	19.81	243.71	15.9	299.51	13.93	65
F9002001	37.63	41.74	48.99	35.65	132.54	14.46	181.28	11.59	222.94	10.14	-
F9002002	80.01	90.15	108.73	75.21	326.87	26.88	459.18	20.9	578.36	17.61	60
F9003001	19.96	22.06	24.69	18.91	36.38	13.12	42.3	11.16	46.75	9.38	50
F9003002	25.62	28.55	32.24	24.17	47.79	16.69	55.9	14.09	62.01	11.72	65
F9004001	46.95	51.74	57.74	44.56	84.9	30.94	98.5	26.39	108.71	22.27	85
F9004002	49.05	54.24	60.75	46.47	89.56	32.22	104.17	27.39	115.15	23.02	85
F9005001	44.52	47.35	50.94	42.99	72.24	30.43	81.48	26.83	88.35	23.34	70
F9005002	74.84	84.78	103.23	70.17	321.14	24	455.63	18.47	578.71	15.36	75
F9006001	22.55	24.52	26.99	21.55	39.23	15.07	45.05	13.01	49.4	11.15	50
average	45.23	50.18	58.07	42.81	132.92	22.36	176.72	18.57	214.99	15.79	67.22

City: Halifax
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
N900101	44.04	52.19	61.82	39.89	137.18	12.37	187.8	9.87	298.31	2.56	80
N900201	17.94	21.74	25.25	16	31.59	7.34	33.74	6.64	41.1	1.57	65
N900102	24.15	29.4	34.26	21.48	42.88	9.7	46.05	8.78	55.8	2.03	80
N900302	17.72	21.01	24.9	16.05	55.45	4.95	76	3.94	120.88	1.02	50
N900202	16.98	19.99	22.73	15.42	28.44	7.81	30.4	7.05	36.86	1.95	55
N900203	25.36	29.48	33.22	23.17	41.6	12.22	44.61	11.02	53.73	3.25	55
N900301	24.47	29.49	35.36	22.02	84.39	5.9	119.01	4.62	195.34	1.01	50
N900401	17.75	20.97	23.9	16.09	29.9	8.06	31.94	7.27	38.78	1.98	65
N900501	39.32	46.08	54.12	35.79	114.24	12.17	153.4	9.83	238.86	2.86	85
N900601	52.51	63.39	73.41	46.96	91.84	21.85	97.91	19.77	119.45	4.78	80
N900602	24.78	30.09	35	22.08	43.8	10.06	46.89	9.11	56.99	2.13	80
N900603	46.58	55.99	64.64	41.77	80.85	19.72	86.22	17.83	105.13	4.42	95
N900604	33.09	37.85	42.14	30.48	52.84	16.96	56.84	15.28	67.88	4.87	70
N900605	61.42	72.19	82	55.8	102.61	28.4	109.73	25.63	132.93	7.14	85
average	31.87	37.85	43.77	28.79	66.97	12.68	80.04	11.19	111.57	2.97	71.07

City: Fredericton
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
FRE-01	20.36	24.91	28.96	19.07	35.99	13.13	40.65	10.93	43.46	8.47	60
FRE-02	17.89	20.98	23.59	16.99	29.59	12.21	33.48	10.4	35.62	8.24	60
FRE-03	24.88	29.25	32.95	23.61	41.29	16.93	46.74	14.4	49.73	11.4	85
FRE-04	49.31	57.04	65.04	45.98	151.44	23.56	213.36	18.4	258.14	13.34	70
FRE-05	18.54	21.46	23.87	17.67	30.1	12.87	33.99	11.03	36.1	8.79	75
FRE-06	14.43	17.46	20.12	13.57	24.95	9.45	28.33	7.92	30.25	6.18	65
FRE-07	31.14	37.01	42.04	29.46	52.48	20.9	59.48	17.67	63.37	13.91	80
FRE-08	41.61	50.92	59.21	38.96	73.59	26.81	83.11	22.31	88.86	17.29	65
FRE-09	33.47	39.65	44.93	31.69	56.16	22.55	63.62	19.1	67.76	15.06	80
FRE-10	22.51	28.1	33.2	21.01	41.79	14.77	45.46	12.22	46.69	9.68	65
average	27.41	32.68	37.39	25.80	53.74	17.32	64.82	14.44	72.00	11.24	70.50

City: Quebec
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
Q9005001	27.23	36.23	43.96	27.64	144.52	5.21	201.5	3.53	275.73	0	55
Q9005002	23.94	30.74	36.38	24.36	102.15	5.96	136.37	4.36	181	0	45
Q9006001	19.81	24.88	29	20.16	73.89	5.75	95.93	4.27	123.7	0	50
Q9006002	20.14	25.81	30.49	20.49	84.82	5.09	112.92	3.74	149.46	0	45
Q9007001	23.41	30.89	37.25	23.78	118	4.77	162.88	3.3	221.83	0	60
Q9008001	26.6	33.43	38.99	27.07	99.69	7.68	129.55	5.7	167.22	0	45
Q9008002	25.94	34.57	41.99	26.32	139.11	4.9	194.35	3.31	266.21	0	45
Q9009001	29.72	39.76	48.43	30.14	163.19	5.44	228.91	3.65	314.7	0	60
Q9009002	27.54	35.54	42.2	28.01	121.16	6.61	162.78	4.79	217.48	0	60
Q9009003	38.8	50.7	60.72	39.45	184.17	8.52	251.34	6.01	341.37	0	55
Q9009004	22.81	30.22	36.55	23.16	117.81	4.51	163.39	3.09	223.02	0	50
Q9010001	33.93	42.34	49.17	34.52	122.18	10.25	157.47	7.61	201.55	0	60
Q9011001	19.83	25.9	31.01	20.16	93.98	4.36	128.22	3.08	174.11	0	45
Q9011002	19.77	25.63	30.52	20.11	89.32	4.6	120.66	3.3	162.14	0	45
Q9012001	53.49	66.62	77.26	54.43	190.37	16.37	244.76	12.16	312.49	0	60
Q9013001	32.31	41.67	49.45	32.87	141.45	7.81	189.85	5.66	253.37	0	55
Q9013002	24.48	31.6	37.52	24.9	107.81	5.87	144.87	4.25	193.6	0	55
Q9014001	18.65	23.98	28.4	18.97	80.27	4.59	107.35	3.35	142.76	0	40
Q9014002	17.24	21.64	25.23	17.54	64.28	5.01	83.45	3.72	107.6	0	40
Q9015001	29.65	39.14	47.22	30.11	149.95	6.02	207.14	4.15	282.2	0	55
average	26.76	34.56	41.09	27.21	119.41	6.47	161.18	4.65	215.58	0.00	51.25

City: Montreal
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
Q9001001	20.05	25.17	31.19	18.04	65.36	5.19	108.69	3.36	131.87	2.3	40
Q9001002	26.68	33.42	41.33	24.04	85.97	7.01	142.37	4.57	172.66	3.14	40
Q9001003	24.15	30.34	37.65	21.71	79.22	6.19	132.05	4.01	160.25	2.73	40
Q9001004	25.31	31.75	39.33	22.78	82.27	6.57	136.68	4.27	165.81	2.92	45
Q9001005	21.51	27.37	34.34	19.18	75.46	5.02	127.79	3.15	156.76	2.09	45
Q9001006	24.57	30.97	38.52	22.05	81.85	6.17	137	3.97	166.57	2.69	45
Q9001007	14.89	18.85	23.55	13.32	50.83	3.61	85.67	2.3	104.45	1.54	45
Q9001008	17.9	22.3	27.46	16.18	56.12	4.88	92.05	3.22	111.47	2.24	40
Q9002001	39.1	48.83	60.25	35.29	124.12	10.49	204.6	6.88	247.79	4.76	50
Q9002002	40.17	50.52	62.72	36.1	132.28	10.25	220.56	6.62	267.97	4.51	50
Q9003001	52.12	65.5	78.92	47.25	154.55	15.78	248.77	10.35	302.84	7.26	55
Q9003002	31.01	39.07	48.59	27.83	103.17	7.79	172.62	5.01	209.87	3.4	50
Q9003003	31.01	39.85	50.46	27.45	114.86	6.7	196.96	4.11	243.73	2.67	55
Q9003004	40.91	51.86	64.84	36.57	140.56	9.83	236.96	6.23	289.6	4.18	55
Q9004001	17.49	22.45	28.41	15.49	64.48	3.8	110.45	2.34	136.58	1.52	60
Q9004002	43.93	54.85	67.66	39.66	139.31	11.8	229.54	7.75	277.99	5.36	60
Q9004003	49.05	60.62	71.95	44.92	133.16	16.68	206.39	11.36	247.11	8.25	65
Q9004004	23.08	28.54	34.92	20.96	69.64	6.63	112.58	4.45	136.76	3.14	45
Q9016001	37.77	47.62	57.54	34.16	113.97	11.17	184.81	7.27	225.73	5.07	65
Q9016002	44.41	54.96	65.31	40.64	121.42	14.96	188.77	10.16	226.31	7.36	65
average	31.26	39.24	48.25	28.18	99.43	8.53	163.77	5.57	199.11	3.86	50.75

City: Ottawa
Leakage Rate Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
OTTCOS9	33.52	42.42	49.03	30.82	62.74	22.06	66.64	15.52	69.31	12.96	70
OTTCOS2	35.62	43.86	50.02	33.31	64.48	24.11	68.28	17.53	70.89	15.31	70
OTTCOS3	48.68	59.76	68.04	45.62	87.78	33.06	92.91	24.13	96.44	21.19	70
OTTCOS1	33.31	40.85	46.49	31.23	59.99	22.63	63.49	16.54	65.9	14.54	70
OTTCOS4	36.77	44.46	50.25	34.75	65.07	25.34	68.74	18.78	71.29	16.9	65
OTTCOS8	33.08	41.74	48.17	30.48	61.69	21.84	65.5	15.44	68.11	12.96	70
OTTCOS7	22.55	28.5	32.93	20.74	42.15	14.85	44.76	10.47	46.55	8.76	55
OTTCOS5	44.55	54.2	61.44	41.96	79.44	30.51	83.99	22.48	87.14	20.03	55
OTTCOS6	36.74	44.92	51.05	34.5	65.93	25.04	69.75	18.35	72.38	16.22	60
OTTURB7	53.65	66.46	76.01	50.01	97.84	36.11	103.67	26.09	107.67	22.57	65
OTTURB2	49.34	61.12	69.9	45.99	89.97	33.2	95.33	23.99	99.02	20.75	55
OTTURB3	44.52	54.94	62.72	41.6	80.81	30.08	85.59	21.83	88.87	19	55
OTTURB4	40.62	49.69	56.48	38.14	72.93	27.67	77.16	20.28	80.07	17.91	55
OTTURB5	37.33	45.15	51.05	35.27	66.09	25.71	69.83	19.05	72.42	17.13	65
OTTURB6	42.3	50.7	57.06	40.16	74.02	29.4	78.11	21.96	80.96	20.06	65
OTTMON2	50.61	61.27	69.29	47.8	89.69	34.83	94.77	25.79	98.29	23.17	65
OTTMON1	38.52	46.96	53.29	36.24	68.87	26.32	72.83	19.36	75.57	17.19	65
OTCOS10	36.88	45.44	51.83	34.48	66.81	24.95	70.74	18.14	73.45	15.82	65
OTCOS11	32.42	39.94	45.56	30.31	58.72	21.93	62.18	15.95	64.56	13.92	70
OTTURB1	38.13	45.71	51.45	36.2	66.74	26.5	70.44	19.79	73.01	18.07	60
average	39.46	48.40	55.10	36.98	71.09	26.81	75.24	19.57	78.10	17.22	63.50

City: Richmond Hill
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
901427	65.3	78.05	87.28	62.74	114.6	39.12	116.63	30.99	123.67	26.14	80
900814	46.28	55.56	62.3	44.38	82.14	27.41	83.62	21.67	88.44	18.25	85
900815	49.14	59.33	66.77	47	88.51	28.65	90.13	22.6	95.32	18.88	80
900918	47.3	56.47	63.1	45.47	82.76	28.43	84.22	22.53	89.37	19.02	80
901019	27.5	34.91	40.54	25.63	56.4	13.84	57.61	10.7	60.92	7.43	75
901020	37.77	47.55	54.94	35.38	75.8	19.52	77.38	15.14	81.83	10.86	75
901121	51.67	63.41	72.07	49.06	97	28.82	98.87	22.57	104.56	17.83	80
901122	46.98	55.05	60.81	45.5	78.38	29.64	79.93	23.68	85.44	20.12	80
901529	44.85	53.51	59.77	43.12	78.35	27	79.73	21.4	84.63	18.07	75
901326	34.77	43.46	49.97	32.7	68.46	18.37	69.86	14.29	73.88	10.54	75
901325	46.63	55.3	61.55	44.94	80.23	28.51	81.62	22.66	86.93	19.17	75
901530	81.56	95.65	106.67	78.95	269.13	36.45	339.48	22.61	399.75	15.26	85
901428	65.36	77.98	87.11	62.84	114.19	39.34	116.2	31.19	123.34	26.33	80
901631	29.71	36.98	42.42	28	57.88	15.9	59.04	12.38	62.44	9.28	75
900101	62.74	76.93	87.41	59.59	117.56	35.06	119.83	27.46	126.72	21.75	75
900102	86.93	101.21	112.22	84.52	268.72	40.91	335.07	26.24	390.85	18.47	80
900203	50.92	58.93	65.04	49.67	149.36	24.97	184.5	16.44	213.59	11.96	75
900204	70.18	83.08	93.35	67.51	252.38	29.26	323.16	17.35	385.3	11.08	80
900305	57.65	67.59	75.36	55.81	189.85	25.8	239.39	16.02	281.81	10.83	75
900306	64.97	76.89	86.38	62.5	233.21	27.13	298.53	16.1	355.84	10.29	75
900407	62.62	73.25	81.52	60.71	201.97	28.49	253.74	17.88	297.81	12.25	75
900408	58.44	68.34	76.04	56.66	187.95	26.65	236.01	16.75	276.89	11.5	75
900509	80.27	92.83	102.41	78.32	234.14	39.53	288.93	26.1	334.22	19.05	80
900510	63.25	74.07	82.49	61.29	205.79	28.58	258.94	17.86	304.29	12.17	95
900611	41.17	48.29	53.84	39.86	135.8	18.4	171.28	11.42	201.68	7.71	70
900612	53.54	62.27	68.99	52.08	164.02	25.37	204.19	16.35	237.87	11.57	75
900916	65.08	76.17	84.8	63.08	210.74	29.52	264.94	18.49	311.13	12.64	75
900917	79.31	92.56	102.83	77	250.57	36.68	313.65	23.27	367.02	16.15	75
901223	55.11	64.4	71.6	53.47	175.92	25.29	220.61	15.95	258.54	11	80
901224	124.79	144.09	158.79	121.9	359.39	62.07	442.48	41.23	510.91	30.34	85
average	58.39	69.14	77.28	56.32	156.04	29.49	186.32	20.64	213.83	15.53	78.17

City: Winnipeg
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
M901001	9.36	11.61	13.13	8.84	16.2	5.68	17.67	4.01	18.51	2.17	55
M902001	45.48	54.09	57.36	48.12	129.48	23.23	180.27	13.15	242.48	4.24	80
M903001	17.78	21.3	22.65	18.83	52.51	8.8	74.16	4.88	100.84	1.5	55
M904001	25.56	30.31	32.1	27.04	71.55	13.25	98.97	7.57	132.45	2.49	60
M904002	26.74	31.51	33.3	28.26	72.59	14.22	99.23	8.27	131.62	2.83	55
M905001	42.18	49.37	52.02	44.54	110.43	23.13	148.88	13.74	195.36	4.92	65
M905002	10.29	12.59	14.11	9.81	17.25	6.47	18.96	4.63	19.97	2.59	55
M905003	24.72	29.9	33.28	23.72	40.56	15.94	44.68	11.54	47.22	6.6	70
M905004	8.64	10.7	12.09	8.16	14.92	5.25	16.28	3.71	17.06	2.01	55
M905005	8.53	10.3	11.45	8.19	13.95	5.52	15.37	4	16.25	2.3	55
M905006	16.47	20.42	23.09	15.55	28.5	9.99	31.08	7.06	32.56	3.82	65
M906001	63.04	75.68	80.56	66.76	188.61	30.83	267.75	16.97	365.51	5.12	85
M907001	16.97	19.75	20.76	17.91	43.16	9.53	57.55	5.75	74.88	2.14	50
M907002	41.17	47.82	50.23	43.44	103.51	23.34	137.44	14.19	178.2	5.35	70
M907003	50.27	59.85	63.5	53.19	143.93	25.55	200.83	14.42	270.59	4.61	65
M907004	21.75	24.83	25.9	22.91	50.01	13.26	64.23	8.49	81.11	3.56	50
M907005	18.2	21.06	22.09	19.2	44.86	10.49	59.12	6.45	76.19	2.49	50
M907006	14.36	16.63	17.44	15.15	35.5	8.26	46.84	5.07	60.42	1.95	55
M908001	19.18	22.71	24.05	20.28	53.41	9.98	73.72	5.72	98.52	1.9	55
M909001	36.66	45.61	51.65	34.54	63.95	22.06	69.57	15.54	72.78	8.35	75
average	25.87	30.80	33.04	26.72	64.74	14.24	86.13	8.76	111.63	3.55	61.25

City: Regina
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
SA1001	35.17	43.39	49.72	31.87	66.96	17.93	68.94	13.4	71.42	6.27	70
SA1002	10.59	12.53	14.11	9.72	18.49	5.74	18.99	4.57	20.18	2.16	60
SA3005	12.07	15.09	17.22	11.09	22.67	6.64	23.24	4.58	23.77	2.67	45
SA3006	30.42	35.56	39.88	27.88	52.93	16.25	55.32	12.98	59.14	5.84	70
SA3007	11.31	13.37	15.04	10.38	19.7	6.14	20.24	4.9	21.52	2.31	55
SA3008	49.02	63.35	73.41	44.36	100.33	25.1	102.5	15.86	104.69	8.32	70
SA4003	12.06	14.92	17.04	11.01	22.63	6.4	23.27	4.66	23.98	2.42	45
SA4004	24.08	28.73	32.47	22.03	42.87	12.83	43.95	10.13	46.47	4.7	60
SA6001	18.45	19.31	21.09	16.8	33.22	8.71	36.68	5.43	42.66	1.75	70
SA6002	23.4	28.46	32.47	21.23	43.62	11.96	44.85	9.24	46.64	4.13	55
average	22.66	27.47	31.25	20.64	42.34	11.77	43.80	8.58	46.05	4.06	60.00

City: Saskatoon
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
SA2001	28.03	31.92	35.46	24.87	50.58	16.13	54.22	11.57	64.09	2	65
SA2002	14.59	15.38	16.65	12.99	27.18	8.02	31.08	6.33	36.81	0.87	60
SA3001	33.08	37.4	41.28	29.44	59.1	19.34	63.51	13.98	74.81	2.51	70
SA3002	16.06	17.54	18.99	14.31	28.97	9.67	32	6.96	37.69	1.18	65
SA3003	13.22	15.08	16.77	11.87	22.7	7.88	23.97	5.76	27.95	1.21	75
SA3004	13.04	14.6	15.98	11.71	22.42	7.92	24.01	5.85	27.97	1.21	55
SA4001	14.27	17.72	20.97	12.79	26.66	7.85	27.09	5.43	27.4	1.22	75
SA4002	12.45	13.6	14.7	11.13	22.16	7.57	24.39	5.48	28.61	0.98	60
SA5001	16.9	19.92	22.76	15.12	29.05	9.65	29.92	6.91	35.02	1.44	70
SA5002	32.33	36.1	39.4	28.5	60.58	18.51	66.57	13.07	79.37	1.94	70
average	19.40	21.93	24.30	17.27	34.94	11.25	37.68	8.13	43.97	1.46	66.50

City: Edmonton
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
EDM-01	19.02	22.77	26.63	18.67	32.05	13.61	35.55	11	38.6	8.43	70
EDM-02	38.56	45.37	52.39	37.94	62.81	28.09	70.99	23.35	76.81	18.26	70
EDM-03	20.61	22.59	26.81	19.82	62.88	11.61	94.78	9.63	115.18	6.53	45
EDM-04	33.47	40.1	46.92	32.83	56.49	23.91	62.59	19.31	67.96	14.78	75
EDM-05	31.4	37.42	43.61	30.84	52.43	22.57	58.46	18.39	63.41	14.17	70
EDM-06	28.84	34.65	40.62	28.28	48.94	20.54	54.06	16.51	58.73	12.6	50
EDM-07	12.63	16.5	20.58	12.11	26.3	8.04	28.42	5.55	29.59	3.93	75
EDM-08	25.25	30.77	36.44	24.69	44.08	17.69	47.88	13.9	52.17	10.42	80
EDM-09	35.88	43.85	52.06	35.05	63.03	25.04	68.2	19.57	74.36	14.62	70
EDM-10	21.38	27.98	34.7	20.59	44.12	13.86	47.43	9.58	49.62	7.03	55
average	26.70	32.20	38.08	26.08	49.31	18.50	56.84	14.68	62.64	11.08	66.00

City: Vancouver
Leakage Rate, Condition A - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
BC-01	113.85	132.1	148.2	121.2	368.48	64.05	510.05	50.42	652.34	28.67	70
BC-02	48.11	56.32	61.21	50.22	79.1	34.99	90.61	28.08	99.81	15.54	70
BC-03	71.18	82.11	88.44	74.06	114.71	53.05	130.68	43.49	143.02	24.87	55
BC-04	44.23	51.54	55.86	46.13	72.18	32.41	82.65	26.19	90.82	14.65	60
BC-05	47.52	57.16	63.21	49.89	81.75	32.93	93.76	25.35	104.85	13.15	75
BC-06	48.57	56.25	60.73	50.58	78.65	35.96	89.8	29.31	98.35	16.62	65
BC-07	73.45	84.69	91.18	76.42	118.3	54.79	134.74	44.95	147.45	25.73	75
BC-08	50.56	58.99	63.98	52.74	82.68	36.97	94.68	29.82	104.11	16.63	65
BC-09	70.08	78.17	82.49	72.33	108.3	54.24	121.09	46.32	131.72	28.88	85
BC-10	21.32	25.16	27.48	22.3	35.52	15.3	40.7	12.14	45.02	6.6	75
BC-11	44.72	52.52	57.2	46.71	73.93	32.34	84.69	25.83	93.46	14.19	55
BC-12	43.41	50.49	54.64	45.25	70.63	31.93	80.83	25.88	88.72	14.54	65
BC-13	44.64	52.44	57.11	46.64	73.81	32.29	84.56	25.79	93.31	14.17	65
BC-14	43.34	50.4	54.55	45.18	70.52	31.88	80.7	25.84	88.57	14.52	60
BC-15	60.06	71.29	78.17	62.88	101.06	42.63	115.86	33.5	128.61	17.95	75
BC-16	85.52	95.09	100.17	88.19	131.62	66.41	146.91	56.89	159.7	35.76	65
BC-17	45.39	53.01	57.54	47.36	74.35	33.13	85.15	26.68	93.68	14.84	55
BC-18	61.32	71.02	79.55	65.26	195.36	34.83	269.62	27.53	346.03	15.82	70
BC-19	50.97	59.99	68.23	54.14	187.66	26.49	265.56	20.15	344.95	10.49	75
BC-20	52.38	61.81	70.48	55.6	197.45	26.82	280.32	20.27	365.43	10.38	65
average	56.03	65.03	71.02	58.65	115.80	38.67	144.15	31.22	171.00	17.70	67.25

City: St. John's
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
F9001001	51.14	56.67	66.41	48.46	178.51	19.81	243.71	15.9	299.51	13.93	65
F9002001	37.63	41.74	48.99	35.65	132.54	14.46	181.28	11.59	222.94	10.14	?
F9002002	80.01	90.15	108.73	75.21	326.87	26.88	459.18	20.9	578.36	17.61	60
F9003001	19.96	22.06	24.69	18.91	36.38	13.12	42.3	11.16	46.75	9.38	50
F9003002	25.62	28.55	32.24	24.17	47.79	16.69	55.9	14.09	62.01	11.72	65
F9004001	46.95	51.74	57.74	44.56	84.9	30.94	98.5	26.39	108.71	22.27	85
F9004002	49.05	54.24	60.75	46.47	89.56	32.22	104.17	27.39	115.15	23.02	85
F9005001	44.52	47.35	50.94	42.99	72.24	30.43	81.48	26.83	88.35	23.34	70
F9005002	74.84	84.78	103.23	70.17	321.14	24	455.63	18.47	578.71	15.36	75
F9006001	22.55	24.52	26.99	21.55	39.23	15.07	45.05	13.01	49.4	11.15	50
average	45.23	50.18	58.07	42.81	132.92	22.36	176.72	18.57	214.99	15.79	67.22

City: Halifax
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
N900101	46.6	55.8	66.6	42.04	154.69	11.93	215.36	9.42	349.01	2.2	80
N900201	18.27	22.03	25.49	16.35	31.89	7.64	34	6.91	41.47	1.68	65
N900102	23.67	28.55	33.04	21.19	41.33	9.89	44.07	8.95	53.76	2.18	80
N900302	17.31	20.57	24.41	15.66	54.87	4.74	75.5	3.77	120.53	0.95	50
N900202	15.84	18.95	21.81	14.24	27.27	6.83	29.09	6.17	35.45	1.57	55
N900203	25.36	29.48	33.22	23.17	41.6	12.22	44.61	11.02	53.73	3.25	55
N900301	24.47	29.49	35.36	22.02	84.39	5.9	119.01	4.62	195.34	1.01	50
N900401	17.26	20.28	23.04	15.68	28.83	7.98	30.83	7.2	37.35	2.01	65
N900501	39.48	46.81	55.45	35.76	123.22	11.06	168.77	8.82	268.22	2.29	85
N900601	24.78	30.09	35	22.08	43.8	10.06	46.89	9.11	56.99	2.13	80
N900602	24.78	30.09	35	22.08	43.8	10.06	46.89	9.11	56.99	2.13	80
N900603	46.58	55.99	64.64	41.77	80.85	19.72	86.22	17.83	105.13	4.42	95
N900604	33.09	37.85	42.14	30.48	52.84	16.96	56.84	15.28	67.88	4.87	70
N900605	60.96	71.78	81.64	55.33	102.15	28	109.19	25.26	132.39	6.98	85
average	29.89	35.55	41.20	26.99	65.11	11.64	79.09	10.25	112.45	2.69	71.07

City: Fredericton
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
FRE-01	20.18	24.37	28.04	18.99	34.79	13.25	39.5	11.11	42.16	8.67	60
FRE-02	16.86	20.11	22.92	15.93	28.57	11.26	32.39	9.5	34.53	7.46	60
FRE-03	23.33	27.58	31.19	22.11	39.02	15.77	44.19	13.37	47.06	10.56	85
FRE-04	49.34	57.33	65.65	45.89	156.71	22.98	222.82	17.79	271.17	12.8	70
FRE-05	14.13	17.02	19.54	13.31	24.28	9.31	27.55	7.82	29.4	6.11	75
FRE-06	13.46	16.12	18.43	12.7	22.94	8.93	26.02	7.52	27.75	5.9	65
FRE-07	29.35	35.11	40.1	27.7	49.93	19.52	56.63	16.44	60.38	12.9	80
FRE-08	39.8	48.58	56.37	37.3	69.95	25.74	79.19	21.45	84.63	16.64	65
FRE-09	31.22	37	41.94	29.56	52.4	21.03	59.37	17.81	63.24	14.04	80
FRE-10	19.26	23.65	27.58	18.01	34.35	12.35	38.68	10.26	41.37	7.93	65
average	25.69	30.69	35.18	24.15	51.29	16.01	62.63	13.31	70.17	10.30	70.50

City: Quebec
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
Q9005001											55
Q9005002											45
Q9006001											50
Q9006002											45
Q9007001											60
Q9008001											45
Q9008002											45
Q9009001											60
Q9009002											60
Q9009003											55
Q9009004											50
Q9010001											60
Q9011001											45
Q9011002											45
Q9012001											60
Q9013001											55
Q9013002											55
Q9014001											40
Q9014002											40
Q9015001											55
average											51.25

City: Montreal
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
Q9001001											40
Q9001002											40
Q9001003											40
Q9001004											45
Q9001005											45
Q9001006											45
Q9001007											45
Q9001008											40
Q9002001											50
Q9002002											50
Q9003001											55
Q9003002											50
Q9003003											55
Q9003004											55
Q9004001											60
Q9004002											60
Q9004003											65
Q9004004											45
Q9016001											65
Q9016002											65
average											50.75

City: Ottawa
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
OTTCOS9	32.63	41.32	47.78	29.99	61.13	21.46	64.93	15.09	67.53	12.59	70
OTTCOS2	33.24	41.05	46.87	31.04	60.38	22.44	63.96	16.28	66.41	14.15	70
OTTCOS3	44.44	53.51	60.35	42.1	78.22	30.75	82.59	22.89	85.63	20.74	70
OTTCOS1	32.63	40.13	45.73	30.55	58.98	22.12	62.44	16.12	64.82	14.11	70
OTTCOS4	35	42.85	48.72	32.85	62.9	23.83	66.55	17.45	69.07	15.38	65
OTTCOS8	31.87	40.37	46.68	29.29	59.73	20.95	63.44	14.73	65.98	12.29	70
OTTCOS7	21.54	27.17	31.34	19.86	40.15	14.23	42.63	10.07	44.32	8.46	55
OTTCOS5	43.54	53.56	61.06	40.75	78.73	29.5	83.35	21.48	86.53	18.79	55
OTTCOS6	35.15	43.17	49.17	32.93	63.43	23.85	67.14	17.4	69.7	15.26	60
OTTURB7	51.5	62.67	71.05	48.5	91.87	35.26	97.13	25.98	100.77	23.14	65
OTTURB2	46.94	58.61	67.29	43.54	86.43	31.33	91.66	22.43	95.25	19.15	55
OTTURB3	43.13	53.22	60.76	40.29	78.29	29.13	82.91	21.14	86.1	18.39	55
OTTURB4	39.15	47.23	53.33	37.05	69.08	27.04	72.96	20.09	75.65	18.15	55
OTTURB5	34.44	42.87	49.14	32.01	63.17	23.07	66.97	16.57	69.58	14.22	65
OTTURB6	41.7	50.27	56.74	39.48	73.51	28.82	77.64	21.43	80.5	19.38	65
OTTMON2	48.85	59.2	66.99	46.11	86.7	33.58	91.62	24.84	95.03	22.27	65
OTTMON1	36.93	44.74	50.62	34.86	65.52	25.39	69.23	18.79	71.81	16.85	65
OTCOS10	35.81	44.38	50.77	33.37	65.34	24.09	69.24	17.4	71.91	15.04	65
OTCOS11	32.04	39.69	45.4	29.87	58.43	21.57	61.92	15.58	64.31	13.48	70
OTTURB1	35.53	43.71	49.82	33.26	64.24	24.08	68.01	17.54	70.6	15.34	60
average	37.80	46.49	52.98	35.39	68.31	25.62	72.32	18.67	75.08	16.36	63.50

City: Richmond Hill
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
901427	58.07	68.38	75.98	56.07	101.23	35.05	106.08	26.63	113.7	21.76	80
900814	42.06	49.38	54.76	40.67	72.76	25.59	76.53	19.49	81.82	15.92	85
900815	42.25	50.45	56.54	40.55	76.25	24.58	78.8	18.55	85.16	15.12	80
900918	38.4	45.45	50.66	37	67.8	22.87	70.6	17.32	75.99	14.16	80
901019	23.85	29.84	34.45	22.36	48.64	12.14	49.74	8.96	53.26	6.84	75
901020	33.33	40.94	46.72	31.55	64.78	17.9	66.16	13.33	71.26	10.77	75
901121	47.39	56.83	63.87	45.4	86.5	27.25	89.04	20.52	96.39	16.71	80
901122	47.4	55.04	60.48	46.06	77.3	30.58	79.43	24.53	84.63	20.91	80
901529	37.12	43.85	48.82	35.8	65.23	22.22	68.08	16.85	73.17	13.77	75
901326	32.36	39.14	44.22	30.88	60.37	18.18	61.67	13.64	66.98	11.08	75
901325	38.13	46.15	52.16	36.37	71.27	21.38	72.75	16.03	79.04	13.02	75
901530	77.08	89.22	99.9	74.91	264.19	34.38	334.04	20.06	393.6	15.27	85
901428	53.92	64.45	72.29	51.72	97.6	31.27	100.75	23.58	108.94	19.22	80
901631	24.14	30.66	35.75	22.43	51.24	11.73	52.45	8.6	56.16	6.2	75
900101	56.78	67.3	75.08	54.68	100.6	33.68	104.58	25.5	112.7	20.83	75
900102	82.95	93.47	102.66	81.67	227.04	44.02	275.66	28.8	314.41	22.97	80
900203	46.95	54.08	60.35	45.74	154.46	21.62	193.9	12.89	227.12	9.97	75
900204	64.19	74.36	83.33	62.35	221.74	28.46	280.76	16.53	331.19	12.52	80
900305	53.73	61.67	68.62	52.46	171.16	25.38	213.62	15.39	249.05	11.97	75
900306	60.12	68.51	75.84	58.9	180.36	29.75	222.7	18.6	257.39	14.61	75
900407	57.51	66.83	75.06	55.76	204.16	24.95	259.74	14.28	307.61	10.63	75
900408	55.98	65.05	73.06	54.27	198.77	24.28	252.89	13.89	299.51	10.34	75
900509	76.07	87.4	97.33	74.22	244.6	35.67	305.8	21.52	357	16.71	80
900510	57.4	66.66	74.83	55.68	202.64	25.01	257.55	14.36	304.78	10.73	95
900611	38.94	45.01	50.36	37.86	132.1	17.51	166.72	10.27	196.15	7.87	70
900612	50.17	58.08	65.05	48.74	172.4	22.33	218.08	13.01	257.07	9.88	75
900916	57.99	67.97	76.86	55.89	222.61	23.62	286.91	12.95	344.09	9.16	75
900917	73.9	83.86	92.56	72.54	214.22	37.55	262.85	23.88	302.3	18.87	75
901223	50.63	58.3	65.03	49.35	165.9	23.4	208.11	13.98	243.61	10.82	80
901224	106.66	124.41	140.14	103.15	391.72	45.03	501.3	25.31	596.64	18.42	85
average	52.85	61.76	69.09	51.17	146.99	26.58	177.24	17.64	204.69	13.90	78.17

City: Winnipeg
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
M901001	11.64	14.25	15.98	11.08	19.55	7.29	21.48	5.22	22.61	2.91	55
M902001	44.5	53.85	57.5	47.16	138.87	20.97	200.47	11.27	277.11	3.21	80
M903001	18.22	21.61	22.89	19.27	51.12	9.42	70.77	5.38	94.78	1.77	55
M904001	28.7	33.89	35.83	30.34	78.69	15.13	107.97	8.76	143.62	2.96	60
M904002	29.67	34.78	36.67	31.34	78.32	16.16	105.92	9.55	139.33	3.39	55
M905001	41.81	49.58	52.52	44.22	117.22	21.64	162.22	12.36	217.21	4.06	65
M905002	10.89	13.36	15	10.36	18.36	6.79	20.17	4.85	21.22	2.69	55
M905003	26.11	31.36	34.76	25.15	42.28	17.12	46.67	12.47	49.39	7.24	70
M905004	8.55	10.41	11.63	8.18	14.19	5.44	15.61	3.92	16.47	2.21	55
M905005	8.23	10.15	11.43	7.8	14.03	5.07	15.37	3.6	16.14	1.98	55
M905006	15.21	18.76	21.13	14.41	25.96	9.35	28.43	6.64	29.84	3.64	65
M906001	64.23	79.05	84.97	68.16	219.23	27.92	327.1	14.26	464.19	3.59	85
M907001	15.81	18.57	19.59	16.7	42.12	8.54	57.16	5.02	75.39	1.76	50
M907002	38.45	44.87	47.22	40.59	99.1	21.36	132.82	12.8	173.48	4.68	70
M907003	56.92	66.48	70	60.09	147.46	31.48	198.01	18.81	259.01	6.83	65
M907004	21.43	24.17	25.09	22.54	46.23	13.74	58.02	9.12	71.9	4.12	50
M907005	17.96	20.76	21.77	18.94	44.04	10.4	57.93	6.41	74.55	2.49	50
M907006	14.41	16.62	17.41	15.19	34.94	8.42	45.77	5.23	58.71	2.06	55
M908001	16.38	19.2	20.24	17.3	43.18	8.93	58.36	5.29	76.72	1.88	55
M909001	10.55	13.01	14.65	9.99	17.99	6.49	19.71	4.61	20.69	2.53	75
average	24.98	29.74	31.81	25.94	64.64	13.58	87.50	8.28	115.12	3.30	61.25

City: Regina
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
SA1001	36.85	43.45	48.68	34.05	62.89	20.76	64.34	16.72	67.76	8.36	70
SA1002	11.12	13.07	14.66	10.23	19.12	6.11	19.71	4.9	20.96	2.34	60
SA3005	13.01	16.13	18.32	12.01	23.88	7.31	24.48	5.15	25.06	3.09	45
SA3006	31.8	36.66	40.82	29.29	53.77	17.48	56.58	14.15	60.45	6.53	70
SA3007	12.15	14.14	15.77	11.23	20.46	6.83	21.21	5.54	22.54	2.7	55
SA3008	52.56	70.19	82.77	46.54	118.17	24.58	120.66	14.16	123.15	6.55	70
SA4003	13.02	15.87	18	11.96	23.56	7.15	24.19	5.38	24.94	2.84	45
SA4004	26.69	31.82	35.95	24.43	47.43	14.24	48.61	11.25	51.45	5.23	60
SA6001	20.94	21.69	23.57	19.14	36.69	10.21	40.44	6.15	47	2.09	70
SA6002	24.8	30.4	34.82	22.42	47.12	12.45	48.5	9.53	50.42	4.2	55
average	24.29	29.34	33.34	22.13	45.31	12.71	46.87	9.29	49.37	4.39	60.00

City: Saskatoon
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
SA2001	30.34	34.34	37.93	26.99	54.36	17.69	58.43	12.77	68.88	2.27	65
SA2002	17.92	18.61	20.18	16.07	32.44	9.85	37.17	8.17	43.63	1.19	60
SA3001	33.76	37.89	41.53	30.14	59.77	20.05	64.43	14.58	75.65	2.7	70
SA3002	19.81	21.21	22.81	17.82	34.68	12.24	38.55	9.11	44.95	1.68	65
SA3003	15.57	17.62	19.46	14.01	26.49	9.43	28.07	6.95	32.63	1.5	75
SA3004	15.48	17.14	18.58	13.96	26.26	9.62	28.25	7.15	32.75	1.55	55
SA4001	16.58	20.37	23.91	14.93	30.09	9.34	30.53	6.56	30.94	1.55	75
SA4002	14.23	15.5	16.74	12.73	25.23	8.7	27.79	6.32	32.56	1.14	60
SA5001	16.09	18.98	21.69	14.4	27.68	9.18	28.5	6.56	33.36	1.36	70
SA5002	31.95	35.18	38.23	28.33	58.78	18.82	64.91	13.41	76.9	2.12	70
average	21.17	23.68	26.11	18.94	37.58	12.49	40.66	9.16	47.23	1.71	66.50

City: Edmonton
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
EDM-01	25.6	30.07	34.68	25.2	41.59	18.68	47.06	15.57	50.9	12.2	70
EDM-02	43.27	48.46	54	42.87	65.9	32.97	76.05	29.1	81.49	23.49	70
EDM-03	25.97	28.44	33.69	25	78.36	14.72	117.69	12.25	142.73	8.34	45
EDM-04	34.18	40.8	47.61	33.55	57.27	24.52	63.72	19.92	69.14	15.31	75
EDM-05	33.77	39.94	46.3	33.21	55.55	24.47	62.46	20.17	67.65	15.68	70
EDM-06	31.71	37.68	43.82	31.16	52.64	22.86	58.88	18.71	63.83	14.47	50
EDM-07	17.02	20.77	24.64	16.63	29.82	11.89	32.32	9.32	35.22	6.97	75
EDM-08	30.99	37.16	43.5	30.39	52.39	22.12	57.99	17.84	62.98	13.64	80
EDM-09	38.17	46.64	55.35	37.3	66.99	26.66	72.54	20.85	79.08	15.58	70
EDM-10	21.85	27.54	33.45	21.18	41.54	14.65	44.46	10.86	46.7	7.88	55
average	30.25	35.75	41.70	29.65	54.21	21.35	63.32	17.46	69.97	13.36	66.00

City: Vancouver
Leakage Rate, Condition B - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
BC-01	103	120.2	139.2	107.4	398	50.76	559.89	38.18	726.4	19.2	70
BC-02	36.01	42.08	45.68	37.66	63.28	25.45	73.53	19.94	81.87	10.14	70
BC-03	63.19	71.74	76.48	65.66	107	46.22	122.29	37.34	135.4	20.59	55
BC-04	40.86	46.61	49.84	42.5	69.63	29.72	79.8	23.9	88.44	13.01	60
BC-05	36.23	42.83	46.83	37.98	64.56	25.24	75.5	19.5	84.24	9.58	75
BC-06	39.7	45.84	49.38	41.41	68.71	28.46	79.29	22.6	88.1	11.89	65
BC-07	60.1	68.86	73.81	62.58	102.99	43.5	118.31	34.83	131.24	18.74	75
BC-08	48.53	55.34	59.15	50.48	82.65	35.32	94.7	28.41	104.95	15.48	65
BC-09	49.54	57.81	62.69	51.79	86.89	35.06	100.87	27.52	112.29	14.05	85
BC-10	19.89	23.19	25.14	20.79	34.85	14.1	40.44	11.07	45.01	5.67	75
BC-11	36.33	42.63	46.4	38.03	64.16	25.54	74.72	19.91	83.26	10	55
BC-12	38.1	42.82	45.37	39.49	63.63	28.2	72.3	23	79.87	13.03	65
BC-13	40.34	47.03	50.98	42.16	70.68	28.58	82.01	22.45	91.28	11.49	65
BC-14	50.02	56.96	60.82	52.01	85.03	36.47	97.33	29.38	107.83	16.08	60
BC-15	49.73	57.34	61.71	51.86	85.92	35.72	99.07	28.41	110.03	15.02	75
BC-16	51.77	58.2	61.67	53.66	86.5	38.3	98.31	31.23	108.61	17.68	65
BC-17	37.84	44.48	48.47	39.63	66.98	26.54	78.08	20.65	87.04	10.32	55
BC-18	55.98	65.36	75.73	58.37	217.25	27.51	305.78	20.67	397.06	10.36	70
BC-19	46.76	54.74	63.59	48.72	185.88	22.61	262.43	16.88	342.41	8.31	75
BC-20	52.79	61.15	70.34	55.13	191.59	27.11	267.29	20.74	342.35	10.92	65
average	47.84	55.26	60.66	49.87	109.81	31.52	139.10	24.83	167.38	13.08	67.25

City: St. John's
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
F9001001	46.66	50.89	58.02	44.56	138.27	20.67	181.96	17.09	220.41	15.55	65
F9002001											?
F9002002											60
F9003001											50
F9003002											65
F9004001	51.11	56.94	64.07	48.3	89.52	35.7	103.24	30.45	113.34	26.52	85
F9004002											85
F9005001											70
F9005002											75
F9006001											50
average	48.89	53.92	61.05	46.43	113.90	28.19	142.60	23.77	166.88	21.04	67.22

City: Halifax
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
N900101	45.8	54.68	64.08	41.56	136.94	13.19	188.48	11.1	300.05	2.99	80
N900201	20.81	24.65	28.16	18.82	35.22	9.34	37.6	8.43	45.71	2.26	65
N900102	28.14	34.18	39.6	25.21	48.94	11.97	52.17	11.16	59.15	3.01	80
N900302	21.63	25.28	29.11	19.83	56.35	7.53	73.95	6.47	112.29	2.18	50
N900202	19.99	24.06	27.7	18.01	33.89	8.83	36.08	8.22	41.34	2.33	55
N900203	25.87	30.52	34.77	23.45	43.5	11.78	46.48	10.63	56.41	2.9	55
N900301	28.88	33.76	38.9	26.46	75.54	9.99	99.29	8.58	150.88	2.87	50
N900401	19.51	22.94	26.06	17.73	32.62	9.01	34.87	8.13	42.25	2.26	65
N900501	44.45	52.9	61.83	40.4	130.12	13.18	177.93	11.13	281.75	3.11	85
N900601	67.35	79.97	91.16	61.2	109.9	31.43	116.83	29.24	135.96	8.91	80
N900602	28.59	34.97	40.73	25.5	50.74	11.8	54.13	11	60.85	2.85	80
N900603	50.82	62.52	73.14	45.15	91.7	20.45	97.92	19.08	109.3	4.78	95
N900604	36.67	42.31	47.26	33.83	56.76	19.05	59.85	17.68	70.27	6.22	70
N900605	62.73	77.02	89.95	55.82	112.5	25.49	120.09	23.78	134.41	6.03	85
average	35.80	42.84	49.46	32.36	72.48	14.50	85.41	13.19	114.33	3.76	71.07

City: Fredericton
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
FRE-01	25.07	29.23	32.7	23.85	41.12	17.25	46.49	14.73	49.42	11.7	60
FRE-02	17.89	20.98	23.59	16.99	29.59	12.21	33.48	10.4	35.62	8.24	60
FRE-03	29.24	35.4	40.83	27.63	50.09	20.07	53.9	17.15	56.49	13.66	85
FRE-04	51.38	59.18	67.22	48.01	153.15	25.11	214.01	19.76	257.57	14.42	70
FRE-05	18.54	21.46	23.87	17.67	30.1	12.87	33.99	11.03	36.1	8.79	75
FRE-06	18.64	22.79	26.49	17.55	32.77	12.63	35.39	10.67	36.59	8.49	65
FRE-07	36.56	44.14	50.82	34.56	62.22	25.17	66.89	21.55	70.33	17.18	80
FRE-08	41.61	50.92	59.21	38.96	73.59	26.81	83.11	22.31	88.86	17.29	65
FRE-09	38.53	47.02	54.58	36.3	67.4	26.17	72.75	22.17	75.42	17.63	80
FRE-10	22.51	28.1	33.2	21.01	41.79	14.77	45.46	12.22	46.69	9.68	65
average	30.00	35.92	41.25	28.25	58.18	19.31	68.55	16.20	75.31	12.71	70.50

City: Quebec
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
Q9005001	27.23	36.23	43.96	27.64	144.52	5.21	201.5	3.53	275.73	0	55
Q9005002	23.94	30.74	36.38	24.36	102.15	5.96	136.37	4.36	181	0	45
Q9006001	19.81	24.88	29	20.16	73.89	5.75	95.93	4.27	123.7	0	50
Q9006002	20.14	25.81	30.49	20.49	84.82	5.09	112.92	3.74	149.46	0	45
Q9007001	24.51	32.39	39.11	24.89	124.75	4.94	172.53	3.4	235.19	0	60
Q9008001	26.6	33.43	38.99	27.07	99.69	7.68	129.55	5.7	167.22	0	45
Q9008002	23.65	30.72	36.63	24.05	108.26	5.42	146.64	3.87	197.62	0	45
Q9009001	29.72	39.76	48.43	30.14	163.19	5.44	228.91	3.65	314.7	0	60
Q9009002	28.21	36.61	43.64	28.7	128.34	6.52	173.62	4.66	233.65	0	60
Q9009003	41.81	54.84	64.96	42.24	187.9	10.08	254.46	7.03	343.01	0	55
Q9009004	25.62	33.22	39.58	26.06	116.04	5.95	156.84	4.26	210.87	0	50
Q9010001	38.03	48.16	56.47	38.7	149.35	10.42	195.99	7.72	255.54	0	60
Q9011001	19.83	25.9	31.01	20.16	93.98	4.36	128.22	3.08	174.11	0	45
Q9011002	19.77	25.63	30.52	20.11	89.32	4.6	120.66	3.3	162.14	0	45
Q9012001	58.14	73.16	84.19	58.86	201.94	18.78	259.38	13.56	331.01	0	60
Q9013001	33.19	43.02	51.24	33.76	150	7.72	202.65	5.54	272.33	0	55
Q9013002	24.48	31.6	37.52	24.9	107.81	5.87	144.87	4.25	193.6	0	55
Q9014001	18.65	23.98	28.4	18.97	80.27	4.59	107.35	3.35	142.76	0	40
Q9014002	17.24	21.64	25.23	17.54	64.28	5.01	83.45	3.72	107.6	0	40
Q9015001	30.73	39.38	46.54	31.27	129.52	7.76	172.47	5.7	228.32	0	55
average	27.57	35.56	42.11	28.00	120.00	6.86	161.22	4.93	214.98	0.00	51.25

City: Montreal
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
Q9001001	20.61	25.82	31.96	18.56	66.59	5.39	110.39	3.51	133.89	2.41	40
Q9001002	27.43	34.25	42.25	24.76	87.01	7.36	143.39	4.83	173.66	3.34	40
Q9001003	26.27	33.33	41.7	23.48	90.61	6.28	152.9	3.98	186.97	2.66	40
Q9001004	29.12	37.23	46.89	25.89	104.68	6.57	178.26	4.08	219.53	2.68	45
Q9001005	21.51	27.37	34.34	19.18	75.46	5.02	127.79	3.15	156.76	2.09	45
Q9001006	26.85	34.3	41.96	24.06	87.16	7.18	145.51	4.53	178.26	3.07	45
Q9001007	14.89	18.85	23.55	13.32	50.83	3.61	85.67	2.3	104.45	1.54	45
Q9001008	17.9	22.3	27.46	16.18	56.12	4.88	92.05	3.22	111.47	2.24	40
Q9002001	41.07	51.58	63.95	36.94	134.28	10.58	223.55	6.85	271.25	4.68	50
Q9002002	40.17	50.52	62.72	36.1	132.28	10.25	220.56	6.62	267.97	4.51	50
Q9003001	52.12	65.5	78.92	47.25	154.55	15.78	248.77	10.35	302.84	7.26	55
Q9003002	31.01	39.07	48.59	27.83	103.17	7.79	172.62	5.01	209.87	3.4	50
Q9003003	31.01	39.85	50.46	27.45	114.86	6.7	196.96	4.11	243.73	2.67	55
Q9003004	44.16	55.73	67.42	39.91	134.09	12.94	218.03	8.41	266.62	5.84	55
Q9004001	20.98	26.4	32.81	18.84	69.41	5.32	115.9	3.43	140.86	2.33	60
Q9004002	49.05	61.93	77.16	43.96	165.03	12.14	277.16	7.77	337.21	5.25	60
Q9004003	49.05	60.62	71.95	44.92	133.16	16.68	206.39	11.36	247.11	8.25	65
Q9004004	25.7	32.4	40.32	23.06	85.81	6.43	143.73	4.13	174.78	2.8	45
Q9016001	37.77	47.62	57.54	34.16	113.97	11.17	184.81	7.27	225.73	5.07	65
Q9016002	44.41	54.96	65.31	40.64	121.42	14.96	188.77	10.16	226.31	7.36	65
average	32.55	40.98	50.36	29.32	104.02	8.85	171.66	5.75	208.96	3.97	50.75

City: Ottawa
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
OTTCOS9	40.61	51.43	59.05	37.45	74.94	27.59	77.14	20.99	79.17	16.65	70
OTTCOS2	42.79	53.73	61.44	39.67	77.17	29.65	79.35	22.58	81.42	18.06	70
OTTCOS3	50.62	63.09	71.88	47.15	89.47	35.6	92.16	27.19	95.28	21.92	70
OTTCOS1	40.85	51.35	58.76	37.85	73.91	28.23	76.01	21.49	78	17.18	70
OTTCOS4	44.71	54.97	62.21	41.97	76.18	32.02	79.94	24.76	82.58	20.34	65
OTTCOS8	42.45	53.22	60.81	39.4	76.24	29.52	78.38	22.48	80.56	18.02	70
OTTCOS7	28.38	36.32	41.92	25.99	53.9	18.79	55.56	14.28	57.03	11.21	55
OTTCOS5	52.8	65.93	75.19	49.12	93.81	37.04	96.39	28.23	99.64	22.71	55
OTTCOS6	43.56	54.69	62.54	40.39	78.55	30.19	80.77	22.99	82.88	18.39	60
OTTURB7	63.88	77.71	87.49	60.31	107.21	46.36	112.59	36.18	116.24	30.2	65
OTTURB2	54.16	66.98	76.02	50.67	93.75	38.48	97.58	29.6	100.85	24.1	55
OTTURB3	52.77	65.57	74.59	49.23	92.5	37.26	95.67	28.54	98.9	23.08	55
OTTURB4	50.07	61.9	70.24	46.86	86.56	35.6	90.16	27.4	93.18	22.32	55
OTTURB5	44.35	54.58	61.81	41.6	75.78	31.71	79.4	24.5	82.03	20.09	65
OTTURB6	50.04	60.72	68.28	47.3	83.73	36.43	87.91	28.48	90.75	23.87	65
OTTMON2	56.73	70.62	80.41	52.87	99.94	39.96	103.1	30.55	106.59	24.66	65
OTTMON1	45.31	56.1	63.71	42.36	78.67	32.15	81.76	24.7	84.5	20.07	65
OTCOS10	41.67	52.38	59.93	38.61	75.37	28.81	77.51	21.93	79.54	17.53	65
OTCOS11	41.07	50.77	57.62	38.43	71.02	29.2	73.97	22.46	76.44	18.3	70
OTTURB1	42.98	53.51	60.93	40.05	75.74	30.27	78.12	23.14	80.77	18.67	60
average	46.49	57.78	65.74	43.36	81.72	32.74	84.67	25.12	87.32	20.37	63.50

City: Richmond Hill
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
901427	66.32	79.26	88.62	63.72	116.36	39.74	118.42	31.48	125.57	26.56	80
900814	47.19	57.44	64.95	44.98	86.74	26.93	88.37	21.17	93.46	17.21	85
900815	49.21	60.04	68.01	46.84	91.05	27.88	92.77	21.88	98.11	17.63	80
900918	47.55	57.32	64.44	45.51	85.29	27.84	86.84	21.97	91.85	18.46	80
901019	31.96	39.24	44.62	30.33	60.08	17.8	61.24	13.93	64.77	10.98	75
901020	37.34	47.66	55.52	34.71	77.66	18.49	79.36	14.26	83.92	9.7	75
901121	57.07	68.84	77.42	54.62	102.53	33.37	104.4	26.33	110.41	22.08	80
901122	46.42	54.8	60.81	44.82	78.93	28.73	80.28	22.88	85.72	19.39	80
901529	45.57	54.66	61.25	43.72	80.68	27.06	82.12	21.4	86.91	18.03	75
901326	41.5	49.4	55.11	39.93	72.1	25.12	73.36	19.93	77.96	16.84	75
901325	47.42	56.59	63.21	45.59	82.87	28.54	84.33	22.62	89.5	19.1	75
901530	86.87	102.11	114.07	83.96	292.56	38.19	370.36	23.44	437.41	15.62	85
901428	61.03	75.14	85.59	57.84	115.56	33.71	117.81	26.36	124.59	20.57	80
901631	32.3	38.4	42.92	31.06	57.67	19	59.8	14.36	64.53	11.72	75
900101	65.16	79.81	90.6	61.92	121.71	36.54	124.05	28.64	131.19	22.78	75
900102	96.31	112.49	125.04	93.46	306.32	44.31	383.89	28.01	449.65	19.36	80
900203	52.45	60.99	67.56	51.03	160.42	24.89	199.65	16.05	232.52	11.37	75
900204	71.67	83.92	93.46	69.45	232.98	32.41	293.1	20.26	344.39	13.81	80
900305	60.18	69.96	77.48	58.55	183.63	28.61	228.45	18.47	265.98	13.11	75
900306	67.66	79.92	89.63	65.18	238.29	28.69	304.02	17.2	361.39	11.14	75
900407	63.94	74.97	83.58	61.9	210.48	28.63	265.39	17.78	312.4	12.02	75
900408	63.87	74.57	82.86	61.99	202.44	29.46	253.55	18.66	296.84	12.93	75
900509	87.12	102.87	115.35	83.95	305.98	37.03	390.19	22.24	463.63	14.42	80
900510	65.82	76.95	85.6	63.84	211.14	30.08	265	18.93	310.78	13.02	95
900611	44	50.32	55.07	43.16	117.04	23.27	142.02	16.07	162.12	12.42	70
900612	57.64	66.67	73.55	56.24	168.31	28.36	207.74	18.72	240.34	13.66	75
900916	67.21	78.76	87.77	65.09	220.13	30.21	277.32	18.81	326.2	12.76	75
900917	81.63	94.87	105.05	79.44	248.51	38.88	309.02	25.13	359.67	17.86	75
901223	61.47	71.49	79.21	59.79	188.42	29.12	234.59	18.75	273.31	13.27	80
901224	130.48	150.86	168.78	126.88	442.93	58.65	559.09	34.39	657.85	26.33	85
average	61.15	72.34	80.90	58.98	165.29	30.72	197.88	21.34	227.43	16.14	78.17

City: Winnipeg
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
M901001	15.26	17.97	19.68	14.87	23.85	10.46	26.48	7.75	28.08	4.7	55
M902001	54.02	65.63	70.18	57.28	172.08	25	250.45	13.28	348.31	3.68	80
M903001	22.34	26.45	28.21	23.16	55.52	12.19	74.24	7.46	96.07	2.92	55
M904001	29.89	34.96	36.82	31.56	77.92	16.45	104.88	9.8	137.44	3.53	60
M904002	33.22	39.03	41.19	35.1	88.77	17.91	120.61	10.51	159.21	3.67	55
M905001	45.01	53.14	56.19	47.58	123.37	23.74	169.27	13.74	225.15	4.65	65
M905002	13.48	16.4	18.32	12.88	22.37	8.57	24.61	6.17	25.96	3.48	55
M905003	30.99	38.1	42.84	29.43	52.46	19.22	57.61	13.7	60.54	7.56	70
M905004	12.97	15.16	16.51	12.7	19.98	9.06	22.24	6.76	23.6	4.13	55
M905005	12.3	14.34	15.6	12.06	18.87	8.63	21.02	6.46	22.3	3.95	55
M905006	28.29	33.6	36.98	27.43	44.88	19.03	49.71	14	52.69	8.33	65
M906001	63.69	71.42	73.94	66.96	133.23	41.83	165.41	28.26	203.13	13.2	85
M907001	20.23	23.8	25.33	20.95	48.67	11.33	64.31	7.07	82.43	2.88	50
M907002	46.48	55.09	58.81	48.17	116.47	25.17	156.24	15.34	202.68	5.94	70
M907003	62.02	72.74	76.7	65.51	164.07	33.72	222.05	19.91	292.26	7.04	65
M907004	25.19	29.21	30.88	26.06	56.01	15.05	71.89	9.84	90.05	4.39	50
M907005	20.92	24.14	25.29	22.05	50.86	12.19	66.69	7.56	85.61	2.96	50
M907006	18.29	22.11	23.8	19	50.99	9.05	71.23	5.18	95.34	1.76	55
M908001	23.7	27.61	29.04	25.01	60.6	13.25	80.98	7.98	105.52	2.94	55
M909001	38.44	49.88	57.94	35.13	74.5	20.67	78.7	13.95	80.74	6.8	75
average	30.84	36.54	39.21	31.64	72.77	17.63	94.93	11.24	120.86	4.93	61.25

City: Regina
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
SA1001	43.56	50.79	56.57	40.41	72.39	25.12	74.37	20.48	78.69	10.45	70
SA1002	14.75	17.19	19.18	13.62	24.9	8.27	25.79	6.69	27.41	3.25	60
SA3005	17.36	21.45	24.33	16.04	31.58	9.82	32.39	6.98	33.15	4.19	45
SA3006	36.56	42.15	46.92	33.69	61.81	20.11	65.05	16.28	69.5	7.52	70
SA3007	15.55	18.1	20.19	14.37	26.19	8.73	27.14	7.08	28.85	3.44	55
SA3008	54.46	69.56	80.13	49.61	107.94	28.75	110.32	18.71	112.67	10.23	70
SA4003	17.43	21.43	24.41	15.95	32.23	9.38	33.12	6.92	34.14	3.62	45
SA4004	31.68	37.62	42.41	29.05	55.75	17.06	57.12	13.54	60.68	6.35	60
SA6001	24.44	25.49	27.79	22.28	43.61	11.66	48.13	7.19	55.97	2.36	70
SA6002	31.42	36.9	41.35	28.94	53.89	17.34	55.61	13.92	59.12	6.67	55
average	28.72	34.07	38.33	26.40	51.03	15.62	52.90	11.78	56.02	5.81	60.00

City: Saskatoon
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
SA2001	30.34	34.34	37.93	26.99	54.36	17.69	58.43	12.77	68.88	2.27	65
SA2002	17.92	18.61	20.18	16.07	32.44	9.85	37.17	8.17	43.63	1.19	60
SA3001	33.76	37.89	41.53	30.14	59.77	20.05	64.43	14.58	75.65	2.7	70
SA3002	19.81	21.21	22.81	17.82	34.68	12.24	38.55	9.11	44.95	1.68	65
SA3003	15.57	17.62	19.46	14.01	26.49	9.43	28.07	6.95	32.63	1.5	75
SA3004	15.48	17.14	18.58	13.96	26.26	9.62	28.25	7.15	32.75	1.55	55
SA4001	16.58	20.37	23.91	14.93	30.09	9.34	30.53	6.56	30.94	1.55	75
SA4002	14.23	15.5	16.74	12.73	25.23	8.7	27.79	6.32	32.56	1.14	60
SA5001	16.09	18.98	21.69	14.4	27.68	9.18	28.5	6.56	33.36	1.36	70
SA5002	31.95	35.18	38.23	28.33	58.78	18.82	64.91	13.41	76.9	2.12	70
average	21.17	23.68	26.11	18.94	37.58	12.49	40.66	9.16	47.23	1.71	66.50

City: Edmonton
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
EDM-01	33.06	39.94	47.01	32.38	56.73	23.4	62.25	18.64	67.71	14.13	70
EDM-02	36.63	45.12	53.87	35.73	65.62	25.33	70.07	19.54	76.52	14.45	70
EDM-03	33.04	36.11	42.56	31.84	97.16	19.02	144.75	15.9	174.73	10.93	45
EDM-04	39.07	45.97	53.08	38.45	63.64	28.47	71.93	23.67	77.83	18.51	75
EDM-05	37.04	43.53	50.22	36.45	60.23	27.01	68.12	22.49	73.69	17.61	70
EDM-06	37.58	43.06	48.78	37.12	58.94	28.09	67.54	24.33	72.7	19.57	50
EDM-07	20.05	24.63	29.35	19.57	35.69	13.91	38.27	10.78	41.77	7.99	75
EDM-08	37.25	44.24	51.43	36.6	61.77	26.87	69.13	22	74.93	17.02	80
EDM-09	40.06	49.31	58.84	39.08	71.63	27.72	76.59	21.41	83.61	15.85	70
EDM-10	24.67	30.58	36.68	24.03	44.91	16.92	47.78	12.92	51.86	9.5	55
average	33.85	40.25	47.18	33.13	61.63	23.67	71.64	19.17	79.54	14.56	66.00

City: Vancouver
Leakage Rate, Condition C - L/s

House ID	Year average	Heating Season average	Max. Monthly average	Min. Monthly average	Max. running 24 hr avg.	Min. running 24 hr avg.	Max. running 8 hr avg.	Min. running 8 hr avg.	Max. Hourly	Min. Hourly	Required Ventilation
BC-01	121.18	140.47	157.44	128.95	388.81	68.53	537.63	54.08	691.12	30.92	70
BC-02	50.65	59.1	64.11	52.83	82.84	37.03	94.87	29.86	104.33	16.65	70
BC-03	80.04	90.72	96.65	82.93	126.24	60.89	142.41	51.15	155.38	30.58	55
BC-04	46.56	56.03	61.98	48.88	80.15	32.24	91.93	24.8	102.83	12.85	60
BC-05	52.47	61.76	67.35	54.83	87.06	37.8	99.76	30.09	110.21	16.44	75
BC-06	51.8	58.6	62.36	53.64	81.51	39.48	91.85	33.23	100.18	19.96	65
BC-07	73.59	85.28	92.1	76.65	119.24	54.44	136.19	44.34	149.2	25.11	75
BC-08	54.5	63.84	69.41	56.9	89.71	39.6	102.76	31.75	113.23	17.55	65
BC-09	73.44	85.1	91.91	76.49	118.99	54.33	135.9	44.26	148.88	25.06	85
BC-10	28.54	33.23	35.99	29.76	46.51	20.95	53.25	16.95	58.48	9.5	75
BC-11	58.14	69.25	76.11	60.92	98.4	41.01	112.83	32.06	125.48	17.03	55
BC-12	28.49	33.17	35.93	29.71	46.43	20.91	53.16	16.92	58.38	9.48	65
BC-13	56.22	64.86	69.85	58.5	90.6	41.9	103.21	34.35	112.96	19.64	65
BC-14	48.02	55.13	59.2	49.9	76.94	36	87.42	29.76	95.6	17.19	60
BC-15	63.85	75.48	82.54	66.79	106.7	45.66	122.29	36.12	135.42	19.54	75
BC-16	81.92	93.88	100.7	85.1	130.98	61.55	148.67	51.05	162.53	29.61	65
BC-17	41.14	49.04	53.91	43.12	69.7	29	79.92	22.65	88.9	12.02	55
BC-18	64.7	75.58	85.32	68.82	222.28	35.11	311.33	27.2	400.45	14.85	70
BC-19	54.27	63.69	72.21	57.69	194.31	28.71	274.21	22	354.3	11.67	75
BC-20	59.82	69.77	78.64	63.64	202.59	32.75	283.49	25.47	363.45	14.04	65
average	59.47	69.20	75.69	62.30	123.00	40.89	153.15	32.90	181.57	18.48	67.25