Airtightness Tests on 200 New Houses Across Canada: Summary of Results

A RESEARCH REPORT

An Investigation of the Levels of Airtightness in New Canadian Housing, Including Regional Variations.

Sponsored by the
Energy Conservation and Oil Substitution Branch
Energy, Mines and Resources Canada

Prepared by
Michael Sulatisky
Saskatchewan Research Council
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1

January, 1984

BETT Publication No. 84.01

The Buildings Ener
assist building ov
and operation of b
Through a nationwi
BETT carries out r
mentioned above wi
visual aids and da

For further inform

The Buildings Ene
Transfer Program
Energy, Mines and
580 Booth St.
Ottawa, Ontario
K1A 0E4

Cat. No. M91-3/84-01E
ISBN 0-662-13231-9

ABSTRACT/RESUME

A data base on the airtightness performance of houses built according to current construction practices (1980 to 82) was established, province by province, across Canada. Airtightness tests were conducted using the fan-depressurization method and the results were compared by province, builder, house style, and house size.

The survey shows considerable variation in the leakiness of the houses when the results are compared by province. Less variation in airtightness exists when the houses are compared by builder, house style, and house size on a provincial basis. The results suggest that builders in Canada should have little difficulty in constructing houses with a 50% improvement in the level of airtightness at little extra cost.

* * *

On a établi, pour tout le Canada et province par province, une base de données sur l'étanchéité des maisons construites selon les normes du bâtiment actuellement en vigueur (de 1980 à 1982). Des essais d'étanchéité ont été menés à l'aide d'un ventilateur aspirant, et les résultats obtenus ont été compilés en fonction de la province, de l'entrepreneur, du modèle de maison et des dimensions.

Il ressort de ces recherches que le taux de fuites d'air des maisons varie beaucoup de province en province. Toutefois, les écarts sont moins marqués lorsqu'on compare les résultats en fonction de l'entrepreneur, du modèle ou des dimensions, à l'intérieur d'une même province. Il semble que les entrepreneurs canadiens devraient avoir peu de difficulté à augmenter de moitié l'étanchéité des maisons qu'ils construisent sans ajouter beaucoup aux frais de construction.

CONTENTS

This report is issued as part of the activities of the Building Energy Technology Transfer (BETT) program - a program administered by the federal department of Energy, Mines and Resources (EMR). The objective of the program is to develop competent energy conservation technologies for buildings of all types, and to deliver these technologies to builders, homeowners, policy-makers, and building scientists. This report falls in the category of Low-Rise Residential Buildings - a category that is managed by the Saskatchewan Research Council under contract to EMR.

With the cooperation of the Housing and Urban Development Association of Canada, a data base was established on the airtightness performance of new houses (1980 to 1982) across Canada. This was done to establish how good current building practices are in terms of airtightness. The progress being made in this regard can be assessed by comparing the results to historical levels of airtightness, and to the levels of airtightness that can be achieved in Super Energy-Efficient Houses (SEEH, R2000). Moreover, airtightness tests are regarded as fast and effective means of detecting cold drafts, and estimating the consequent energy loss.

The author would like to thank R.S. Dumont and C.Y. Shaw of the National Research Council and W.R. Jones of Ontario Hydro for their advice and guidance in conducting this project and assembling the report.

M. Sulatisky
Saskatchewan Research Council
January, 1984

INTRODUCTION

Energy is lost from buildings by conduction through the walls and ceilings, and air infiltration through the unintentional openings (cracks and holes) in the building envelope. The R-value of a wall, or ceiling, reflects the resistance to conductive heat transfer. The resistance to the movement of cold, outside air into the building is determined by the airtightness of the building envelope. Both conduction and infiltration heat losses are ultimately determined by climatic conditions: outdoor temperature and wind velocity.

Airtight construction is recognized as being an important element in energy-efficient housing. A Canadian General Standards Board (CGSB) standard is now being developed for airtightness testing procedures (1) and it is probable that, over the next few years, Canadian housing will move in the direction of improved airtightness performance.

The building industry recognizes the desirability of airtight construction and is preparing to develop the appropriate improvements in construction practice. Currently though, the industry lacks the right sort of information on which to base this development. It needs to know:

- how good its current practices are in terms of airtightness;
- which practices, region by region, are responsible for poor airtightness performance; and
- how best to improve these practices.

To answer these questions, fan-door tests were conducted in 200 houses of recent construction, province by province, across Canada. The intent was to test houses constructed to current construction practices (1980-82). Super energy-efficient houses, that are often fitted with a continuous air/vapour barrier, were only tested if they were seen to represent a significant protion of new housing starts "in a region." (Methods for installing a continuous air/vapour barrier are discussed in Reference 2).

There is a growing amount of information on the airtightness of houses, but the majority of the information has been gathered in and around Ottawa (3) and Saskatoon (4). It is therefore restricted to a fairly small, unrepresentative sample of the national housing stock. Moreover, the existing information is spread over a wide range of house ages, and contains relatively little data on houses of recent construction.

Table 1: Saskatoon

Year	Q/V at 50 Pa (h^{-1})
pre-1945	10.4
1946-1960	4.6
1961-1980	3.6
Airtight Houses	1.5

The results of the airtightness tests in Saskatoon are summarized in Table 1 by age of house for reference purposes. Another reference is provided by the Super Energy-Efficient Home (SEEH) program, R2000, sponsored by Energy, Mines and Resources (EMR) Canada and the Housing and Urban Development Association of Canada (HUDAC). The R2000 houses are to meet an airtightness performance level of 1.5 air changes per hour at a 50 Pa pressure differential; all 300 homes in the SEEH Program have met this requirement by using continuous air/vapour barrier techniques. Also, an airtightness standard of 3.0 air changes per hour at 50 Pa has been established in Sweden (5).

The results presented in this summary report are based on the results of a more detailed investigation (6). In the sections that follow, the aims and objectives of the work are presented, and the procedures used to conduct the work discussed. A brief description of the houses is given, and the results of the house inspections and the airtightness tests summarized. The Appendices include the results of pressure tests on each house (Appendix A), a few more detailed comparisons (Appendix B), and a brief presentation on the sources of error (Appendix C).

AIMS

The objectives of this project were to:

- establish a data base on the airtightness performance of houses built according to current practices across Canada, and
- identify those houses that have poor airtightness performance and investigate the reasons for this poor performance.

AIRTIGHTNESS TESTING METHOD

The 200 houses were selected by the regional offices of HUDAC. Locations were selected to represent significant centres of construction activity. The sample size in each province was:

- British Columbia, Alberta, Saskatchewan, Manitoba, 20 houses;

- Ontario, Quebec, 40 houses;

- New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland, 10 houses.

Consultants in each region conducted the airtightness tests and inspected the houses. The size and style of the houses were recorded along with the types of windows and doors, and the type of heating system. During the course of the pressure tests, major leakage areas were identified with a smoke pencil.

The pressure tests were conducted to the CGSB standard on airtightness testing with the following exceptions:

- Pressure tests were conducted with the houses in both the "as is" or unsealed condition, and in the sealed condition. For tests in the sealed condition, all chimney flues and air vents (clothes dryer, fresh-air intakes, exhaust fan openings) are sealed so as to make the test results pertain to the house envelope. Tests in the unsealed condition are useful for estimating natural infiltration rates.

- Corrections were not made for wind velocity; however, most of the tests were conducted under calm conditions.

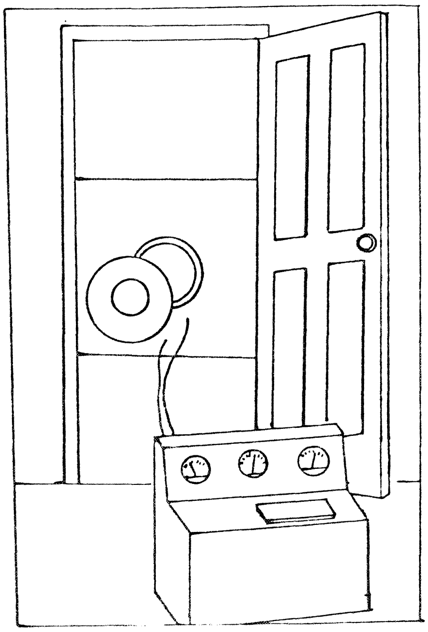


Figure 1. Door Fan

A schematic of a typical door fan is shown in Figure 1. For each test, the pressure differential (interior-exterior) and the corresponding flowrate for at least six test points were recorded. The test points covered a pressure range of 10 to 50 Pa. However, in some cases the upper pressure range was limited by the capacity of the door fan.

The test data for each test condition (unsealed and sealed) was subject to regression analysis to determine the best power-law curve fit to the data points. The following power function was used to characterize the flowrate through the building envelope:

$$Q = C\Delta P^n \qquad (1)$$

where
Q = volumetric flowrate (L/s)
C = flow constant (L/sPa^n)
n = flow exponent
ΔP = pressure differential (Pa)

From the measurements of the houses, the following estimates were made:

- livable floor space, or floor area, A_f (m^2)

- house volume within the building shell, V (m^3); and

- shell area, or above grade surface area, A (m^2).

The equivalent leakage area, which represents the total area of all the cracks and holes in the building envelope, was calculated using the following equation:

$$ELA = 0.001157 \ \sqrt{\rho} \ C \ (10)^{n - 0.5} \qquad (2)$$

where ρ is the density of the outdoor air.

Equations 1 and 2 were used to calculate the following parameters used to rate the level of airtightness of houses:

- the air changes per hour at 50 Pa, Q/V (h^{-1});

- the equivalent leakage area at 10 Pa, ELA (m^2); and

- the equivalent leakage area per above grade surface area at 10 Pa, ELA/A (cm^2/m^2).

The airtightness results were broken down in different ways according to province, builder, house size, and house style. Although the ELA/A at 10 Pa was the primary parameter used in the comparisons, some comparisons were also made based on Q/V at 50 Pa.

The houses tested are typical of low-rise housing present in suburban areas in Canada (1980-1982) as shown in Figure 2. Housing styles included: single-storey, bi-level, split-level, and two-storey houses. The average size of the houses in each provincial sample is shown in Table 2. The most commonly used parameter for comparing house size is livable floor space, or floor area. This parameter is compared by province in Figure 3. Basic statistics regarding the geometry of the houses are provided in Appendix B (Table B1).

AIRTIGHTNESS RESULTS

Comparison by Province

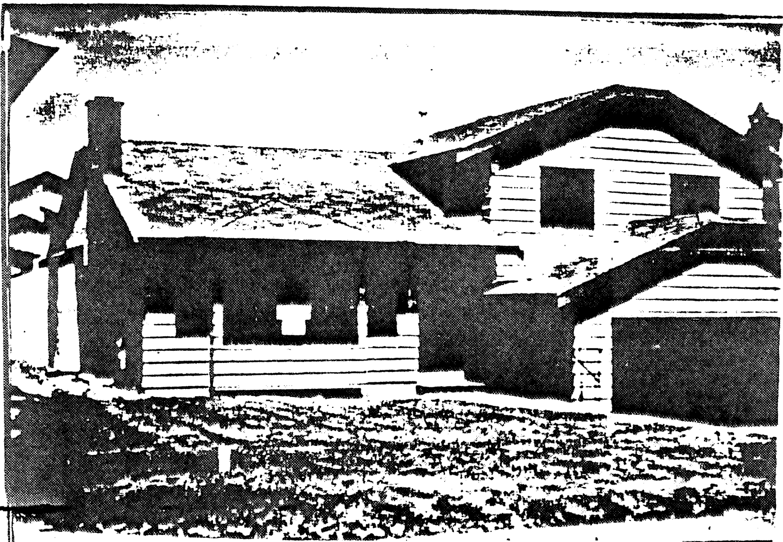
The average pressure test results (sealed condition) are compared by province in Table 3 and Figure 4. The results indicate that the tightest houses are located in the provinces of Manitoba and Saskatchewan. An inspection of these houses indicated that a continuous air/vapour barrier was installed in only one of the houses; however, electrical outlets and fixtures were frequently enclosed in polyethylene, and caulking was used at the header-joist connection in a number of houses.

Major Leakage Areas

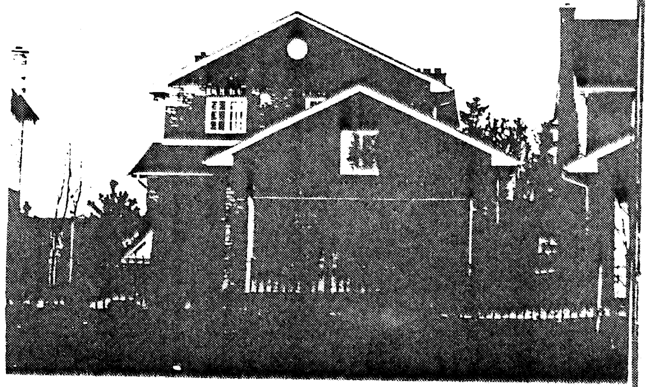
The leakier houses are located in British Columbia, Alberta, Ontario and Prince Edward Island. The major leakage areas of the houses in these four provinces were identified by smoke pencils and found to be:

- the sill-header-joist-wall connections,
- electrical outlets and fixtures,
- utility service and plumbing penetrations of the building envelope,
- the frames around windows, doors, and attic hatches,
- around fireplaces, and
- around wall overhangs and bay windows.

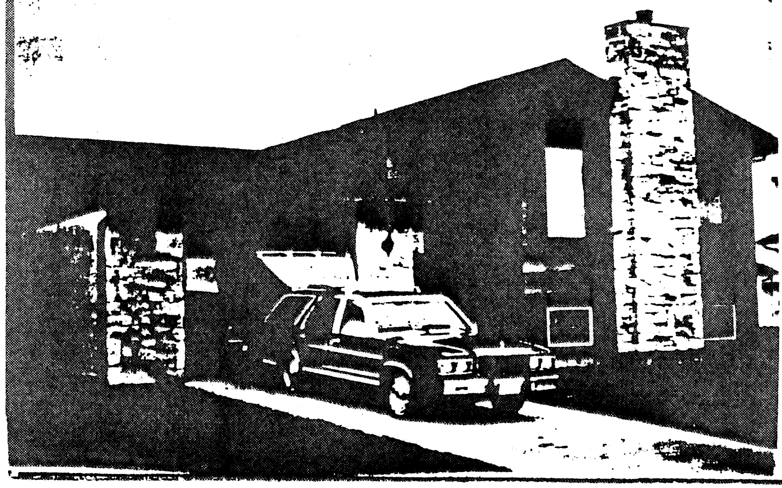
Basic statistics regarding the provincial comparisons are provided in Appendix B (Table B2).



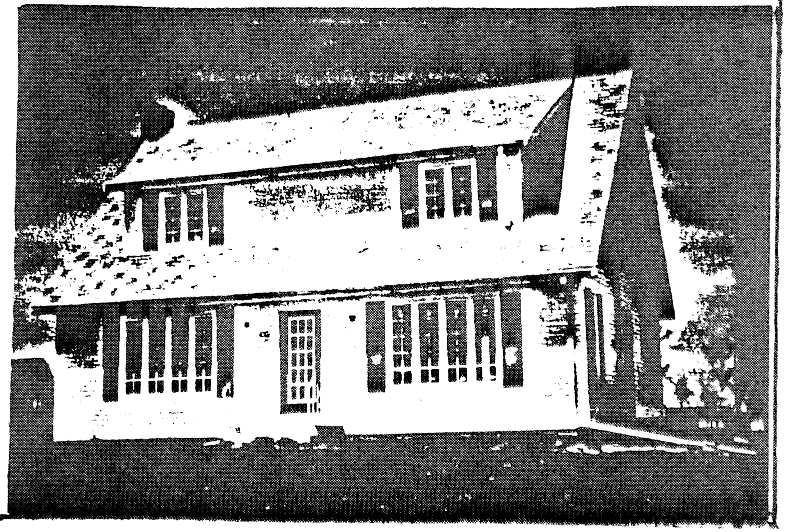
British Columbia



Ontario



Manitoba



Prince Edward Island

Figure 2. Typical Canadian Housing (1980-82)

Table 2: Comparison of Average Floor Area, Volume, and Above Grade Surface Area

Province	A_f (m^2)	V (m^3)	A (m^2)
British Columbia	160	474	362
Alberta	148	620	299
Saskatchewan	142	605	283
Manitoba	113	508	238
Ontario A	147	548	300
Ontario B	165	613	285
Quebec	114	445	282
New Brunswick	153	564	231
Nova Scotia	220	747	395
Prince Edward Island	161	642	264
Newfoundland	169	757	437

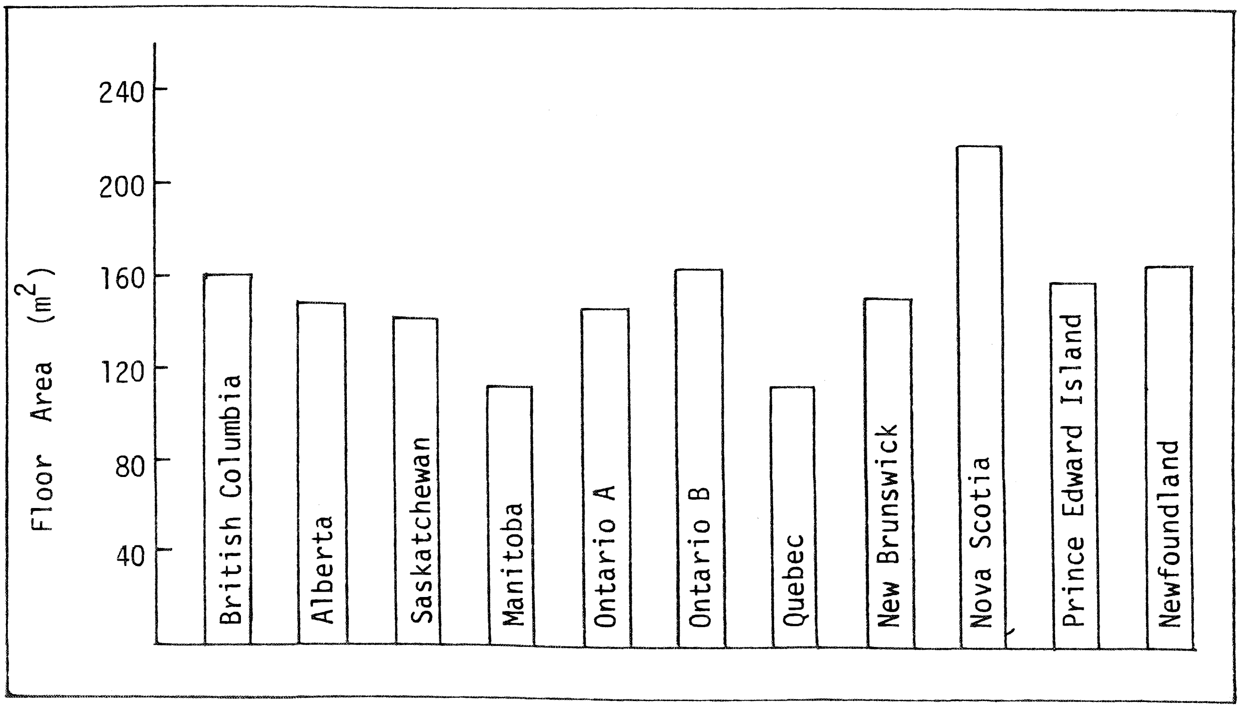


Figure 3. Livable floor space by province.

Table 3. Comparison of ELA, ELA/A and Q/V in the Sealed Condition.

Province	ELA at 10 Pa (m^2)	ELA/A at 10 Pa (cm^2/m^2)	Q/V at 50 Pa (h^{-1})
British Columbia	0.157	4.32	9.33
Alberta	0.119	3.92	5.26
Saskatchewan	0.055	1.96	3.18
Manitoba	0.038	1.58	2.12
Ontario A	0.129	4.20	5.46
Ontario B	0.092	3.28	4.56
Quebec	0.080	2.87	4.74
New Brunswick	0.073	3.23	3.62
Nova Scotia	0.129	3.46	5.20
Prince Edward Island	0.101	3.85	4.15
Newfoundland	0.132	3.64	5.34

International Comparisons

The results of the airtightness survey are compared against the housing stock in Sweden, the United States, and Great Britain in Figure 5. The level of airtightness for Canadian housing appears to match that of the houses constructed after 1965 in Sweden, and encompasses the range of energy-efficient houses constructed in the United States.

Comparison By Builder

The intent of the comparison by builder was to investigate if some builders consistently construct airtight or leaky houses. A total of 77 builders participated in this study. Thus the sample size was too small to make comparisons with respect to all the builders.

The comparisons shown in Figure 6 are for builders who constructed 4 houses or more. Although this remains a fairly small sample size, two observations can be made:

- The builders in Manitoba constructed houses having a uniformly lower level of air leakage than the builders in other provinces.

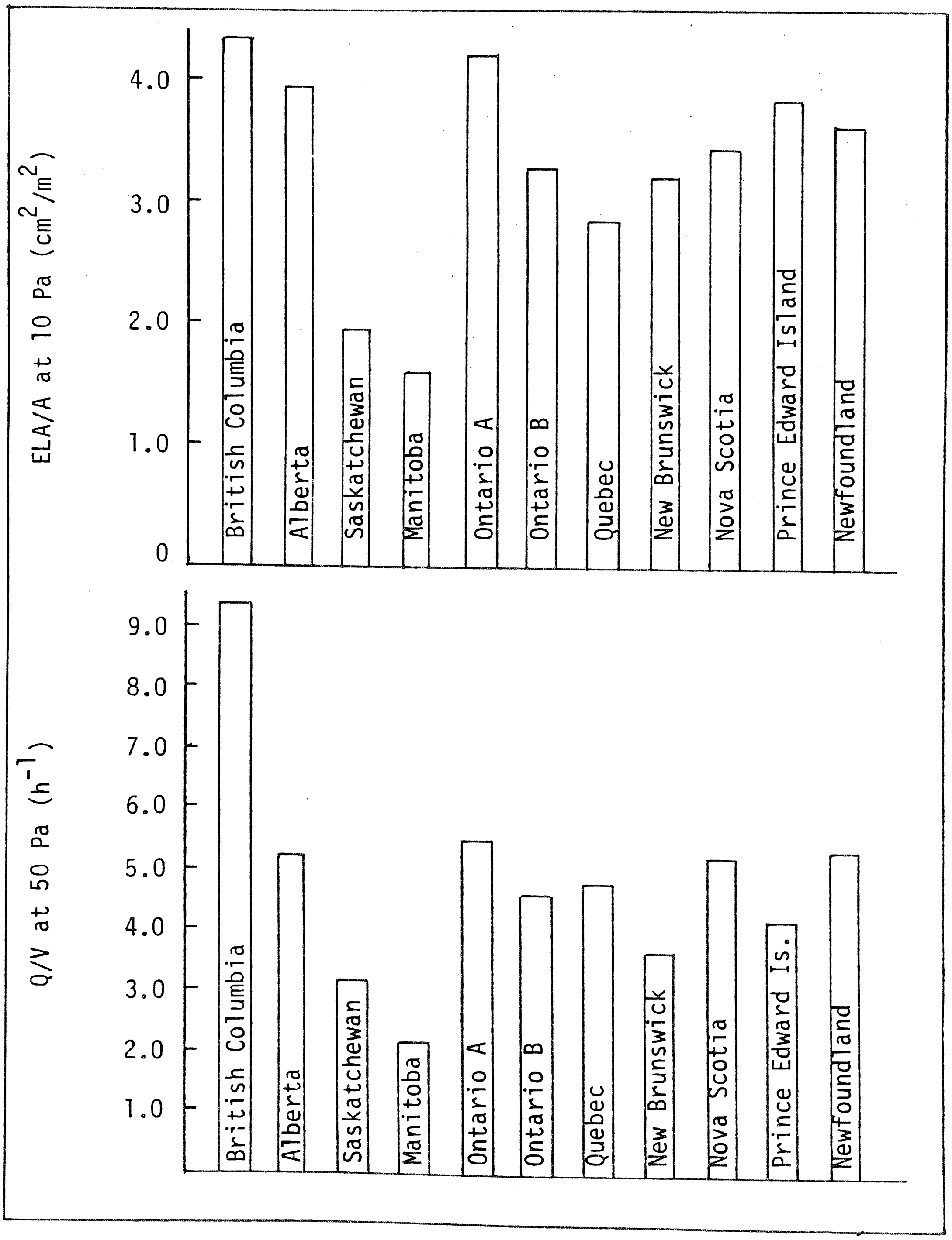


Figure 4. Equivalent Leakage Area per Shell Area and Airchanges per Hour by Province.

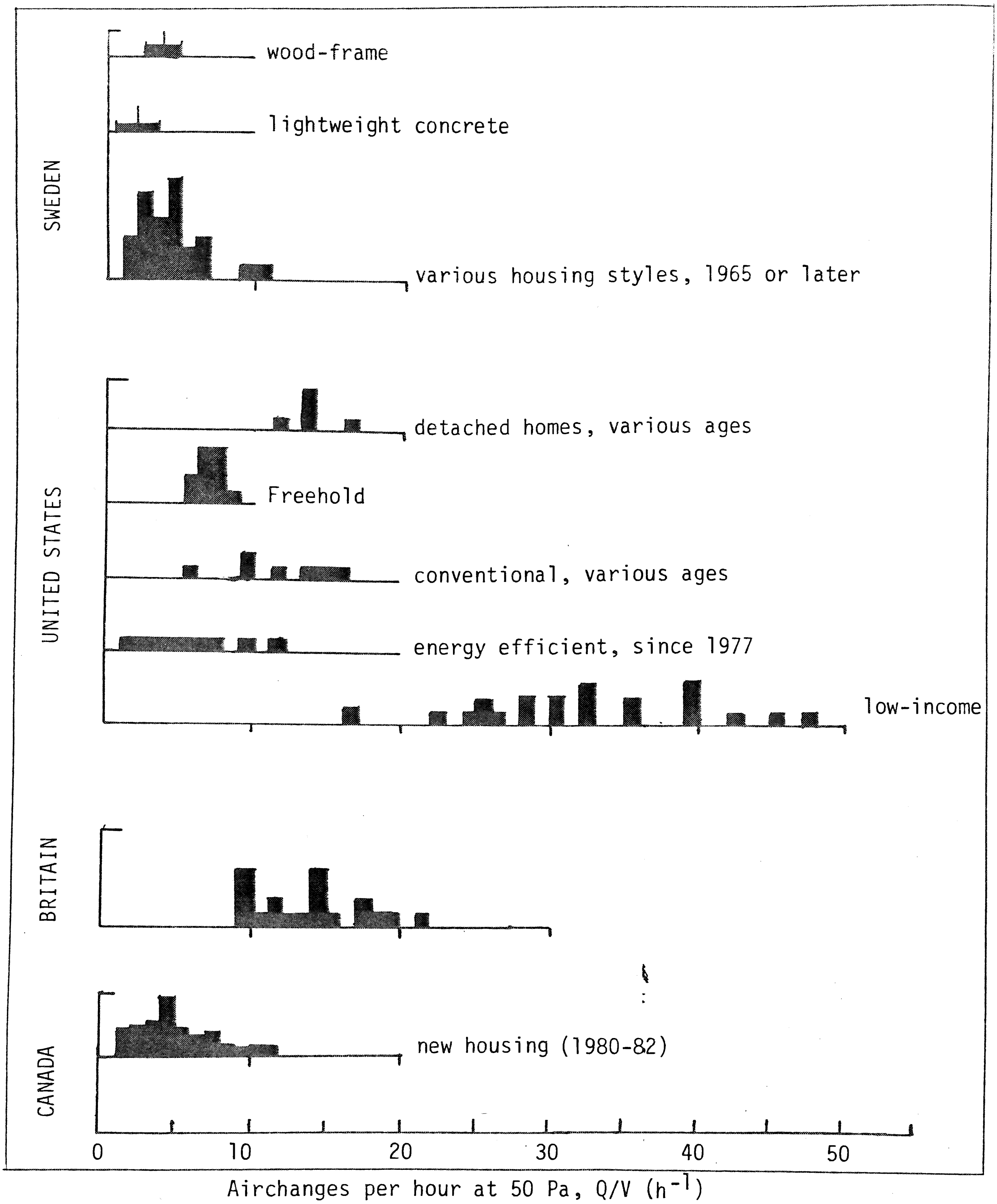


Figure 5. International Comparison of Air Leakage (Extracted from "Understanding Air Leakage in Homes", by A. Persily, Princeton University, Center for Energy and Environmental Studies, Report PU/CEES #129, February, 1982).

- In Ontario and Quebec, the leakiness of the houses appears to reflect considerable variations in practice from builder to builder.

Comparison by Style

A fairly uniform level of airtightness exists when the single-storey, split-level, and two-storey houses are compared in each province. However, when the results for all the houses in the study are compared according to style, a small variation in airtightness is indicated: the single-storey houses are approximately 6% tighter than the split-level houses and the split-level houses are approximately 12% tighter than the two-storey houses. Statistical information regarding these comparisons is given in Appendix B (Table B4).

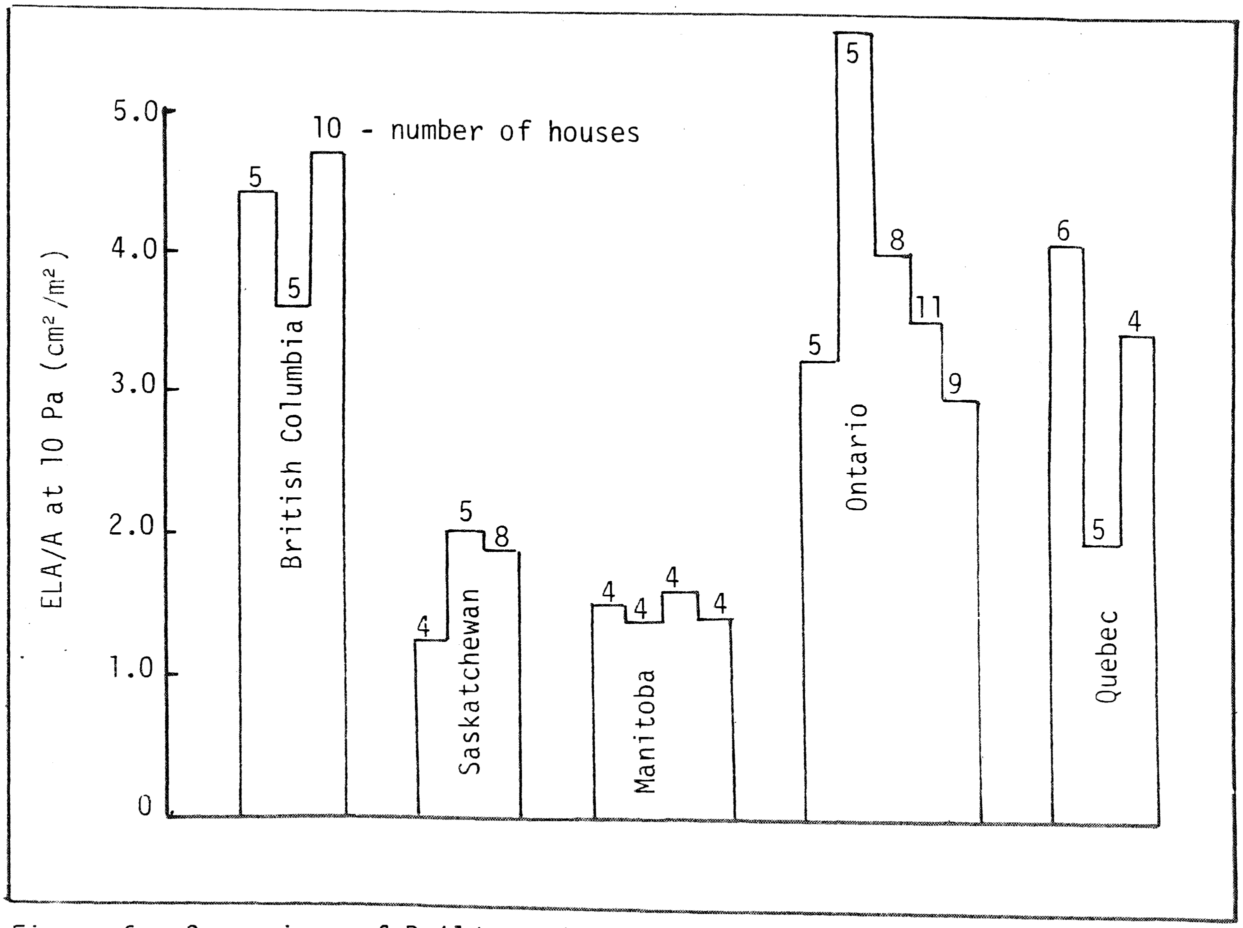


Figure 6. Comparison of Builders who Constructed Four Houses or More.

Comparison by Size

Comparisons with respect to the size of the houses are based on an analysis of the increase in air leakage with the size of the house: floor area, above grade surface area, and house volume (6). It was found that the leakiness of the houses (in terms of Q and ELA) increases with increasing above grade surface area. The airtightness was less uniform when the results were compared with floor area and house volume. This was especially true for the British Columbia houses where many of the houses do not have basements, and house volume is small compared to the above grade surface area and floor area (see Table B1, Appendix B).

DISCUSSION

This survey establishes a data base on the airtightness performance of houses constructed according to current building practices across Canada. The results indicate a fairly large regional variation in the levels of airtightness. The highest average level of airtightness was found in Manitoba and the lowest in British Columbia. The ratio of airtightness for these two provinces was 2.7 to 1, based on ELA/A.

Climate

Although the regional differences in airtightness are due to different construction practices, the construction methods used may partly reflect the colder climate and related comfort considerations in some regions of Canada. The heating degree days are almost a factor of 2 higher in Winnipeg (5933 °C days) than in Vancouver (3064 °C days). An exception is the province of Alberta where the climate can be as severe as in Manitoba, but the results indicate that the houses are 2.5 times leakier. This may, in part, be due to lower home heating costs in Alberta than in other provinces.

Costs

The builders in Manitoba estimated the extra cost of enclosing electrical outlets and fixtures in polyethylene and caulking the header-joist connection as somewhere between $60 and $110, depending on the house. These results tend to indicate that builders in Canada should have little difficulty in constructing houses with a 50% improvement in levels of airtightness at little extra cost. The results from Manitoba and Saskatchewan also demonstrate that good airtightness performance can be achieved independent of the style of the house.

Air/Vapour Barrier

Table 4. Polyethylene

Thickness (mm)	ELA/A at 10 Pa (cm^2/m^2)
0.05	4.20
0.10	3.28

The selection of the houses made possible a comparison of the houses with respect to the materials used for the air/vapour barrier. Although polyethylene does not leak, the thinner material can be more difficult to fit in place, and easily torn during installation. This can result in a higher leakage area than would normally be expected. In the Ontario sample, 20 houses used 0.05 mm (2 mil) polyethylene and 20 houses used a 0.10 mm (4 mil) polyethylene as the air/vapour barrier material. The results indicated a 22% improvement in airtightness for the 0.10 mm material over the 0.05 mm material as shown in Table 4.

Table 5. Material Comparison

Type	ELA/A at 10 Pa (cm^2/m^2)
Composite	3.37
0.10 mm poly.	2.61

One of the features of construction in the Quebec houses, that differed from other Canadian regions, was the use of a composite air/vapour barrier material made of building paper, asphalt, and aluminum foil. Of the 40 houses tested, 17 used the composite material and 18 used 0.10 mm polyethylene. The airtightness results indicated that the houses constructed with 0.10 mm (4 mil) polyethylene were 23% tighter than those built using the composite material as shown in Table 5. Kraft-backed batts and combinations of the polyethylene and the composite material were used in the remaining 5 houses.

It should be noted that the above comparisons of vapour barrier materials are based on statistically small samples and may not reflect some other variations in construction practice.

Sources of Error

The sources of error in an airtightness survey of this kind can be divided into two categories: the error associated with an individual airtightness test, and the accuracy associated with averaging the results of a sample of 20 houses or more. The error inherent in a single pressure test depends on:

- the accuracy of the pressure and flowrate instrumentation,

- climatic conditions (wind velocity, outdoor temperature) under which the test was conducted,

- the depressurization capacity of the door fan used to conduct the test, and

- the equations used to model the leakiness of the building envelope.

When a survey is done on a group of houses, statistical techniques can be used to estimate averages (means) and the level of confidence in the results. Techniques also exist for estimating how close the sample mean of the houses is to the true mean for the population.

In order to investigate the sources of error in this work, an airtightness testing agency, with considerable expertise, was commissioned to test two of the houses tested by each regional testing agency. The results indicated that the average ELA/A at 10 Pa and Q/V at 50 Pa for all the duplicated tests differed by 24 and 14%, respectively. Some of the individual results differed by 40 to 70% as a result of large differences in wind conditions (30 to 44 km/h) between the two tests on some houses. Details on the comparisons are provided in Appendix C (Tables C 1 to C3).

An error analysis was conducted to estimate the overall system accuracy of door fans used in this study. The analytical technique accounted for the inaccuracy of each component in the measurement system: flowrate, pressure drop, curve fitting. It was found that the probable errors in the ELA/A at 10 Pa and the Q/V at 50 Pa measurements were higher than the discrepancies due to the comparative tests (mentioned above). These results are discussed in detail in Reference 6.

For very leaky houses, the door fans were not capable of depressurizing the houses over the full range of 10 to 50 Pa. This was true for virtually all the houses in British Columbia and a number of other houses across the country. Hence, the results for these houses at 50 Pa contain an extrapolation error.

Houses that are very tight demonstrated a similar problem in the 10 Pa range. In some cases, the instrumentation was not sensitive enough to measure the low flowrates through the nozzle and the 10 Pa reading had to be dropped. Thus the 10 Pa results contain an extrapolation error for these cases.

From the house inspections and airtightness tests conducted in this across-Canada survey, the following conclusions can be drawn:

1. A variation exists in the airtightness performance of new houses constructed according to current building practices when the houses are compared by province and builder. The houses tested in Manitoba and Saskatchewan are the tightest, while the houses tested in British Columbia, Alberta, and Ontario are the leakiest. The ratio of airtightness, leakiest to tightest province, is 2.7 to 1 based on ELA/A at 10 Pa.

2. The leakiest areas in the building envelope are: the sill-header-joist-wall connection; electrical outlets and fixtures; utility service and plumbing penetrations; the frames around windows, doors, and attic hatches; around fireplaces; and around wall overhangs and bay windows.

3. The good results in Manitoba are attributed to sealing the sill-header-joist-wall connection and enclosing the electrical outlets and fixtures in polyethylene. The participating builders estimated that the added cost of doing this work was in the range of \$60 to \$110 per house.

4. The building envelopes in the houses tested in Ontario and Quebec appear to be more airtight if 0.10 mm (4 mil) polyethylene is used for the air/vapour barrier material instead of 0.05 mm (2 mil) polyethylene or a composite material.

An important observation of this study is that a number of houses tested are leakier than houses constructed prior to 1945 in Saskatoon. Moreover, the housing samples from Manitoba and Saskatchewan as a group are 50 to 100% leakier than houses constructed to the R2000 house standard. Hence, continuous air/vapour barrier installation techniques (as demonstrated by the SEEH Program) are probably necessary to achieve the airtightness level given in the R2000 specifications.

1. Canadian General Standards Board, Standard for Determination of the Airtightness of Buildings by the Fan Depressurization Method, Fifth draft, 146-GP-10M, September, 1982.

2. D. Eyre and D. Jennings, "Air-Vapour Barriers," Report of the Energy Conservation and Oil Substitution Branch, EMR of Canada, Fourth Edition, January, 1983.

3. R.K. Beach, "Relative Tightness of New Housing in the Ottawa Area", Building Research Note 149, DBR, NRC, Ottawa, June, 1979.

4. R.S. Dumont, H.W. Orr, and D.A. Figley, "Airtightness Measurements of Detached Houses in the Saskatchewan Area", Building Research Note No. 178, DBR, NRC, Ottawa, November, 1981.

5. Arne Elmroth and Per Levin, "Air Infiltration Control in Housing, A Guide to International Practice," Swedish Council of Building Research, International Energy Agency, Energy Conservation in Buildings and Community Systems Programme, Air Infiltration Centre D2: 1983.

6. M. Sulatisky and M. Gleadhill, "Airtightness Tests on 200 Houses Across Canada: Results and Technical Commentary," a project of the Energy Conservation and Oil Substitution Branch, EMR, SRC Publication No. R-825-7-E-83, July, 1983.

APPENDIX A

AIRTIGHTNESS RESULTS

Table A1. British Columbia House Descriptions.

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
BC 1	2SA	38 x 140	wood siding	sliders	sg	0.05	155	529	350	FA/G	G/So	2	bf/kf/as
BC 2	2SA	38 x 140	wood siding	sliders	sg	0.05	166	474	363	FA/G	G/So	2	bf/kf/as
BC 3	2SA	38 x 140	wood siding	sliders	sg	0.05	154	536	339	FA/G	G/So	2	bf/kf/as
BC 4	2SA	38 x 140	wood siding	sliders	sg	0.05	150	457	326	FA/G	G/So	2	bf/kf/as
BC 5	1SA	38 x 140	wood siding	sliders	sg	0.05	139	376	324	FA/G	G/So	2	bf/kf/as
BC 6	1SC	38 x 89	stucco	wood casement	-	0.05	155	390	450	FA/G/Bb/E	G	1	bf/kf/as
BC 7	2SC	38 x 89	stucco	sliders	sg	0.05	211	651	457	FA/G/Bb/E	G	1	bf/kf/as
BC 8	2SC	38 x 140	stucco	sliders	sg	0.05	163	395	413	FA/G/Bb/E	G	1	bf/kf/as
BC 9	2SC	38 x 140	siding stone	sliders	sg	0.05	160	422	434	FA/G/Bb/E	G	1	bf/kf/as
BC 10	2SC	38 x 140	stucco	sliders	sg	0.05	174	439	434	FA/G/Bb/E	G	1	bf/kf/as
BC 11	Bi	38 x 89	stucco siding	sliders	sg	0.05	210	618	414	FA/G	G	2	bf/kf/as
BC 12	Bi	38 x 89	stucco siding	sliders	sg	0.05	158	424	319	FA/G	G	1	bf/kf/as
BC 13	3L/C/B	38 x 89	wood siding	sliders	sg	0.05	151	466	329	FA/G	G	1	bf/kf/as
BC 14	3L/C/B	38 x 89	stucco siding	sliders	sg	0.05	151	461	328	FA/G	G	1	bf/kf/as
BC 15	Bi	38 x 89	stucco siding	slider awning	sg	0.05	161	364	333	FA/G	G	1	bf/kf/as
BC 16	3L/A/C	38 x 89	stucco siding	sliders	sg	0.05	151	453	310	FA/G	G	1	bf/kf/as
BC 17	Bi	38 x 89	stucco siding	sliders	-	0.05	212	560	335	FA/G	G	2	bf/kf/as
BC 18	3L/C/B	38 x 89	stucco siding	sliders	sg	0.05	157	439	329	FA/G	G	1	bf/kf/as
BC 19	Bi	38 x 89	stucco siding	sliders	-	0.05	210	554	350	FA/G	G	2	bf/kf/as
BC 20	3L/C/B	38 x 89	stucco siding	sliders	sg	0.05	153	457	317	FA/G	G	1	bf/kf/as

LEGEND

Bi - bilevel
1S - single storey
2S - two storey
nL - number of levels split
- A slab on grade
- B basement (w - wood)
- C crawlspace

E - electric
G - natural gas

FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
w - wood stove
O - oil
o/w - oil/wood
t/c - tankless coil DHW
asb - as per building code

A_f - floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - fresh air intake to cold air return
sg - sliding glass

Table A2. British Columbia Pressure Tests Results.

	UNSEALED HOUSE							SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
CODE	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	Q (L/s)	Q/V (h^{-1})	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	Q (L/s)	Q/V (h^{-1})
BC 1	59.4	.760	.136	342	3.89	1161	7.90	60.7	.744	.134	336	3.83	1115	7.59
BC 2	78.1	.716	.161	405	4.44	1283	9.74	59.2	.757	.134	338	3.69	1144	8.69
BC 3	68.9	.726	.146	367	4.31	1180	7.93	69.2	.673	.129	325	3.81	963	6.47
BC 4	102.3	.642	.178	448	5.46	1262	9.94	99.2	.622	.165	415	5.06	1130	8.90
BC 5	110.2	.665	.202	509	6.23	1484	14.20	110.2	.620	.183	460	5.65	1248	11.95
BC 6	142.4	.580	.215	542	3.98	1378	12.72	89.8	.625	.150	378	3.33	1034	9.55
BC 7	119.2	.617	.196	493	4.29	1331	7.36	77.8	.678	.147	370	3.22	1102	6.09
BC 8	91.7	.717	.190	479	4.60	1518	13.23	54.5	.815	.141	356	3.41	1322	11.52
BC 9	127.1	.644	.222	559	5.12	1576	13.45	99.7	.635	.171	431	3.94	1198	10.22
BC10	102.5	.737	.222	560	5.12	1832	15.02	79.9	.744	.176	443	4.06	1467	12.03
BC11	115.7	.719	.240	605	5.80	1925	11.21	106.3	.642	.185	467	4.47	1312	7.64
BC12	101.8	.626	.171	430	5.36	1178	10.00	70.2	.702	.140	354	4.39	1096	9.30
BC13	129.0	.589	.199	500	6.05	1291	9.97	107.8	.644	.188	475	5.71	1337	10.33
BC14	91.8	.755	.207	522	6.31	1758	13.70	73.4	.783	.176	445	5.37	1570	12.30
BC15	100.1	.663	.183	461	5.50	1340	13.30	89.4	.667	.165	415	4.96	1214	12.00
BC16	120.4	.620	.199	502	6.42	1362	10.83	91.4	.692	.179	450	5.77	1372	10.90
BC17	66.4	.719	.138	348	4.12	1107	7.12	72.2	.669	.134	336	4.00	987	6.34
BC18	68.6	.706	.138	349	4.19	1086	8.52	78.6	.637	.135	341	4.10	949	7.44
BC19	80.7	.683	.155	389	4.43	1169	7.59	68.9	.682	.133	331	3.74	991	6.44
BC20	80.9	.737	.175	441	5.52	1444	11.37	85.3	.714	.175	441	5.52	1391	10.95

Table A3. Alberta House Descriptions.

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
A21	2SB	38x89	vinyl siding	wood casement	sg	0.05	150	590	302	FA/G	G	2	kf/as
A22	1SB	38x89	brick vinyl siding	wood casement al sliders	sg	0.05	150	520	276	FA/G	G	1	-
A23	2SB	38x89	vinyl siding	al sliders	sg	0.05	124	437	262	FA/G	G	1	-
A24	3LB	38x89	vinyl siding	vinyl sliders	sg	0.05	153	695	295	FA/G	G	1	-
A25	2SB	38x89	siding	wood awning	sg	0.05	175	747	299	FA/G	G	1	bf/
A26	1SB	38x140	brick stucco	wood casement al sliders	sg	0.05	181	964	477	FA/G	G	2	-
A27	3LB	38x89	siding	wood casements	sg	0.05	151	800	400	FA/G	G	1	kf/
A28	2SB	38x89	siding brick	al sliders	sg	0.05	179	700	286	FA/G	G	1	bf/kf/
A29	3LB	38x89	stucco	wood casements	wood french		122	402	306	FA/G	G	1	-
A30	2SB	38x89		al sliders	sg	0.05	159	589	282	FA/G	G	-	bf/kf/
A31	1SB	38x89	siding	wood awning al sliders	-	0.05	95	492	220	FA/G	G	-	bf/
A32	1SB	38x89	siding	wood awning al sliders	-	0.05	106	514	234	FA/G	G	-	bf/
A33	2SB	38x89	siding	wood awning	sg	0.05	169	798	311	FA/G	G	1	bf/kf/
A34	2SB	38x89	siding	vinyl sliders	-	0.05	150	555	286	FA/G	G	1	bf/
A35	2SB	38x89	siding stucco	al sliders	sg	0.05	121	442	234	FA/G	G	-	bf/
A36	2SB	38x89	siding	vinyl sliders	sg	0.05	180	675	318	FA/G	G	1	bf/
A37	4LB	38x89	stucco	wood awning vinyl sliders	sg	0.10	101	426	218	FA/G	G	-	bf/
A38	2SB	38x140	brick vinyl siding	wood casements	sg	0.10	211	806	374	FA/G	G	1	-
A39	house unavailable												
A40	house unavailable												

LEGEND

Bi - bilevel
1S - single storey
2S - two storey
nL - number of levels split
- A slab on grade
- B basement (w - wood)
- C crawlspace
E - electric
G - natural gas

FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
w - wood stove
O - oil
o/w - oil/wood
t/c - tankless coil DHW
asb - as per building code

A_f - floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - fresh air intake to cold air return
sg - sliding glass

Table A4 Alberta Pressure Test Results

CODE	UNSEALED HOUSE C (L/s Pa^n)	n	10 Pascal ELA (m²)	Q (L/s)	ELA/A (cm²/m²)	50 Pascal Q (L/s)	Q/V (h⁻¹)	SEALED HOUSE C (L/s Pa^n)	n	10 Pascal ELA (m²)	Q (L/s)	ELA/A (cm²/m²)	Q/V (h⁻¹)	50 Pascal Q (L/s)	Q/V (h⁻¹)
A21	35.15	.928	.124	298	4.11	1326	8.09			Test Discarded					
A22	27.33	.853	.081	195	2.93	768	5.32			Test Discarded					
A23	55.29	.730	.124	296	4.73	963	7.93	25.48	.950	.095	227	3.63	1.87	1049	8.64
A24	43.31	.839	.124	298	4.20	1154	5.98			Test Discarded					
A25	46.47	.854	.138	332	4.61	1313	6.33	38.12	.854	.112	269	3.76	1.30	1062	5.12
A26	160.17	.541	.232	558	4.86	1328	4.96	145.71	.541	.212	510	4.44	1.90	1226	4.58
			Test Discarded												
A28	126.68	.536	.181	434	6.33	1028	5.29	85.68	.636	.154	371	5.38	1.95	1032	5.31
A29	106.15	.614	.182	437	5.95	1171	10.49	84.56	.669	.164	393	5.36	3.52	1160	10.39
A30	115.72	.513	.157	378	5.57	862	5.27	56.33	.770	.138	332	4.89	2.03	1143	6.99
A31	34.24	.631	.061	147	2.77	405	2.96	22.08	.668	.043	102	1.95	.75	302	2.21
A32	30.09	.677	.060	143	2.56	425	2.98	29.01	.647	.054	128	2.31	.90	365	2.56
A33	105.95	.583	.169	407	5.43	1037	4.68	90.86	.611	.154	372	4.95	1.68	993	4.48
A34	102.20	.520	.141	339	4.93	780	5.06	57.05	.695	.118	282	4.13	1.82	863	5.60
A35	45.64	.626	.080	193	3.42	530	4.32	41.29	.620	.072	172	3.08	1.40	467	3.81
A36	88.30	.630	.157	377	4.94	1036	5.53	78.42	.641	.143	343	4.50	1.83	961	5.13
A37	43.33	.605	.070	175	3.21	463	3.91	29.04	.652	.052	130	2.38	1.10	373	3.15
A38	101.28	.634	.175	437	4.68	1215	5.43	71.08	.734	.154	385	4.12	1.72	1254	5.60
A39	house unavailable														
A40	house unavailable														

Table A5. Saskatchewan House Descriptions

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
S41	2SB	38x140	siding brick	wood easement	sg	0.05	158	613	284	FA/G	G	1	bf
* S42	2LB	38x140	siding stucco	al sliders	sg	0.15	129	363	270	FA/G	G	-	as/ca/cf
S43	1SB	38x140	vinyl siding	Wood casement	sg	0.10	121	607	260	FA/G	G	1	bf/ /as
S44	1SB	38x140	siding	al sliders	-	0.05	126	630	284	FA/G	G	1	bf/ /as
S45	4LB	38x140	siding stucco	wood casement	sg	0.05	122	438	214	FA/G	G	-	bf
S46	1SB	38x140	siding	al sliders	-	0.05	116	579	278	FA/G	G	1	bf
S47	4LB	38x140	siding brick	wood casement	sg	0.05	163	617	287	FA/G	G	1	bf
S48	2SB	38x89	cedar siding	al sliders	sg	0.05	149	590	306	FA/G	G	1	bf/as
S49	2SB	38x140	alumin siding	al sliders	sg	0.10	201	560	348	FA/G	G	1	bf/as
S50	1SB	38x140	siding stucco	al sliders	sg	0.05	92	460	219	FA/G	G	1	bf
S51	4LB	38x89	alumin siding	al sliders	-	0.05	142	533	229	FA/G	G	1	bf/as
S52	2SB	38x89	siding	al sliders	-	0.05	151	598	316	FA/G	G	1	-
S53	1SB	38x140	alumin siding	wood casement	-	0.10	118	589	212	FA/G	G	1	bf/as
S54	1SB	38x140	siding stucco	al sliders	sg	0.05	86	426	217	FA/G	G	-	bf
S55	1SB	38x140	brick	wood awning	sg	0.10	248	1434	587	FA/G	G	1	bf
S56	1SB	38x89	siding	al sliders	-	0.05	85	420	224	FA/G	G	-	-
S57	2SB	38x89	brick & cedar siding	wood awning casement	sg	0.05	177	678	316	FA/G	G	1	bf/as
S58	2SB	38x140	cedar siding	al sliders	sg	0.10	142	569	275	FA/G	G	1	bf/as
S59	1SB	38x140	siding brick	wood easement	sg	0.05	144	694	285	FA/G	G	1	bf
S60	2SB	38x 89	cedar siding	al sliders	sg	0.05	175	642	265	FA/G	G	1	bf/as

* H.E.L.P. House

Legend

Bi - bilevel
1S - single-storey
2S - two-storey
nL - number of levels split
A slab on grade
B basement (w-wood)
C crawlspace

E - electric
G - natural gas
FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
w - wood stove
O - oil
o/w - oil/wood
t/c - tankless coil DHW

asb - as per building code
Af - floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - fresh air intake to cold air return
sg - sliding glass
ca - combustion air intake
cf - central ventilation fan

Table A6. Saskatchewan, Pressure Test Results

CODE	UNSEALED HOUSE							SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	Q (L/s)	Q/V (h^{-1})	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	Q (L/s)	Q/V (h^{-1})
S41	61	.629	.10	260	3.52	710	4.22	22	.828	.06	150	2.11	580	3.41
S42	22	.616	.03	90	1.11	240	2.44	12	.624	.02	50	0.74	140	1.40
S43	18	.978	.08	170	3.08	850	5.04	27	.849	.07	190	2.69	760	4.52
S44	38	.744	.08	210	2.82	700	4.02	16	.916	.05	130	1.76	580	3.35
S45	25	.690	.05	120	2.34	380	3.13	31	.583	.04	120	1.87	310	2.57
S46	35	.696	.07	170	2.52	540	5.34	34	.650	.06	150	2.16	440	4.32
S47	46	.723	.09	240	3.14	780	4.58	58	.634	.10	250	3.48	690	4.08
S48	18	.939	.06	160	1.96	730	4.50	19	.908	.06	150	1.96	660	4.05
S49	15	.901	.04	120	1.15	520	3.38	19	.820	.05	120	1.44	480	3.09
S50	30	.599	.04	110	1.83	310	2.46	18	.656	.03	80	1.37	230	1.86
S51	26	.808	.06	170	2.62	620	4.22	25	.768	.05	140	2.18	510	3.47
S52	31	.810	.08	200	2.53	760	4.49	17	.946	.06	150	1.90	700	4.16
S53	20	.994	.07	190	3.30	970	5.98	19	.714	.04	100	1.89	310	1.93
S54	15	.748	.03	80	1.38	290	2.46	10	.806	.02	60	0.92	240	2.03
S55	31	.926	.10	260	1.70	1180	2.98	27	.824	.07	180	1.19	690	1.75
S56	12	.857	.03	80	1.34	340	2.98	15	.725	.03	80	1.34	260	2.27
S57	41	.783	.10	250	3.16	890	4.74	35	.788	.08	220	2.53	780	4.15
S58	30	.831	.08	200	2.91	790	5.01	26	.859	.07	190	2.55	770	4.87
S59	29	.750	.06	160	2.11	540	3.47	27	.677	.05	130	1.75	380	2.45
S60	52	.707	.10	260	3.85	840	4.38	52	.675	.09	240	3.46	730	3.81

Table A7. Manitoba House Descriptions

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
M61	1SB	38x89	stucco	wood awning vinyl sliders	-	0.15	94	461	210	FA/G	G	1	bf
M62	MLB	38x89	wood stucco	vinyl sliders	-	0.15	71	351	196	FA/G	G	-	bf
M63	MLB	38x89	wood stucco	wood awning vinyl slider	-	0.15	76	399	184	FA/G	G	-	bf
M64	1SB	38x89	stucco	wood casement vinyl sliders	-	0.10	103	506	237	FA/G	G	-	
M65	1SB	38x140	stone wood stucco	al sliders	-	0.15	128	615	254	FA/G	G	1	2bf/kf
M66	2SB	38x140	brick wood stucco	al sliders	-	0.15	211	760	315	FA/G	G	1	3bf/kf
M67	MLB	38x140	brick wood stucco	al sliders	-	0.15	80	402	211	FA/G	G	1	2bf/kf
M68	MLB	38x140	brick wood stucco	al sliders	-	0.15	75	356	182	FA/G	G	1	bf/kf
M69	MLB	38x140	stucco	wood casement wood awning	-	0.10	145	507	232	FA/G	G	1	2bf
M70	MLB	38x140	wood stucco	wood casement wood awning	-	0.10	81	403	220	FA/G	G	1	bf
M71	1SB	38x140	brick wood stucco	wood casement wood awning	sg	0.10	129	646	273	FA/G	G	1	2bf
M72	2SB	38x140	stone wood stucco	wood casement wood awning	sg	0.05/0.10	170	687	320	FA/G	G	1	3bf
M73	MLB	38x140	wood stucco	vinyl sliders wood awnings	-	0.05	87	415	215	FA/G	G	0	2bf
M74	1SB	38x89	brick wood stucco	wood awnings	-	0.05	120	595	259	FA/G	G	1	bf/kf
M75	1SB	38x140	wood stucco	wood awnings	-	0.05	104	516	232	FA/G	G	1	bf
M76	2SB	38x89	brick wood stucco	wood awnings	sg	0.05	150	568	239	FA/G	G	1	2bf
M77	2SB	38x140	brick wood stucco	wood casement vinyl sliders	sg	0.10/0.15	107	401	217	FA/G	G	1	2bf
M78	1SB	38x140	stone wood stucco	wood awning vinyl slider	sg	0.10	121	617	270	FA/G	G	W	2bf
M79	2SB	38x140	brick wood stucco	wood awning vinyl slider	sg	0.10	110	419	288	FA/G	G	9	2bf
M80	1SB	38x140	brick wood stucco	wood casement vinyl slider	sg	0.10	106	528	214	FA/G	G	1	2bf

Legend
- B_i - bilevel
- 1S - single storey
- 2S - two storey
- nL - number of levels split
  - A slab on grade
  - B basement (w-wood)
  - C crawlspace
  - M multilevel
- E - electric
- G - natural gas
- FA - forced air
- So - solar collectors
- nF - number of fireplaces
- Bb - baseboard
- W - wood stove
- O - oil
- o/w- oil/wood
- t/c- tankless coil D.H.W.
- asb - as per building code
- Af - floor area
- V - house volume
- A - shall area, above grade surface area
- DHW - domestic hot water
- bf - bathroom fan vented outside
- Kf - kitchen fan vented outside
- Kr - kitchen fan recirculating
- as - return air or furnace air supply to heating

Table A8. Manitoba, Pressure Test Results

CODE	UNSEALED HOUSE C (L/s Pa^n)	n	10 Pascal ELA (m²)	Q (L/s)	ELA/A (cm²/m²)	50 Pascal Q (L/s)	Q/V (h⁻¹)	SEALED HOUSE C (L/s Pa^n)	n	10 Pascal ELA (m²)	Q (L/s)	ELA/A (cm²/m²)	50 Pascal Q (L/s)	Q/V (h⁻¹)
M61	17.26	.671	.033	80.9	1.57	238	1.86	16.51	.664	.031	76.2	1.48	222	1.73
M62	21.03	.621	.035	88.5	1.79	242	2.48	16.39	.675	.031	77.6	1.58	230	2.36
M63	18.47	.618	.030	76.6	1.63	207	1.87	17.30	.626	.029	73.1	1.58	200	1.81
M64	17.34	.661	.032	79.4	1.35	230	1.64	15.82	.675	.030	74.9	1.27	222	1.58
M65	22.51	.663	.042	103.6	1.65	301	1.76	12.29	.750	.028	69.2	1.10	232	1.36
M66	17.58	.708	.037	89.7	1.17	280	1.33	17.91	.695	.036	88.8	1.14	272	1.29
M67	21.03	.677	.040	99.9	1.90	297	2.66	19.74	.680	.038	94.6	1.80	283	2.53
M68	13.52	.709	.026	69.1	1.43	216	2.19	12.72	.701	.026	63.9	1.43	198	2.00
M69	18.20	.745	.041	101.1	1.77	335	2.38	15.70	.714	.033	81.3	1.42	257	1.82
M70	21.65	.638	.038	94.1	1.73	263	2.35	12.49	.716	.026	64.9	1.18	205	1.83
M71	29.34	.643	.052	129.0	1.90	363	2.02	20.58	.665	.038	95.3	1.39	278	1.55
M72	38.74	.725	.083	205.6	2.59	660	3.46	37.21	.706	.077	188.9	2.41	588	3.08
M73	22.96	.607	.038	93.0	1.77	247	2.14	14.69	.647	.026	65.1	1.21	184	1.60
M74	27.35	.655	.050	123.4	1.93	354	2.14	24.59	.628	.043	104.4	1.66	287	1.73
M75	21.60	.567	.032	79.8	1.38	199	1.39	9.37	.737	.021	51.2	0.91	168	1.17
M76	26.19	.679	.050	124.9	2.09	372	2.36	20.02	.728	.043	107.1	1.80	346	2.19
M77	32.42	.743	.071	179.3	3.27	592	5.32	31.24	.741	.068	172.0	3.13	567	5.09
M78	20.65	.708	.042	105.3	1.56	329	1.92	17.88	.709	.037	91.4	1.37	286	1.67
M79	34.13	.716	.071	177.4	2.47	561	4.82	25.57	.754	.058	145.3	2.01	489	4.20
M80	16.62	.743	.037	91.9	1.73	303	2.07	16.44	.724	.035	87.1	1.64	279	1.90

Table A9. Ontario A House Descriptions

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
OA81	2SB	38x140	brick siding	sliders wood casement	sg	0.05	128	469	254	FA/G	G	0	b_f/k_f/as
OA82	3LB	38x140	brick siding	sliders wood casement	sg	0.05	136	573	304	FA/G	G	1	k_f/as
OA83	3LB	38x140	brick siding	sliders	sg	0.05	129	488	264	FA/G	G	1	b_f/k_f/as
OA84	2SB	38x140	brick siding	sliders	sg	0.05	139	532	276	FA/G	G	1	b_f/k_f/as
OA85	2SB	38x140	brick siding	sliders	sg	0.05	128	469	254	FA/G	G	0	b_f/k_f
OA86	2SB	38x89	brick siding	sliders wood awning	sg	0.05	131	422	238	FA/G	G	1	b_f/k_f/as
OA87	2SB	38x89	brick siding	sliders	-	0.05	86	382	226	FA/G	G	1	b_f/k_f/as
OA88	2SB	38x89	brick siding	wood awning	sg	0.05	227	765	397	FA/G	G	2	b_f/k_f/as
OA89	2SB	38x89	brick siding	wood awning	sg	0.05	227	765	397	FA/G	G	2	b_f/k_f/as
OA90	2SB	38x89	brick siding	sliders	-	0.05	86	382	226	FA/G	G	W	b_f as
OA91	4LC/B	38x89	brick siding	sliders	sg	0.05	174	615	373	FA/G	G	1	b_f as
OA92	2SB	38x89	brick siding	sliders	sg	0.05	170	639	341	FA/G	G	1	b_f as
OA93	2SB	38x89	brick siding	sliders	sg	0.05	153	666	410	FA/G	G	1	b_f as
OA94	2SB	38x89	brick siding	sliders wood casement	sg	0.05	150	579	281	FA/G	G	1	b_f as
OA95	2SB	38x89	brick siding	sliders single hung	sg	0.05	128	473	287	FA/G	G	1	as
OA96	Bi B	38x89	brick siding	sliders wood casement	sg	0.05	173	490	330	FA/G	G	1	b_f as
OA97	4LC/G	38x89	brick siding	sliders wood casement	sg	0.05	159	655	420	FA/G	G	1	b_f as
OA98	2SB	38x89	brick siding	sliders	sg	0.05	157	644	323	FA/G	G	1	b_f as
OA99	2SB	38x89	brick	sliders wood casement	sg	0.05	123	450	235	FA/G	G	1	b_f/k_f/as
OA100	2SB	38x89	brick	sliders wood casement	sg	0.05	137	496	285	FA/G	G	1	b_f/k_f/as

Legend
B_i - bilevel
1S - single story
2S - two story
nL - number of levels split
- A slab on grade
- B basement (w-wood)
- C crawlspace

E - electric
G - natural gas

FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
w - wood stove
o - oil
o/w - oil/wood
t/c - tankless coil D.H.W.
asb - as per building Code

A_f - floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
b_f - bathroom fan vented outside
k_f - kitchen fan vented outside
kr - kitchen fan recirculating
as - return air or furnace air supply to heating
sg - sliding glass patio doors

Table A10: Ontario A, Pressure Test Results

CODE	UNSEALED HOUSE							SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
	C (L/s Pa^n)	n	ELA (m²)	Q (L/s)	ELA/A (cm²/m²)	Q (L/s)	Q/V (h⁻¹)	C (L/s Pa^n)	n	ELA (m²)	Q (L/s)	ELA/A (cm²/m²)	Q (L/s)	Q/V (h⁻¹)
OA81	49	.600	.07	190	2.76	520	4.00	56	.542	.07	190	2.76	460	3.53
OA82	63	.627	.10	260	3.29	730	4.58	63	.604	.10	250	3.29	669	4.21
OA83	71	.588	.11	269	4.17	710	5.24	54	.635	.09	230	3.41	649	4.79
OA84	74	.567	.10	270	3.99	679	4.60	70	.553	.10	250	3.62	610	4.13
OA85	58	.615	.09	240	3.54	650	4.99	43	.672	.08	200	3.15	600	4.60
OA86	91	.523	.12	700	5.04	250	5.97	67	.570	.10	250	4.20	631	5.37
OA87	103	.554	.14	371	6.19	900	8.48	96	.551	.13	341	5.75	829	7.82
OA88	156	.568	.23	572	5.79	1441	6.78	156	.554	.22	560	5.54	1370	6.45
OA89	206	.542	.28	710	7.05	1719	8.09	212	.527	.28	711	7.05	1671	7.86
OA90	93	.563	.13	339	5.75	841	7.92	87	.556	.12	310	5.31	771	7.27
OA91	84	.583	.13	320	3.49	832	4.86	90	.562	.13	320	3.49	811	4.74
OA92	77	.634	.13	330	3.81	921	5.18	55	.704	.11	280	3.23	870	4.90
OA93	89	.586	.13	340	3.17	890	4.81	96	.555	.13	340	3.17	841	4.54
OA94	125	.539	.17	430	6.05	1031	6.40	115	.548	.16	400	5.69	981	6.09
OA95	105	.525	.14	350	4.88	821	6.24	96	.532	.13	330	4.53	770	5.86
OA96	116	.535	.15	389	4.55	941	6.91	119	.506	.15	380	4.55	871	6.39
OA97	146	.511	.18	470	4.29	1071	5.88	90	.605	.14	360	3.33	958	5.28
OA98	104	.527	.14	349	4.33	817	4.58	99	.529	.13	330	4.02	784	4.36
OA99	54	.663	.10	240	4.26	719	5.76	39	.723	.08	210	3.40	670	5.36
OA100	109	.529	.14	359	4.91	861	6.24	100	.529	.13	331	4.56	790	5.73

Table A11. Ontario B House Descriptions

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
OB101	2SB	38x89	brick	wood casement	sg	0.10	263	864	386	FA/G	G	1	bf/kf
OB102	1SB	38x89	brick	wood casement	sg	0.10	186	777	304	FA/G	G	1	bf/kf
OB103	2SB	38x89	brick	wood casement	sg	0.10	242	933	377	FA/G	G	1	bf/kf
OB104	2SB	38x89	brick	wood casement	sg	0.10	199	703	309	FA/G	G	1	bf/kf
OB105	2SB	38x89	brick	wood casement	sg	0.10	259	894	365	FA/G	G	1	bf/kf
OB106	2SB	38x89	brick	wood casement	sg	0.10	125	445	249	FA/G	G	1	bf/kf
OB107	2SB	38x89	brick	wood casement	sg	0.10	142	550	278	FA/G	G	1	bf/kf
OB108	2SB	38x89	brick	wood casement	sg	0.10	125	476	224	FA/G	G	1	bf/kf
OB109	2SB	38x89	brick	wood casement	sg	0.10	148	543	243	FA/G	G	1	bf/kf
OB110	2SB	38x89	brick	wood casement	sg	0.10	161	561	292	FA/G	G	1	bf/kf
OB111	2SB	38x89	brick	wood casement	sg	0.10	171	630	300	FA/G	G	1	bf/kf
OB112	2SB	38x89	siding	wood casement	-	0.10	155	531	269	FA/G	G	1	bf/kf
OB113	2SB	38x89	stucco siding	wood casement	sg	0.10	142	583	241	FA/G	G	1	bf/kf
OB114	2SB	38x89	brick siding	wood casement	-	0.10	131	555	257	FA/G	G	1	bf/kf
OB115	2SB	38x89	brick siding	wood awning	-	0.10	116	443	243	FA/G	G	1	bf/kf
OB116	2SB	38x89	siding stucco	wood awning	-	0.10	119	441	260	FA/G	G	1	bf/kf
OB117	2SB	38x89	siding	wood awning	-	0.10	134	474	246	FA/G	G	1	bf/kf
OB118	2SB	38x89	brick siding	wood awning	sg	0.10	148	593	266	FA/G	G	1	bf/kf
OB119	2SB	38x89	brick siding	wood casement	sg	0.10	188	699	334	FA/G	G	1	bf/kf
OB120	2SB	38x89	brick stucco	wood casement	sg	0.10	144	558	262	FA/G	G	1	bf/kf

<u>Legend</u>

B_i - bilevel
1S - single story
2S - two story
nL - number of levels split
- A slab on grade
- B basement (w-wood)
- C crawlspace

E - electric
G - natural gas

FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
w - wood stove
o - oil
o/w - oil/wood
t/c - tankless coil D.H.W.
asb - as per building Code
Af - floor area

V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - return air or furnace air supply to heating
sg - sliding glass patio doors

Table A12. Ontario B, Pressure Test Results

	UNSEALED HOUSE							SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
CODE	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	Q (L/s)	Q/V (h^{-1})	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	Q (L/s)	Q/V (h^{-1})
OB101	33	.900	.107	267	2.77	1137	4.74	26	.908	.086	215	2.23	931	3.88
OB102	59	.688	.117	291	3.85	884	4.10	30	.836	.084	211	2.76	812	3.76
OB103	42	.913	.140	351	3.71	1527	5.89	26	.988	.103	235	2.73	1304	5.03
OB104	92	.725	.197	493	6.38	1584	8.12	66	.776	.158	395	5.11	1380	7.06
OB105	76	.664	.141	351	3.86	1024	4.13	85	.592	.133	333	3.64	866	3.49
OB106	93	.705	.190	474	7.36	1480	11.97	70	.755	.162	403	6.51	1362	11.03
OB107	49	.744	.111	276	3.99	918	6.01	37	.780	.090	226	3.29	794	5.20
OB108	50	.686	.097	243	4.33	734	5.55	21	.978	.083	201	3.71	729	5.51
OB109	58	.723	.123	308	5.06	988	6.55	41	.811	.106	265	4.36	979	6.49
OB110	26	.889	.082	204	2.81	857	5.50	15	.947	.057	148	1.95	668	4.29
OB111	22	.987	.089	224	2.97	1116	6.38	20	.962	.076	190	2.53	898	5.13
OB112	48	.601	.077	193	2.36	509	3.46	45	.554	.064	161	2.38	393	2.66
OB113	46	.665	.086	216	3.57	631	3.90	45	.609	074	185	3.07	495	3.07
OB114	55	.661	.102	254	3.97	739	4.80	50	.687	.097	243	3.77	736	4.78
OB115	37	.744	.082	206	3.37	684	5.56	36	.685	.070	174	2.88	526	4.28
OB116	48	.700	.098	244	3.77	755	6.17	51	.629	.088	219	3.38	605	4.95
OB117	47	.638	.082	205	3.33	573	4.36	38	.628	.065	164	2.64	452	3.43
OB118	45	.728	.097	243	3.65	788	4.79	31	.746	.071	177	2.67	591	3.59
OB119	39	.651	.071	177	2.13	507	2.61	45	.504	.057	144	1.71	325	1.67
OB120	93	.588	.146	364	5.57	939	6.78	59	.678	.112	281	4.27	838	5.41

Table A13a. Quebec House Descriptions

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	Af (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
Q121	2SB	38x89	stucco, wood	wood casement	sg	Comp	114	417	275	FA/E	E	0	asb
Q122	3L B/C	38x89	brick wood siding	wood vinyl sliders	sg	Comp	89	384	234	FA/E	E	1	asb
Q123	Bi	38x89	brick siding	wood vinyl sliders	sg	Comp	84	368	220	FA/E	E	0	asb
Q124	3 LB/C	38x89	brick wood siding	wood vinyl sliders	sg	Comp	94	403	256	FA/E	E	1	asb
Q125	Bi	38x89	brick siding	wood casement vinyl sliders	sg	Comp	85	403	235	FA/E	E	0	asb
Q126	3LB/C	38x89	brick siding	wood vinyl sliders	sg	Comp	84	396	244	FA/E	E	0	asb
Q127	1SB	38x89	brick siding	wood casement	sg	Comp	80	397	217	FA/E	E	0	asb
Q128	1½SB	38x89	vinyl siding	wood casement	sg	Comp	129	458	312	FA/E	E	0	asb
Q129	3LB	38x89	brick siding stucco	wood casement	sg	Comp	91	554	285	FA/E	E	1	asb
Q130	Bi	38x89	brick wood siding	wood casement	sg	Comp	93	432	229	FA/E	E	2	asb
Q131	2SB	38x89	brick siding	wood casement	sg	Comp	115	563	220	FA/E	E	1	asb
Q132	3L B/C	38x89	brick siding	vinyl sliders	sg	Comp	76	306	184	FA/E	E	0	asb
Q133	2SB	38x140	stucco	wood casement	-	-	317	1579	489	FA/E	E	3	asb
Q134	1SB	38x89	brick siding	vinyl sliders	-	0.10	90	382	204	FA/E	E	0	asb
Q135	3L B/C	38x89	brick alum. siding	vinyl sliders	sg	0.10	93	304	213	FA/E	E	0	asb
Q136	Bi	38x89	brick siding	vinyl sliders	sg	0.10	79	401	210	FA/E	E	0	asb
Q137	1SB	38x89	brick siding	vinyl sliders	sg	0.10	93	323	217	FA/E	E	0	asb
Q138	3L B/C	38x89	brick alum. siding	vinyl sliders	sg	0.10	95	409	203	FA/E	E	0	asb
Q139	2SB	38x89	brick, stone alum. siding	wood casement	-	Comp	202	588	312	FA/E	E	1	asb
Q140	1½SB	38x89	brick, stone alum. siding	wood casement	sg	Comp	139	577	318	FA/E	E	1	asb

Legend
- Bi - bilevel
- 1S - single storey
- 2S - two storey
- nL - number of levels split
  - A slab on grade
  - B basement (w-wood)
  - C crawlspace
- E - electric
- G - natural gas
- FA - forced air
- So - solar collectors
- nF - number of fireplaces
- Bb - baseboard
- W - woodstove
- O - oil
- o/w - oil/wood
- t/c - tankless coil D.H.W.
- comp - composite building paper asphalt center, aluminum foil face
- Af - floor area
- V - house volume
- A - shell area, above grade surface area
- DHW - domestic hot water
- bf - bathroom fan vented outside
- kf - kitchen fan vented outside
- kr - kitchen fan recirculating
- as - return air or furnace air supply to heating
- asb - as per building code
- sg - sliding glass patio doors

Table A14a: Quebec, Pressure Test Results

	UNSEALED HOUSE								SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
CODE	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	Q (L/s)	Q/V (h^{-1})	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	Q (L/s)	Q/V (h^{-1})
Q121	27.49	.758	.066	157	2.40	533	4.60	25.23	.775	.063	150	2.29	523	4.52
Q122	49.05	.681	.103	235	4.40	702	6.59	49.05	.681	.098	235	4.19	705	6.61
Q123	55.56	.640	.101	243	4.59	680	6.65	45.39	.689	.092	222	4.18	672	6.57
Q124	97.36	.558	.146	352	5.70	864	7.71	75.82	.624	.133	319	5.20	870	7.76
Q125	50.02	.672	.098	235	4.17	693	6.19	50.29	.670	.098	235	4.17	691	6.18
Q126	55.66	.715	.120	288	4.92	912	8.51	50.56	.709	.109	259	4.47	810	7.37
Q127	62.20	.673	.122	293	5.62	865	7.84	42.29	.689	.086	207	3.96	627	5.69
Q128	31.14	.739	.071	171	2.28	560	4.40	21.59	.833	.061	147	1.96	562	4.41
Q129	46.19	.707	.098	236	3.44	736	4.78	46.85	.699	.098	235	3.44	723	4.70
Q130	40.18	.685	.081	195	3.54	586	4.89	35.42	.701	.074	178	3.23	549	4.58
Q131	30.22	.665	.058	140	2.64	408	2.61	28.15	.684	.056	136	2.55	409	2.61
Q132	22.05	.666	.042	102	2.28	300	3.52	5.45	.951	.020	49	1.09	225	2.65
Q133	80.65	.668	.156	375	3.19	1098	2.51	88.49	.633	.158	380	3.23	1052	2.40
Q134	20.06	.631	.036	86	1.76	237	2.23	18.40	.641	.034	81	1.67	226	2.13
Q135	27.46	.627	.048	116	2.25	319	3.77	27.06	.618	.047	112	2.21	304	3.59
Q136	25.69	.612	.044	105	2.10	281	2.53	23.03	.629	.041	94	1.95	252	2.26
Q137	27.25	.660	.052	125	2.40	361	4.02	26.84	.660	.051	123	2.35	355	3.96
Q138	18.15	.670	.035	85	1.72	250	2.20	15.43	.692	.032	76	1.58	232	2.04
Q139	104.00	.620	.181	434	5.80	1178	7.21	85.41	.676	.169	405	5.42	1204	7.37
Q140	51.76	.792	.133	320	4.18	1146	7.15	51.76	.792	.133	320	4.18	1146	7.15

Table A13b. Quebec House Descriptions

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	Af (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
Q141	4LB	38x89	brick alum. siding	sliders	-	0.10	73	449	329	FA/E	E	0	asb
Q142	Bi	38x140	brick stucco alum. siding	wood casement sliders	sg	0.10	120	407	306	FA/E	E	1	asb
Q143	Bi	38x140	brick wood alum. siding	wood casement sliders	sg	0.10	100	384	251	FA/E	E	0	asb
Q144	4LB	38x140	brick siding	wood casement	sg	0.10	219	510	308	FA/E	E	1	asb
Q145	4LB	38x89	brick siding	wood casement	-	Comp	124	551	341	FA/E	E	1	asb
Q146	3LB	38x89	brick alum. siding	wood casement	sg	0.10	114	525	228	FA/E	E	1	asb
Q147	Bi	38x140	brick wood alum. siding	wood casement	sg	0.10	97	348	227	FA/E	E	0	asb
Q148	1½ SB	38x140	stone alum. siding	wood casement	sg	0.10	96	380	211	FA/E	E	1	asb
Q149	3LB	38x140	brick alum. siding	wood casement	sg	0.10	98	336	267	FA/E	E	1	asb
Q150	3LB	38x140	brick alum. siding	wood casement sliders	sg	Comp	177	586	384	FA/E	E	1	asb
Q151	2SB	38x140	brick siding	wood casement sliders	sg	Comp	197	653	351	FA/E	E	1	asb
Q152	1½ SB	38x89	brick alum. siding	wood casement	-	0.10 ceiling comp walls	113	252	423	FA/E	E	0	asb
Q153	Bi	38x89	brick alum. siding	sliders	sg	0.10 ceiling comp walls	88	224	393	FA/E	E	0	asb
Q154	1½ SB	38x89	brick stone alum. siding	wood casement sliders	-	0.10 ceiling comp walls	113	252	423	FA/E	E	0	asb
Q155	3L B/C	38x89	brick alum. siding	sliders	sg	KB	76	306	191	FA/E	E	0	asb
Q156	2SB	38x89	wood stucco	wood casement	-	0.10	121	679	366	FA/E	E	2	asb
Q157	3LB	38x89	brick wood siding	wood casement	-	0.10	114	450	288	heat pump	E	2	asb
Q158	3LB	38x89	wood stucco	wood casement	-	0.10	114	450	289	FA/E	E	2	asb
Q159	3LB	38x89	wood stucco	wood casement	-	0.10	103	321	250	FA/E	E	1	asb
Q160	3LB	38x89	brick alum. siding	sliders	-	0.10	73	450	329	FA/E	E	1	asb

Legend

Bi - bilevel
1S - single storey
2S - two storey
nL - number of levels split
- A slab on grade
- B basement (w-wood)
- C crawlspace

E - electric
G - natural gas
FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
W - woodstove
O - oil
o/w - oil/wood
t/c - tankless coil D.H.W.
comp - composite building paper asphalt center, aluminum foil face
KB - Kraft-backed batt

Af - floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - return air or furnace air supply to heating
asb - as per building code
sg - sliding glass patio doors

Table A14b: Quebec, Pressure Test Results

CODE	UNSEALED HOUSE C (L/s Pa^n)	n	10 Pascal ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	50 Pascal Q (L/s)	Q/V (h^{-1})	SEALED HOUSE C (L/s Pa^n)	n	10 Pascal ELA (m^2)	Q (L/s)	ELA/A (cm^2/m^2)	50 Pascal Q (L/s)	Q/V (h^{-1})
Q141	46.33	.713	.100	239	3.04	754	6.05	40.77	.726	.090	217	2.74	698	5.59
Q142	74.73	.544	.109	261	3.56	627	5.54	32.46	.723	.071	171	2.32	549	4.85
Q143	29.69	.683	.060	143	2.39	429	4.03	27.19	.699	.057	136	2.27	419	3.93
Q144	51.28	.608	.087	208	2.82	554	3.91	29.24	.735	.066	159	2.14	519	3.66
Q145	33.08	.664	.063	153	1.85	444	2.89	33.04	.663	.063	152	1.85	441	2.88
Q146	30.45	.688	.062	148	2.72	449	3.08	29.36	.670	.057	137	2.50	404	2.77
Q147	33.08	.665	.064	153	2.82	447	4.62	31.01	.682	.058	149	2.56	446	4.62
Q148	43.25	.650	.080	193	3.79	549	5.21	35.40	.670	.069	165	3.27	486	4.61
Q149	32.70	.668	.063	152	2.36	445	4.77	56.47	.675	.061	148	2.28	439	4.70
Q150	49.94	.686	.102	242	2.66	731	4.49	40.28	.739	.092	221	2.40	725	4.45
Q151	69.58	.600	.115	277	3.28	726	4.01	33.30	.791	.086	206	2.45	734	4.05
Q152	31.91	.691	.065	157	1.54	477	4.06	28.60	.715	.062	148	1.47	469	3.99
Q153	25.49	.670	.049	119	1.25	351	3.22	25.15	.670	.049	118	1.25	345	3.17
Q154	32.04	.687	.087	156	2.06	471	4.01	21.79	.766	.066	127	1.56	437	3.72
Q155	32.52	.648	.060	145	3.14	411	4.83	24.40	.703	.051	123	2.67	382	4.50
Q156	50.84	.701	.106	256	2.90	791	4.20	46.28	.724	.102	245	2.79	785	4.16
Q157	57.45	.710	.123	295	4.27	925	7.39	48.02	.752	.113	271	3.92	910	7.28
Q158	76.36	.669	.148	356	5.12	1046	8.37	47.17	.792	.122	292	4.22	1046	8.37
Q159	35.09	.705	.074	178	2.96	552	6.20	32.82	.719	.071	172	2.84	546	6.13
Q160	87.38	.617	.150	362	4.56	975	7.82	64.52	.687	.131	314	3.98	950	7.62

Table A15. Newfoundland, House Descriptions.

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
NF161	2 SB	38x140	vinyl siding	wood casement vertical sliders	sg	0.10	210	838	383	Bb/E	E	1	asb
NF162	1 SB	38x89	wood siding	sliders	sg	0.10	193	801	312	FA/O	E	2	asb
NF163	2 SB	38x140	brick vinyl	wood casement	sg	0.10	213	838	365	Bb/E	E	1	asb
NF164	2 SB	38x89	vinyl siding	wood casement	-	0.10	198	690	304	Bb/E	E	0	asb
NF165	2 SB	38x89	vinyl siding	wood casement	sg	0.15	202	800	355	Bb/E	E	0	asb
NF166	1 SB	38x140	wood siding	wood casement	-	0.10	103	573	434	E	E	1	asb
NF167	1½ SB	38x140	vinyl siding	wood casement	-	0.10	155	880	321	Bb/E	E	0	asb
NF168	1½ SB	38x140	wood siding	vertical sliders sliders	-	0.10	85	414	295	Bb/E	E	W	asb
NF169	2 SC	38x89	vinyl siding	wood awning vinyl sliders	-	0.15	220	645	494	Bb/E	E	W/F	asb
NF170	1 SB	38x89	brick siding	vinyl sliders	-	0.10	110	616	353	E	E	1	asb

Legend
B_i - bilevel
1S - single storey
2S - two storey
nL - number of levels split
- A slab on grade
- B basement (w-wood)
- C crawlspace

E - electric
G - natural gas

FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
w - wood stove
o - oil
o/w - oil/wood
t/c - tankless coil D.H.W.
asb - as per Building Code

A_f - Floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - return air or furnace air supply to heating
sg - sliding glass patio doors

Table A16. Newfoundland, Pressure Test Results

	UNSEALED HOUSE							SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
Code	C $(L/S\ Pa^n)$	n	ELA (m^2)	Q (L/s)	ELA/A $\left(\frac{cm^2}{m^2}\right)$	Q (L/s)	Q/V (h^{-1})	C $(L/s\ Pa^n)$	n	ELA (m^2)	Q (L/s)	ELA/A $\left(\frac{cm^2}{m^2}\right)$	Q (L/s)	Q/V (h^{-1})
NF161	71.57	.711	.149	368	3.89	1155	4.96	61.34	.755	.141	349	3.69	1176	5.05
NF162	34.86	.809	.091	225	2.92	826	3.71	29.00	.856	.084	208	2.71	826	3.71
NF163	44.83	.909	.147	364	4.04	1570	6.75	37.34	.957	.137	338	3.75	1578	6.78
NF164	64.79	.693	.130	320	4.26	975	5.09	61.10	.706	.126	310	4.14	967	5.05
NF165	45.13	.713	.094	233	2.65	734	3.28	38.06	.754	.087	216	2.45	727	3.25
NF166	100.41	.550	.144	356	3.31	863	5.42	93.50	.567	.139	344	3.20	857	5.39
NF167	89.46	.691	.177	439	5.52	1335	5.46	82.68	.709	.171	423	5.32	1324	5.42
NF168	36.14	.651	.065	162	2.21	461	4.01	31.07	.680	.060	149	2.03	444	3.86
NF169	106.17	.641	.188	465	3.82	1303	7.27	97.22	.666	.183	451	3.76	1316	7.35
NF170	109.32	.629	.189	465	5.35	1280	7.48	107.08	.636	.188	463	5.32	1289	7.53

Table A17. Nova Scotia, House Descriptions.

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
NS171	2 SB	38x140	brick wood siding	casement	sg	0.10	176	780	414	0	0	-	asb
NS172	2 SB	38x140	brick vinyl siding	wood casement	sg	0.10	260	827	406	Bb/0	t/c	-	asb
NS173	4L/B/C	38x89	brick wood siding	-	sg	0.10	186	432	338	Bb/0	0	-	asb
NS174	2 SB	38x140	brick siding	-	sg	0.10	214	-		FA/0	0	1	asb
NS175	1 SB	38x140	brick wood siding	-	-	-	204	514	260	Bb/0	t/c	1	asb
NS176	1 SB	38x140	brick wood siding	- -	-	0.10	251	696	333	Bb/0	t/c	2	asb
NS177	2 SB	38x140	brick vinyl siding	wood casement	sg	0.10	223	816	294	Bb/0	t/c	1	asb
NS178	2 SB	38x140	brick vinyl siding	wood awning	-	0.10	214	1008	378	Bb/E	E	-	asb
NS179	1 SB	38x140	brick wood siding	-	sg	0.10	249	620	354	Bb/0	t/c	-	asb
NS180	2 SB	38x140	brick vinyl siding	wood casement	sg	0.10	223	1031	775	-	-	-	asb

Legend

B_i - bilevel
1S - single storey
2S - two storey
nL - number of levels split
- A slab on grade
- B basement (w-wood)
- C crawlspace

E - electric
G - natural gas

FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
w - wood stove
o - oil
o/w - oil/wood
t/c - tankless coil D.H.W.
asb - as per Building Code

A_f - floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
Kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - return air or furnace air supply to heating
sg - sliding glass patio doors

Table A18. Nova Scotia, Pressure Test Results

Code	UNSEALED HOUSE							SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
	C ($L/S\ Pa^n$)	n	ELA (m^2)	Q (L/s)	ELA/A $\left(\frac{cm^2}{m^2}\right)$	Q (L/s)	Q/V (h^{-1})	C ($L/s\ Pa^n$)	n	ELA (m^2)	Q (L/s)	ELA/A $\left(\frac{cm^2}{m^2}\right)$	Q (L/s)	Q/V (h^{-1})
NS171	67.29	.654	.122	303	2.94	869	4.01			Untested: under construction				
NS172	77.83	.657	.141	354	3.47	1019	4.43			Untested: difficult to test				
NS173	71.88	.623	.121	302	3.58	822	6.85	63.47	.616	.105	262	3.11	707	5.89
NS174			House too leaky to test											
NS175	65.35	.704	.133	331	5.10	1026	7.19	93.30	.580	.142	355	5.47	902	6.32
NS176	61.16	.717	.127	319	3.81	1011	5.23			Untested: under construction				
NS177			Under construction											
NS178	82.16	.595	.129	323	3.41	843	3.00			Untested: almost complete				
NS179	60.93	.672	.114	286	3.02	844	3.02			Untested: almost complete				
NS180	94.75	.614	.156	390	2.01	1047	3.65	80.56	.636	.139	348	1.80	970	3.39

Table A20. New Brunswick, Pressure Test Results

	UNSEALED HOUSE							SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
Code	C (L/S Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A ($\frac{cm^2}{m^2}$)	Q (L/s)	Q/V (h^{-1})	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A ($\frac{cm^2}{m^2}$)	Q (L/s)	Q/V (h^{-1})
NB181	8.42	.891	.027	66	1.20	275	1.83	8.42	.891	.027	66	1.20	275	1.83
NB182	50.11	.759	.117	288	4.12	976	5.10	48.04	.770	.115	283	4.05	977	5.10
NB183	25.46	.750	.058	144	2.83	479	3.45	23.57	.764	.055	137	2.70	468	3.37
NB184						under construction								
NB185	37.02	.706	.076	188	3.70	586	4.22	33.93	.722	.072	179	3.52	572	4.12
NB186		Test	Discarded					51.05	.547	.073	180	3.72	434	3.25
NB187	38.08	.685	.075	184	4.01	555	4.41	35.93	.672	.068	169	3.67	498	3.96
NB188	48.78	.684	.095	236	3.52	709	3.82	59.22	.623	.101	249	3.72	678	3.70
NB189						house unavailable								
NB190						house unavailable								

Table A19. New Brunswick, House Descriptions.

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
NB181	1 SB	38x89	vinyl siding	-	-	-	115	542	222	Bb/E	E	-	asb
NB182	3 LB	38x140	stone siding	-	-	0.15	204	689	283	E	E	W	asb
NB183	Bi B	38x140	vinyl siding	wood awning	sg	0.15	236	500	205	Bb/E	E	W	asb
NB184	2 SB	-	-	-	-		188	688	282	0	0	-	asb
NB185	1 SB	-	-	-	-	-	103	500	205	E	E	-	asb
NB186	-	-	brick	-	-	-	98	480	197	0	-	-	asb
NB187	Bi B	38x89	vinyl siding	wood casement	sg	-	93	453	186	E	E	-	asb
NB188	1½ B	38x89	cedar shingles	wood casement	-	-	186	660	271	-	-	-	asb
NB189	house unavailable												
NB190	house unavailable												

Legend

B_i - bilevel
1S - single storey
2S - two storey
nL - number of levels split
- A slab on grade
- B basement (w-wood)
- C crawlspace

E - electric
G - natural gas

FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - baseboard
w - wood stove
o - oil
o/w - oil/wood
t/c - tankless coil D.H.W.
asb - as per Building Code

Af - floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
Kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - return air or furnace air supply to heating
sg - sliding glass patio doors

Table A21. Prince Edward Island, House Descriptions.

Code	Construction Style	Wall Stud (mm)	Exterior Finish	Windows	Patio Doors	Vapour Barrier (mm)	A_f (m^2)	V (m^3)	A (m^2)	Heating System	DHW	Fireplace	Ventilators
P191	1 SC	38x89	vinyl siding	sliders	-	0.10	80	746	306	E	-	-	asb
P192	2 LBW	Dble 38x89	wood siding	wood casement	-	0.10	148	584	323	FA/0	0	w	asb
P193	2 SB	38x140	siding	sliders	-	-	143	554	228	Bb/0	t/c	w	asb
P194	2 SB	38x140	vinyl siding	wood casement	-	-	186	668	274	Bb/0	t/c	-	asb
P195	1 SB	Dble 38x89	brick vinyl siding	wood casement	-	-	149	196	80	Fa/0	0	1	asb
P196	2 SB	38x140	wood siding	sliders	-	-	168	528	217	Fa/0/w	t/c	-	asb
P197	1½ SB	38x140	brick vinyl siding	wood casement sliders	-	0.15	246	833	342	Bb/0	0	1	asb
P198	B_i B	38x140	vinyl siding	sliders	-	-	120	601	247	Fa/0/w	t/c	-	asb
P199	2 SB	38x140	cedar shingles	wood casement	S.G.	-	204	639	273	Bb/0	t/c	w	asb
P200	2 SB	38x140	vinyl siding	wood casement	-	-	167	623	255	Bb/0	t/c	-	asb

Legend

B_i - bilevel
1S - single storey
2S - two storey
nL - number of levels split
- A slab on grade
- B basement (w-wood)
- C crawlspace

E - electric
G - natural gas

FA - forced air
So - solar collectors
nF - number of fireplaces
Bb - basebord
w - wood stove
o - oil
o/w - oil/wood
t/c - tankless coil D.H.W.
asb - as per Building Code

Af - floor area
V - house volume
A - shell area, above grade surface area
DHW - domestic hot water
bf - bathroom fan vented outside
kf - kitchen fan vented outside
kr - kitchen fan recirculating
as - fresh air intake to cold air return
sg - sliding glass patio doors

Table A22. Prince Edward Island, Pressure Test Results

	UNSEALED HOUSE							SEALED HOUSE						
			10 Pascal			50 Pascal				10 Pascal			50 Pascal	
Code	C (L/S Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A $\left(\frac{cm^2}{m^2}\right)$	Q (L/s)	Q/V (h^{-1})	C (L/s Pa^n)	n	ELA (m^2)	Q (L/s)	ELA/A $\left(\frac{cm^2}{m^2}\right)$	Q (L/s)	Q/V (h^{-1})
P191	36.59	.796	.094	229	3.08	824	3.98	58.60	.635	.104	253	3.41	703	3.39
P192	60.24	.634	.105	259	4.56	720	4.43	61.19	.623	.105	257	4.52	700	4.32
P193	36.44	.696	.066	161	2.88	456	2.96	36.49	.639	.065	159	2.83	444	2.89
P194	32.55	.748	.075	182	2.73	607	3.27	31.40	.751	.073	177	2.65	593	3.19
P195			Test Discarded											
P196	70.11	.562	.105	255	4.84	629	4.29	66.16	.571	.101	246	4.67	618	4.21
P197	54.05	.771	.131	319	3.83	1103	4.77	53.34	.754	.124	303	3.64	1019	4.40
P198	41.06	.805	.108	262	4.36	957	5.75	47.97	.752	.111	271	4.51	909	5.45
P199		Test	Discarded					87.56	.631	.154	374	5.63	1034	5.82
P200	23.28	.853	.068	166	2.67	655	3.78	25.75	.822	.070	171	2.75	642	3.71

APPENDIX B

BASIC STATISTICS ON AIRTIGHTNESS

Table B1. Provincial Comparison of Floor Area, Volume and Shell Area

Province	Floor Area, A_f				Volume, V				Shell Area, A			
	mean (m^2)	min (m^2)	max (m^2)	S (m^2)	mean (m^2)	min (m^2)	max (m^2)	S (m^2)	mean (m^2)	min (m^2)	max (m^2)	S (m^2)
British Columbia	160	139	212	41	474	364	651	76	362	310	457	50
Alberta	148	95	211	37	620	402	964	161	299	218	477	65
Saskatchewan	142	86	248	39	605	363	1434	211	283	212	587	81
Manitoba	113	70	211	35	508	351	760	114	238	182	320	40
Ontario A	147	86	227	36	548	382	765	112	300	226	420	64
Ontario B	165	116	263	45	613	441	933	145	285	224	356	48
Quebec	114	73	317	48	445	224	1579	219	282	184	489	73
New Brunswick	153	93	236	56	564	453	689	99	231	186	283	41
Nova Scotia	220	176	260	28	747	432	1031	432	395	260	775	151
Prince Edward Island	161	80	246	45	642	528	833	96	264	217	342	40
Newfoundland	169	85	220	51	757	414	880	157	437	295	494	101

S = standard deviation

Table B2. Provincial Comparisons of ELA, Q/V, and ELA/A for New Houses in the Sealed Condition

Region	ELA at 10 Pa				ELA/A at 10 Pa				Q/V at 50 Pa			
	Mean (m^2)	Min (m^2)	Max (m^2)	S (m^2)	Mean (cm^2/m^2)	Min (cm^2/m^2)	Max (cm^2/m^2)	S (cm^2/m^2)	Mean (h^{-1})	Min (h^{-1})	Max (h^{-1})	S (h^{-1})
British Columbia	0.157	0.129	0.188	0.021	4.40	3.22	5.77	0.85	9.33	6.09	12.03	2.15
Alberta	0.119	0.043	0.212	0.050	3.92	1.95	5.38	1.13	5.26	2.21	10.39	2.24
Saskatchewan	0.055	0.02	0.10	0.022	1.96	0.74	3.48	0.73	3.18	1.40	4.87	1.06
Manitoba	0.038	0.021	0.077	0.015	1.58	0.91	3.13	0.50	2.12	1.17	5.09	0.98
Ontario A	0.129	0.070	0.28	0.049	4.20	2.76	7.05	1.15	5.46	3.53	7.86	1.22
Ontario B	0.092	0.057	0.162	0.030	3.28	1.71	6.51	1.14	4.56	1.67	11.03	1.96
Quebec	0.080	0.020	0.167	0.034	2.87	1.09	5.35	1.09	4.74	2.04	8.37	1.76
New Brunswick	0.073	0.027	0.115	0.029	3.23	1.20	4.05	0.99	3.62	1.83	5.10	1.00
Nova Scotia	0.129	0.105	0.124	0.021	3.46	1.80	5.47	1.86	5.20	3.39	6.31	1.58
Prince Edward Island	0.101	0.065	0.154	0.029	3.85	2.65	5.63	1.04	4.15	2.89	5.82	0.99
Newfoundland	0.132	0.060	0.188	0.043	3.64	2.03	5.32	1.11	5.34	3.25	7.53	1.50

Table B3. Regional Comparison of C and n by Province

Province	Unsealed				Sealed			
	C Mean ($L/s\ Pa^n$)	S ($L/s\ Pa^n$)	n Mean	S	C Mean ($L/s\ Pa^n$)	S ($L/s\ Pa^n$)	n Mean	S
British Columbia	97.9	23.5	0.681	0.056	82.2	16.7	0.687	0.057
Alberta	74.5	40.9	0.638	0.183	61.1	34.4	0.692	0.106
Saskatchewan	29.8	12.9	0.786	0.118	25.5	12.2	0.763	0.108
Manitoba	22.9	6.6	0.675	0.050	18.6	6.6	0.696	0.039
Ontario A	98.7	38.3	0.569	0.042	90.2	40.5	0.578	0.061
Ontario B	52.9	20.8	0.730	0.109	41.2	16.6	0.759	0.144
Quebec	46.1	24.5	0.668	0.048	38.4	21.5	0.710	0.062
New Brunswick	34.6	15.7	0.746	0.078	34.9	17.9	0.740	0.093
Nova Scotia*	72.7	11.7	0.653	0.045	79.2	14.8	0.611	0.028
Prince Edward Island	44.3	15.7	0.733	0.097	52.1	19.3	0.686	0.084
Newfoundland	70.3	29.5	0.700	0.100	63.8	29.6	0.729	0.111

*8 houses unsealed, 3 houses sealed

S - standard deviation

Table B4. Comparison by House Style, Sealed Condition

Province	ELA/A at 10 Pa (cm^2/m^2)											
	Single-Story			Two-Storey			Split-Level			All Houses		
	No.	Mean	$S\bar{x}$	No.	Mean	$S\bar{x}$	No.	Mean	$S\bar{x}$	No.	Mean	$S\bar{x}$
British Columbia	7	4.36	0.32	8	3.88	0.21	5	5.29	0.34	20	4.40	0.20
~~Alberta~~	3	2.90	0.95	9	4.27	0.26	2	3.87	2.11	14	3.92	0.31
Saskatchewan	9	1.67	0.19	7	2.28	0.26	4	2.07	0.65	20	1.96	0.17
Manitoba	8	1.35	0.10	5	2.10	0.37	7	1.46	0.09	20	1.58	0.11
Ontario	2	3.66	1.27	36	3.76	0.22	2	3.41	0.11	40	3.74	0.20
Quebec	14	3.00	0.33	11	2.83	0.37	15	2.77	0.26	40	2.87	0.17
Atlantic Canada	8	3.67	0.53	15	3.52	0.30	6	3.62	0.29	29	3.58	0.21
All Houses	51	2.81	0.20	91	3.46	0.13	41	3.00	0.21	183	3.18	0.01

$S\bar{x}$ = standard deviation of the mean

B5

Table B5. Tightest to Leakiest Builders Who Constructed Four Houses or More

Rank	Builder	No. of Houses	Province	ELA/A at 10 Pa Mean (cm^2/m^2)	S (cm^2/m^2)	$S\bar{x}$ (cm^2/m^2)
1	19	4	Saskatchewan	1.23	0.51	0.29
2	23	4	Manitoba	1.37	0.32	0.19
3	25	4	Manitoba	1.40	0.41	0.24
4	22	4	Manitoba	1.48	0.14	0.08
5	24	4	Manitoba	1.60	0.55	0.32
6	40	5	Quebec	1.95	0.33	0.17
7	20	5	Saskatchewan	1.95	0.66	0.33
8	21	8	Saskatchewan	2.16	0.63	0.24
9	34	9	Ontario	2.97	0.76	0.27
10	29	5	Ontario	3.24	0.32	0.16
11	48	4	Quebec	3.44	0.74	0.42
12	33	11	Ontario	3.47	1.40	0.44
13	2	5	British Columbia	3.59	0.38	0.19
14	71	3	Prince Edward Island	3.68	1.69	1.20
15	31	8	Ontario	4.00	0.88	0.33
16	35	7	Quebec	4.07	0.88	0.36
17	5	2	Alberta	4.13	0.52	0.52
18	1	5	British Columbia	4.41	0.89	0.44
19	3	10	British Columbia	4.80	0.76	0.25
20	30	5	Ontario	5.57	1.02	0.51

S = standard deviation

$S\bar{x}$ = standard deviation of the mean

APPENDIX C

SOURCES OF ERROR

Table T.C1: Detailed Comparison of House Geometry: Volume, V, and Above Grade Surface Area, A.

Code	Test Agency	Style	V (m^3)	% Diff.	A (m^2)	% Diff.
BC14	R	3L/C/B	461	+1	328	-8
	B		457		356	
BC15	R	BiB	364	-13	333	+7
	B		420		312	
A31	R	1SB	492	+6	220	+1
	B		465		218	
A32	R	1SB	514	+5	234	+1
	B		492		231	
S41	R	2SB	613	+4	284	-4
	B		592		295	
S52	R	2SB	598	-2	316	-5
	B		610		332	
M70	R	2LB	403	+0	220	-10
	B		402		245	
M77	R	3LB	401	-4	217	-26
	B		418		294	
OA81	R	2SB	469	-2	254	+1
	B		477		252	
OA82	R	2SB	573	+9	304	+9
	B		528		280	
OB112	R	2SB	531	-6	269	-11
	B		564		302	
OB114	R	2SB	555	-8	257	-19
	B		600		319	
Q130	R	1SB	432	+11	229	-2
	B		391		234	
Q131	R	2SB	563	+17	220	-11
	B		482		248	
P194	R	2SB	668	+8	274	-9
	B		616		302	
P200	R	2SB	623	-1	255	-16
	B		627		303	
MEAN				6		9

R - regional contractor

B - base contractor

1s - one storey
2s - two storey
nL - number of levels split
- L slab
- B basement
- C crawlspace

Table C3: Regional Subcontractor/Base Subcontractor comparisons of correlation coefficient, windspeed, ELA/A 10Pa and Q/V at 50Pa

				UNSEALED				SEALED			
				ELA/A at 10Pa		Q/V at 50Pa		ELA/A at 10Pa		Q/V at 50 Pa	
CODE	Test Agency	r	V (km/h)	(cm^2/m^2)	% Diff.	(h^{-1})	% Diff.	(cm^2/m^2)	% Diff.	(h^{-1})	% Diff.
BC14	R*	.9986	3	6.31	+1	13.70	+59	5.37	-4	12.30	+46
	B	.9861	31	6.23		8.60		5.59		8.40	
BC15	R	.0086	7	5.50		13.30	--	4.96	-1	12.00	+14
	B	--	42	No data: ΔP achievable = 10 Pa				5.00		10.50	
A31	R	.9997	--	2.77	+4	2.96	0	1.95	+70	2.21	+34
	B	.9980	24	2.66		2.96		1.15		1.65	
A32	R	.9982	--	2.56	+29	2.98	+4	2.31	+52	2.56	+15
	B	.9972	22	1.99		2.86		1.52		2.22	
S41	R	.9908	10	3.66	+71	4.22	+9	2.08	-2	3.41	0
	B	.9813	30	2.14		3.89		2.13		3.40	
S52	R	.9965	15	2.53	-49	4.49	+4	1.90	-56	4.13	-4
	B	.9813	44	5.00		4.32		4.31		4.30	
M70	R	.9987	15	1.73	+15	2.35	-1	1.18	-13	1.83	+3
	B	.9964	37	1.51		2.37		1.35		1.78	
M77	R	.9991	10	3.27	+22	5.32	-2	3.13	+7	5.09	+2
	B	.9954	39	2.69		5.45		2.93		5.01	
OA81	R	.9927	9	3.07	+17	4.00	+3	3.07	+21	3.53	+1
	B	.9993	22	2.62		3.90		2.54		3.49	
OA82	R	.9956	9	3.52	-6	4.58	+11	3.36	+15	4.21	+3
	B	.9797	15	3.75		4.11		2.93		4.07	
OB112	R	.9933	15	2.86	+18	3.46	+1	2.38	+16	2.66	-14
	B	.9988	11	2.42		3.43		2.05		3.10	
OB114	R	.9956	15	3.97	+44	4.80	+15	3.77	+45	4.78	+17
	B	.9964	13	2.76		4.17		2.60		4.07	
Q130	R	.9969	14	3.54	+22	4.89	-12	3.23	+11	4.58	-17
	B	.9992	6	2.91		5.53		2.91		5.53	
Q131	R	.9967	14	2.64	+43	2.61	-17	2.55	+38	2.61	-17
	B	.9953	4	1.85		3.14		1.85		3.14	
P194	R	.9998	--	2.74	0	3.27	-12	2.66	+3	3.19	-10
	B	.9965	<5	2.75		3.73		2.58		3.56	
P200	R	.9879	--	2.67	+5	3.78	+16	2.75	+24	3.71	+26
	B	.9977	<5	2.54		3.26		2.21		2.95	
MEAN					23		11		24		14

* R - regional subcontractor, B - base subcontractor

Table C2: Regional Subcontractor/Base Subcontractor Comparisons of Correlation Coefficient, Wind Speed, Leakage Area and Flowrate

CODE	TEST	r	V (km/h)	ELA at 10Pa (m^2)	% DIFF.	Q at 50Pa (L/s)	% DIFF	r	ELA at 10Pa (m^2)	% DIFF.	Q at 50Pa (L/s)	% DIFF.
BC14	R*	~~.9986~~	3	.207		1760	+61	.9985	.176	-12	1570	+47
	B	.9861	31	.222	-7	.1090		.9817	.199		1070	
BC15	R	.9986	7	.183		1340	--	.9945	.165	+6	1210	-2
	B		42	No data: Max. ΔP				.9933	.156		1230	
A31	R	.9997	-	.061	-5	405	+6	.9998	.043	+72	302	+42
	B	.9980	24	.058		382		.9995	.025		213	
A32	R	.9982	-	.060	+30	425	+9	.9944	.054	+54	366	+21
	B	.9972	22	.046		391		.9987	.035		303	
S41	R	.9908	10	.104	+65	710	+12	.8977	.059	-6	580	+3
	B	.9813	30	.063		636		.0831	.063		561	
S52	R	.9965	15	.080	-52	760	0	.9834	.060	-58	700	-7
	B	.9813	44	.166		760		.9831	.143		756	
M70	R	.9987	15	.038	+3	263	-1	.9993	.026	-21	205	+3
	B	.9964	37	.037		265		.0087	.033		199	
M77	R	.9991	10	.071	-10	593	-6	.9999	.068	-21	567	-3
	B	.9954	39	.079		633		.9985	.086		582	
OA81	R	.9927	9	.078	+18	520	+1	.9923	.078	+22	460	0
	B	.9993	22	.066		517		.9991	.064		462	
OA82	R	.9956	9	.107	+2	729	+21	.9955	.102	+24	670	+12
	B	.9797	15	.105		603		.9992	.082		597	
OB112	R	.9933	15	.077	+6	509	-5	.9956	.064	+3	393	-19
	B	.9988	11	.073		537		.9984	.062		486	
OB114	R	.9956	15	.102	+16	739	+6	.9917	.097	+17	736	+9
	B	.9964	13	.088		695		.9980	.083		678	
Q130	R	.9969	14	.081	+19	506	-16	.9951	.074	+9	549	-9
	B	.9992	6	.068		601		.9992	.068		601	
Q131	R	.9967	14	.058	+26	408	-3	.9983	.056	+22	409	-3
	B	.9953	4	.046		420		.9953	.046		420	
P194	R	.9998	--	.075	-10	607	-5	.9996	.073	-6	593	-3
	B	.9965	<5	.083		638		.9979	.078		609	
P200	R	.9879	--	.068	-12	655	+15	.9973	.070	+4	642	+25
	B	.9977	<5	0.077		569		.9996	.067		515	
MEAN					19		11			22		13

*R - regional subcontractor, B - base subcontactor.