Towards Healthy House Renovations

**Research on Trends and Practices
Relating to Healthy Housing, Indoor Air Quality and Ventilation
within the Residential Renovation Industry**

Conducted For
**Technical Policy and Research Division
Canada Mortgage and Housing Corporation**

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1.0 Executive Summary

This project focuses in particular on the knowledge and experience of residential renovation contractors in relation to indoor air quality and ventilation. It also reflects consumer attitudes and preferences in this area, as reported by renovators.

The central element in the project was a national survey of renovators that examined a range of business concerns and practices, with emphasis on assessment and remediation of indoor air quality problems in homes. The reference year for the data was 1995.

The results, based on responses from 263 renovators across Canada, provide considerable insight into current industry practices, areas where renovator knowledge is lacking and methods by which Canada Mortgage and Housing Corporation (CMHC) could assist renovators and homeowners in dealing with air quality problems more adequately.

In relation to business conditions, the survey results identified three distinct groups of renovators.

1) Members of the Canadian Home Builders' Association (CHBA) had the highest gross revenues and undertook the largest projects.

2) Québec renovators, members of the Association provinciale des constructeurs d'habitations du Québec inc. (APCHQ), had the lowest gross revenues and reported the most difficulty in competing with "underground" contractors.

3) Non-CHBA renovators operating outside Québec had gross revenues slightly more than half those of their CHBA competitors.

In relation to the renovators knowledge in the areas of indoor air quality and ventilation, the CHBA and APCHQ renovators exhibited higher knowledge levels than the non-member group. While renovators reported that they find several problems affecting indoor air quality on a regular basis, it appears that many of them, particularly in the non-member group, do not know what appropriate remedial measures to recommend to customers.

According to the renovators surveyed, lack of consumer awareness about indoor air quality and ventilation is a significant barrier to including relevant measures in renovation projects. From the point-of-view of renovators, this lack of awareness leads to an unwillingness to sacrifice other aspects of their renovation plans in favour of covering the cost of improving air quality. In many cases, it appears that consumers are yet to view indoor air quality and ventilation as being personally relevant, unless they are environmentally sensitive.

These results indicate room for promoting greater awareness of indoor air quality and ventilation among both renovators and consumers. The research also suggests that both groups would be receptive to more information, provided it is appropriately tailored to their level of information need and mode of learning. Just as energy efficiency has gained prominence in the marketplace, so can indoor air quality and ventilation if they are seen as having broad significance.

A large amount of information on these topics already exists. More effective means of transferring technical knowledge and practical skills to renovators, and of communicating awareness and benefits to homeowners, will have to be developed.

Renovators need appropriate tools to use in assessing air quality conditions in homes and in planning their renovation work so as to avoid creating any new problems. Consumer information needs to broaden people's appreciation that attention to indoor air quality and ventilation should be an integral part of every renovation.

1.0 Résumé

Le projet porte principalement sur les connaissances et l'expérience des entrepreneurs de rénovation résidentielle par rapport à la qualité de l'air intérieur et à la ventilation. Les rénovateurs nous indiquent les attitudes et les préférences des consommateurs dans ce domaine.

Le projet repose sur une enquête nationale menée auprès des rénovateurs pour examiner une vaste gamme de préoccupations et de pratiques, en insistant sur l'évaluation et la correction des problèmes de qualité de l'air intérieur dans les habitations. L'année de référence des données est 1995.

Les résultats, basés sur les réponses fournies par 263 rénovateurs de toutes les régions du Canada, fournissent des renseignements considérables sur les pratiques actuelles de l'industrie, les domaines où les rénovateurs manquent de connaissances et les méthodes grâce auxquelles la Société canadienne d'hypothèques et de logement (SCHL) pourrait aider les rénovateurs et les propriétaires-occupants à mieux faire face aux problèmes liés à la qualité de l'air.

En ce qui a trait à la situation des entreprises, les résultats de l'enquête ont révélé l'existence de trois groupes de rénovateurs distincts :

1) les membres de l'Association canadienne des constructeurs d'habitations (ACCH),   qui ont le revenu brut le plus élevé et ont entrepris les projets les plus importants;

2) les rénovateurs du Québec, membres de l'Association provinciale des constructeurs d'habitations du Québec inc. (APCHQ), qui ont le revenu brut le plus bas et qui ont indiqué avoir davantage de difficultés à faire concurrence aux entrepreneurs travaillant «au noir»;

3) les rénovateurs non membres de l'ACCH et travaillant à l'extérieur du Québec, qui ont un revenu brut légèrement supérieur à celui de la moitié de leurs concurrents membres de l'ACCH.

Au sujet des connaissances des rénovateurs en ce qui a trait à la qualité de l'air intérieur et à la ventilation, les rénovateurs de l'ACCH et de l'APCHQ ont fait preuve d'un niveau de connaissance supérieur à celui du groupe des non-membres. Les rénovateurs ont indiqué relever régulièrement plusieurs problèmes liés à la qualité de l'air, mais il semble que bon nombre d'entre eux, en particulier chez les non-membres, ne sachent pas quelles mesures correctives recommandées aux clients.

Selon les rénovateurs sondés, le manque de sensibilisation des consommateurs au sujet de la qualité de l'air intérieur et de la ventilation est un obstacle considérable lorsqu'ils tentent d'inclure les mesures requises dans les projets de rénovation. Du point de vue des rénovateurs, ce manque de sensibilisation fait en sorte que les clients sont peu enclins à sacrifier d'autres aspects de leurs plans de rénovation pour couvrir le coût de l'amélioration de la qualité de l'air. Dans de nombreux cas, il semble que les consommateurs ne voient pas encore la qualité de l'air et la ventilation comme des aspects les touchant personnellement, à moins qu'ils ne soient sensibles aux polluants environnementaux.

Les résultats indiquent qu'il y a lieu de promouvoir la sensibilisation des rénovateurs et des consommateurs à la qualité de l'air intérieur et à la ventilation. L'étude indique également que les deux groupes seraient prêts à recevoir de l'information supplémentaire à condition qu'elle soit adaptée à leur niveau de connaissance et à leur mode d'apprentissage. Tout comme l'efficacité énergétique qui a gagné de l'importance sur le marché, la qualité de l'air intérieur et la ventilation peuvent prendre leur place s'ils sont perçus comme des éléments ayant de grandes répercussions.

Une grande quantité de renseignements existent déjà sur le sujet. On devra tenter d'élaborer des moyens plus efficaces de transmettre les connaissances techniques et les compétences pratiques aux rénovateurs et de sensibiliser les propriétaires-
occupants en leur faisant part des avantages.

Les rénovateurs ont besoin des outils qui conviennent pour évaluer les conditions de l'air dans les habitations et pour planifier leurs travaux de rénovation s'ils veulent éviter de créer de nouveaux problèmes. L'information diffusée aux consommateurs doit leur faire prendre davantage conscience du fait que la qualité de l'air intérieur et la ventilation doivent faire partie intégrante de chaque projet de rénovation.

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2.0 Project Objectives

Canada Mortgage and Housing Corporation commissioned this research project in order to better understand current renovation industry practices having to do with indoor air quality and ventilation. The initial objective of the project was to conduct a survey of residential renovators to determine their knowledge levels and renovation experience in relation to a range of Healthy Housing topics, with emphasis on indoor air quality and ventilation. CMHC also wished to determine renovators' awareness of, attitude towards and use of CMHC as an information provider.

The results of the survey would identify any knowledge gaps within the industry relating to the assessment and treatment of indoor air quality problems. The remedial approach of primary interest to CMHC is the use of ventilation systems.

Should the results of the survey indicate that renovators are generally lacking the knowledge required to address indoor air quality and ventilation issues, a second objective of the study was to identify these additional information needs and develop an information strategy for addressing them. This was to include the identification of specific indoor air quality assessment tools or resources for use by renovators.

In order to provide a representative sampling of the renovation industry, CMHC directed that this survey be sent to renovation firms across Canada, including members of the Canadian Home Builders' Association, Association provinciale des constructeurs d'habitations du Québec and non-affiliated renovators.

3.0 Survey Methodology and Respondent Profile

3.1 Survey Design

The Questionnaire

The survey was designed in consultation with CMHC's Research Division, and with extensive input from the members of the expert panel acting as advisors to the project team. Initial meetings with CMHC served to define the objectives of the research and to set the conceptual plan for the survey. Several draft versions of the questionnaire were prepared for in-depth review by all members of the project team.

A draft version of the questionnaire was pretested with 10 renovators working in and around the Ottawa market. English and French versions of the questionnaire were then prepared for distribution to renovators across Canada.

The final version of the questionnaire, annotated with the survey statistics, is presented in Appendix A.

Sample of Renovators

The survey sample was comprised of three main groups of renovators: 1) CHBA members; 2) non-members in the nine provinces outside Québec; and 3) APCHQ members (non-members were not surveyed in Québec). The final mailing sample consisted of 1,835 renovators: 835 CHBA members, 600 non-members and 400 APCHQ members.

CHBA member renovators were identified by CHBA staff from their membership directories. This information was forwarded after a round of telephone and fax contacts to all the CHBA offices across the country. A total of 63 CHBA offices out of 68 assisted with this process.

Non-members were identified from telephone yellow page listings for all major markets in Canada. Priority was given to firms which identified "additions" in their advertisements. Non-members were sampled in proportions approximately equal to the number of CHBA members in their respective markets.

For APCHQ members, the APCHQ provided the project team with a random listing of 400 of its members currently registered under the Association's renovation warranty program.

3.2　Survey Administration

Survey packages including a copy of the questionnaire and an addressed, postage-paid return envelope were mailed to all renovators in June 1996. Postcard-style reminder notices were sent to all renovators in the sample approximately two weeks later. To boost the number of returns beyond the minimum 250 required for the analysis and to increase response rates, a second complete questionnaire package was sent to non-responding CHBA members and non-members in August. A telephone "hotline" was administered for the duration of the survey field work to assist renovators with any questions about the survey.

All completed questionnaires were returned to Ottawa with a cutoff date for processing survey returns of September 20, 1996.

A telephone survey of non-respondents was conducted during the first two weeks of October to establish the mail survey response rates by refining the estimates of "eligible" and "ineligible" respondents. Eligible respondents were defined as companies that are active in renovation and for which we had the correct mailing address. Ineligible respondents were defined as companies which were no longer in business or no longer active in renovation, or for which we did not have a correct address (e.g., the company had moved, our address was incorrect).

3.3　Data Base Management and Analysis

The survey data was entered employing standard procedures for quality control and error reduction. The data base used for the analysis was created with SPSS Version 7.0 for Windows.

The survey data was subjected to a round of data quality checks including expert review of the univariate distributions (i.e., by the project team and expert panel), reliability tests of both individual variables (e.g., split halves, measures of variation/dispersion) and multiple-indicator scales (e.g., Cronbach's alpha for additive scales), and construct validity tests to verify that relationships among key variables conformed to expectations.

The univariate distributions and descriptive statistics for all survey variables are presented with the survey questionnaire in Appendix A. A complete set of statistical tests was conducted to assess the relationships between all questions asking about the opinions, practices and experiences of renovators (i.e., most survey questions) and the following key variables: membership status, years in the renovation experience, annual revenues from renovation, renovation as a percentage of all construction activity, and number of employees. Multivariate statistical tests were conducted in specific areas where preliminary analyses indicated that further exploration was warranted. Where these relationships are both substantively and statistically significant, the results are presented in Section 4 and in more detail in Appendix B.

3.4 Sample Size and Response Rates

A total of 302 responses was received by return mail from companies in the original mailout sample. Some of these responses were from individuals and companies who took the time to report that they were not active in the renovation business. The final data base includes 263 completed questionnaires from active renovation companies: 149 from CHBA members, 77 from non-members, and 37 from APCHQ members.

The final response rate to the survey was 20%. The calculation of response rates takes account of both the survey returns and the results of the non-response survey. The non-response survey included successful contacts with 110 companies in the original sample. Of these 110 contacts, 34 or 31% were with companies considered to be ineligible for the survey: 17 were no longer renovators and 17 were companies no longer at the address (e.g., moved, wrong address, no longer in business). The response rate calculations are presented in Table 3.1.

Table 3.1: **Renovator Survey Response Rates**	
Total number of questionnaires in initial sample:	1,835
Completed questionnaires:	263
Initial number of ineligible companies in initial sample:	50
Returned by Canada Post:	31
Companies indicating they do not do renovation:	19
Residual non-response 1,835 - (263 + 50):	1,522
Estimated ineligible cases from non-response survey:	472
Estimate of total number of eligible renovators 1,835 - (50 + 472) = 1,313:	1,313
Overall response rate (263 / 1,313):	20%

The principal reason given by renovators for not responding to the survey was that they were too busy. Almost two-thirds (64%) said that they simply did not have the time to respond at this time of the year (i.e., June and July).

3.5   Sample Representativeness

Sample representativeness or, conversely, sample bias - the degree to which a survey sample represents the overall study population - is always a crucial question for survey data analysis. One of the principal means used to assess the representativeness of the sample was by comparing the results from the mail survey with the results from the telephone survey of non-respondents: i.e., the more similar the results, the greater the confidence we can have in the representativeness of the survey data. Comparisons are possible for four questions, two factual and two opinion. Overall, the results are very similar. These findings are presented in Table 3.2.

Table 3.2: **Comparison of Survey and Non-Respondent Samples**

Question	Survey Sample (n = 263)	Non-Respondents (n = 40)
1) Renovation as a % of revenues		
• 100%	25.0%	23.2%
• 50% - 99%	32.5%	36.4%
• less than 50%	42.5%	38.4%
2) Years in Business (avg.)	15.4 years	17.8 years
3) Familiarity with Ventilation Equipment		
• Not familiar	26.0%	25.0%
• Somewhat familiar	37.8%	30.0%
• Very familiar	36.2%	45.0%
4) Customer Interest in IAQ/Health Impacts		
• No/little interest	34.9%	34.2%
• Somewhat interested	52.7%	47.3%
• Very interested	12.4%	18.4%

3.6 Respondent Profile

Membership Status

Approximately half of the sample is composed of CHBA members. Response rates (the percentage of renovators completing the questionnaires) were relatively similar for the three sample sub-groups.

- 149 CHBA members   56.6%
- 77 non-members   29.3%
- 37 APCHQ   14.1%

Renovation Experience

Respondents have been in the renovation business an average of approximately 15 years. About one-third (32%) have been in the renovation business for 20 years or more.

- 10 years or less: 22.7%
- 11-15 years: 17.9%
- 16-20 years: 27.0%
- over 20 years: 32.4%

Respondents have operated their own renovation business for an average of 13.5 years.

- 5 years or less   15.1%
- 5-10 years: 30.3%
- 11-15 years: 18.3%
- 16-20 years: 21.2%
- over 20 years: 15.1%

On average, CHBA members (19 years) and APCHQ members (18 years) have been in the industry slightly longer than non-members (16 years). CHBA members have operated their own businesses longer than renovators in the other two groups: 15 years.

The length of time in the renovation business is not related to their status as an exclusive renovator (i.e., 100% of revenues from renovation) or non-exclusive renovator.

Current Renovation Activity

Respondents reported an average of 35.3 renovation projects in the last year, including an average of 9.2 large projects (valued at $10,000 or higher). Not surprisingly, respondents for whom renovation represents at least half of their revenues reported more projects overall:

- 100% of revenues (only renovates): 47 projects
- 50%-99% of revenues: 46 projects
- less than 50% of revenues: 22 projects

The number of large-scale projects does not differ much according to renovation revenues i.e., companies with less than 50% of revenues from renovation had an average of 8 large projects. Companies with over 50% revenues from renovation had an average of 11 large projects.

The relationships between the total number of projects and company revenues are given in Table 3.3.

Table 3.3: **Renovation Activity**

Renovation Revenues	Number of Projects	Number of Large Projects ($10,000+)
Less than $100,000	23.3	4.5
$100,000 - $250,000	31.2	6.8
$250,000 - $500,000	32.8	9.4
Over $500,000	71.8	20.2

For smaller CHBA member companies (i.e., revenues of $500,000 or less), the average dollar value of their projects is greater than for other companies. CHBA member companies with revenues of between $250,000 and $500,000 reported an average of 20 projects compared to over 30 for other companies of this size. For the smallest companies (under $100,000 revenues), CHBA members had half the number of projects of other companies (i.e., the average project size is about double).

The renovation project activity profile is as follows (figures represent the average percentages for the survey sample):

- Kitchen and bathroom: 19%
- Exterior: 24%
- Interior: 17%
- Basement/attic: 9%
- Additions: 23%
- Energy retrofit: 13%
- Other: 7%

There were some important differences in activity among the different sample sub-groups (note that the revenue profile of these groups is very different):

- APCHQ members reported the fewest kitchen/bathroom projects: 11% (20% for CHBA members).
- APCHQ members reported the most exterior projects: 40% (23% for CHBA members).
- CHBA members reported the most additions: 28%.
- APCHQ members reported the most energy retrofits: 28% (12% for CHBA).

CHBA members are much more involved in the combined activities of additions and interior work than other respondents: i.e., these projects represent 46% of their work compared to 35% for non-members and 18% for APCHQ members.

Overall, the combined activities of additions and interior work represents at least 50% of projects for one-third of the renovators (34%). For another third (33%), these projects represent between 20 and 50% of their work. For the remaining third of the sample (33%), these projects represent less than 20% of their work.

Staffing

Most of the companies (88%) reported that they have at least one full-time employee (excluding owners and partners). This is similar to the 1993 National Survey of Renovators (CHBA/CMHC) in which 85% of companies reported having at least one employee. The results from the 1993 survey indicate, however, that not all of the these employees are involved in renovation (e.g., some are office staff; only 45% of the companies reported that all employees work only on renovation).

The average number of full-time employees is 5: 49% of renovation companies with employees have 4 or more employees; 51% have 3 or fewer employees. CHBA members (5.5) and APCHQ members (5.3) have more employees on average than non-members (3.7).

The average number of part-time employees is 2.7. Most companies (57%) have between 1 and 3 part-time employees; 20% have none and 23% have 4 or more.

Revenues

Average gross annual revenues from renovation for firms in the sample is $441,419. This breaks down as follows:

- under $100,000:   31%
- $100,000 - $250,000:   22%
- $250,000 - $500,000:   26%
- over $500,000:   21%

Average renovation-derived revenues vary greatly by member status:

- CHBA members: $553,000
- non-members: $305,000
- APCHQ members: $264,000

Respondents earned an average of two-thirds (66%) of their total construction business revenues from residential renovation in 1995. One-quarter (23%) are exclusive renovators, earning 100% of their revenues from renovation; 37% earned between 50% and 99% from renovation; and 40% earned less than 50% from renovation. CHBA members, on average, earned a slightly smaller proportion of their 1995 revenues from renovation: 60% compared to 77% for non-members and 71% for APCHQ members.

4.0 Overview and Analysis of Survey Results

Given the size and complexity of the survey, a large amount of data was generated. In order to focus this portion of the report on key findings from the survey, the detailed results are presented in Appendix B. The information contained in this section of the report provides an overview and analysis of the results.

The survey collected information from renovators in five main areas:

1) Business Characteristics and Business Conditions
2) Renovators' Views on Technology Trends in Home Renovation
3) Renovators' Knowledge, Experience and Attitudes Related to Indoor Air Quality and Ventilation
4) Renovators' Information Needs and Preferences
5) Renovators' Views on Consumer Attitudes and Preferences

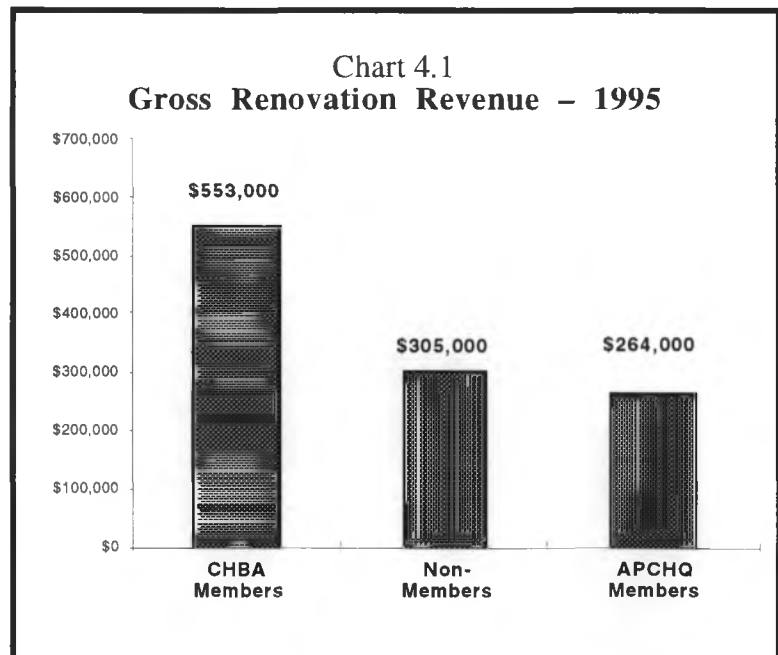This overview presents salient findings from each of these areas.

4.1 Business Characteristics and Business Conditions

In reviewing the data, the consultants found that the three groups making up the survey sample—CHBA members, non-CHBA members outside Quebec and APCHQ members within Quebec—achieved very different levels of business performance in 1995. There was concern that merging results from the three groups would obscure useful information. For this reason, data on a number of key variables are presented separately for each group.

The survey indicates sharp differences in the level of revenues generated by renovators in the three groups. In terms of gross 1995 revenues from residential renovation, Chart 4.1 illustrates these differences.

Clearly, CHBA renovators operate businesses that out-perform their competitors by a significant margin.

Lagging business performance among renovators in Quebec reflects very poor renovation market conditions experienced in the province during 1995.

Chart 4.1
Gross Renovation Revenue – 1995

CHBA Members: $553,000
Non-Members: $305,000
APCHQ Members: $264,000

The data becomes even more relevant when the volume of jobs is considered in relation to gross revenues. CHBA renovators reported an average of 30.11 projects during 1995, compared to non-CHBA members who reported 37.17 projects and APCHQ renovators reporting 48.58 projects. Taken together, the data shows that CHBA renovators not only did more business than their counterparts, but also captured a greater share of larger and more expensive projects. Average job value for the three groups is presented in Chart 4.2.

This profile of revenues and job value characteristics is relevant to the study because the types of renovation projects considered most likely to include remedial indoor air quality measures are typically larger. In part, this reflects the cost of installing a home ventilation system.

As the overall cost of a project increases, the proportionate cost of including ventilation measures decreases.
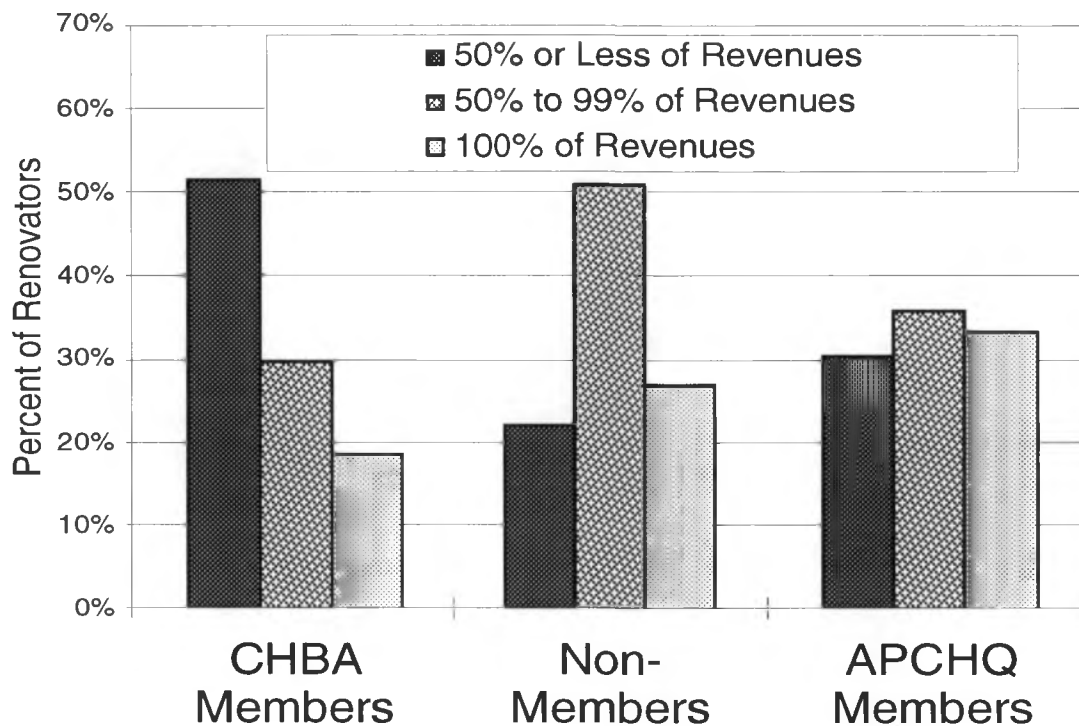
There is one other data set that completes the business profiles of the three renovator groups. This data

Chart 4.2
Average Job Value - 1995

CHBA Members	$18,366
Non-Members	$8,206
APCHQ Members	$5,434

shows that a significant number of renovation companies, more than 50%, are also active in other areas of the construction industry, mostly in the areas of commercial renovation and custom new residential construction.
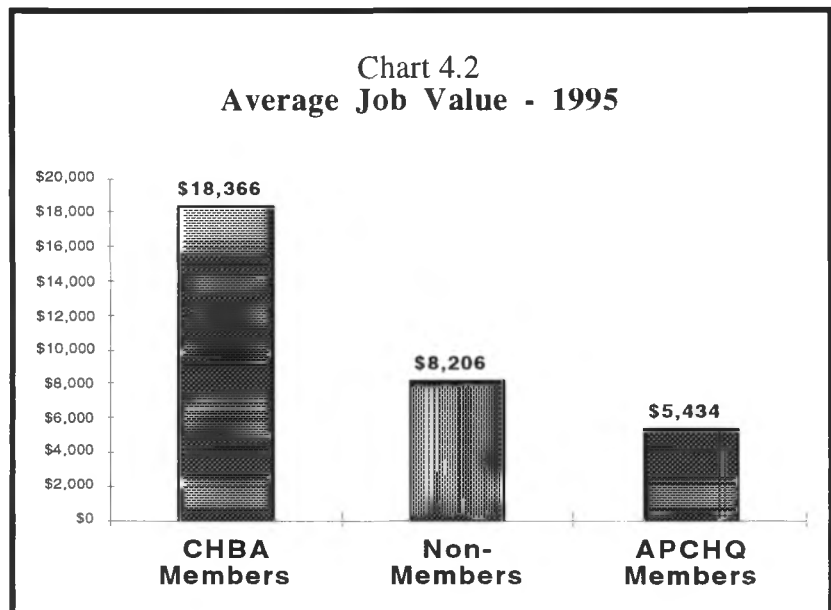
There was considerable variation in the ratio of revenues generated through renovation activity and through other construction activities between firms in each of the three groups. Slightly more than half of the CHBA renovators earned 50% or less of their total revenues from renovation. Among non-CHBA members this dropped to just over 20%. For APCHQ members, the figure was about 30%. Chart 4.3 presents the renovation/non-renovation revenue mix within the three groups.

The business characteristics contained in these three sets of data are important when considering possible strategies for influencing renovator treatment of indoor air quality and ventilation. Renovation projects that involve foundation, heating system and major structural alterations offer many opportunities to address air quality issues. Such projects tend to be expensive. The data indicates that renovators belonging to the CHBA are more likely to be involved in these larger projects.

Chart 4.3
Percentage of Total Revenues Derived From Residential Renovation – 1995

Legend:
- ■ 50% or Less of Revenues
- ▨ 50% to 99% of Revenues
- ▢ 100% of Revenues

Y-axis: Percent of Renovators (0% to 70%)

X-axis categories: CHBA Members, Non-Members, APCHQ Members

In addition to project cost considerations, each type of renovation project is likely to have a different link to air quality/ventilation considerations. There were some significant differences in the types of jobs the three renovator groups were involved in.

For instance, CHBA renovators carried out a higher percentage of additions (28% of jobs) than either non-members (20% of jobs) or APCHQ members (7% of jobs). APCHQ members were involved in significantly more energy retrofits (28% of jobs) than either CHBA renovators (12% of jobs) or non-members (8% of jobs), a reflection of utility and government support for energy conservation-related renovations in Quebec.

Again, the significance of these differences comes to the fore when considering approaches to working with the industry, as each renovator group operates in somewhat different ways.

The last set of data on general business conditions identified business problems experienced by the renovators during 1995.

In general, the three renovator groups identified similar problems, all of which relate to the level and type of competition they face.   There was some variation in the impact each group attributed to their competition, as indicated in Chart 4.4.

Chart 4.4
To What Extent Have the Following Business Situations Been a Problem for Your Renovation Business in the Last 12 Months?
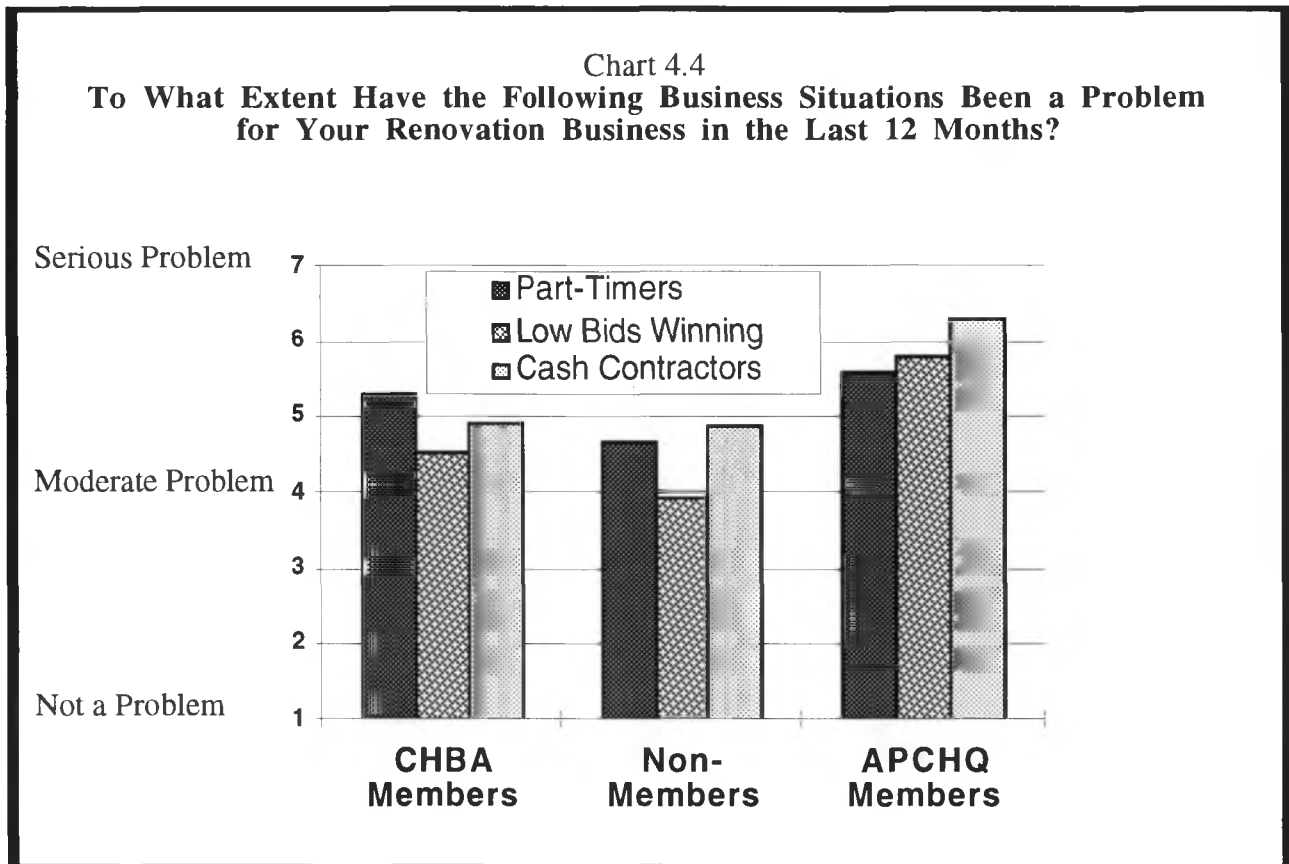
The three problems identified in the chart are closely linked and reflect a heightened level of price competition within the marketplace.   All three problems can also be tied, at least in part, to competition from firms that are not conducting business in a legitimate manner. These responses reinforce anecdotal reports from renovators concerning the growing impact of "underground" contractors on business conditions. It is noteworthy that specific reference to "cash contractors" was highest among Quebec-based renovators, the province where this problem is generally regarded to be the most serious.

4.2 Renovators' Views on Technology Trends in Renovation

Renovators reported that customers ask about some products and technologies much more frequently than others. Of the three renovator groups, CHBA members reported a generally higher level of customer inquiries in all areas. The results for CHBA renovators are presented in Chart 4.6.

Chart 4.6
CHBA Renovators Only:
How Often Do Your Customers Ask About the Following Products and Technologies?

Never/Rarely — 1 2 3 | Sometimes — 4 5 | Very Frequently — 6 7

- Hardwood Floors
- High-Perf. Windows
- High-Eff. Heating
- Gas Fireplace
- Ventilation Equipment
- HRV
- Above-Code Insulation
- Low-flow Fixtures
- Air Filters
- Low-Odor Paints
- Low-Emission Millwork
- Solar Heat
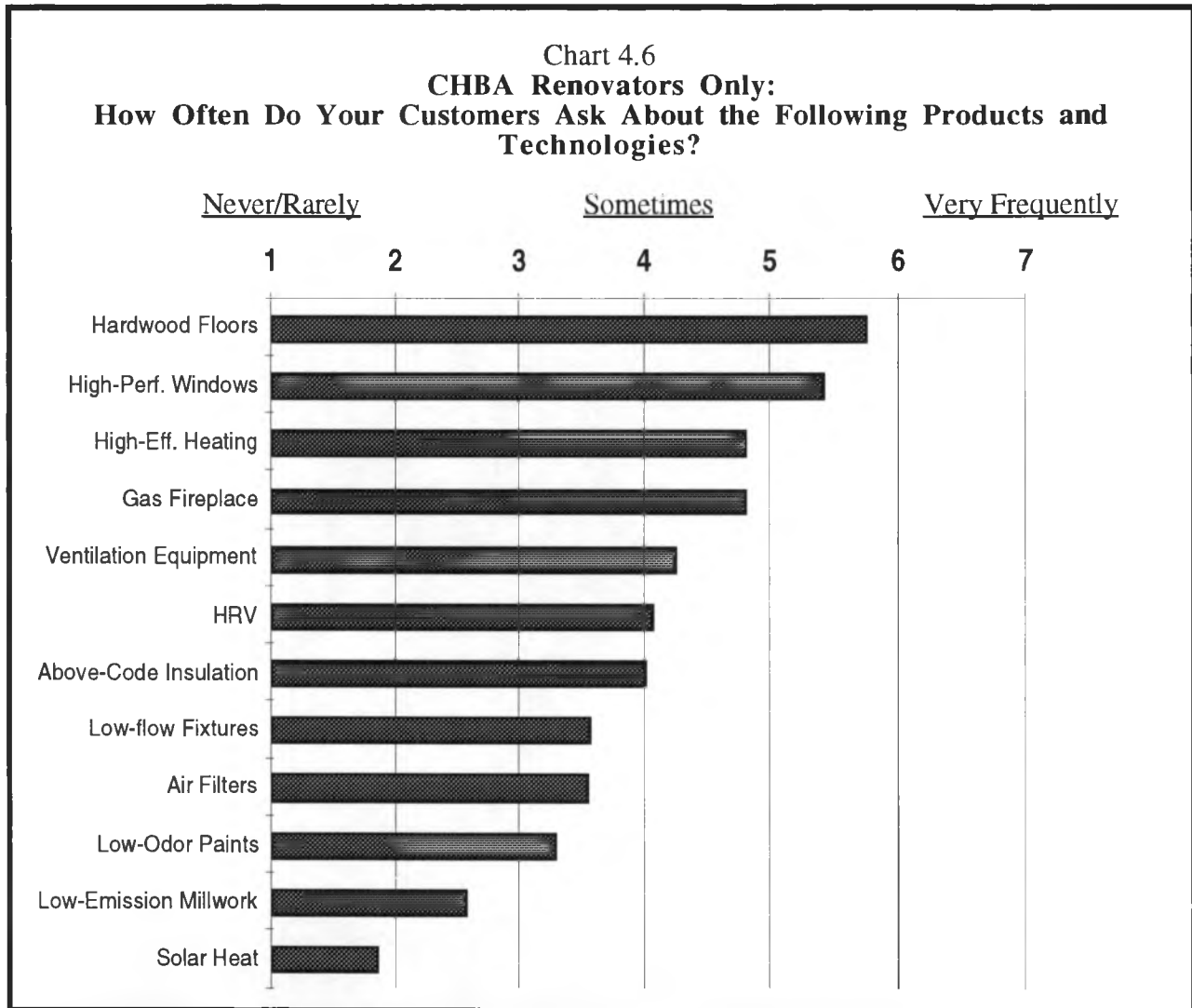
As this chart shows, the level of customer interest in energy-efficient features, such as high-performance windows and energy efficient heating systems, compares favourably with that for mainstream design features like hardwood flooring and gas fireplaces. Ventilation equipment and heat recovery ventilators are of somewhat less interest to customers. The other energy efficiency and healthy housing features listed are asked about infrequently.

In this section of the survey, renovators were also asked about the presence of exiting problems in homes.

These problems are frequently associated with poor indoor air quality (IAQ) and/or the need for more ventilation in a home. Chart 4.7 shows the results from this question.

Clearly, all of these problems, with the exception of material off-gassing, are found by renovators on a regular basis. This indicates the considerable potential for improving indoor air quality when renovating.

Chart 4.7
In Your Experience, How Common are the Following Pre-Existing Problems in Homes You Renovate?

| Not Common | Fairly Common | Very Common |

1   2   3   4   5   6   7

Drainage Problems

Excess Indoor Humidity

Poor Air Circulation

Sealing Without Ventilation

Lack of Indoor Ventilation

Material Off-Gassing
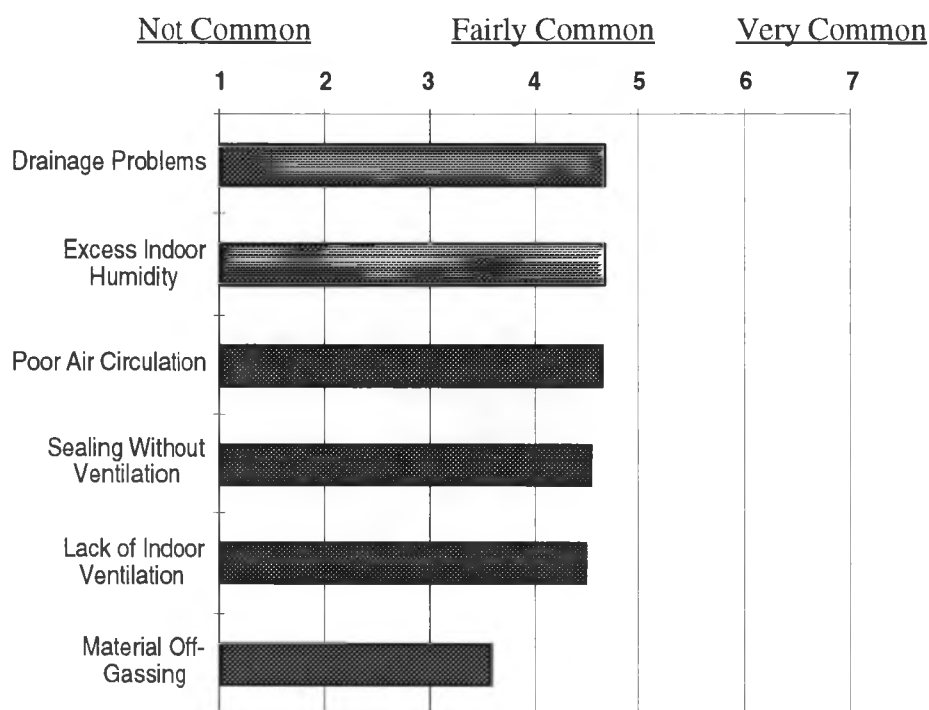
4.3 Renovators' Knowledge, Experience and Attitudes Related to Indoor Air Quality and Ventilation

This portion of the survey dealt with many issues of most concern to CMHC. The results point to some significant shortfalls in terms of renovator knowledge, particularly related to ventilation strategies in problem homes.

Renovators reported that they identify indoor air quality problems with some frequency. When these problems are noticed, they are usually discussed with the homeowners. Adding ventilation is the most common strategy recommended by the renovators, but they have mixed success in getting customers to accept these recommendations. As Chart 4.7 indicates, there are only slight differences in the responses to these questions from the three renovator groups.

Chart 4.7
How Often do You . .

Never/Rarely   Sometimes   Always
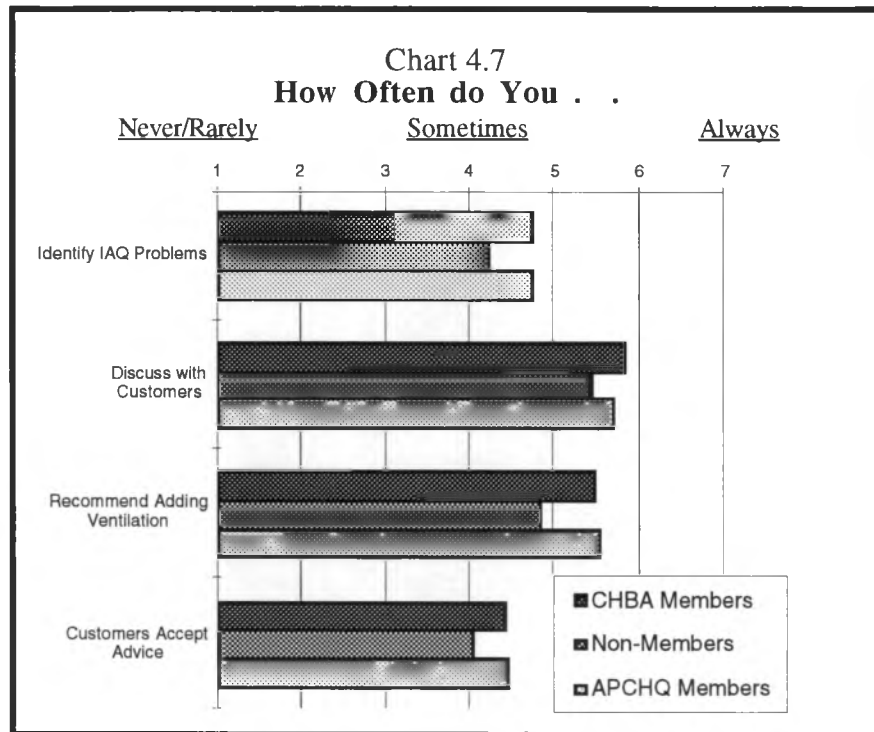
The next question on the survey questionnaire asked what specific ventilation measures are recommend to customers. The results are shown in Chart 4.8.

Chart 4.8
When Recommending Ways to Improve Air Quality, Which of the Following Do You Usually Recommend?
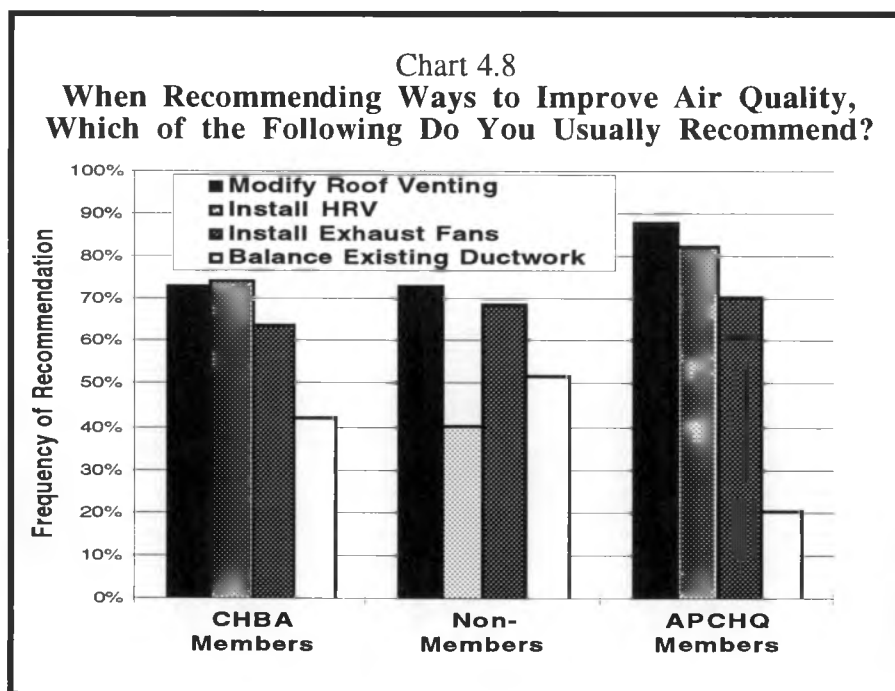
These responses are quite revealing and bring into question the level of understanding that renovators who responded to the survey have about ventilation measures. Renovators cited *Add or Modify Venting in Soffits and Roof* more frequently than any other single option, yet this measure has no bearing on correction of indoor air quality problems per se.

Given this pattern of responses, there is some basis for proposing that a significant percentage, if not a majority, of the renovators who responded to the survey lack a fundamental understanding of both the causes and remedies of poor indoor air quality.

There are also some sharp differences in how renovators from each of the three groups handled this question. CHBA and APCHQ renovators are significantly more likely to recommend adding a heat recovery ventilation system than the non-CHBA renovator group. This likely reflects their exposure to technical information and training through their associations.

The implications of these findings were considered by the technical panel, and the results of this review are discussed in Section 6 of the report.

The renovators were also asked whether they had done any renovations during the previous year that included features related to homeowner health needs. The responses to this question are presented in Chart 4.9.

Chart 4.9
In the last 12 Months, Have You Done Any Renovations That Included Features Related to the Following . . .
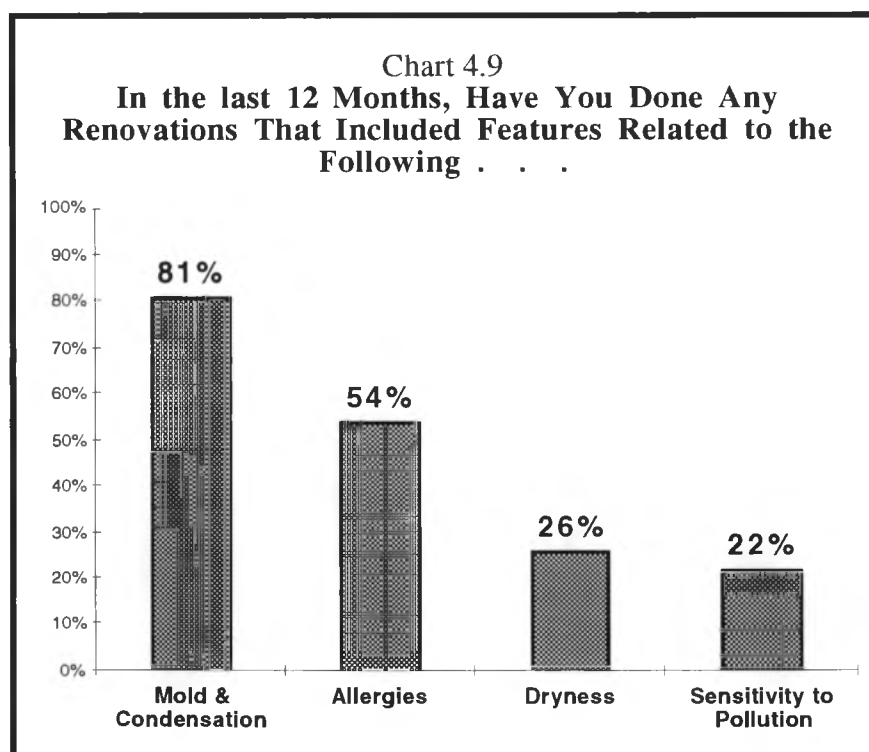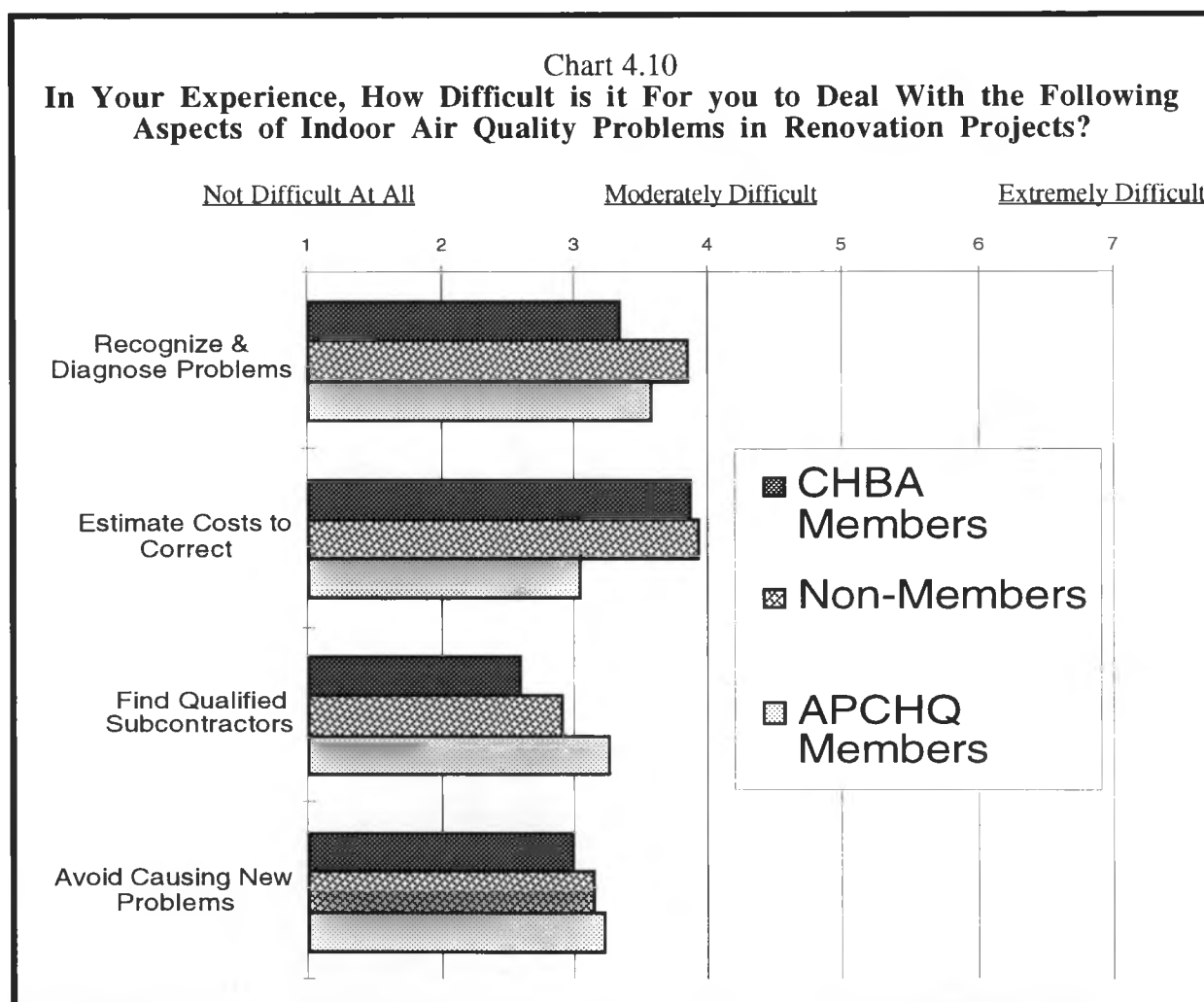
Measures to correct mold and condensation problems, as well as those related to homeowner allergies, are fairly common. Measure to correct a lack of humidity or that

address homeowner chemical sensitivities are less common, but were still carried out by more than 20% of the renovators during the preceding year.

There was a general consensus that renovators and mechanical contractors share primary responsibility for setting specifications for ventilation equipment.

The final question in this section of the survey asked renovators about the level of difficulty they experience when diagnosing and correcting air quality problems, as well as difficulties in avoiding new problems as a result of renovation. Responses are presented in Chart 4.10.

Chart 4.10
In Your Experience, How Difficult is it For you to Deal With the Following Aspects of Indoor Air Quality Problems in Renovation Projects?

Taken at face value, these results indicate that renovators have the most difficulty in diagnosing indoor air quality problems and estimating the cost of correcting these problems. However, as the data in chart 4.8 indicated, in many cases there is reason to question whether the renovators have a sound understanding of what it is they are diagnosing. Other aspects of this Chart must also be viewed in light of these previous findings. For instance, if the most common remedial measure taken is the addition of

soffit and roof venting, the issue of finding competent subcontractors is somewhat mute. It is difficult to know whether the renovators are referring to problems in finding HVAC technicians or roofing contractors.

On balance, the responses to this section of the survey appear to indicate that renovators are familiar with the general concepts related to indoor air quality and ventilation, but likely do not have an underlying knowledge of the building science involved. As a result, they may be prone to misdiagnose problems and prescribe incorrect treatments for these problems.

4.4   Renovators' Information Needs and Preferences

This section of the survey probed a number of issues pertaining to renovators' needs and preferences in the area of new product a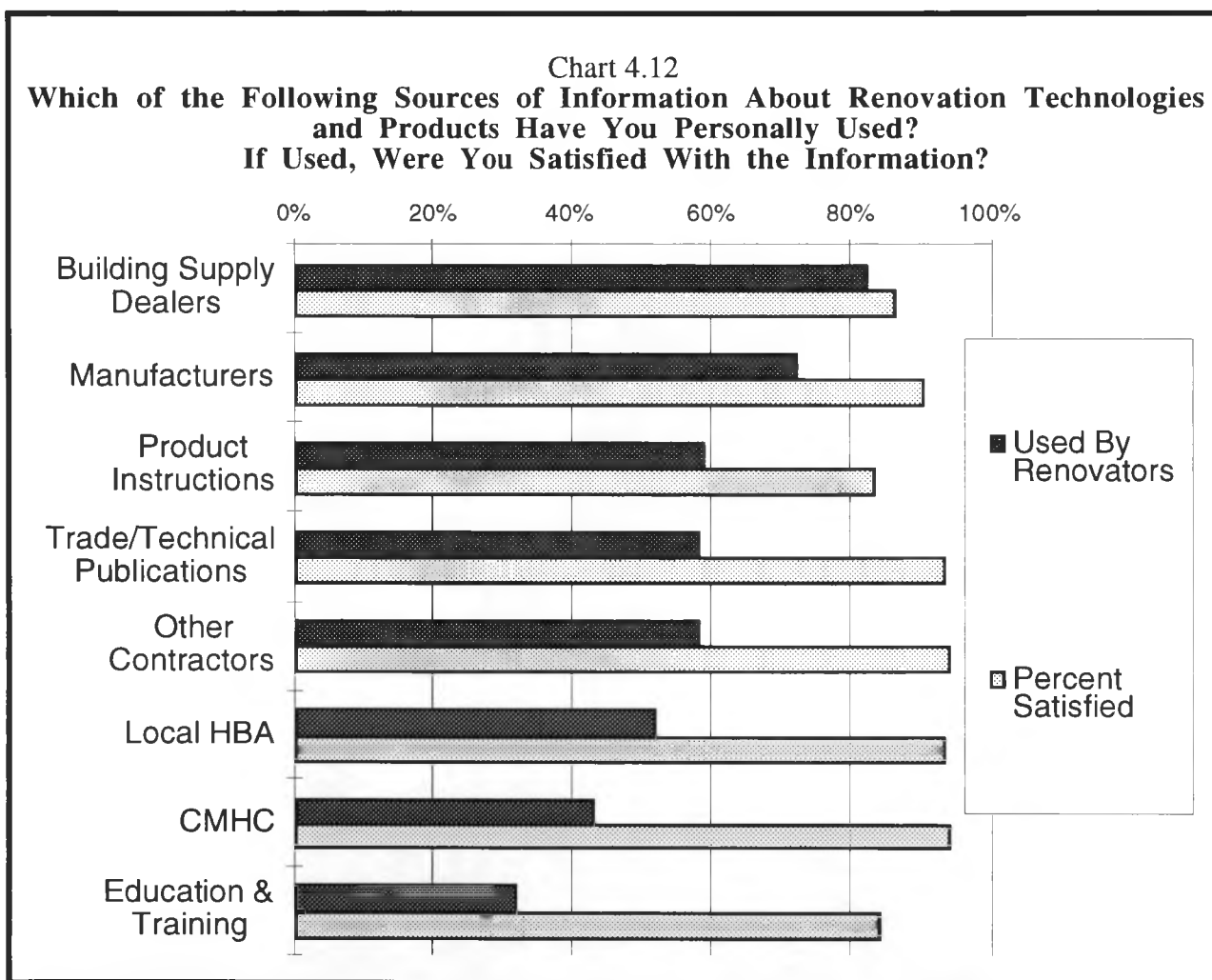nd technology information. The first question asked about the renovators' familiarity with ventilation equipment. Chart 4.11 presents the results from this question.

Chart 4.11
In General, How Familiar are You and Your Employees With the Following?
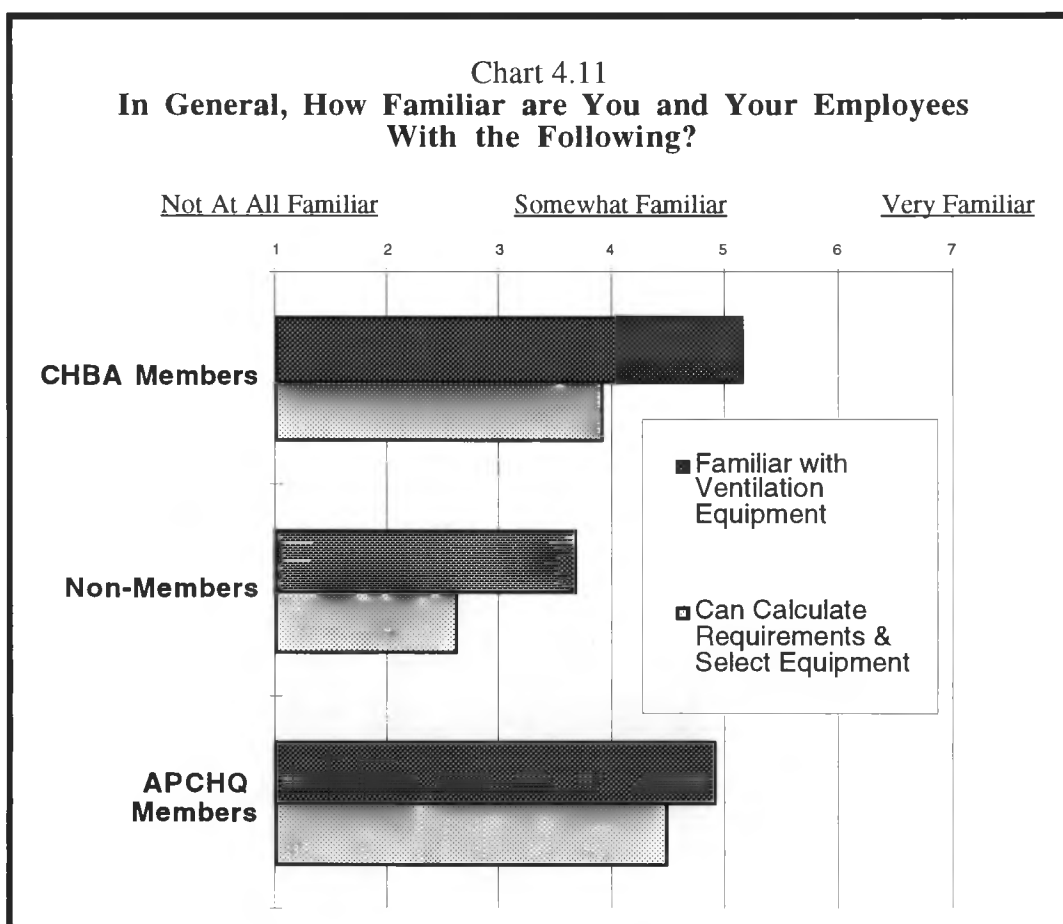
As Chart 4.11 indicates, there were significant differences in responses from among the three groups. However, the self-assessed lower knowledge levels related to calculating ventilation requirements and selecting equipment would seem to correspond to the previous difficulty the renovators exhibited with selecting remedial strategies. As concluded in the previous section, these results point to a poor underlying knowledge of building science related to indoor air quality and ventilation.

The next question asked renovators where they obtain information on technologies and products, and their level of satisfaction with the information sources used. The results are presented in Chart 4.12.

Chart 4.12
Which of the Following Sources of Information About Renovation Technologies and Products Have You Personally Used? If Used, Were You Satisfied With the Information?


In general, renovators obtain most of their information from those sources with which they have the most frequent contact—supplier and manufacturer representatives. These two sources also provide information that is anecdotal, a learning approach that previous research[1] determined to be most popular with renovators.

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[1] *Occupational Analysis of the Builder/Renovator*, CHBA and HRDC.

Although CMHC was cited as a source of information by less than half of the renovators, those who use CMHC information reported a high level of satisfaction. Not surprisingly, 51% of CHBA members cited CMHC as an information source. Only 31% of APCHQ renovators cited CMHC as an information source.

Renovators were also asked about their interest in obtaining additional technical information. As indicated in Chart 4.13, there was a high level of interest in relation to both general information about renovation-related products and technologies and information more specifically related to indoor air quality and ventilation. There was less interest in taking part in a 3-day training course on indoor air quality and ventilation.

Chart 4.13
How Interested Are You in Obtaining More Information About:
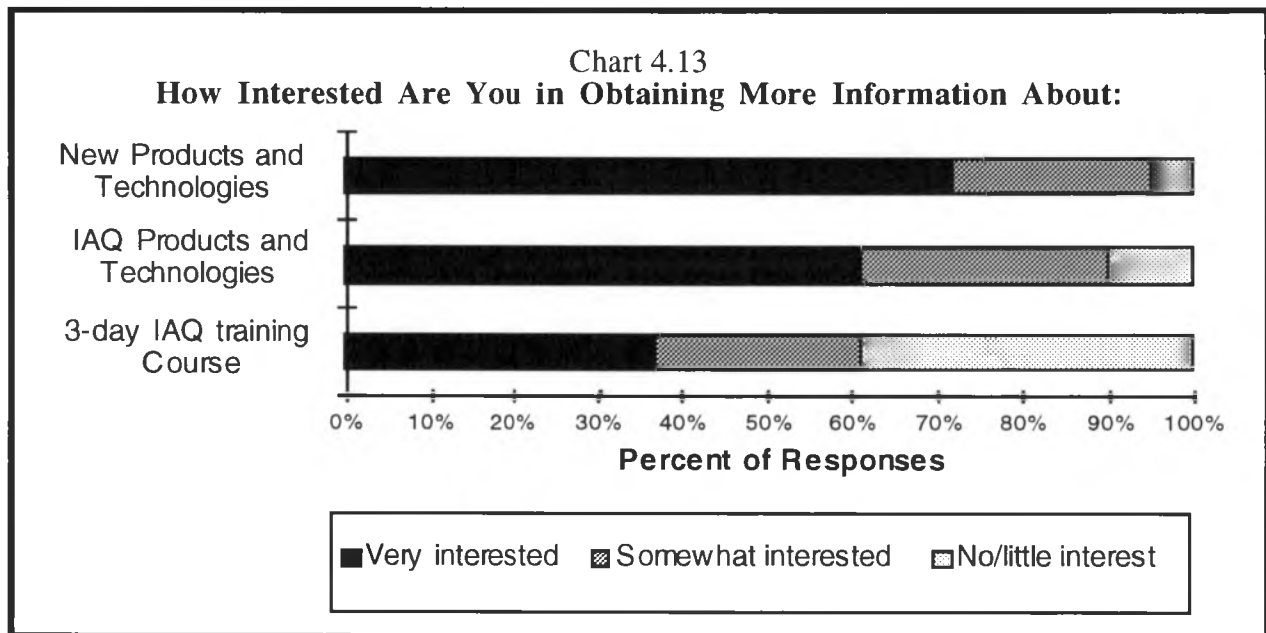
The last question in this section of the survey focused on the renovators' preferred means of obtaining additional technical and product information. The results from this question were as follows:

Means of Getting Information	% of Renovators
Trade publications and magazines	74%
Pamphlets and fact sheets	69%
Trade shows	50%
Technical reports	45%
Seminars	44%
Sales meetings/presentations	30%
Video seminars	28%
CD Rom	17%
Internet	13%

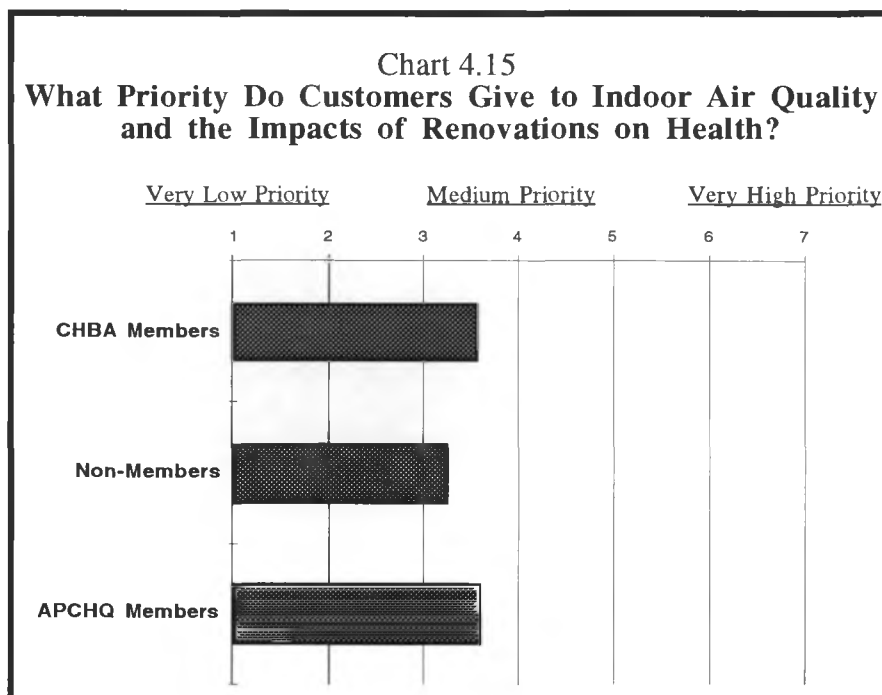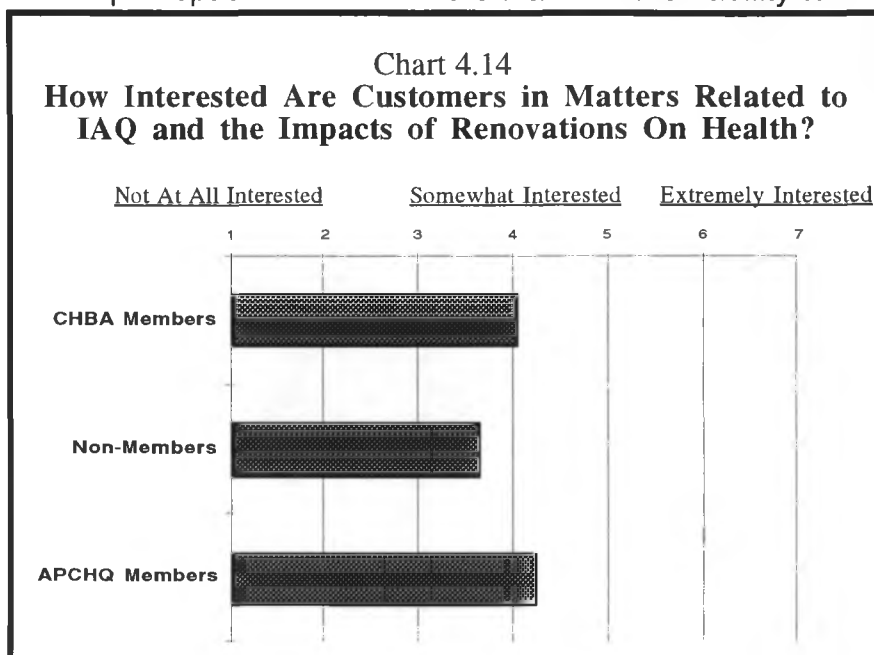## 4.5 Renovators' Views on Consumer Attitudes and Preferences

The final section of the survey dealt with the renovators' view of customer attitudes and preferences, as well as renovator perceptions of the barriers that limit their ability to sell ventilation and indoor air quality measures as part of renovation projects.

In terms of customer interest in matters related to indoor air quality and the impact of renovation on occupant health, renovator responses are reported in Charts 4.14. and 4.15.

Not surprisingly, the renovators reported that customers express more interest in these matters than they are willing to take in assigning them a priority in their renovation plans.

Chart 4.14
How Interested Are Customers in Matters Related to IAQ and the Impacts of Renovations On Health?

Not At All Interested   Somewhat Interested   Extremely Interested
1   2   3   4   5   6   7

CHBA Members

Non-Members

APCHQ Members

It is also interesting to note that renovator experience in these areas seems to positively correlate with their general level of knowledge about indoor air quality and ventilation. CHBA renovators, who exhibit the greatest knowledge about indoor air quality and ventilation, reported their customers are more interested in these matters. This suggests that renovator knowledge in this area does play a role in developing a corresponding interest among customers.

At the same time, the two data sets also suggest that renovators who have less knowledge in

Chart 4.15
What Priority Do Customers Give to Indoor Air Quality and the Impacts of Renovations on Health?

Very Low Priority   Medium Priority   Very High Priority
1   2   3   4   5   6   7

CHBA Members

Non-Members

APCHQ Members

these areas encounter greater difficulty converting customer interest in this area and into add-on sales of products and services.

This hypothesis is supported by the renovators themselves: 68% of them expressed the view that their knowledge in this area has at least a moderately positive impact on their ability to get renovation jobs. Almost one in four (23%) believes that this has a large impact on securing jobs. The higher the renovators' self-assessed level of knowledge about indoor air quality and ventilation, the more beneficial they believe this knowledge is in getting work.

In terms of the barriers to selling customers on indoor air quality and ventilation features as part of a renovation job, the renovators provided the assessment in Chart 4.16.

Chart 4.16
Do You Agree or Disagree With the Following Statements About Barriers Which May Limit Your Ability to Sell Ventilation and Indoor Air Quality Features as a Part of Renovation Projects?
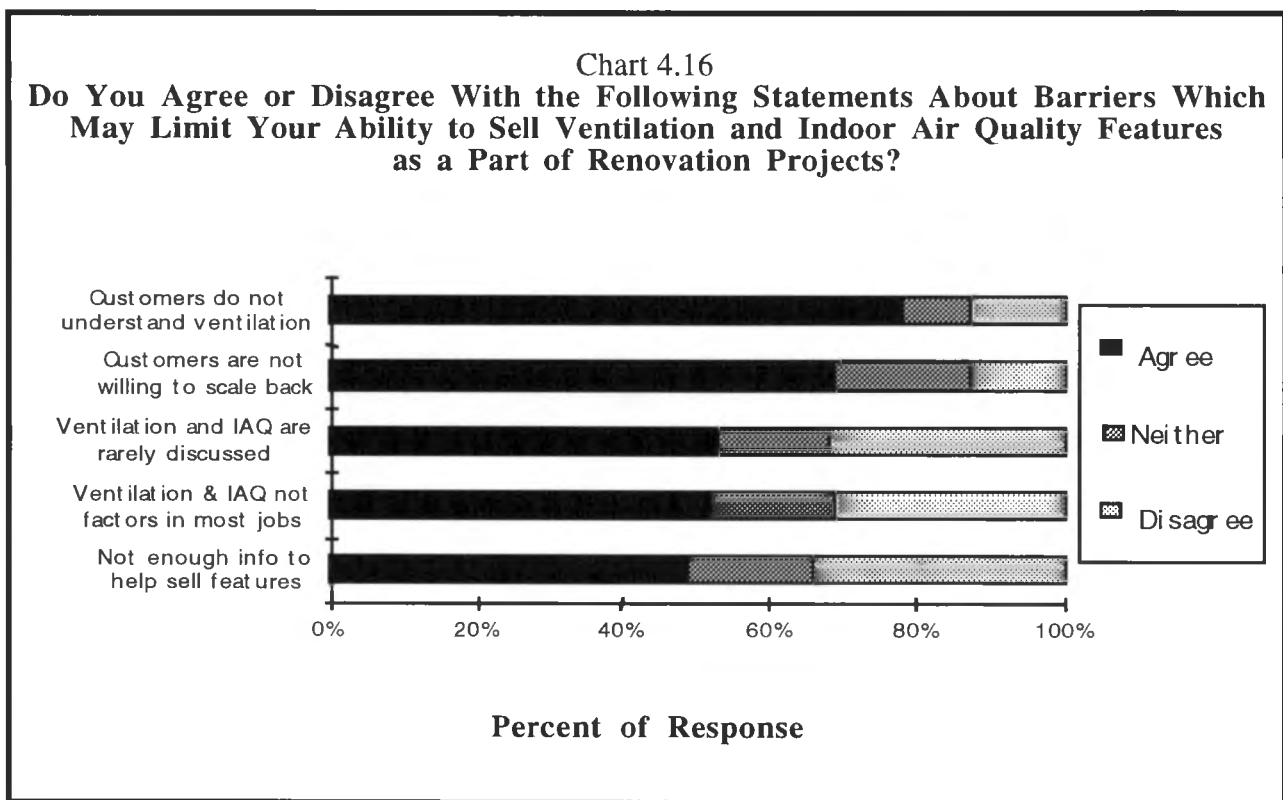
These responses can be segregated into two groups.

The first are barriers that limit closure on sales attempted by renovators. The renovators cited lack of customer knowledge about indoor air quality and customer unwillingness to scale back other aspects of their plans to accommodate the cost of ventilation as the most significant barriers. A general lack of information that renovators can use in selling these features to homeowners was also cited as a barrier by half the renovators. In summary, the first group of barriers involves either customers

who don't know enough to buy or assign priority to indoor air quality and ventilation measures, or renovators who feel ill-equipped to sell these features effectively.

The second group of barriers is more problematic. When a renovator does not think that indoor air quality or ventilation should be considered in a project, this assessment may, or may not, be accurate. Renovators with low knowledge levels may simply fail to recognize potential or actual sources of indoor air contamination.

In order to gain additional insight into this issue, Chart 4.17 compares the patterns of response offered by CHBA members and non-members to the statement that IAQ and ventilation are not factors in most projects.

Chart 4.17
Ventilation and Indoor Air quality Are Not Factors in Most Projects
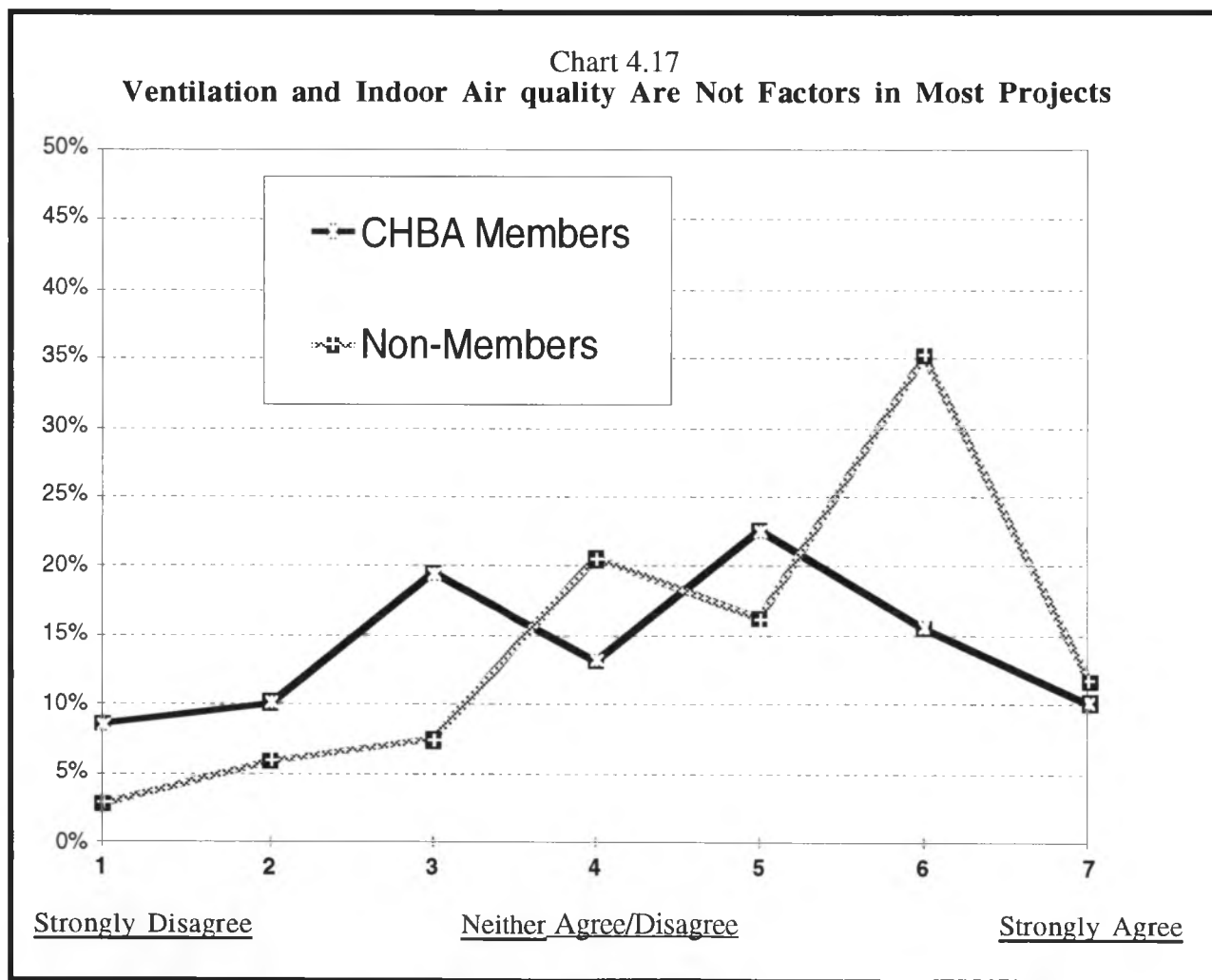
• The CHBA renovators, who exhibit the highest level of knowledge in this area, are less inclined to agree with this statement than non-members, who exhibit generally lower knowledge levels. These results suggest that in some cases where ventilation should be considered in a project it is not recognized by either the renovator or the customer.

5.0 Correlating the Data with the Homeowner Repair and Renovation Survey

The survey findings suggest that competitive conditions could play a significant role in encouraging renovators to adopt indoor air quality practices and technologies. Generally, the renovators reported that 1995 brought increased competition, particularly from firms offering "cash deals". At the same time, the survey suggested a positive correlation between renovators' knowledge about indoor air quality and their ability to achieve related add-on sales. This indicates some potential to market indoor air quality training and information to renovators as a means by which they can improve their competitive position in the marketplace.

In an effort to secure an independent assessment of market conditions, the consultants conducted additional research using data derived from the *Homeowner Repair and Renovation Survey* (HRRS) conducted annually by Statistics Canada with the support of CMHC.

When considering industry performance, the major drawback of HRRS lies in its framework. This survey analyzes expenditures from a national account perspective, and includes all home repair and renovation expenditures made by homeowners, regardless of the amount spent. For instance, the replacement of a $10 showerhead by a homeowner, or a $100,000 contracted renovation, are equally relevant in this survey.

This broad capture of expenditure data significantly limits the usefulness of the survey to the industry, as it does not isolate contracted renovation services from do-it-yourself homeowner repairs and renovations. This also leads to yearly trends in the aggregate expenditure data being taken to indicate business conditions within the home renovation industry, which may or may not be the case. For instance, between 1994 and 1995, aggregate expenditures on home renovation deceased by about 6% while expenditures on large projects decreased more than 9%, half again as much.

In an effort to increase the relevance of the HRRS data to the renovation industry, Statistics Canada re-tabulated the data for the years 1991 through 1995.

Two criteria were applied to this re-tabulation in an attempt to focus on expenditures that had a higher likelihood of involving a renovation contractor.

The first criteria was to exclude all repair expenditures, regardless of size. While some of this repair work was no doubt done by renovation contractors, in overall terms the category appears to be the least relevant to the industry, with homeowners reporting average 1995 expenditures in this category of only $698.

The second criteria involved excluding all remaining cases where the total expenditure was less than $7,000. While somewhat arbitrary, this figure represents a

workable compromise between the level of expenditure of commercial interest to renovators and the ability of the data to provide a reasonable level of confidence.

As well, these large renovation projects are more likely to involve elements of the house that can either contribute to, or help to solve, indoor air quality problems. For instance, additions commonly require reconfiguration of heating and duct systems, alteration to foundations and the building envelope. Within the scope of such a project, there are a number of potential problems and remedial actions related to air quality.

The effect of these criteria can be seen in Table 5.1, which shows the breakdown of 1995 HRRS data into the various categories discussed.

Table 5.1 **Modified HRRS Data Relevant to the Residential Renovation Industry**

Category	Total Number of Households	Percent of All Households	Total Expenditure ($ Millions)	Average Expenditure
All Households Reporting a Repair or Renovation Expenditure	4,821,160	66.4%	$12,046	$2,499
Repair Expenditures Only	3,884,300	53.5%	$2,712	$698
Non-Repair Expenditures Less Than $7,000	3,321,540	45.8%	$4,164	$1,254
Non-Repair Expenditures of $7,000 or More	**323,630**	**4.46%**	**$5,170**	**$15,974**

As the table indicates, non-repair expenditures of $7,000 or more involve cases that differ significantly from those in other categories. While this category makes up only 4.46% of households, it accounts for more than half of all non-repair renovation expenditures. As well, the survey data indicates a very high incidence of paid labour reported among this group of homeowners, well in excess of 90%.

For the purposes of this report, projects falling within this area of the HRRS data base were taken to represent the core of the renovation market being serviced by renovation contractors. While the validity of this relationship is difficult to prove conclusively, there is some basis upon which to support this hypothesis.

Chart 5.1 compares the results of the re-tabulated HRRS job-cost data for 1995 with the revenue data reported by the three groups of renovators. As the chart indicates, the adjusted HRRS job cost is quite close to the average CHBA renovator job value.

Chart 5.1
Average Job Cost/Value Comparison – 1995
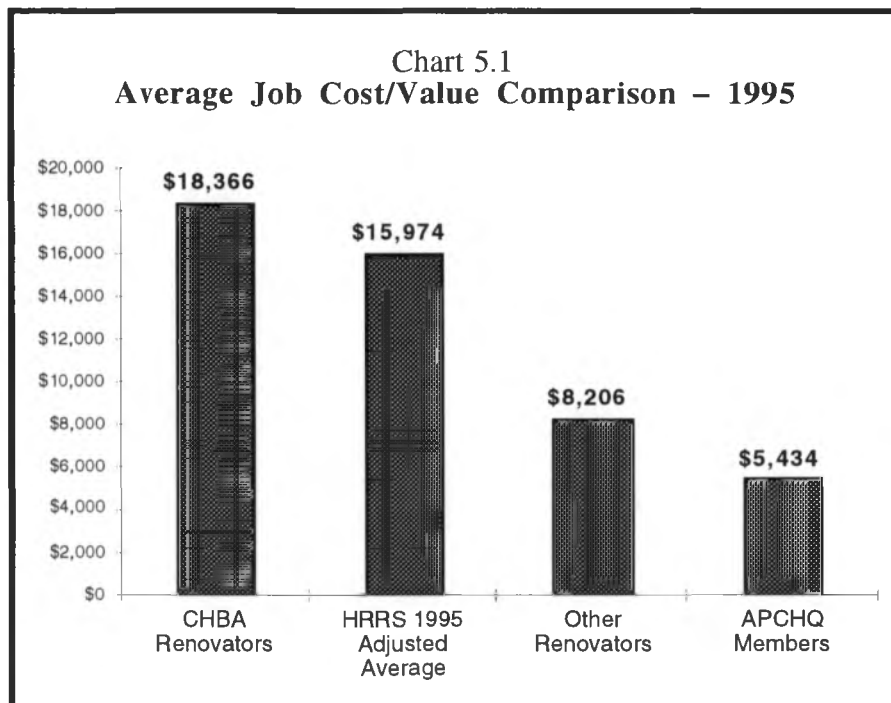
If the adjusted HRRS average job value is accepted as a valid indicator of general market conditions affecting renovation contractors, then this extensive data base can provide considerable insight into the market developments that affect renovators.

For instance, between 1994 and 1995, the HRRS data shows a 6% overall decrease in homeowner repair and renovation expenditures.

However, when the trend for the adjusted job value is examined, the data shows a much sharper decrease, 9.3%, or more than 50% greater than the average for all expenditures. This would appear to validate the claims by renovators that 1995 brought heightened competition within the marketplace.

5.1 Putting the Performance of the Renovation Market into a Broader Industry Context

This application of the revised HRRS data also allows some comparison of the economic performance between the renovation and the new home sectors of the industry. In turn, this can provide a more solid business context for understanding the experiences of renovation contractors.

Rather than comparing the two sectors in terms of gross dollar value of sales, the approach taken examined the frequency of non-repair renovation expenditures of $7,000 or more and the frequency of new home starts over the period 1991 through

1995. Within this framework, the areas of interest include both general levels of activity in the two sectors, as well as business cycle trends, and some measure of business volatility.

Within the industry, anecdotal information from renovators suggests that the market for home renovation services is less cyclical than the new home market. As shown by the renovator survey data, a significant portion of renovators are also active in the new home sector, so there is reason to give some credence to this view.

Using the data generated by the re-analysis of HRRS, the number of larger renovation projects was compared with new home starts for the period 1991 through 1995. The results of this are presented in Chart 5.2.

As the graph indicates, while large-scale renovation activity declined in 1995, this downturn was less severe than a similar trend in the new home market.

Clearly, one of the concerns within the industry is erosion of markets due to underground economic activity. While the overall level of large-scale renovations has not reduced significantly over the last five years, the portion of this total being lost to

Chart 5.2

Number of Renovation Projects Costing $7,000+ and New Home Starts 1991 – 1995

underground operators may be significant. This could result in a disproportionately large decrease in business for legitimate renovation contractors.

The next area of analysis involved a more detailed comparison of market trends within the two sectors of the residential construction industry. Chart 5.3 shows the annual variation in business volume experienced by each of the two sectors relative to their average performance over the five-year period.

This data provides considerable insight into the degree of volatility encountered within each sector during the first half of the 1990s.
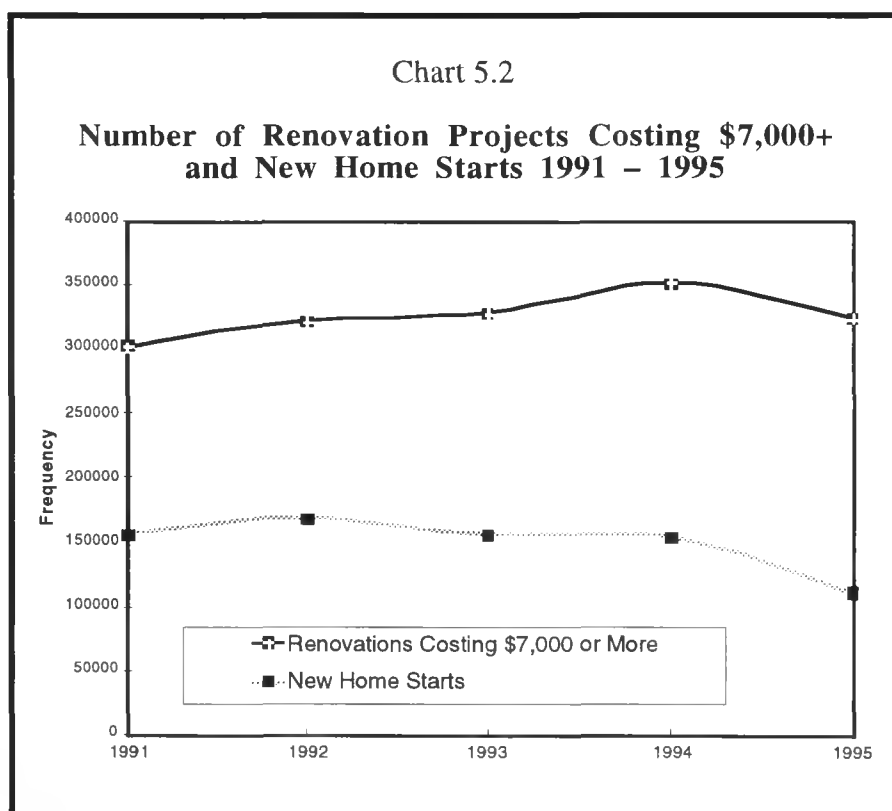
Clearly, the renovation sector enjoys more stable market conditions. The annual rate of large renovation projects varied by less than 8% above or below the five-year average. 1995 results were only 0.5% below this average.

The new home sector had a much greater variation—more than a 45% within the same period, ranging from 12% above to 35% below the average.

Preliminary new home data for 1996 indicates that new home market

Chart 5.3

Annual Variation in Number of Large Renovations and New Home Starts Compared to Five-Year Average 1991 - 1995

conditions improved somewhat during the past 12 months, but remain some 20% below the 1991-95 average. At the time this report was written, comparable data for renovation performance during 1996 was not yet available.
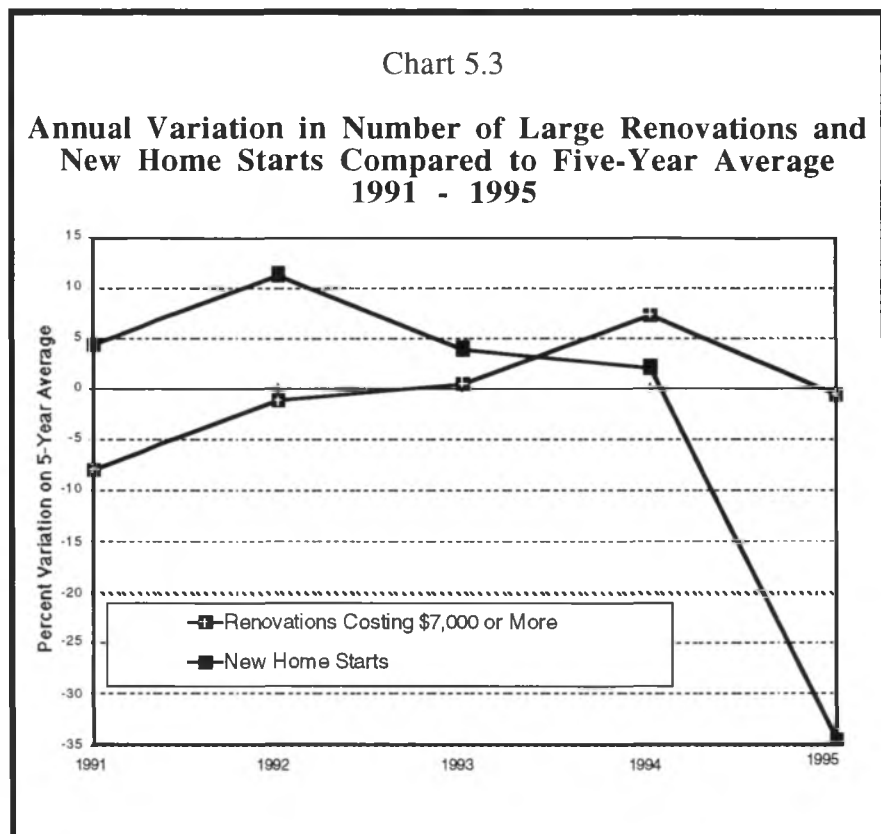
5.2 Key Indicators Related to Expenditures on Larger Renovation Projects

There is relatively little information available about business cycle characteristics within the home renovation sector of the industry. The data presented previously suggest that between 1991 and 1995 this sector experienced quite different conditions than those affecting new home builders. However, it would be useful to have greater insight into how general economic conditions in Canada affect homeowner decisions regarding the timing and cost of their renovation projects. The following two data sets attempt to address this issue.

Chart 5.4 shows the average annual cost of renovations involving expenditures of $7,000 or more. While this value varied somewhat, it demonstrates significant stability, with only about 8% variation over the period.

It is interesting to note that 1994's modest decline in the average expenditure made by homeowners preceded the actual decline in the number of these projects experienced in 1995.

The next graph, Chart 5.5, combines measures of variability related to both the frequency of large renovation projects and the average expenditure made by homeowners on these projects.

As the graph shows, during this period the yearly variation in the level of renovation expenditure was less than the variation in the number of projects taking place. Yearly expenditure averages kept within +/- 5% of the five-year average, while the number of larger renovations varied within a range of +/- 8%.

Chart 5.4

Average Household Expenditures on Renovations Costing $7,000 or More 1991 - 1995

It is difficult to draw any conclusions from this limited data, but a number of possible relationships are suggested. On a positive note, the data suggests that homeowners may be more likely to delay a renovation project than to reduce the scale, and resulting cost, of the planned work. This could enhance renovators' ability to sell indoor air quality and ventilation measures, if these features were to become more desirable to homeowners.

Chart 5.5

Annual Variation in the Frequency and Cost of Large Home Renovation Projects 1991 - 1995
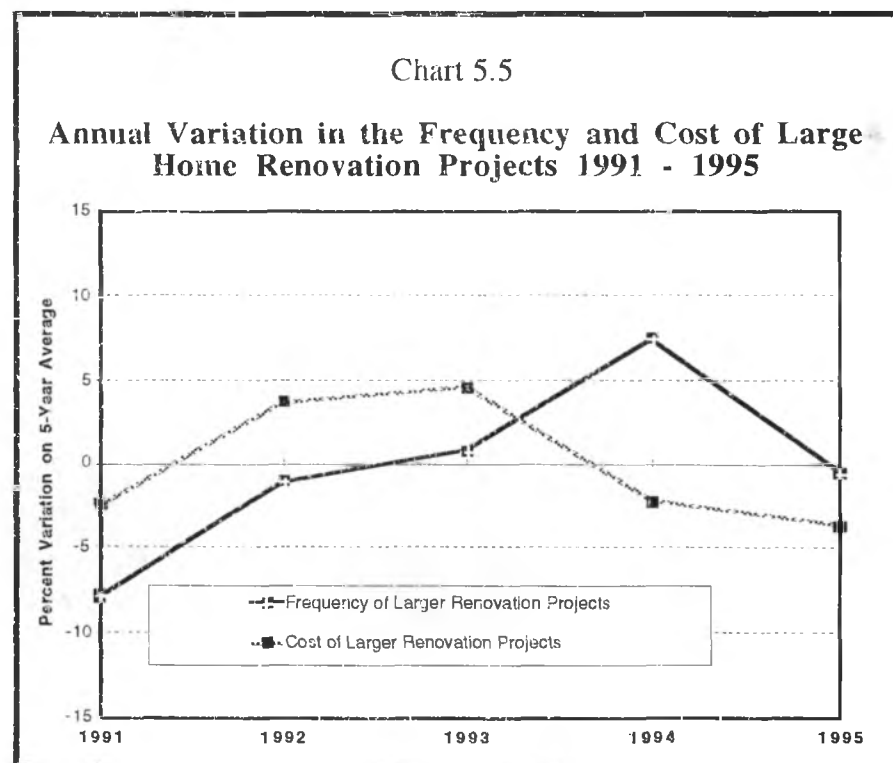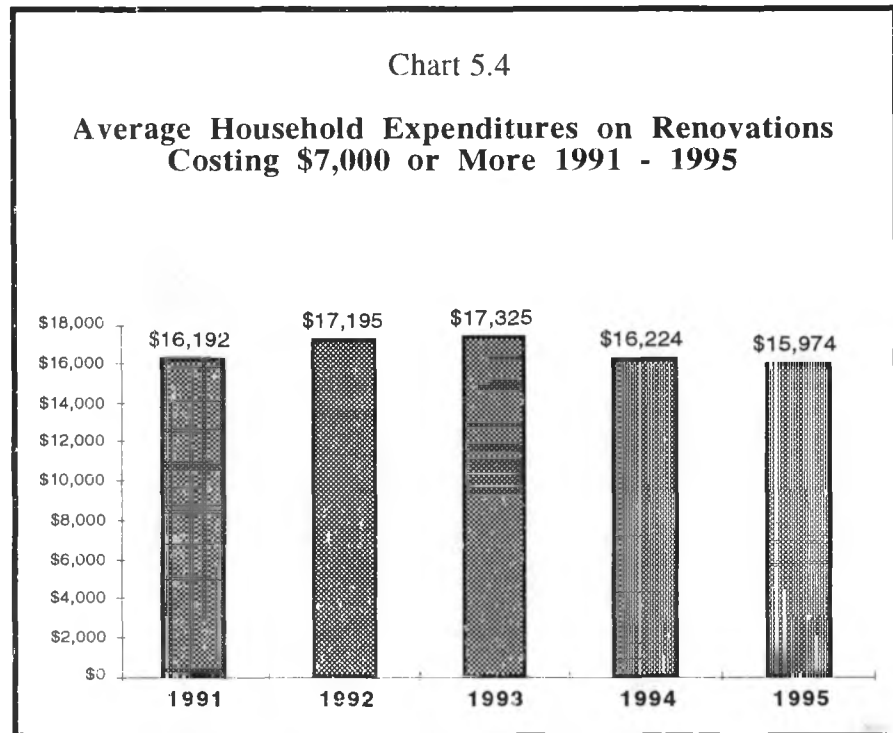
On the other hand, recent decreases in average job costs may reflect discounts in labour charges and an erosion of profit margin within the sector.

When compared to new home construction, renovation projects typically involve a significantly higher proportion of on-site labour costs. When the average expenditure made on large renovations falls, it raises questions concerning where labour cost reductions may be taking place. Growth of "underground" renovation activity, which typically involves reduced labour costs to consumers due to avoided taxes and business costs, would produce such a decrease. This may well be a factor in these data.

It seems unlikely that firms involved in underground activity will have access to the information and training required to improve their technical and business skills. This would limit their ability to initiate or respond to discussions with customers concerning indoor air quality or ventilation requirements in projects.

6.0 Technical Overview of Findings

This research project was organized in two sequential phases. The initial phase involved the development, fielding and analysis of the renovator survey presented in the previous sections. The second phase involved a multi-disciplinary review of these findings with the objective of developing a broader interpretation of the results, as well as identifying specific ideas and possible "next steps" for consideration by CMHC. This phase included consideration of an information delivery strategy as well as assessment procedures and resource materials.

This methodology reflects CMHC's concern that conclusions drawn from the research findings be adequately tested to ensure they reflect both technical and commercial realities. Further, the research results need to be tied to potential actions that will assist both renovators and homeowners in dealing with indoor air quality and ventilation effectively.

The introduction of housing innovations, particularly technical innovations that can increase costs, is often limited by market acceptance. The overview was carried out to ensure that CMHC was provided with directions that make technical sense and are actionable from a commercial standpoint.

6.1 The Technical Team and Review Process

The technical team was organized to provide a broad range of practical overview to the research process. Team members represent a wide array of knowledge and experience, ranging from research and academic pursuits to "hands-on" management of a design and renovation company.

The technical team members were consulted during the development of the survey itself and were provided with initial survey results and a list of issues to address.

The team then assembled for a one-day workshop session. A number of CMHC research staff also took part in this workshop.

6.2 Technical Review Goals

The technical review process had a number of specific goals. Foremost among these was to test the research results against the team's professional experiences working in this area of the housing industry. Subsequent goals focused on defining problems related to ventilation and indoor air quality and proposing strategies for overcoming these problems.

The review workshop followed this agenda:

a) Review and Discussion of Survey Data
b) Problem Identification and Analysis
c) Identification of Strategies and Tactics for Addressing Problems

To derive full benefit from the multi-disciplinary composition of the team, participants were encouraged to challenge assumptions and identify any practical barriers they believed would limit the effectiveness of a strategy or tactic. This process served to refine options and eliminate those that would likely prove ineffective.

6.3 Technical Review Findings

While the workshop produced wide-ranging discussions on all aspects of the survey results, the salient elements of this discussion addressed the following topics:

a) Renovators' information needs
b) Assessment of existing information resources, especially CMHC's
c) Identification of potential assessment and planning tools
e) Development of an information delivery strategy

Five technical review findings are presented separately in the following section.

6.3.1 Finding One: Most Renovators have an inadequate understanding of building science

The survey results indicate that renovators' practical knowledge of building science as related to indoor air quality and ventilation may have significant limits. This serves as a barrier to improved assessment and remediation of indoor air quality problems in homes.

Common recommendations renovators make to their to customers for correcting indoor air quality problems are shown in Chart 6.1. This question provided renovators with a range of potential actions to select from, some of which were deliberately unrelated to indoor air quality.

Chart 6.1
Indoor Air Quality Recommendations to Customers

Legend:
- Modify Roof Venting
- Install HRV
- Install Exhaust Fans
- Balance Existing Ductwork

Y-axis: Frequency of Recommendation (0% to 100%)
X-axis categories: CHBA Members, Non-Members, APCHQ Members
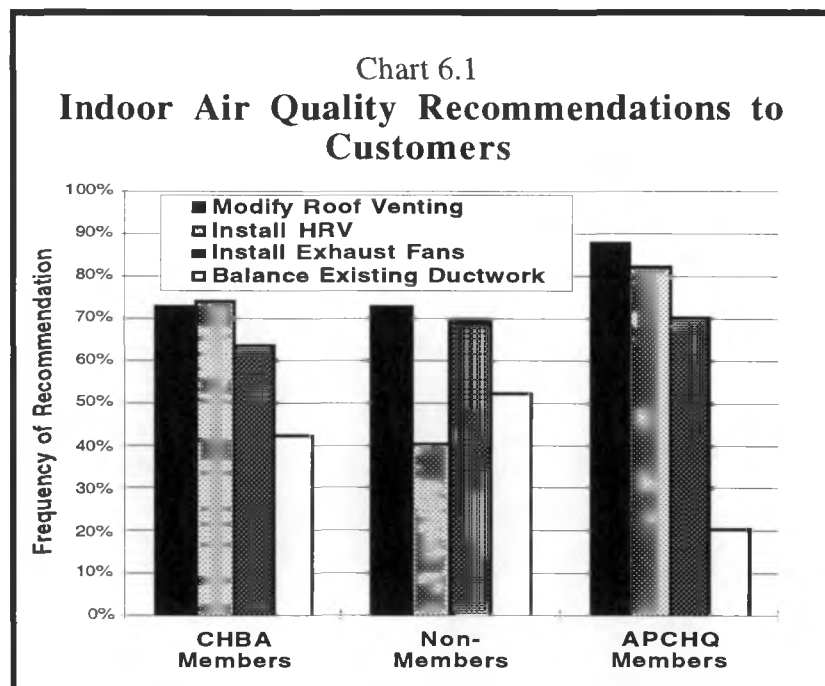
As discussed in Section 4 of the report, modification of soffit and roof venting was the most frequently cited option. In practice, this action will not lead to indoor air quality improvements. This response indicated to the technical panel_that renovators' awareness and understanding of building science as it relates to indoor air quality and ventilation is clearly inadequate.

Renovators appear to confuse methods for controlling moisture levels in unheated attics with those suited to controlling air quality within the living area of the home. Again, this finding is not that surprising. Current education and training resources for renovators are not as comprehensive as those targeted at new home builders, and there is little emphasis on instruction in building science. This situation is compounded by the varying availability, and utilization, of training programs across the country.

6.3.2 Finding Two: Most Renovators lack adequate knowledge of ventilation methods

In relation to the renovators' general awareness and knowledge of indoor air quality and ventilation, the technical panel was in agreement that inadequacies appear to exist in a number of areas.

As indicated in Chart 6.2, renovators within all three groups surveyed are more familiar with ventilation equipment than they are with how to specify its use.

This may simply reflect their experience with this equipment in new construction, where subtrades and suppliers bear primary responsibility for designing and installing systems.

Chart 6.2

Ventilation Knowledge

Nevertheless, it indicates a potential barrier to the use of ventilation systems, as the cost of such systems in renovation applications vary far more than in new construction. Renovators need to be able to develop ventilation specifications and costs reliably at the time they bid on a project. If this cannot be accomplished easily, it serves as a disincentive for including ventilation in the project specifications.

The technical panel also expressed some concern that the renovators' inability to properly specify ventilation equipment reflects a more basic problem with developing
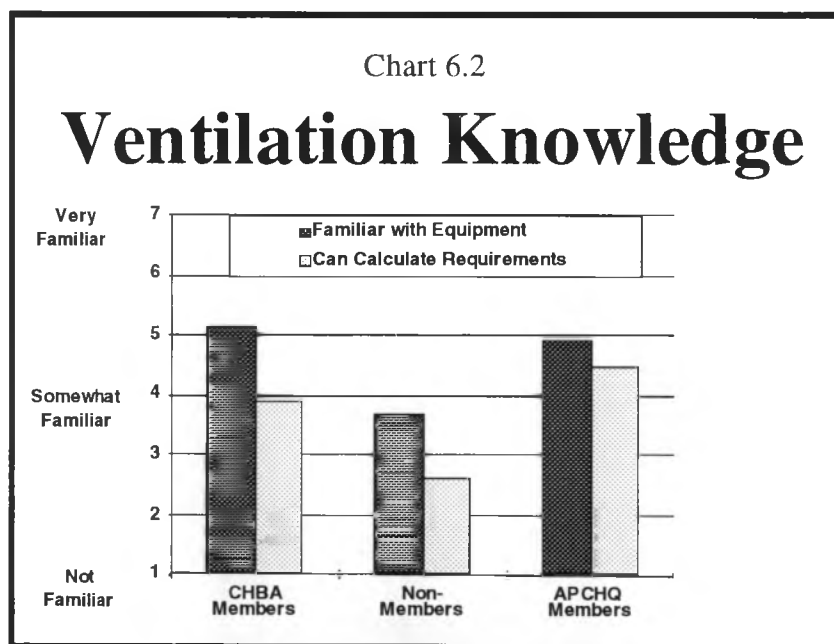
goal-oriented ventilation strategies. Simply put, many renovators appear to have inadequate technical and product knowledge related to indoor air quality. As a result, many renovators have a poor understanding of the methods available for achieving particular air quality and ventilation goals, especially in practical areas such as ducting techniques.

6.3.3 Finding Three: There is a lack of consumer awareness of the importance of indoor air quality and ventilation in renovation and a lack of renovator ability to present and sell these measures

The technical panel noted that market forces, or lack thereof, will continue to have a significant effect on the use of ventilation equipment and Healthy Housing approaches in the renovation marketplace.

This amounts to somewhat of a "chicken and egg" situation. If consumers expressed more interest in indoor air quality and ventilation issues, renovators would be more inclined to invest the time to learn about these matters. If renovators were able to present and sell these measures more effectively, then consumers would become more interested in them.

There is no simple solution in this area, but some of the survey findings do point to some possibilities. Renovators who knew the most about indoor air quality and ventilation report that their customers are more interested in, and willing to pay for, these features. Renovators who knew the least about indoor air quality and ventilation reported the least customer interest. Clearly, renovator training could be one important element in promoting market demand for ventilation and consideration of indoor air quality factors in renovation. Just as clearly, consumer education will also stimulate this demand. In lieu of either initiative, it is difficult to envision how these changes will gain market momentum.

6.3.4 Finding Four: While there is some industry and consumer recognition of indoor air quality and ventilation issues, other Healthy Housing principles are virtually unknown

The technical panel noted that while this project was primarily concerned with indoor air quality as this relates to ventilation, it is difficult to limit consideration of these issues from other Healthy Housing principles, specifically source reduction of pollutants, and sealing techniques. The overall Healthy Housing approach developed by CMHC is sound, and all aspects of this approach should be included in long-term strategies to increase consumer and renovator knowledge levels.

6.3.5 Finding Five: The information base required to support renovator understanding of indoor air quality and ventilation approaches already exists. Ways to deliver this information to renovators effectively do not.

A large amount of valuable information about indoor air quality and ventilation in existing housing already exists within CMHC and other housing organizations. There is no shortage of such information. However, there is a continuing problem in terms of how best to get this information into the hands of renovators.

Information and technology transfer is the central problem that needs to be addressed, not the development of new information resources. The technical panel recognized that CMHC has a wide range of excellent information and research data that are directly relevant to the issues of indoor air quality and ventilation of renovated homes. However, these resources may not be in a sufficiently simplified format to be usable by renovators who have little knowledge of indoor air quality.

Considerable discussion took place on the challenge of information delivery. While there was no clear consensus on how best to achieve this, the general thrust of comments pointed to the importance of using existing channels that are currently being accessed by renovators. This could include building supply dealers and manufacturer representatives who conduct on-site demonstrations. If this approach were used, it is likely that a majority of full-time renovators would be reached.

There was little belief that formal learning methods are likely to prove effective, an opinion generally consistent with the renovators' own assessment of how they prefer to obtain information. Clearly, a new strategy is needed in order to inform renovators effectively.

7.0 Research Conclusions

In developing conclusions from this project, both the survey results and the analysis provided by the technical panel have been carefully reviewed. In addition, the consultants have applied their understanding of business practices within the renovation sector to develop additional commentary on the research conclusions.

Reflecting this two-step approach, this section of the report presents both the central conclusions from the research and an overview of the implications drawn from these conclusions.

7.1 The Central Research Conclusions

The survey data and subsequent technical panel review leads to four central conclusions:

a) **While most renovators are able to recognize the more common causes of poor indoor air quality, such as mould growth and excessive indoor moisture levels, many lack the technical expertise required to solve these problems effectively.**

b) **Most consumers do not understand why homes can require supplemental ventilation as part of a renovation. As well, many consumers lack both awareness and knowledge about many indoor air quality issues.**

c) **At the present time, most renovation customers place a higher value on conventional renovation features than on ventilation or indoor air quality measures. Consequently, they are most often unwilling to make the trade-offs required to incorporate ventilation measures in their projects.**

d) **Renovators lack the information tools required to introduce indoor air quality topics into their business discussions with customers in an effective manner.**

While broad in scope, these four conclusions provide the basis for more detailed discussion of methods, actions and measures to promote recognition of indoor air quality problems and the application of ventilation techniques to resolve these problems.

7.2　Research Implications—A Communications Overview

The following section of the report provides an overview of the key communications issues related to the research conclusions. This overview is focused on typical renovation business conditions and practices in the marketplace and is intended:

- to provide a strategic assessment of the barriers that may be limiting adoption of Healthy Housing measures, such as ventilation, by renovators and consumers.

- to define potential approaches to reducing these barriers, and

- to provide a foundation upon which to base specific recommendations to CMHC.

The results from the renovator survey are consistent with the generally accepted model of how technology is adopted by the renovation industry. This process of change is incremental and governed principally by two factors:

- a) the ability of renovators to present and sell the benefits of a product or technology effectively, and

- b) the level of consumer awareness and valuing of new products or technologies.

In considering how renovators are dealing with indoor air quality and ventilation, this market context is very important. It provides additional insight into why renovators may have difficulty with these aspects of renovation and the specific obstacles that need to be overcome if the situation is to change.

7.2.1 The Dynamics of the Renovator/Customer Relationship

A major home renovation involves a buyer and a seller of a service, yet it is far more complex than almost any other purchase process consumers carry out. Some of the key characteristics of this process are as follows:

- Most consumers spend a prolonged period thinking about, and informally planning, their renovation project before meeting with a renovation contractor. When they initiate formal planning with a renovator, they almost always have a general plan or "vision" of what they want. However, this vision is typically focused on "lifestyle" outcomes and most often excludes any sense of the technical requirements inherent to the project.

- Most consumers are unfamiliar with the renovation industry, uncertain about how to interview and select a renovation contractor and are frequently apprehensive about the reliability and honesty of contractors.

- Renovation involves changes to the consumer's personal environment and is both a highly personalized and inherently stressful process. Successful renovation contractors are able to deliver their services in a manner that minimizes customer stress.

- When compared to the new home sector of the industry, the renovation business is far more service-based than it is product-based. The scope and quality of a renovation is, in large part, a reflection of the relationship that is built between a renovator and his or her customer. Trust, effective communications and mutual respect characterize a successful relationship and are most often pre-conditions for a technically sound renovation project.

Based on many years of experience interviewing homeowners before, during and after a renovation project, the consultants submit that any strategy aimed at changing how renovations are carried out must take advantage of these characteristics. Ideally, such a strategy should go further and actually enhance the development of successful business relationships between renovators and their customers.

7.2.2 The Practical Problems of the Planning Cycle

Ideally, when homeowners and renovation contractors begin to work out detailed renovation plans, consideration of air quality measures such as ventilation would be a normal part of this process.

While a general lack of awareness among homeowners and of practical knowledge among renovators are obvious barriers to this process, the planning cycle itself presents additional challenges.

In practice, setting the plan for a renovation project is the most crucial event in the development of the business relationship between the renovator and customer. Planning takes place at the beginning of the process, when both parties are assessing each other and no binding decisions have been made. For renovators, the planning process must establish customer commitment to both the project and the renovator. This is also the point in the process where consideration of indoor air quality factors makes the most sense.

Unless a renovator has adequate knowledge and a high degree of personal confidence, backed up by very well developed presentation and selling skills, the prospect of having to educate customers about the importance of indoor air quality may be seen to involve some degree of risk.

Consider the following scenario:

- A customer wants to renovate a kitchen, replacing all cabinets, flooring and appliances and adding a "bump out" kitchen nook. The project is likely to cost between $25,000 and $35,000. There are no significant structural limitations to be dealt with so the project is relatively easy to plan and estimate.

- During the planning process, the homeowner expresses concern over the potential dust that the work may create, due to her allergies.

- While inspecting the basement to confirm wiring, plumbing and structural conditions, the renovator notices signs of persistent dampness and the "musty" smell characteristic of mould growth. The renovator knows that these conditions likely contribute to the homeowners allergies. The renovator also knows that additional foundation drainage, sealing and basement ventilation could solve this problem, but these measures could add $10,000 to the cost of the project.

The renovator now faces a decision:

- He can simply ignore the problems in the basement and provide the homeowner with a price for the work she asked him to quote on.

- Or he can follow up on her comment about allergies, explain the conditions he observed in the basement, how these may be contributing to her allergies and suggest that there are a number of ways to correct these problems. However, this option will either increase the project cost by $10,000 or mean that the budget for the kitchen renovation must be reduced by 40%.

In all likelihood, the renovator's decision will rest on an assessment of whether introducing IAQ issues into the planning process will increase or decrease his chances of getting the job. The data produced through the renovator survey suggest that, in many cases, renovators are likely to decide that expanding the scope of discussion at this point involves more risk than potential benefit.

Whatever methods are used to promote indoor air quality and ventilation concepts in renovation, these must be consistent with the planning/sales process. Renovators require knowledge, tools and confidence that customers will value their advice in order for ventilation expertise to provide a competitive advantage in the marketplace.

7.2.3 Moving Indoor Air Quality and Ventilation into the Renovation Planning Framework

Any strategy designed to make indoor air quality assessment and remedial ventilation more widely accepted must respect two fundamental realities:

1) Renovators are in the business of satisfying customers, and consumer education is a tool renovators use to achieve this goal.

2) Customers want renovators to provide them with solutions, not problems. If the renovator cannot present options effectively, customers may be reluctant to accept these options, particularly if they are outside of the anticipated scope of the renovation.

The first point needs to be understood clearly. Customer education is a presentation and client relations technique useful to renovators in the sales and project management process. Good renovators educate their customers because it makes their job easier and more profitable. This being the case, it is unrealistic to expect renovators to take on a pro-active role in presenting indoor air quality or ventilation information unless they are well informed and have confidence in their ability to convert this effort into add-on sales.

This leads to the importance of the second point. Consumer awareness of the importance of indoor air quality and potential benefits of ventilation will prompt renovators, who may not have previously considered indoor air quality to be important, to view skill in this area as a competitive requirement.

Increased consumer awareness about indoor air quality issues and ventilation will therefore stimulate greater renovator interest in this area. In essence, indoor air quality and ventilation need to be things that consumers see as desirable elements in renovation planning.

Renovators and consumers are equally important audiences for indoor air quality and ventilation messages. Ideally, both groups will be able and active participants in bringing indoor air quality and ventilation into the planning process.

7.2.4 The Importance of Keeping the Indoor Air Quality and Ventilation Message Relevant to the Average Consumer

Following on the previous point, it is clear that the direction taken by CMHC to date in targeting both the housing industry and housing consumers with information on issues related to indoor air quality is appropriate. The growing awareness of the linkage between housing and feeling healthy among both renovators and the general population, can be largely attributed to CMHC's efforts in this area.

This being the case, there is also some risk of the Healthy Housing "message" being viewed as of marginal relevance in the average home renovation. In discussions with renovators, and in some of the survey results, there is an indication that some homeowners and renovators disregard concepts such as indoor air quality because they do not personally suffer from allergies or other similar environmental sensitivities.

Understandably, much of CMHC's work in the area of Healthy Housing has focused on the needs of individuals who are acutely symptomatic. Clearly, these individuals need the practical assistance provided by CMHC. However, the consultants have some concern that media and other attention given to cases of acute environmental sensitivity may lead many homeowners to assume that unless they are ill in this manner, Healthy Housing concepts are not that relevant to them personally.

While it is not CMHC's intention to communicate this message, some caution should be taken to ensure that the average consumer recognizes Healthy Housing benefits that are relevant to them. In order for indoor air quality assessment and the use of ventilation measures to become a normal part of renovation planning, these measures must be seem to be personally relevant and beneficial by the average homeowner.

7.2.5 Helping Renovators Incorporate Indoor Air quality Assessment and Ventilation Into Their Service Package

Figure 7.1 **Service Delivery Skill Set**

As discussed previously, renovators must be able to both assess and sell IAQ and ventilation concepts confidently. As indicated by the survey results, to accomplish this requires two separate and distinct sets of skills, as illustrated in the attached schematic.

If renovators are lacking skills in either of the two areas, they are not equipped to deal with indoor air quality and ventilation requirements properly in their projects.

This is an important point to bear in mind, because most education and training materials that have been developed for renovators organize technical and marketing knowledge into parallel, but independent, skill areas. In practice, these skill sets are closely linked and used in an interdependent manner.

This suggests that any information or training materials aimed at increasing renovators' practical knowledge of indoor air quality assessment and

Figure 7.1 **Service Delivery Skill Set**

- **Renovator IAQ Skill Set**
  - **Technical Skills**
    - Ability to Assess IAQ
    - Ability to Formulate Remedial Strategy
    - Ability to Specify and Cost Options
    - Ability to Supervise and Quality Assure Work
  - **Communications & Sales Skills**
    - Ability to Present IAQ as Part of Planning Process
    - Ability to Guide Customer Through Assessment Process
    - Ability to Present Recommended Actions
    - Ability to Sell Trade-offs, When Necessary

ventilation should be structured to reflect this transactional model rather than into separate discipline-based streams. Integrating the technical aspects of indoor air quality assessment and remediation with the customer relations aspects of the process should provide renovators with a more practical skill set.

7.2.6 The Value of a Tiered Information Strategy

The technical panel was of the opinion that the indoor air quality and ventilation knowledge base within CMHC is quite comprehensive. While there is no significant lack of information in technical areas, there is concern about the accessibility and usefulness of much of this information to both renovators and consumers.

In relation to consumer information, the panel offer the following observations.

As discussed previously, information suited to a mass audience must reflect the real interests and concerns of that audience. Excessive detail or too much focus on matters that are not clearly relevant to the average person undermines the utility and effectiveness of information. Not everyone is going to invest the time and energy required to utilize comprehensive information. It is unreasonable to expect such an outcome.

When consumer information products dealing with indoor air quality and ventilation are developed, the level of interest that the average consumer is likely to bring to the subject needs to be carefully considered. A practical example of this can be found in reviewing CMHC's *Clean Air Guide*. The general communications approach used in this publication is excellent, linking sources of indoor air contamination to observable conditions in the home and appropriate corrective measures. However, the level of detail provided goes beyond what the average consumer is likely to find interesting or useful initially.

For instance, the book makes use of check-boxes that allow the reader to check off sources, symptoms and corrective measures suited to their home. There are a total of 268 such boxes in the publication. Unless already knowledgeable and concerned about indoor air quality, few consumers are going to invest the time required to work through the 268 decisions required to fully utilize the book.

As a result, the utility of the publication is limited to a minority of consumers who have a very high level of interest in the topic. Further, those who lack sufficient interest are liable to walk away from the book, believing it is of little or no relevance to them.

An approach that is more suited to the average consumer would be more successful at promoting the central concepts involved.

The consultants suggest that experience gained in the late 1970s in relation to energy efficiency information for consumers offers some useful guidance. At that time, few consumers were familiar with concepts such as air infiltration, thermal resistance,

weatherizing or the host of other terms related to energy efficiency upgrading. What they did know was that oil had become expensive and there were real concerns about the security of energy supplies in Canada.

In order to change this situation, the federal government initiated a program to inform, motivate and assist consumers in becoming actively involved in energy efficiency. The techniques used centred on two specific elements.

The first was an awareness campaign involving techniques that have been broadly described as "social marketing". What this entailed was somewhat less Machiavellian than it sounds. Simply put, awareness-building activities centred on establishing a broad consensus among citizens that wasting energy was not a good, or responsible, thing to do—it cost consumers money and it contributed to Canada's dependence on uncertain supplies of foreign oil. The purpose of these messages was simply to make the issue personally relevant to consumers, to establish energy saving as "something you need to do" rather than something that others—government or industry—would look after.

The second element in the program involved providing concrete information tools and assistance to consumers. In part, this involved grant programs such as the Canadian Home Insulation Program (CHIP) and the Canadian Oil substitution Program (COSP), which provided financial incentives to take specific actions. Somewhat more importantly, it involved the design and delivery of information support to consumers through organizations like the Ener$ave Heat Line, originally a private-sector information service operated under contract to the then Department of Energy, Mines and Resources.

Many of those employed by Ener$ave had previous experience as community workers and brought with them valuable experience in relation to consumer information and outreach methodology. This gave rise to the concept of a *tiered information service* that could deliver varying levels of information to consumers based on their level of interest, need and knowledge base. This approach was part of the *Action Learning* model, based on established concepts in the field of adult education that maintain most adults learn experientially, through taking in small amounts of information and then using this knowledge in a practical manner.

The approach holds that if the initial application of knowledge is successful, the learner often moves on to seek additional information that can be used.

Information that is too abstract, or that cannot be tied to specific and achievable goals, risks being dismissed as irrelevant by adult learners. In relation to indoor air quality and ventilation, this approach suggests two things:

1) Indoor air quality is often positioned by CMHC as a component, or subset, of the broader Healthy Housing concept. Care must be taken to ensure that the overall presentation of Healthy Housing concepts does not communicate to consumers

that they must deal with all aspects of the Healthy Housing framework in order to take actions in relation to indoor air quality or ventilation. It may be more productive to reverse this and emphasize the link between indoor air quality and feeling healthy. It needs to be very easy for consumers to accept that some aspect of indoor air quality is relevant to them. Once they accept this, and carry out some simple action successfully, their commitment to indoor air quality and, in the longer-term, other elements of Healthy Housing, will begin to build.

2) CMHC's indoor air quality communication strategy needs to provide easy and attainable steps or tiers for consumers. The level of information provided by *The Clean Air Guide* is not appropriate as the first step or tier in this system. The initial communications goal should be to build awareness and to motivate the average consumer to conduct a simple assessment of conditions in their home. This first step can then be linked to simple actions that consumers can choose to carry out that would improve indoor air quality. First tier information must guide the consumer through this simple awareness building, self-assessment and remediation action process.

For example, this could centre on the benefits of reducing indoor dust levels by installing a medium-efficiency mechanical furnace filter in place of the low-efficiency filters commonly used. The technical information required need only involve how to compare filter types available in hardware and home supply stores. Consumers could be encouraged to measure the effectiveness of this action by examining the new filter after one week and seeing the particulate and other fine residues that would have otherwise been recirculated in the indoor air.

This approach has modest goals. It allows the average consumer to do something which is easy to understand, produces tangible results at low cost and does not require outside assistance. While the consumer is still far from knowledgeable about the indoor air quality, let alone Healthy Housing, they will have taken an important first step, improving the quality of the air they and their family breathe. Many aspects of Healthy Housing are linked so it will be important to present consumers with options that are unlikely to create secondary problems if carried out.

In practice, this approach to information design rests on creating linked program elements that take the consumer from small, narrowly defined steps towards larger, more complex ones. Each level, or tier, provides information resources matched to the level of consumer interest and commitment that realistically exists. Consumers are not asked to accept a "big picture" at the outset. Rather, they come to this picture by filling-in parts of it incrementally.

Conceptually, the design of an indoor air quality/ventilation information system might be structured as presented in Table 7.2. In this system, Awareness Building, and Tier One information would be suited to both consumers and renovators with little or no knowledge of Healthy Housing. Tier Two and Tier Three information would be primarily relevant to renovation contractors and hypersensitive consumers.

Table 7.2: **I.A.Q and Ventilation Communication Program Design**

Levels	Goals	Tools
Awareness Building Theme: *The Air We Breathe*	• Promote the concept that breathing clean air is part of being healthy. • Establish that keeping the air in your home clean is something only you can do.	• Concept messages, tag lines, images and symbols. • Advertising, handouts, visual imaging, school programs, public service announcements.
Tier One	• Connect awareness to simple assessment techniques. • Identify and support entry-level remedial actions and preventative measures.	• Primarily pro-active distribution. • Single-topic factsheets and pamphlets. • In-store displays and point-of-sale instructional information.
Tier Two	• Expand the range possible problems and remedial actions. • Introduce concept of prevention. • Introduce simple tools for indoor air quality assessment and remediation. • Identify appropriate renovation planning approaches.	• Primarily on-request distribution. • Specific information of use in renovation planning. • Technical information on products and equipment required to treat specific indoor air quality problems.
Tier Three	• Introduce complex tools for comprehensive indoor air quality assessment. • Provide special-needs information to environmentally sensitive individuals. • Provide entry into other Healthy Housing topic areas.	• On-request distribution only. • Detailed assessment tools such as *The Clean Air Guide* as well as research reports and technical publications. • Special information for the environmentally sensitive distributed in cooperation with medical community. • Information on other elements of Healthy Housing.

7.2.7 Entry-Level Indoor Air Quality and Healthy Housing Tools

As established at the beginning of the discussion, for indoor air quality and ventilation to be properly addressed in the context of a major home renovation, both parties should come to the planning process (the point-of-sale) with appropriate awareness, knowledge and skills. Renovators require knowledge. Consumers require awareness.

There is also a need for tools that will assist both renovators and consumers in considering indoor air quality factors in some realistic and comprehensible manner. This section of the report will focus on the design of tools that can support this process.

Little concern need be given to cases where both the renovator and the customer have some level of knowledge concerning indoor air quality and ventilation. Many of CMHC's existing information materials can serve their needs. In terms of the information strategy presented on the previous page, this would involve customers suited to Tier Three information products.

However, for the majority of renovators and consumers, entry-level information tools that are quite simple to use will be needed. Specifically, in relation to the renovation planning tools cited for Awareness Building and Tier One use, simple assessment and action guides could be very useful.

These tools were generally described by the technical panel as simple "If/Then" tables incorporating a checklist that would link cause, effect and action. This approach is not substantially different than that used in *The Clean Air Guide*, other than involving a much reduced scope and level of detail.

A number of different tools will be needed, reflecting the range of interests and knowledge among renovators and consumers. Table 7.3 outlines a general strategy for the design and goals of tools for these first two information levels.

This plan provides for parallel support to consumers and renovators. The objective is to provide both audiences with information tools which will lead to action. At the same time, the strategy includes a clear marketing component designed to lead consumers to knowledgeable renovators while convincing renovators that gaining this knowledge is a competitive requirement.

In marketing terms, this plan includes both "push" and "pull" components—renovators are pushed by the need to remain competitive with their peers because consumers are pulling the market in a new direction.

Figure 7.3 **Communications Strategy for Development of Awareness Building and Tier One Information Tools**

Information Level	Consumer Messages & Tools	Renovator Messages & Tools
Awareness Building	• Establish link between occupant choices, conditions the home, feeling healthy and general environmental conditions. • Provide simple information that allows consumers to identify familiar actions and products that can affect the indoor and outdoor environment. • Identify simple measures that can prevent or correct problems.	• Establish that renovation work can affect the quality of the indoor and outdoor environments. • Establish that consumers are becoming more aware of, and interested in, and willing to pay for measures that make their homes as healthy and comfortable as possible. • Establish that the renovator is in the best position to provide advice to homeowners and that having this knowledge can provide a competitive advantage.
Tier One	• Introduce the concept of assessment and provide simple assessment procedures for the more common existing and potential IAQ problems associated with renovation. • Provide information that will assist consumers in determining whether a renovator is knowledgeable about IAQ and Healthy Housing practices.	• Provide instructional resources that will give basic building science and introduction to Healthy Housing practices. • Provide instructional resources that will assist renovators in presenting and selling Healthy housing and IAQ measures to prospective customers. • Provide point-of-sale materials that will assist renovators in discussing Healthy Housing and IAQ issues with prospective customers.

The level of consumer information included at the awareness-building stage needs to focus primarily on "opening eyes" to the concept of Healthy Housing. Indoor air quality is the most conceptually accessible element of the Healthy Housing "mix" and should

provide the prime area for demonstrating linkages between home, feeling healthy and taking responsibility for our personal environment. One way to approach this information goal would be to outline a series of simple, familiar household actions and illustrate how occupant choices can affect the indoor and outdoor environments. This could be a *Did You Know That . . .*format as illustrated below.

Did You Know That . . .

- applying oil-based paint inside your home can put the following chemicals into the air you breathe? (list chemicals) Choosing a latex paint bearing the Environmental Choice Ecologo keeps the air in your home air cleaner.

- vinyl flooring can emit chemicals like (name of chemical) for up to x years after it is installed in your home? Choosing linoleum, ceramic tile or pre-finished hardwood keeps the air in your home cleaner.

- a single area of dampness in your basement can result in (approximate number) of mould spores being in the air you breathe. Sealing your basement and adding ventilation to your home can dramatically reduce this problem.

- frying a steak on your kitchen range can fill your home with these chemicals (name of chemicals)? A range hood that exhausts to the outside can keep these pollutants out of your home's air.

- weather stripping with butyl caulking can release (name of chemical) into the air. Choosing a latex or silicone caulking product avoids this problem.

- your new 18 cu. ft refrigerator could use $xxx.xx worth of electricity over its lifespan? Choosing the most energy efficient model of the same size could save you $xx.xx on your Hydro bill and help keep our environment cleaner.

Clearly, the purpose of this information is to set context and establish a link between common actions, conditions and the quality of the home environment. The goal is to create consumer interest and set the stage for consumers to request additional, more comprehensive information. The parallel activities and tools aimed at renovators will sensitize them to this consumer interest and establish a direct link with their competitive situation.

Tier Two information assumes an audience which has already accepted the premise of Healthy Housing. In terms of consumers, this involves a basic level of understanding that conditions within the home have consequences for the living environment and that they can choose what these consequences are. For renovators, it will have established a commercial context for Healthy housing knowledge and service provision. If training resources are to be provided to renovators, this would be the appropriate level for these to be initiated.

As a consequence, the next information tier will need to provide much more detail, while still being relevant to the majority of consumers and renovators. This might focus on only the most common problems and actions. Or it could provide for assessment on a room-by-room basis (i.e., a kitchen checklist or a basement checklist) or for specific housing types (i.e., CMHC's proposed "generic" renovation planners).

In terms of function, Tier Two tools were described as something that the renovator and customer could complete together and which would, for instance, provide a defined context for their discussions of indoor air quality and potential ventilation approaches.

Some technical panel members cautioned that such tools may be somewhat unrealistic because of the wide range of potential causes underlying many indoor air quality problems. However, it was generally agreed that limiting the level of detail incorporated in the tool would increase its usefulness.

CMHC will need to examine further the practicality of developing a simplified indoor air quality assessment tool. The consultants suggest that the best approach may be to determine if indoor air quality problems can be approached using the "80/20 rule" —80% of the symptoms are caused by 20% of the problems. It is suggested that, if this approach has adequate technical validity, the scope of this assessment tool be limited to a handful of the most common problems likely to be encountered when planning a home renovation. A similar tool for predicting and avoiding indoor air quality problems would also be needed.

Based on discussions among members of the technical panel, these two tools might be limited to the items presented in Tables 7.4 and 7.5

Table 7.4: **Examples of Tier One Information on Existing Indoor Air Quality Problems to Consider When Planning a Renovation Project**

Symptom	Problem	Action
Allergies, sneezing, rapid dust accumulation on furniture and surfaces	Excessive dust levels	• Alter floor coverings • Upgrade/install air filtration system
Allergies, visible signs of dampness and "musty" smell in basement or bathroom, visual evidence of mould growth	Moisture and resulting mould growth in basement, kitchen or bathrooms	• Moisture control in foundations • Addition of exhaust-only or balanced ventilation • Replacement of mould-prone materials
Stale smell in home, lingering cooking odours, headaches, window condensation in winter	Poor air circulation, lack of ventilation	• Modification to air distribution system • Addition of balanced ventilation system
Drafts, cold areas in home	Excessive air infiltration	• Air sealing • Window upgrading
Tobacco smoke, odours from hobby activities and pets	Common lifestyle sources of indoor pollution	• Air filtration • Addition of balanced ventilation system

Table 7.5: Examples of Tier One Information on Potential Indoor Air Quality Problems to Avoid When Planning a Renovation Project

Renovation Action	Potential Problem	Healthy Housing Opportunity
Replacing floor coverings	Carpeting and vinyl floor coverings can emit chemicals to the air. Carpeting can also make it harder to clean the floor and remove dust, dander, etc.	• Ceramic tile, linoleum, pre-finished hardwood flooring or hardwood finished with water-based coatings emit fewer chemicals and are easier to keep clean. • A fresh air ventilation system will help reduce chemicals in the air.
Exterior refinishing, new siding with or without insulation added, window replacement	Exterior refinishing and/or window replacement can significantly reduce the natural ventilation in your home by "tightening" the outside walls. This can lead to increased levels of moisture and chemicals in your homes air.	• Make sure moisture sources in your home are reduced as much as possible. (e.g., basement dampness) • Consider adding a ventilation system to bring fresh air into your home. • Make sure areas where moisture is generated are properly ventilated (e.g. kitchen and bathroom exhaust fans)
Basement Conversion	Unfinished basements can have moisture problems without obvious leaks and damp areas. Finishing walls and covering floors can trap such moisture causing mould growth and water damage.	• Make sure a qualified renovators inspects your basement carefully before beginning renovation work. • If moisture is a problem, solve this through waterproofing or additional foundation drainage before you renovate.

While this is far from being an exhaustive list of pre-existing and potential problems, it likely encompasses the vast majority of conditions that would normally be encountered. By limiting the scope of the assessment process, the renovator can focus the discussion in just a few areas, increasing the likelihood of influencing the customer's renovation plans.

The technical panel members were in agreement that this assessment tool needs to be quite simple and easy to use. Ideally, it should be in the form of a small and inexpensive checklist. While it would be most useful as a tool the renovator could use to introduce indoor air quality into discussions with customers, it should be equally suitable for interested consumers to use on their own.

In addition to a relatively short format, it may be worthwhile to consider simple illustrations that would guide consumers in completing the assessment, specifically in identifying areas of the home that should be inspected and to describe the visual conditions being looked for. This document should be designed so that average homeowner can carry out the assessment procedure for the most common sources of poor indoor air quality.

In the longer term, renovators need to be knowledgeable about a broader range of indoor air quality issues. The initial focus for renovator information should be the assessment and treatment of existing problems in the home. Beyond this, it is also important that renovators can prevent new indoor air quality problems that could potentially be caused by their renovation work.

A renovator tool that is similar in nature to the previous assessment approach may be worthwhile. This could provide renovators with a checklist of items related to a given renovation action. For instance, the action of installing of an indoor grill in the kitchen could be linked with the need to ensure sufficient make-up air is provided. Renovators could use these checklists, at the design stage of their projects, to ensure that they have developed proper job specifications. If checklists were developed for a broad range of renovation actions, it might be useful to assemble this information into a pocket-sized ring-bound booklet, similar to a span table.

8.0 Recommendations

Based on the survey results and the input received from the technical panel, the consultants offer recommendations to CMHC in four areas:

1) Information Product Review

2) New Information Products, Market Research and Tools

3) Industry Training and Training Delivery Methods

4) Information Transfer and Marketing Options

8.1 Information Product Review

Recommendation One

CMHC should review the adequacy and suitability of current information on ventilation strategies, practices and techniques as renovators are clearly more aware of the types of ventilation equipment available than of how to use this equipment.

Commentary

It is clear from the survey results that most renovators are at least moderately aware of the various types of ventilation equipment available on the market. It is equally clear that, in many cases, they have inadequate knowledge of how, and when, to use this equipment. CMHC could look to partnerships with equipment manufacturers and suppliers in an effort to inform renovators about how, and when, ventilation equipment should be specified on a job.

Recommendation Two

CMHC should modify its consumer information dealing with indoor air quality and ventilation. The objective of this process should be the development of a comprehensive tiered information system.

Commentary

The tiered information strategy outlined in section 7.2.7 is recommended.

8.2 New Information Products, Market Research and Tools

Recommendation Three

CMHC should consider some level of field monitoring activity to better quantify actual industry practices related to indoor air quality and ventilation. CMHC should also consider additional consumer research to identify strategies for increasing the market-perceived value of indoor air quality solutions among consumers.

Commentary

The survey results give cause for some alarm concerning the ability of many renovators to deal with indoor air quality problems effectively. It would be useful to better quantify current practices. CMHC has an indoor air quality auditing procedure that provides the basis for field monitoring activities in this area. CMHC research staff should consider establishing a post-renovation inspection process that would assess actual renovator practices and identify any common conditions that cause difficulties from either an assessment or action standpoint.

The second research requirement recognizes that in order for indoor air quality assessment and ventilation to become a normal element in renovation planning and projects, these concepts must have value in the marketplace.

One way to assist in this process would be to develop a better understanding of the consumer "hot buttons" related to indoor air quality and ventilation. Research conducted by the consultants in a number of previous projects indicates that the potential to safeguard or improve consumer health can be a significant sales tool if deployed properly. Additional and well-focused consumer research in this area is warranted.

Recommendation Four

CMHC should develop a simplified indoor air quality assessment tool for renovators to use with clients during the planning of a renovation project.

Commentary

This recommendation is specifically related to the assessment tools discussed in section 7.2.7.

8.3 Industry Training and Training Delivery Methods

Recommendation Five

In cooperation with the renovation industry, CMHC should identify an effective training delivery strategy that would be utilized by renovators. Whatever training approach is selected will need to reflect the work-day realities of the renovation business. Based on the survey results, the following training requirements were identified:

- **Training in general building science, particularly related to moisture and air movement in structures.**
- **Practical training in indoor air quality assessment and development of cost-effective ventilation strategies.**
- **Renovator training related to effective presentation and sales of "new" renovation technologies, such as ventilation.**

Commentary

The survey clearly indicated that many renovators lack a sound understanding of building science fundamentals. The most telling example of this was the erroneous belief, expressed by a majority of those who responded to the survey, that additional attic ventilation can solve indoor air quality problems.

CMHC is well equipped to specify the building science knowledge that renovators require to diagnose indoor air quality problems correctly. Finding an effective way to deliver this information to renovators is somewhat more of a challenge.

Over the several years, CMHC has invested considerable time and resources in the development of training programs for renovators. These programs are valuable and should provide a solid base upon which to build greater technical knowledge among practicing renovators.

In those provinces where the industry is moving to the adopt some permanent arrangements for the delivery of training, these resources are being put to some use. In other provinces, they are not readily available to renovators. Even where the courses are offered, uptake by renovators is often problematic.

It is time for CMHC and the renovation industry to take a detailed look at why these courses are not in greater demand and use. At least in Ontario, there is every indication that the course format and cost has been wholly unsuited to the real needs and capabilities of renovators. Training programs are a product that must be designed and sold effectively. While renovators express continued interest in training, actual enrollment is often inadequate to support delivery

costs. Perhaps it is time to re-think the format and cost structure of the courses and find another approach that will be more successful.

The consultants also suggest that renovator training should be more integrated and multi-disciplinary to reflect the realities of the marketplace. Existing course structure tends to compartmentalize knowledge into discrete topics areas—technical matters, business management, marketing and sales, etc. In practice, these knowledge blocks are not discrete, they must be used in an integrated manner for the renovator to be successful. Technical knowledge is of little use if a renovator does not know how to present and sell the specific technology involved to customers.

8.4 Information Transfer and Marketing Options

Recommendation Six

Based on the success achieved to date, CMHC should continue its consumer information efforts related to Healthy Housing, indoor air quality and ventilation.

However, CMHC should ensure that the central thrust of indoor air quality and Healthy Housing messages is seen to be relevant by the average homeowner. This may require less emphasis being placed on the occurrence and needs of "sensitive" individuals.

CMHC should seek additional partnerships with industry, particularly retailers of hardware and building supplies, in getting basic information (awareness building and Tier One - see Section 7.2.7) on indoor air quality and ventilation to consumers.

Commentary

CMHC's publications, as well as its participation in home shows, consumer seminars, events and its media relations activities in support of Healthy Housing, are making substantial headway in creating general consumer awareness in this area.

Section 7.2.4 addresses the importance of ensuring that the range of information provided by CMHC is relevant to the interests and needs of average consumers.

A number of major building supply chains provide extensive consumer "how-to" information as part of their customer service system. This may provide an opportunity for CMHC to work with building supply dealers in providing indoor air quality and ventilation information of value to consumers.

Recommendation Seven

CMHC should target indoor air quality and ventilation information at those renovators most likely to use it. This would include renovators who take on larger-scale projects and "aspiring" renovators seeking to build a successful career in the renovation field.

Commentary

The survey results point to the diverse nature of the renovation industry. As a result, a targeted industry information strategy is recommended. There are two renovator audiences of primary interest.

The first group are renovators who specialize in larger renovation projects. The technical panel noted that indoor air quality measures such as ventilation are a "harder sell" in small projects where the relative cost of such measures is high. As well, large projects are more likely to involve alterations to the basic systems of the home—foundations, heating systems, insulation, etc.—making remedial measures more practical.

Targeting information efforts at these renovators makes sense. However, based on the survey results, this would direct CMHC's efforts towards CHBA members. Over time, new practices taken up by this group of renovators will likely tend to diffuse within the industry as a whole.

The second group of renovators that should be a target for information are the cadre of "aspiring" contractors—newer entrants to the industry who are looking for competitive advantages. The technical panel expressed the view that these renovators are more likely to get involved in training activities offered to them. The survey data did not provide any clear direction on the best way to identify such "aspiring" renovators, but additional discussion with the industry is likely to produce some workable approaches.

Appendix A

Appendix A

CMHC RENOVATOR RESEARCH PROJECT
QUESTIONNAIRE AND MARGINALS

I. RENOVATION BUSINESS CHARACTERISTICS

To begin, we would like to ask a few questions about your renovation business. All such information will be kept strictly confidential.

1. **Approximately how many years have you been in the renovation business?**

			$\bar{Q}$	s	n
a.	In total	Number of years...........	17.8	8.8	256
b.	On your own	Number of years..........	13.5	7.5	251

2. **Approximately how many renovation projects did you work on in the last 12 months?**

	$\bar{Q}$	s	n
Number of renovation projects.....................	35.3	45.8	257

3. **How many of these projects were large scale renovations (valued at over $10,000) involving major changes to an existing home or large scale additions to a home?**

	$\bar{Q}$	s	n
Number of large scale projects......................	9.2	11.6	250

4. **Approximately what percentage of your renovation business in the last 12 months do the following types of projects represent?**

		$\bar{Q}$ (%)	s	n
a)	Kitchen and/or bathroom renovation	19.4	19.4	249
b)	Exterior: structural, siding, walls, roof, garages, decks, etc.	24.4	23.6	253
c)	Interior: remodeling of existing living area of the home	16.8	17.2	246
d)	Basement/attic conversions/finishing	9.4	12.9	233
e)	Additions: new room/space	22.6	24.0	245
f)	Energy retrofit: HVAC, windows and/or insulation	13.4	21.5	244
g)	Other	7.6	15.3	222

II. BUSINESS CONDITIONS

We would like to know about business conditions in your area during the last year. Please answer the following four questions based on your recent business experiences.

5. **Over the last 12 months, how frequently have your sales leads come from the following sources?** Please circle the appropriate responses on the following scales.

		Rarely/ Never		Sometimes			All the Time				
		1	2	3	4	5	6	7	0	s	n
a)	Referrals from past customers	0.0	1.5	3.8	9.2	24.5	33.7	27.2	5.7	1.2	261
b)	Repeat customers	1.9	5.4	10.4	19.6	18.8	25.4	18.5	5.0	1.5	260
c)	Referrals from trades, business associates, suppliers or industry associations	8.6	16.3	17.5	25.3	17.1	10.9	4.3	3.8	1.6	257
d)	Leads generated through advertising and telephone yellow page listings	29.2	24.9	13.4	13.4	11.1	4.7	3.2	2.8	1.7	253
e)	Leads from consumer shows, seminars or special events	47.2	18.0	8.8	10.0	9.2	5.6	1.2	2.4	1.7	250
f)	Referrals from your municipality	66.0	16.8	6.6	5.7	2.5	1.6	0.8	1.7	1.2	244

6. **To what extent have the following types of business situations been a problem for your renovation business in the last 12 months?**

		Not a Problem			Moderate Problem			Serious Problem				
		1	2	3	4	5	6	7	0	s	n
a)	More contractors than ever to compete with	6.2	7.0	10.5	20.2	17.5	14.4	24.1	4.6	1.8	257
b)	Competition from part-time contractors	4.4	6.3	10.7	13.1	12.7	13.9	38.9	5.2	1.9	252
c)	Often, winning bids are less than the cost of actually doing the project	9.3	11.3	8.5	16.2	15.0	17.0	22.7	4.6	2.0	247
d)	Homeowner does not want to pay the GST	12.8	11.2	13.2	20.2	13.6	7.4	21.7	4.2	2.0	258
e)	Competition against "cash" contractors	7.5	4.3	9.8	11.0	10.6	18.0	38.8	5.2	1.9	255
f)	Non-traditional sources offering renovation services: for example, Gas utilities, Sears	26.1	16.6	14.5	17.8	10.8	6.6	7.5	3.2	1.9	241

7. **Do you agree or disagree with the following statements about consumers?**

		Strongly Disagree 1	2	3	Neither 4	5	6	Strongly Agree 7	O	s	n
a)	It is getting harder to get customers to the point of contract signature	6.2	8.6	10.5	31.1	15.2	16.7	11.7	4.4	1.7	257
b)	Homeowners are more reluctant to spend money on major renovations because of the decline in house values	9.1	8.7	16.2	16.6	20.2	16.6	12.6	4.3	1.8	253
c)	Homeowners frequently ask about the quality and type of materials to be used on the job	3.1	4.7	7.4	13.2	17.4	30.2	24.0	5.2	1.6	258
d)	Customers are concerned about environmental and health issues when planning their renovations	8.9	16.3	14.0	21.4	19.8	13.2	6.2	3.9	1.7	257
e)	When making decisions about price and quality trade-offs, most homeowners chose in favour of quality.	8.1	9.6	16.2	12.7	20.8	20.0	12.7	4.4	1.8	260

8. **Do you think that opportunities to make money in the renovation business are increasing or decreasing in the following areas?**

		Greatly Decreasing 1	2	3	Staying the Same 4	5	6	Greatly Increasing 7	O	s	n
a)	Kitchen or bathroom renovations	3.7	6.5	13.5	40.4	19.6	13.9	2.4	4.2	1.3	245
b)	Additions	4.0	7.7	16.6	25.9	22.7	18.6	4.5	4.3	1.5	247
c)	Conversions of attic or basement areas	6.1	11.3	14.7	35.1	21.2	9.1	2.6	3.9	1.4	231
d)	Mechanical ventilation	3.7	9.5	18.5	41.8	11.6	13.2	1.6	3.9	1.3	189
e)	Renovation for home office	2.8	8.7	10.6	30.3	33.0	12.4	2.3	4.3	1.3	218
f)	Upgrades to energy efficiency of homes	1.7	9.1	11.6	25.9	29.7	19.4	2.6	4.4	1.3	232
g)	Renovations to meet the needs of mature/older homeowners	0.9	5.6	5.2	27.9	27.5	25.3	7.7	4.8	1.3	233
h)	Renovations for people with specific needs/disabilities	2.3	5.9	7.3	34.1	30.0	15.9	4.5	4.5	1.3	220

III. TECHNOLOGY TRENDS

CMHC works with your industry to provide technical information and training opportunities that help renovators keep on top of changes in products and technology. The following three questions deal with changes in the way home renovation work is done.

9. **How frequently do your customers ask about the following products and technologies?**

		Rarely/ Never		Sometimes			Very Frequently				
		1	2	3	4	5	6	7	0	s	n
a)	Hardwood/ceramic flooring	2.4	1.6	2.8	23.0	14.3	31.3	24.6	5.4	1.4	252
b)	Solar heating	52.6	25.7	11.6	7.2	1.6	0.0	1.2	1.8	1.2	249
c)	Water-conserving toilets and fixtures	17.2	18.4	20.0	18.0	11.6	9.6	5.2	3.4	1.7	250
d)	High-efficiency furnaces and air conditioning	7.9	6.7	10.8	21.3	15.8	23.8	13.8	4.6	1.8	240
e)	High-performance, energy-conserving windows	0.8	2.3	5.4	13.9	23.6	31.3	22.8	5.4	1.3	259
f)	Solid wood or low off-gassing millwork (vs. glue base)	39.2	22.9	10.6	14.3	5.7	6.5	0.8	2.5	1.6	245
g)	Gas fireplace	10.9	8.9	8.1	19.0	19.4	21.5	12.1	4.4	1.8	247
h)	Ventilation equipment	10.8	12.0	14.9	20.5	22.5	13.3	6.0	4.0	1.7	249
i)	Heat recovery ventilation systems	14.6	17.4	15.8	14.2	15.8	12.6	9.7	3.8	1.9	247
j)	Upgraded insulation beyond code requirements	10.3	15.0	18.2	21.3	20.6	9.5	5.1	3.8	1.6	253
k)	Low-odor, water-based paints and stains	19.9	17.5	15.5	19.9	10.8	12.0	4.4	3.4	1.8	251
l)	Air filtration/humidification	17.7	15.7	16.1	25.7	14.9	6.0	4.0	3.4	1.7	249

10. **In your experience, how common are the following pre-existing problems in homes you renovate?**

		Not Common		Fairly Common			Very Common		0	s	n
		1	2	3	4	5	6	7			
a)	Poor drainage, foundation problems and damp basements	3.1	7.1	11.8	26.7	18.8	12.2	20.4	4.7	1.6	255
b)	Excess indoor humidity and condensation	1.9	6.2	13.5	26.2	22.7	16.2	13.5	4.6	1.5	260
c)	Poor air circulation in the home	0.8	6.2	13.2	28.0	23.0	16.7	12.1	4.6	1.4	257
d)	Lack of ventilation of the living area	3.5	8.2	15.2	23.8	19.9	16.8	12.5	4.5	1.6	256
e)	Insulation and air sealing without adequate ventilation being added	3.1	6.3	18.5	19.7	22.0	18.9	11.4	4.5	1.6	254
f)	Use of high-odor materials, finishes, adhesives, etc.	12.1	15.4	20.0	25.0	13.3	8.8	5.4	3.6	1.6	240

IV. VENTILATION AND INDOOR AIR QUALITY

Because of changes in the way homes are built and renovated, ventilation is sometimes needed in order to keep the air in homes fresh and healthy. As well, some renovators tell us that customers are asking about ways to reduce moisture and pollution in their homes. The following questions deal with your experience and opinions in this area.

11. **Thinking specifically about ventilation, how often ...**

		Never/ Rarely		Some times			Always		0	s	n
		1	2	3	4	5	6	7			
a)	do you find existing problems in the homes you renovate that indicate the need for ventilation: for example, mold or mildew, condensation, odors, dryness?	1.2	3.1	10.9	33.9	25.7	20.2	5.1	4.6	1.2	257
b)	do you run into ventilation problems that are hard to assess or solve?	9.8	19.9	18.3	30.9	13.8	6.9	0.4	3.4	1.4	246
c)	are these issues discussed with your customers?	1.6	2.4	6.8	12.0	10.0	27.5	39.8	5.7	1.5	251
d)	do you recommend adding ventilation equipment to the home?	2.3	3.5	5.1	18.7	18.7	22.2	29.6	5.3	1.5	257
e)	do customers accept your recommendation to add ventilation equipment to the home?	2.0	6.1	10.2	40.8	22.4	14.7	3.7	4.3	1.2	245
f)	do customers complain about poor air or indoor air quality problems?	7.1	15.8	19.0	34.4	17.0	4.3	2.4	3.6	1.4	253

12. **When recommending ways to improve air quality in a home, which of the following options do you usually recommend?** Circle all that apply.

Addition of an HRV system..01   66.5 %
Modify and balance existing ductwork...............................02   41.6
Add exhaust fans 03   66.9
Provide new drainage system on foundation to reduce dampness... 04   43.6
Add or modify venting in soffits and roof............................05   75.1
Add windows..06   35.0
Change finishes such as carpet to hardwood or tiles................07   26.8
Add an electronic air filter 08   29.8
Other (please specify) _____ 09   8.6   n = 257

13. **In the last 12 months, have you done any renovation projects that included features related to the following homeowner health needs or problems?**

		Yes (%)
a)	Allergies	53.5
b)	Sensitivity to pollution	23.6
c)	Mold, condensation	80.9
d)	Dryness	25.5 n = 157

14. **Who has been primarily responsible for specifying ventilation equipment in your renovation projects?** Circle all that apply.

Renovator...1   64.0 %
Designer...2   20.9
Homeowner...3   28.5
Mechanical contractor....................................4   53.6
Building inspector...5   9.6
Other (please specify) _____ 6   2.1   n = 239

15. **In your experience, how difficult is each of the following in renovation projects?**

		Not at all Difficult			Moderately Difficult			Extremely Difficult				
		1	2	3	4	5	6	7	0	s	n
a)	Recognizing and diagnosing the cause of existing air quality problems in the homes you work on	9.1	14.5	24.8	28.1	13.2	8.3	2.1		3.6	1.4	242
b)	Estimating costs to correct problems	9.5	14.0	19.8	23.0	14.0	13.6	6.2		3.8	1.7	243
c)	Finding subcontractors who can do the work	23.3	31.0	16.7	8.2	10.6	5.7	4.5		2.9	1.7	245
d)	Planning how to avoid new air quality problems that could be caused by renovation activities	13.2	25.6	24.8	17.1	11.5	5.1	2.6		3.1	1.5	234

V. INFORMATION ABOUT NEW PRODUCTS, AND TECHNOLOGIES

CMHC hears from some renovators who are looking for technical information about new products and materials that they could use in their projects. The next few questions will help us understand your needs in this area and how we can help meet these needs.

16. **In general, how familiar are you and your employees with the following?**

		Not at all Familiar		Somewhat Familiar			Very Familiar				
		1	2	3	4	5	6	7	O	s	n
a)	Ventilation equipment, including heat recovery and energy recovery ventilators?	4.3	6.7	15.0	20.1	17.7	17.3	18.9	4.7	1.7	254
b)	How to calculate ventilation requirements and select the right equipment?	16.7	17.1	13.5	19.5	13.1	11.2	8.8	3.6	1.9	251

17.

a) **Which of the following sources of information about renovation technologies and products have you personally used?** Check the box if you have used the source of information and,

b) **If used, were you satisfied with the information?**

		a) Sources Used (%) n = 249	b) Satisfied (%) n = 249	Not Satisfied (%)
i)	Building material supply dealers	81.9	86.2	13.8
ii)	Manufacturers	71.5	90.1	9.9
iii)	Local home builders' association or renovation council	52.2	92.7	7.3
iv)	CMHC	43.4	94.1	5.9
v)	Other renovation companies including sub-contractors	58.2	93.5	6.5
vi)	Trade and technical publications	58.2	92.8	7.2
vii)	Educational, training and research institutions	31.7	84.0	16.0
viii)	Product instructions/catalogues	58.6	83.1	16.9

18. **How interested are you in obtaining more information about:**

	Not at all Interested						Somewhat Interested			Extremely Interested				

Scale: 1 2 3 4 5 6 7   0 s n

a) New renovation products and
technologies? 1.5   0.8   3.1   10.4   12.0   18.1   54.1   6.0   1.4   259

b) Products and technologies
related to occupant health and
indoor air quality?....................2.3   1.9   5.8   15.1   13.6   18.6   42.6   5.6   1.6   258

c) A 3-day training course related to ...
indoor air quality and ventilation?. 17.6   8.2   12.9   11.3   12.5   13.3   24.2   4.3   2.2   256

19. **What are your preferences among the different means of getting new technical and product information?** Circle all that apply.

Trade publications/magazines.............................1	74.0 %	n = 258
Trade shows..2	50.0	
Seminars 3	43.8	
Pamphlets, fact sheets.....................................4	69.4	
Technical reports...5	44.6	
Sales meeting/presentation................................6	29.8	
Video seminars...7	28.3	
CD ROM...8	16.7	
Internet...9	13.2	

VI. CUSTOMER ATTITUDES AND PREFERENCES

We would also like to get your opinion about what customers are interested in today and the things that influence their renovation decisions.

20. **Overall, how interested are customers in matters related to indoor air quality and the impacts of renovations on health?**

Not at all Interested		Somewhat Interested		Extremely Interested					

  3.1   12.0   19.8   29.8   22.9   9.3   3.1   4.0   1.4   258

(0 s n)

21. **What priority do customers give to indoor air quality and the impacts of renovations on health in their overall set of renovation priorities?**

Very Low Priority		Medium Priority		Very High Priority					

  9.1   17.4   19.0   31.2   17.4   3.2   2.8   3.5   1.4   253

(0 s n)

22. **Do you feel that renovators' knowledge of ventilation and indoor air quality has a positive impact on their ability to get renovation jobs?**

No Impact At All			Moderate Impact			Large Impact		0	s	n
4.9	13.2	14.0	27.2	18.1	13.6	9.1		4.2	1.6	243

23. **Do you agree or disagree that the following statements about barriers which may limit your ability to sell ventilation and indoor air quality features as a part of renovation projects?**

	Strongly Disagree			Neither			Strongly Agree				
	1	2	3	4	5	6	7	0	s	n
a) Customers are not willing to scale back other aspects of the project to pay for a ventilation system	5.7	0.9	7.0	17.9	24.9	28.8	14.8	5.0	1.5	229
b) Customers do not understand ventilation equipment and how it affects a home's air quality	2.0	3.3	7.4	9.4	19.7	36.9	21.3	5.4	1.4	244
c) Ventilation and indoor air quality are rarely discussed when work is being planned	7.6	10.0	14.1	15.3	16.9	22.1	14.1	4.5	1.8	249
d) Ventilation and indoor air quality are not factors in most projects	7.6	8.8	14.4	16.8	18.0	21.2	13.2	4.4	1.8	250
e) There is not enough information available to help renovators sell these features	8.6	12.0	13.7	17.2	14.6	17.6	16.3	4.3	1.9	233
f) It is difficult for renovators to recognize indoor air quality problems and how to solve them	9.8	13.0	15.0	22.8	15.9	13.8	9.8	4.0	1.8	246

VII. BACKGROUND INFORMATION

We would like to get some additional information that will help us understand your business better. As we stated at the beginning of this survey, this information is strictly confidential and will not be given to any other group, individual or organization.

24. **On average, over the last 12 months, approximately how many employees (excluding owner/operators and partners) did your company employ?** Please check the box if you had no employees.

	0	s	n
Number of full-time employees	5.0	8.1	222
Number of part-time employees	2.7	3.4	211

25. **Approximately what were your gross revenues from all your <u>residential renovation</u> activity for 1995 (excluding GST)?**

$\underline{0}$ = $441,419   s = $970,127   n = 218

26. **Approximately what percentage of your total construction business activity in 1995 (in terms of gross revenues) does residential renovation represent?**

Residential renovation $\underline{0}$ = 65.8%   s = 31.0%   n = 250

27. **Do you have any other comments to make about renovation information requirements or other topics covered in this survey?**

_____

28. **Would you be interested in:**

		Yes (%)	No (%)	n
a)	A brief summary of the survey results	84.9	15.1	232
b)	Information from CMHC about indoor air quality and healthy housing	84.5	15.5	219
c)	Being available for follow-up contacts by CMHC personnel	57.3	42.7	199

IF YES: Print your name and mailing address on the lines below.
PLEASE NOTE THAT THIS INFORMATION WILL BE KEPT SEPARATE FROM YOUR
RESPONSES TO THIS SURVEY. AN INDEPENDENT CONSULTANT WILL PROCESS THIS
INFORMATION AND WILL NOT PROVIDE YOUR RESPONSES TO CMHC WITH YOUR NAME
OR ADDRESS ATTACHED. ALSO, THIS INFORMATION WILL NOT BE USED FOR ANY OTHER
PURPOSE. YOUR NAME WILL NOT BE PUT ON ANY MAILING LISTS EXCEPT TO RECEIVE
INFORMATION RELATED TO THIS SURVEY.

Name: _____

Title: _____

Company: _____

Mailing Address: _____

_____

_____ Postal Code: _____ _____

Telephone: |__|__|__|__|__|__|__|__| |__|__|__|__|__|

Fax: |__|__|__|__|__|__|__|__| |__|__|__|__|__|

Internet/E-mail: _____

Appendix B

Appendix B

Detailed Survey Results and Analysis

4.1 Business Conditions

4.1.1 Sources of Sales Leads

Past customer referrals (scale mean = 5.7) and repeat customers (scale mean = 5.0) are the only two sources from which renovators reported that their sales leads come with any frequency over the last 12 months. Almost two-thirds of renovators (61%) reported that their sales leads come from referrals from past customers either all the time or almost all the time (6 or 7 on the 7-point scale). Almost everyone (95%) said that such referrals are sources of leads at least sometimes. Similarly, almost half (44%) said their sales leads come from repeat customers either all the time or almost all the time; 82% said sales leads come from repeat customers at least sometimes.

Other sources are much less frequent sources of sales leads. Referrals from industry sources such as trades, business associates, suppliers or industry associations are reported to be very frequent sources of leads for 15% of renovators (scale mean = 3.8). Advertising and yellow page listings (scale mean = 2.8) and consumer shows, seminars and special events (scale mean = 2.4) are infrequent sources of leads. Referrals from the municipality are very infrequent sources of leads. These results are presented in Exhibit 4.1

Exhibit 4.1: Source of Sales Leads

Per Cent of Responses
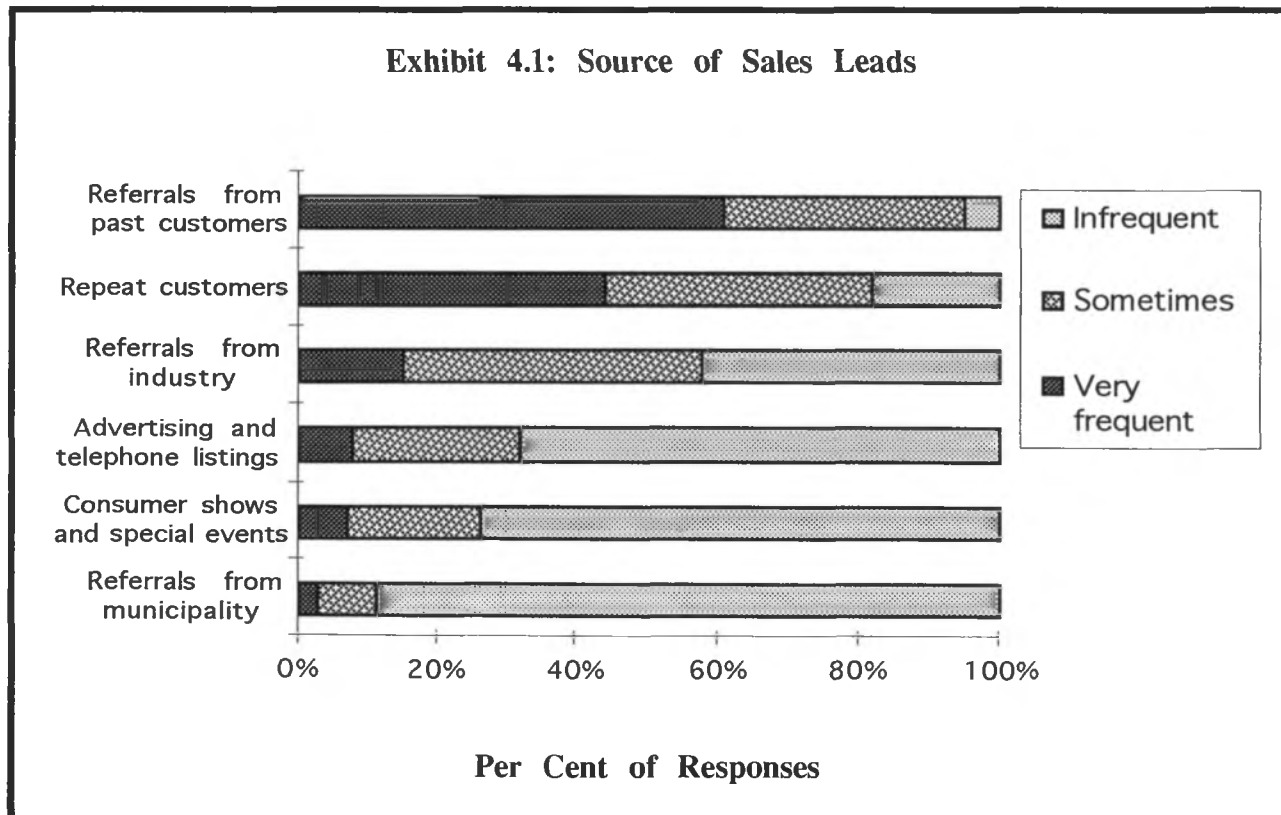
Past customer referrals and repeat customers are more frequent sources of leads for CHBA members and other non-member renovators outside Québec than for APCHQ members. For CHBA member and non-member renovators outside Québec, 60% cited past customers and 46% cited repeat customers as very frequent sources of leads. The corresponding figures for APCHQ members are 40% and 29%.

With the exception of advertising and yellow page listings, which are more important for non-member renovators, all other sources provide sales leads more frequently for CHBA members. For referrals from other industry sources such as trades, business associates and suppliers, 19% of CHBA members said that these are very frequent sources of leads compared to 13% of non-members and just 6% of APCHQ members. Similarly, one-third (32%) of CHBA members reported that consumer shows and special events are sources of leads at least sometimes compared to 26% of non-members and just 14% of APCHQ members.


4.1.2 Business Problems in the Last 12 Months

Renovators were asked about the extent to which several types of situations had been problems for their businesses in the last year. Based on an overall "problem scale", one-quarter (24%) indicate they have had few problems, 41% have had moderate problems, and 35% have had more serious problems. Responses to all of the questions about business situations creating problems for renovators are highly consistent among all sub-groups.

Overall, APCHQ members expressed by far the highest levels of concern about the business problems reviewed. The average score for APCHQ members on the overall problem scale is 5.4 compared to 4.5 for CHBA members and 4.1 for non-members.

The biggest problems for renovators have been competition from part-time contractors and competition from cash contractors. Over three-quarters (79%) of renovators indicated that part-time contractors presented at least a moderate problem for their business; over half (53%) said it was a serious problem (6 or 7 on the 7-point scale). Competition from cash contractors was at least a moderate problem for 78% of renovators and a serious problem for 57%.

Other significant problems are the increased number of contractors to compete with (at least a moderate problem for 76% and a serious problem for 39%) and facing winning bids which are less than the cost of doing the project (at least a moderate problem for 71% and a serious problem for 40%). Owners who do not want to pay the GST (a serious problem for 29%) and competition from non-traditional sources (a serious problem for 14%) are somewhat less serious problems. These results are presented in Exhibit 4.2.

Exhibit 4.2   Business Problems for Renovators
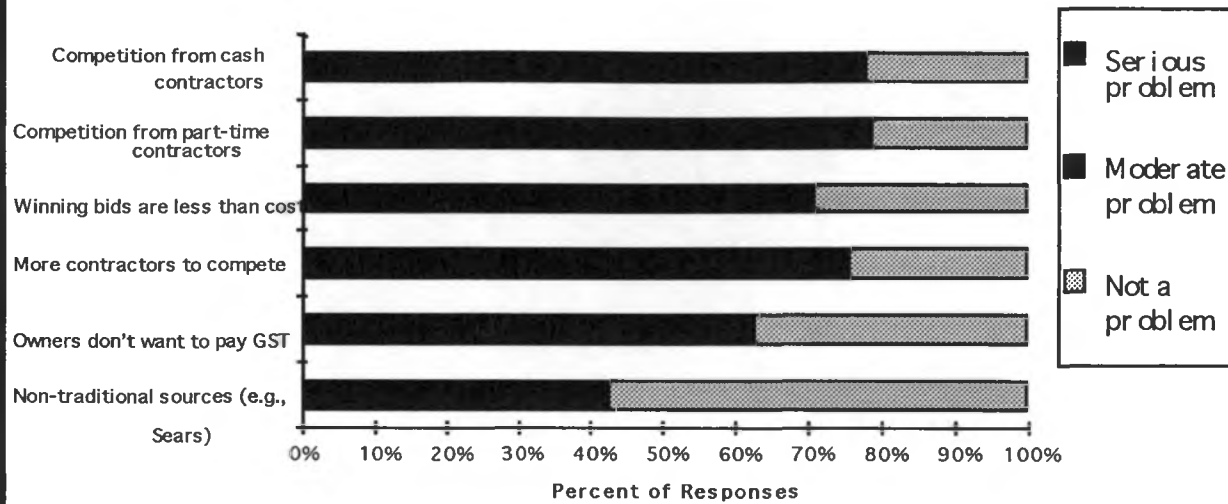
APCHQ members rated all of these problems as much more serious than renovators in the other nine provinces, with the exception of competition from part-time contractors which is equally a problem for CHBA members. For the other problems, non-members rated them as the least serious, with the opinions of CHBA members being between the two other groups. A comparison between the average scores on the six different problem scales for CHBA members, APCHQ members and non-members is presented in Exhibit 4.3.

Exhibit 4.3 Business Problems for Renovators: Comparisons by Member Status

Competition from cash contractors

Competition from part-time

Winning bids are less than project

More contractors to compete with

Owners don't want to pay GST

Non-traditional sources (e.g., Sears)

Legend:
- APCHQ
- Non-member
- CHBA

Average Score on Seven-Point Scale
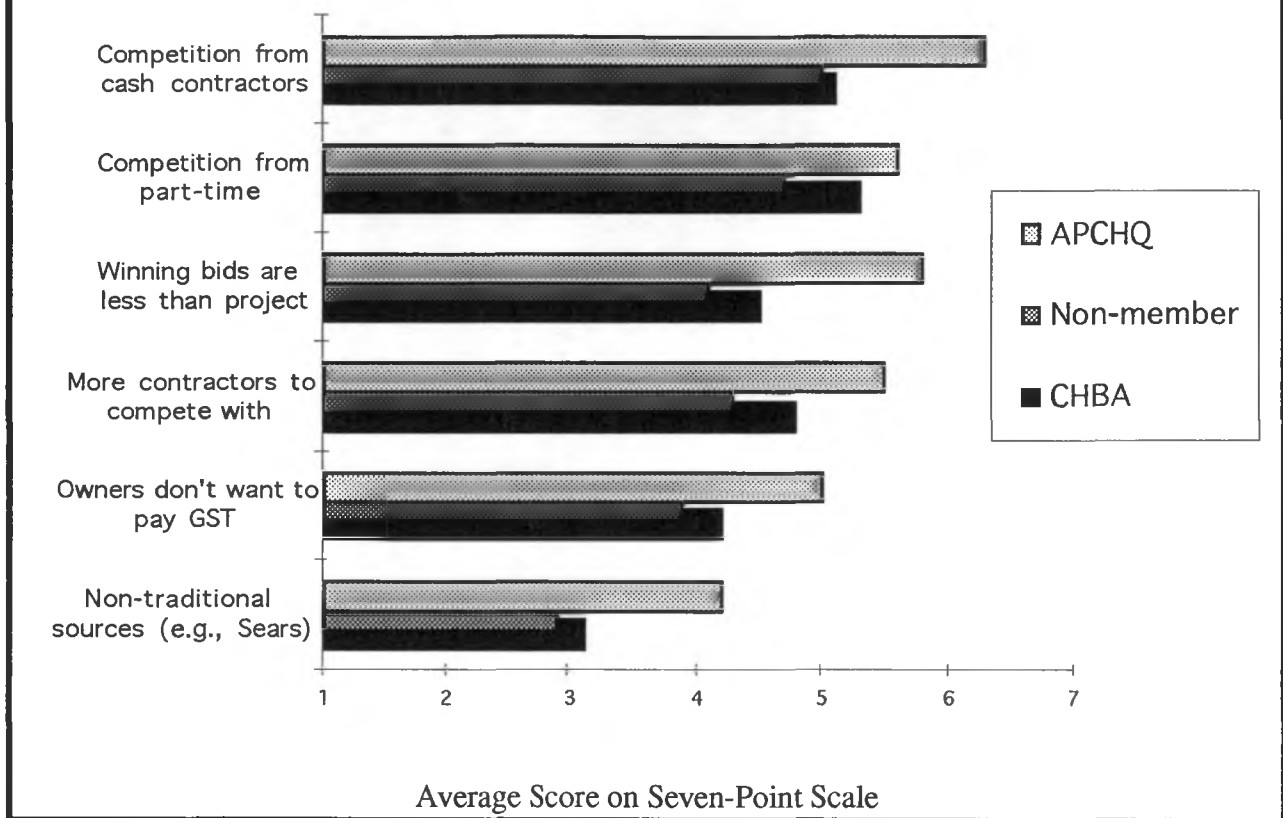
4.1.3 Opportunities to Make Money in the Renovation Business

Overall Business Prospects

The survey results indicate that renovators are cautiously optimistic about their business prospects. Overall - based on an index of work prospects in all different types of renovation work - 44% of renovators indicated that their opportunities to make money in the renovation business will increase. Of these renovators, most think their prospects will improve only modestly; just 13% think they will increase significantly. Over half of the renovators indicated that their opportunities to make money will either stay the same (41%) or will decrease (15%).

CHBA members are the most optimistic about their overall business prospects. Their average overall score on the summary "business prospects" index was 4.4 (on a 7-point scale) compared to 4.1 for non-members and 3.9 for APCHQ members. In percentage terms, 55% of CHBA members indicated that their opportunities to make money will increase compared to 34% of non-members and only 15% of APCHQ members. Only 12% of CHBA members think their prospects will decrease compared to 18% of non-members and 20% of APCHQ members.

Full-time renovators (100% of business) were also the most optimistic. Their overall average score on the "business prospects" index was 4.6 compared to 4.2 for other renovators (99% or less of revenues from renovation). In percentage terms, 63% of full-time renovators think their opportunities to make money will increase compared to 40% of other renovators.

4

Opportunities to Make Money in Specific Areas

The areas in which renovators indicated that their opportunities to make money are most likely to increase are renovating to meet the needs of mature/older homeowners, renovating to meet the needs of people with disabilities, and energy efficiency upgrades. Additions, home office renovations and kitchen or bathroom renovations are other areas in which renovators indicated that opportunities to make money will increase. They were less positive about their business prospects with mechanical ventilation and conversions of basements or attic areas. These results are presented in Exhibit 4.4.

Exhibit 4.4   Opportunities to Make Money in the Renovation Business

Percent of Responses
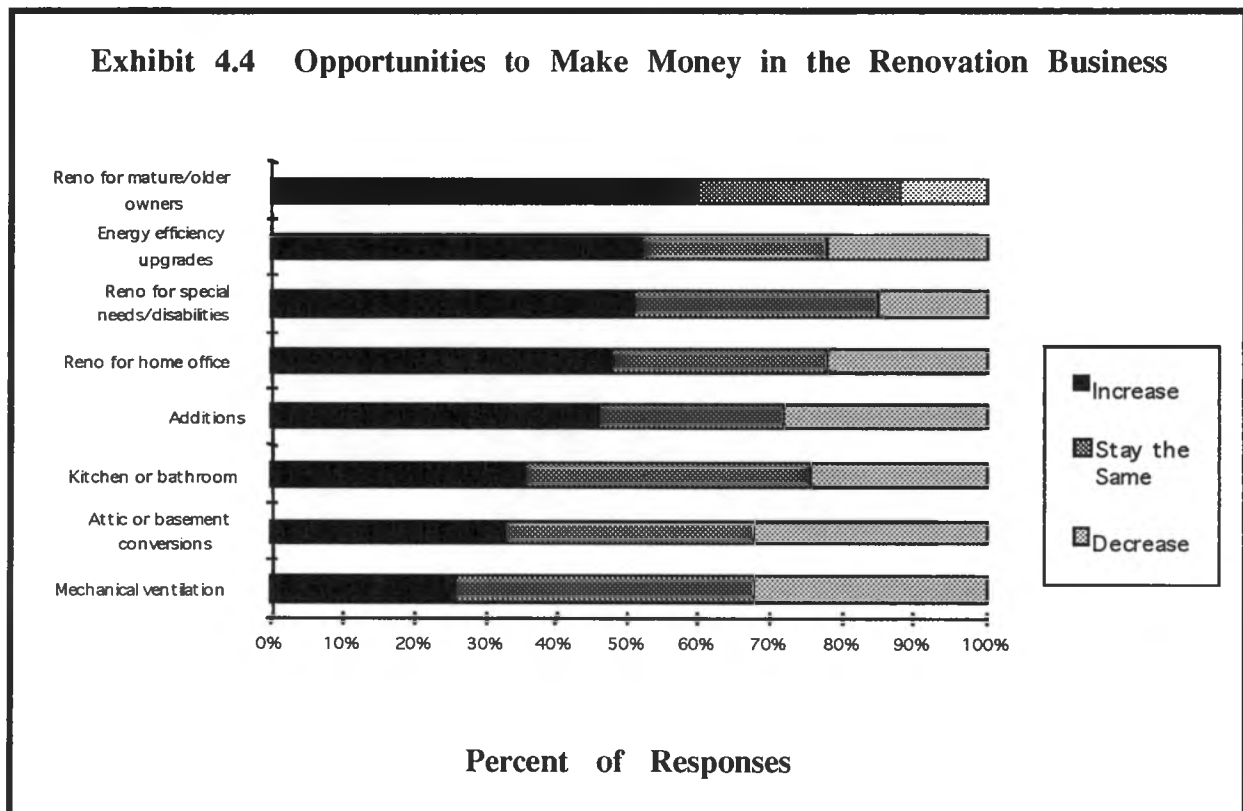
4.1.4 Attitudes of Consumers Affecting Business Conditions

The attitudes and behaviour of consumers create a great part of the business environment for renovation. Most renovators agreed that their customers frequently ask about the quality and type of materials to be used on the job; overall, 72% of renovators agreed, 15% disagreed and 13% were neutral. Renovators with companies which have revenues of more than $100,000 were the more likely to agree than renovators with the smallest companies (76% compared to 60%).

A majority of renovators (54%) also agreed that most homeowners choose in favour of quality when making decisions about price and quality trade-offs. Again large companies were more positive about consumer behaviour: 67% of renovators with companies with renovation revenues over $500,000 agreed that most customers choose quality compared with 56% for companies with revenues between $100,000 and $500,000 and 42% for smaller companies with revenues under $100,000.

Fewer renovators believe that customers are concerned about health and environmental issues. In fact, opinions are very divided on this issue: 39% agreed that customers are concerned about environmental and health issues when planning their renovations; 39% disagreed; and 21% neither agreed nor disagreed. Renovators who said that their customers are concerned about health and environmental issues were much more likely to have said that their customers choose quality in quality/price trade-offs. Again, opinions about customer attitudes vary by company size. Almost half (48%) of renovators with companies with revenues over $250,000 agreed that customers are concerned about environmental and health issues compared to about one-third (30%) of renovators with smaller companies.

On financial issues, almost half (49%) of renovators agreed that customers are more reluctant to spend money on renovation because of the decline of house values; 34% disagreed; and 17% were neutral. These proportions are consistent for all types of renovators. Similarly, 44% of renovators agreed that it is getting harder to get customers to the point of contract signature; 25% disagreed; and 31% were neutral. The views about customer spending and contract signing are closely related. In other words, renovators who indicated that customers are more reluctant to spend money on renovation because of the decline of house values also tend to be the ones who said that it is getting harder to get customers to the point of contract signature.

The results showing renovator opinions about their customers on these issues are presented in Exhibit 4.5

Exhibit 4.5   Renovator Opinions About Customer Choices and Behaviour

Homeowners concerned about the quality of materials used.

Customers willing to chose quality over price.

More reluctance to spend due to decline in house values.

Harder to get customer to contract signature.

Customers concerned about environmental and health issues.

Disagree
Neither
Agree

0% 10% 20% 30% 40% 50% 60% 70% 80%

Percent of Responses

4.2. Technology Trends

4.2.1 Customer Questions About Specific Products and Technologies

Renovators were asked about the frequency with which their customers ask about 12 different renovation products and technologies related to indoor air quality and a healthy house. Overall, the response to these questions are highly correlated. In other words, the customers who ask about one or more of these technologies are more likely to ask about them all, and customers who do not ask about one or more technologies are much less likely to ask about any of them.

Based on an overall scale of the frequency of customer requests about the 12 renovation products and technologies, almost half of renovators (46%) indicated that their customers ask about these products and technologies "sometimes". Only 13% of renovators have customers who ask about them frequently or very frequently. For the other 41% of renovators, their customers ask about these products and technologies only infrequently.

Overall, CHBA members were more likely to report that their customers ask about these 12 products and technologies. The average score on the summary scale for CHBA members is 4.0 compared to 3.6 for non-members and 3.2 for APCHQ members. In percentage terms, 68% of CHBA members say that customers ask about these items as least sometimes (53% sometimes and 15% frequently). For non-members, 50% said their customers ask about these technologies at least sometimes. For APCHQ members, the corresponding figure is only 35%.

For specific products and technologies, renovators reported that customers ask about five of twelve items frequently:

1. **hardwood/ceramic flooring**: 93% report that customers ask about this at least sometimes, including 56% who say customers ask very frequently (6 or 7 on the scale); the scale mean = 5.4

2. **high-performance windows**: 91% ask about this at least sometimes, including 54% who ask very frequently; the scale mean = 5.4

3. **high-efficiency furnaces and AC::** 75% ask about this at least sometimes, including 38% who ask very frequently; the scale mean = 4.6

4. **Gas fireplace**: 71% ask about this at least sometimes, including 34% who ask very frequently; the scale mean = 4.4

5. **Ventilation equipment**: 62% ask about this at least sometimes, including 19% who ask very frequently; the scale mean = 4.0

Renovators reported that most of their customers ask about five of the other seven items only sometimes:

- **upgraded insulation beyond code**: 56% say customers ask at least sometimes; mean = 3.8
- **heat recovery ventilation systems**: 52%; mean = 3.8
- **air filtration/humidification**: 50%; mean = 3.4
- **low odour, water-based paints**: 47%; mean = 3.4
- **water-conserving toilets and fixtures**: 44%; mean = 3.4

Renovators indicated that their customers ask about two other products and technologies only infrequently: solid wood or low off-gassing millwork (scale mean = 2.4), and solar heating (scale mean = 1.8).

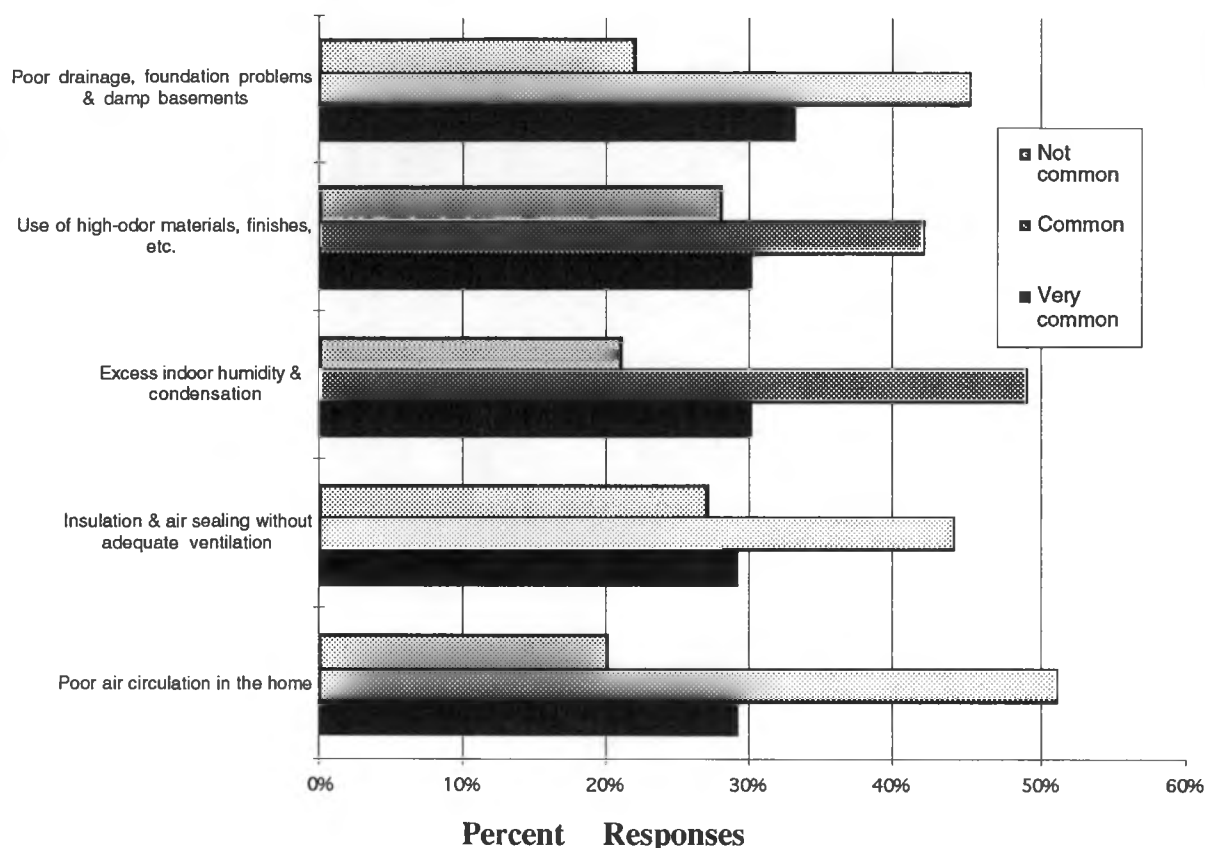### 4.2.2 Pre-existing Indoor Air Quality Problems in Homes

Renovators reported that pre-existing problems affecting indoor air quality such as poor air circulation or excess indoor humidity are fairly common in the homes they renovate. Using an "IAQ problem scale" comprised of the six different types of problems listed in the survey, 30% reported these problems to be very common; 44% said they are fairly common, and 25% said they are not common. The average score on this overall problem scale is 4.4. These results were similar for different types of renovators.

The responses to five of the six problems are similar: poor drainage, excess indoor humidity and condensation, poor air circulation, lack of ventilation in the living area, and insulation and air sealing without adequate ventilation. For these five problems the scale means vary from 4.5 and 4.7. In percentage terms, approximately 20%-30% of renovators reported the problems are not common, 40%- 50% said they are fairly common, and 20%-30% say they are very common.

Use of high-odour materials, finishes and adhesives is not reported to be as common a problem. While 52% of renovators said that this type of problem is at least fairly common, only 14% considered it to be very common.

These results are presented in Exhibit 4.6.

Exhibit 4.6 Existing IAQ Problems in Homes

Horizontal bar chart showing percent responses for categories: Poor drainage, foundation problems & damp basements; Use of high-odor materials, finishes, etc.; Excess indoor humidity & condensation; Insulation & air sealing without adequate ventilation; Poor air circulation in the home. Legend: Not common, Common, Very common. X-axis: Percent Responses (0% to 60%).

4.3 Renovator Experiences and Opinions About Ventilation and Indoor Air Quality

4.3.1 Problems Requiring Ventilation

Most renovators (85%) reported that they encounter existing problems such as mold, mildew or condensation which require ventilation in the homes they renovate at least sometimes; 25% said they encounter these problems very frequently; just 15% said they encounter these problems rarely or infrequently.

CHBA and APCHQ members indicated that they are more likely to encounter existing problems requiring ventilation than non-members. Almost one-third (32%) of CHBA members and 27% of APCHQ members reported that they encounter such problems very frequently compared to just 12% of non-members. The scale means for CHBA and APCHQ members is 4.7 compared to 4.2 for non-members.

Companies with revenues over $100,000 are also more likely to encounter these problems; about 30% of these companies encounter these problems very frequently compared to 16% of small companies with revenues under $100,000.

Renovators are generally quite confident about their ability to deal with ventilation problems. About one-half of renovators (48%) said they seldom run into ventilation problems that are hard for them to assess or solve. Most others (45%) indicate that they encounter hard-to-solve problems only sometimes. Only a few (7%) said they encounter the kinds of problems which they have difficulty solving very frequently.

4.3.2 Renovator-Customer Discussions about IAQ and Ventilation

For 89% of renovators, problems like molds, mildew or condensation which might require ventilation are discussed with customers at least sometimes; for 67% these problems are discussed always or almost always. For virtually all of the large companies with revenues over $500,000, these problems are discussed always or almost always.

Most renovators (89%) said that they recommend adding ventilation equipment to the home at least sometimes; 52% reported that they recommend adding ventilation equipment all the time or almost all the time (6 or 7 on the scale). CHBA and APCHQ members are more likely to recommend adding ventilation equipment than non-members: 57% and 56%, respectively, recommend adding ventilation very frequently compared to 40% of non-members.

Most renovators (82%) indicated that their customers accept their recommendations at least sometimes; 18% said they do so always or almost always. Again, customers of CHBA and APCHQ members are more likely to accept their renovators' recommendations than customers of non-members: 20% and 23%, respectively, said their customers accept their recommendations always or almost always compared to 14% of non-members.

A majority of renovators reported that their customers complain about poor air or indoor air quality problems: 58% said they complain about these problems at least sometimes, including 6% who said they complain frequently; 42% reported that their customers seldom complain about these problems. Customers of CHBA members and APCHQ members are more likely to complain about poor air quality than those of non-members.

4.3.3 Recommendations about Ways to Improve IAQ

A majority of renovators usually recommend one of three ways for improving the air quality in a home: adding or modifying venting in soffits and the roof (75%), addition of an HRV system (66%), and adding exhaust fans (65%). CHBA members were more likely to recommend addition of an HRV system (76%). APCHQ members were more likely to recommend addition of an HRV system (82%), add or modify venting in soffits and roof (88%); they were less likely to recommend modifying and balancing existing ductwork (21%), providing new drainage systems (29%), adding windows (14%) or adding an electronic air filter (12%). Non-members were more likely to recommend adding windows (47%) and less likely to recommend adding an HRV system (40%).

Following is the full set of responses to the question about recommended ways to improve air quality in a home.

10

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┌─────────────────────────────────────────────────────────────────────┐
│                          Exhibit  4.7                                 │
│       Recommended  Ways  to  Improve  Indoor  Air  Quality  in  a  Home │
│                                                                       │
│   Recommendation                          %  of  Renovators           │
│                                                                       │
│   Add or modify venting in soffits and roof        75%                │
│   Addition of HRV system                           67%                │
│   Add exhaust fans                                 67%                │
│   Provide new drainage system                      44%                │
│   Modify and balance existing ductwork             42%                │
│   Add windows                                      35%                │
│   Add electric air filter                          30%                │
│   Change finishes such as carpets                  27%                │
│   Other                                             9%                │
└─────────────────────────────────────────────────────────────────────┘
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Most renovators (81%) have had projects that included features to deal with mold or condensation in the last year. Over half (54%) have had projects that included features to deal with allergies. Dryness (26%) and sensitivity to pollution (22%) have been addressed less frequently in their projects in the last year.

CHBA members are much more likely to have had projects with features to deal with allergies (62%) and sensitivity to pollution (32%). APCHQ members were the least likely to have had projects with features to deal with allergies (33%), sensitivity to pollution (10%) and dryness (14%). They were the most likely to have dealt with mold or condensation (91%). Non-members were also less likely to have dealt with allergies (46%) and sensitivity to pollution (13%).

These results are presented in Exhibit 4.8.

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┌─────────────────────────────────────────────────────────────────────┐
│                          Exhibit  4.8                                 │
│       Renovation  Projects  with  Features  to  Deal  with  Health  Needs │
│                                                                       │
│   Type  of  Problem                   Percent  of  Renovators         │
│                                                                       │
│   Allergies                                 51                        │
│   Sensitivity to pollution                  23                        │
│   Mold, condensation                        82                        │
│   Dryness                                   26                        │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
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Most renovators indicated that the renovator (64%) and the mechanical contractor (55%) have had the primary responsibility for specifying ventilation equipment in their renovation projects. Fewer said that this has been the responsibility of the homeowner (29%), designer (20%) or building inspector (10%). Non-members were more likely to say that the building inspector has been primarily responsible for specifying ventilation equipment (21%); very few of the CHBA or APCHQ members said the building inspector had been responsible. Among all the APCHQ respondents, only one said the designer had been responsible. Few APCHQ members said that the mechanical contractor had been responsible: 19% compared to 59% of CHBA members and 56% of non-members.

These results are presented in Exhibit 4.9.

Exhibit 4.9

Agent with Primary Responsibility for Specifying Ventilation Equipment

Agent with Primary Responsibility	Percent of Renovators
Renovator	64
Designer	20
Homeowner	29
Mechanical contractor	55
Building inspector	10
Other	2

4.3.4 Difficulties Dealing with IAQ Problems in Renovation Projects

In general, most renovators do not think that they have any major difficulties dealing with specific IAQ problems in renovation projects. Overall (using a summary index based on four types of problems), two-thirds of renovators (62%) indicated that they do not find it difficult to deal with indoor air quality problems; 29% rated these problems as moderately difficult, and just 9% rated them as very difficult.

For specific problems, while over one-half of renovators (52%) said that recognition and diagnosis of the cause of air quality problems in the homes they renovate is at least moderately difficult, only 10% said this is very difficult; 42% of renovators said this is moderately difficult. CHBA members were the least likely to think recognition and diagnosis of air quality problems is difficult. A majority (54%) said this is not difficult; just 7% said this is very difficult. Non-members were the most likely to find this very difficult (16%); 41% said this is not difficult.

The most significant problem is estimating costs to correct IAQ problems. A majority (57%) rated cost estimating in this area to be at least moderately difficult, including 20% who rated it as very difficult. APCHQ members were the least likely to rate cost estimating as difficult: just 90% said cost estimating is very difficult compared to 20% of CHBA members and 25% of non-members.

Finding subcontractors to do the work to deal with indoor air quality problems was not rated as a serious problem at all. Only 29% rated finding subcontractors as even a moderate problem and just 10% rated it as a serious problem. APCHQ members were more likely to indicate that finding subcontractors is a problem: 19% of APCHQ members rated this as a serious difficulty and another 26% rated it as a moderate difficulty, compared to 8% and 14% respectively for CHBA members, and 11% and 24% respectively for non-members.

Most renovators (64%) do not think it is difficult to plan how to avoid new air quality problems caused by renovation activities; 29% think it is moderately difficult; and just 8% think this is very difficult. CHBA members were even less likely to rate this as a problem: one-third (33%) rated planning how to avoid new IAQ problems as at least moderately difficult but only 5% rated it as very difficult.

The patterns of responses to the four survey questions about difficulties dealing with indoor air quality problems did not vary by the proportion of revenues that respondents earn from renovation (i.e., full-time or part-time renovators).

The results about renovator difficulties dealing with indoor air quality problems are presented in Exhibit 4.10.

Exhibit 4.10 Renovator Difficulties Dealing with IAQ Problems

Percent of Responses
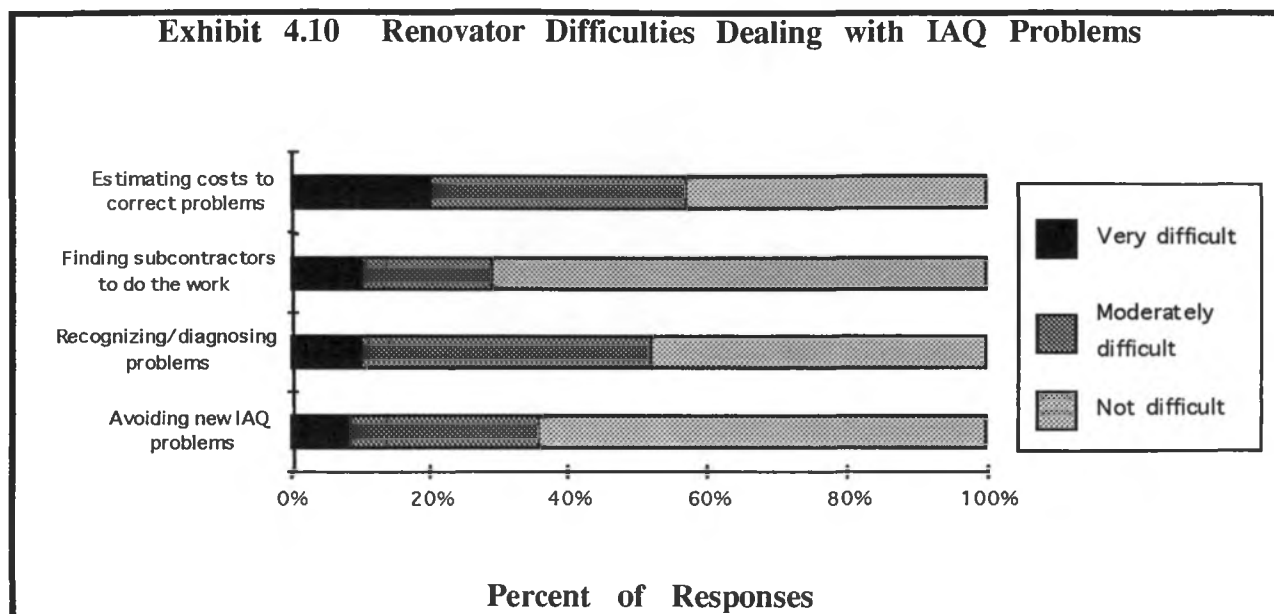
4.4 Information about New Products and Technologies

4.1 Familiarity of Renovators with Ventilation Equipment and Requirements

Most renovators (74%) said they are at least moderately familiar with ventilation equipment including heat recovery and heat recovery ventilators; about one-third (36%) said they are very familiar with ventilation equipment.

CHBA and APCHQ members are far more familiar with ventilation equipment than non-members: 86% of CHBA members and 85% of APCHQ members said they are at least moderately familiar with ventilation equipment compared to just 50% of non-members. The proportions who indicated they are very familiar with ventilation equipment are 47% for CHBA members, 37% for APCHQ members and just 16% for non-members.

Renovators are not nearly as familiar about how to calculate ventilation requirements and select the right equipment. Overall, only about half (53%) said they are at least moderately familiar with how to calculate ventilation requirements; just one in five (20%) said they are very familiar with how to calculate ventilation requirements and select equipment.

Again, CHBA and APCHQ members are far more familiar with how to calculate ventilation requirements and select equipment than non-members: 57% of CHBA members and 79% of APCHQ members said they are at least moderately familiar with how to calculate ventilation requirements compared to just 30% of non-members. The proportions who indicated they are very familiar with how to calculate ventilation requirements are 27% for CHBA members, 23% for APCHQ members and just 4% for non-members.

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4.4.2 Sources of Information about Renovation Products and Technologies

The sources of information about renovation products and technologies used most frequently by renovators are building material supply dealers and manufacturers. Product catalogues, trade and technical publications and their local HBA or Renovation Council are also used as information sources by a majority of renovators.

CHBA members are more likely to use their local HBA or Renovation Council (64%), CMHC (51%), and educational and training institutions (40%).

APCHQ members use a different set of information sources; CMHC (31%), other renovation companies (46%), trade and technical publications (37%), and educational and training institutions (20%). The most significant sources for APCHQ members are manufacturers (83%), their local APCHQ office or renovation council (51%) and product catalogues (54%).

Usage patterns for non-members are similar to those of CHBA members with the exception of educational and training institutions (22%) and their local HBA office or renovation council (32%) - although it is surprising that so many non-affiliated renovators use this source to a relatively high degree.

Levels of satisfaction with the sources of information used are very high: more than 90% of renovators are satisfied with five of the eight sources of information; the lowest level of satisfaction was for product instructions and catalogues for which 83% of renovators expressed satisfaction.

The following exhibit presents the overall results.

Exhibit 4.11		
Information About Renovation Products and Technologies		
Sources of Information and Renovator Satisfaction		
Source of Information	**Usage by Renovators**	**Per cent Satisfied**
Building material supply dealers	82%	86%
Manufacturers	72%	90%
Product instructions/catalogues	59%	83%
Trade and technical publications	58%	93%
Other renovation firms including subcontractors	58%	94%
Local HBA or Renovation Council	52%	93%
CMHC	43%	94%
Educational, training and research institutions	32%	84%

4.4.3 Renovator Interest in Obtaining Information about New Products and Technologies, IAQ and Ventilation

Renovators can be described as being hungry for information about new renovation products and technologies. Almost all renovators (94%) are at least somewhat interested in obtaining more

information, including 72% who are very interested (6 or 7 on the 7 point scale) and 54% who are extremely interested (a rating of 7 on the scale). The overall scale mean is 6.0.

Renovators who earn 100% of their revenues from renovation are highly interested in information about new renovation products and technologies: 81% are very interested (6 or 7 on the 7-point scale), including 71% who are extremely interested (a rating of 7 on the scale). The overall scale mean for exclusive renovators is 6.3.

Renovators are also very interested in obtaining new information about products and technologies related to occupant health and indoor air quality: 89% are at least somewhat interested in obtaining more information; 62% are very interested (6 or 7 on the scale); 43% are extremely interested (a rating of 7 on the 7 point scale). The overall scale mean is 5.6. Exclusive renovators (100% of revenues) are even more interested: 74% are very interested and their average score on the scale is 6.0 compared to 5.3 for companies that earn less than 50% of revenues from renovation.

Companies less involved in interior renovations and additions (under 50% of renovation revenues) are more interested in obtaining new information about products and technologies related to occupant health and indoor air quality: 69% of these companies are very interested compared to 49% of companies earning more than 50% of their renovation revenues from these two activities. The average scores on the scale are 5.9 for the companies with under 50% of revenues from interior renovations and additions and 5.1 for the companies with over 50% of revenues from these activities.

Renovators are divided in their levels of interest in a 3-day training course related to indoor air quality and ventilation. About four out of ten are either not interested (39%) or very interested (38%); the rest (24%) expressed moderate interest in a 3-day course.

Renovators who earn 100% of their revenues from renovation expressed more interest in a course: 50% are very interested and 13% are moderately interested. Only 31% of renovators with companies earning less than 50% of revenues from renovation are very interested; 23% are moderately interested; and 46% are not interested. Companies with 50%-99% of revenues from renovation fall between these two groups: 27% are not interested, 36% are moderately interested and 36% are very interested.

Companies for which interior renovations and additions represent less than 50% or more of their revenues are much more interested in a course: 41% of the companies earning more than 50% of their renovation revenues from interior renovations and additions are very interested compared to 25% of the companies more involved in interior renovations and additions.

Renovator interest in information about these issues is presented in Exhibit 4.12.

Exhibit 4.12 Renovator Interest in Information About New Products and technologies, IAQ and Ventilation

Percent of Responses
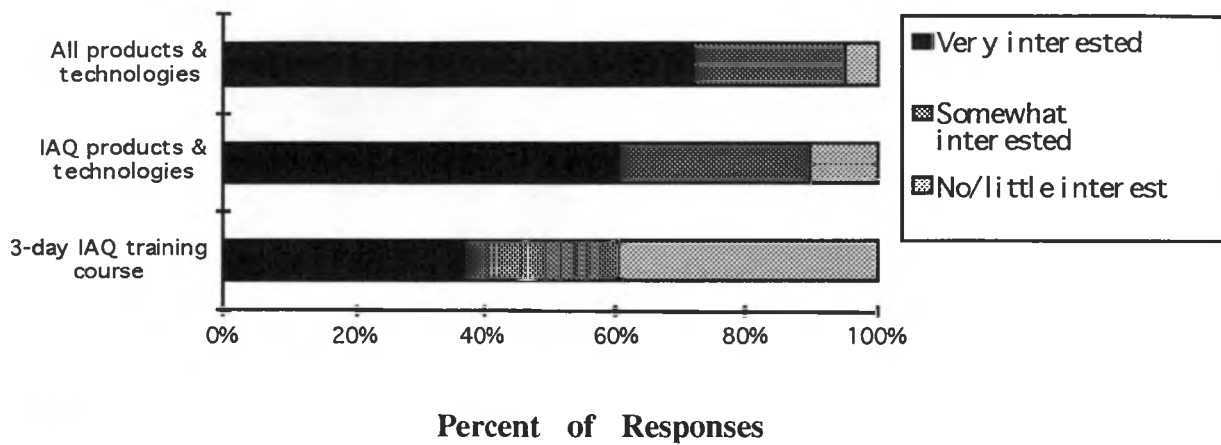
The two most preferred means of getting new information about new technical and product information are trade publications and magazines (74% of renovators) and through pamphlets and fact sheets (69%). Following is a ranking of the preferences of renovators for different ways of getting new information.

Exhibit 4.13
Preferred Means of Getting New Technical and Product Information

Means of Getting Information	% of Renovators
Trade publications and magazines	74%
Pamphlets and fact sheets	69%
Trade shows	50%
Technical reports	45%
Seminars	44%
Sales meetings/presentations	30%
Video seminars	28%
CD Rom	17%
Internet	13%

CHBA members are more interested than others in trade shows (54%), seminars (52%) and technical reports (51%). Almost all of the interest in the Internet comes from CHBA members (18% compared to 9% for non-members and 3% for APCHQ members). APCHQ members are more interested in pamphlets and fact sheets (80%) and sales meetings and presentations (46%). They expressed little interest in seminars (20%) and technical reports (31%).

4.5. Customer Attitudes and Preferences

4.5.1 Customer Interest in Health and Indoor Air Quality Issues

Overall, renovators do not think that consumers are particularly interested in matters related to indoor air quality and the impacts of renovations on health. Nor do they think that customers give a high priority to these issues in their overall set of renovation priorities. Although two-thirds of renovators (65%) said that their customers are at least somewhat interested in matters related to the health and IAQ impacts of their renovations, only 12% said that their customers are very interested. Similarly, while over half (54%) reported that indoor air quality and the health impacts of their renovations are at least a medium priority for customers, only 6% believe that customers give these issues a high priority.

CHBA and APCHQ members think that customers have a slightly higher interest in these issues than non-members. Among CHBA and APCHQ members, 69% said their customers are at least somewhat interested in indoor air quality and the impacts of renovations on health compared to 55% of non-members. Concerning customer priorities, 58% of CHBA members and 53% of APCHQ members indicated that their customers give these issues at least a medium priority in their renovation planning compared to 49% of non-members.

4.5.2 Benefits of Knowledge of Ventilation and IAQ for Renovators

Most renovators (68%) expressed the opinion that renovators' knowledge of ventilation and indoor air quality has at least a moderately positive impact on their ability to get jobs. Almost one-quarter (23%) believe that this knowledge has a large impact.

Renovators who are familiar with ventilation equipment are more likely to think that a renovator's knowledge of ventilation and indoor air quality will have a positive impact on their ability to get jobs. For example, 55% of renovators who are very familiar with ventilation equipment said that their knowledge has a large impact on their ability to get jobs; only 31% of renovators who are somewhat familiar and just 14% of renovators who are not familiar with ventilation equipment said that renovators' knowledge in this area will have a large impact on their ability to get jobs.

CHBA and APCHQ members are more likely to think that knowledge of ventilation and indoor air quality has a moderately positive impact on their ability to get jobs. Three-quarters (73%) of CHBA members and 68% of APCHQ members expressed the opinion that their knowledge of ventilation and indoor air quality has a positive impact on their ability to get jobs compared to 57% of non-members. One-quarter of CHBA members (27%) and APCHQ members (26%) said this knowledge has a large positive impact compared to 12% of non-members.

Companies for which additions and interior work are at least 50% of their revenues are less positive about the benefits of a knowledge of ventilation and indoor air quality. Just 15% of these companies said that such knowledge has a large positive impact compared to 29% of companies for which these activities represent less than 50% of revenues. Conversely, 42% of the over 50% group think this knowledge has no or little impact compared to 25% of the under 50% group of companies. The scale means are 3.8 and 4.4 respectively.

4.5.3 Barriers Limiting Renovators' Ability to Sell Ventilation and IAQ Features

Renovators are divided in their opinions about the consumer appeal of ventilation and indoor air quality features. Over half (53%) of renovators agreed that ventilation and indoor air quality are rarely discussed when work is planned; 36% strongly agree (6 or 7 on the 7-point scale). Similarly, 52% of renovators agreed that ventilation and indoor air quality are not factors in most projects; 34% strongly agreed.

CHBA members are more likely to think that ventilation and IAQ are factors in renovation projects and to indicate that these issues are discussed when work is planned: 46% of CHBA members agreed that ventilation and IAQ are not factors in most renovation projects compared to 63% of APCHQ members and 59% of non-members. Similarly, 44% of CHBA members agreed that ventilation and IAQ are rarely discussed compared to 56% of APCHQ members and 70% of non-members.

Overall (based on a six-question summary scale), one-third of renovators (34%) agreed that there are barriers that make it difficult to sell ventilation and indoor air quality features as part of renovation projects; 22% disagreed; and 44% were unsure (i.e., neither agreed nor disagreed) about this issue. CHBA and APCHQ members were less likely than non-members to think there are barriers that make it difficult to sell these features.

In the opinion of renovators, the most difficult problems that limit their ability to sell ventilation and indoor air quality features are:

1) Customers do not understand ventilation and how it affects a home's air quality: 78% agreed that this as a problem, including 58% who strongly agreed (6 or 7 on the 7-point scale); and

2) Customers are not willing to scale back other aspects of the project to pay for a ventilation system: 69% agreed that this as a problem, including 44% who strongly agreed.

APCHQ members were less likely than CHBA members and non-members to agree with both of these statements: 56% of APCHQ members agreed that customers do not understand ventilation and IAQ compared to 79% of CHBA members and 86% of non-members. Similarly, 47% of APCHQ members agreed that their customers are not willing to scale back other aspects of the project compared to 71% of CHBA members and 74% of non-members.

Many renovators also agreed that they have some problems getting information to help them sell these features. While half (49%) of renovators agreed that there is enough information available to help them sell these features, one-third (34%) disagreed that they have enough information. Similarly, over one-third (38%) agreed that it is difficult for renovators to recognize indoor air quality problems and how to solve them.

CHBA members were far less likely to agree that there is not enough information for renovators to sell indoor air quality and ventilation features: just 33% agreed compared to 67% of APCHQ members and 71% of non-members. CHBA members were also less likely to agree that it is difficult for renovators to recognize IAQ problems and how to solve them: 32% agreed compared to 39% of APCHQ members and 54% of non-members.

Exhibit 4.13   Barriers Limiting Renovators' Ability to Sell Ventilation and IAQ Features

Percent of Response