
Sheet Metal and Roofing Human Resources Analysis

Roofing Final Report

Prepared for:
Sheet Metal and Roofing Trades National Sector
Study Committee

Prepared by:
The ARA Consulting Group Inc.

September 22, 1997

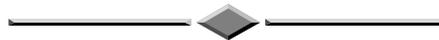
96030

ARA

Table of Contents

1. Introduction and Key Findings	1-1
1.1 Introduction	1-1
1.2 Statement of Objectives and Mandate	1-2
1.3 Key Findings and Recommendations	1-3
1.4 Methodology	1-4
2. Overview of the Industry	2-1
2.1 Contractors	2-1
2.2 Workers	2-4
3. Technology	3-1
3.1 Introduction	3-1
3.2 Background	3-1
3.3 Ongoing Incremental Advancements	3-4
3.4 Sustainable Roofing	3-8
3.5 Environmental Standards and Ecological Conscience	3-8
3.6 Miscellaneous Product Development	3-9
3.7 Conclusion	3-9
3.8 Effects on the Trade	3-10
3.9 Effects on Management	3-12
3.10 Effect on Skills	3-12
4. Contractors' Perspective and Industry Trends	4-1
4.1 Introduction and Methodology	4-2
4.2 Trends in the Business Environment	4-2
4.3 Impact of Technology on the Roofing Industry	4-4
4.4 Impact of Market Trends, Industry Structure and Technology on the Demand for Labour/Skills	4-5
4.5 Supply and Demand for Skills	4-5
4.6 Apprenticeship Training	4-6
4.7 Journeyman Training/ Upgrading	4-7
5. Profile of Workforce and Scope for New Apprentice Intake	5-1
5.1 Industry Structure and Employment	5-2
5.2 Worker Survey	5-3
5.3 Demographics	5-3
5.4 Country of Origin and Language	5-5
5.5 Formal Education	5-6
5.6 Trade Certification	5-7

5.7 Occupational and Skill Requirements	5-9
5.8 Upgrade Training: Importance of Training in Proprietary Systems	5-14
5.9 Types of Upgrade Training and Priorities	5-15
6. Employment Trends	6-1
6.1 Supply/Demand Balance	6-2
6.2 Sources of Employment and Employment Patterns	6-8
6.3 Mobility Across Regions	6-10
7. Skills Profile	7-1
7.1 Skill Breadth	7-2
7.2 Skill Depth — Built-Up Roofing	7-3
7.3 Skill Depth — Single Ply Roofing	7-5
7.4 Skill Depth — Modified Bitumen Roofing	7-7
7.5 Skill Depth — Air Barrier Systems	7-8
7.6 General Conclusions on Skill Breadth and Skill Depth	7-9
7.7 Overview of Basic Skills (Reading, Writing, Trade Math)	7-9
7.8 Reading Skills	7-10
7.9 Schematics and Drawings	7-10
7.10 Trade Math and Basic Math Skills	7-11
7.11 General Prevalence and Requirements	7-12
8. Apprenticeship and Access to the Trade Training	8-1
8.1 Equity Issues	8-1
8.2 Aboriginal People	8-2
8.3 Women in Construction	8-3
9. Training Opportunities	9-1
10. Recommendations	10-1
10.1 Draft Recommendations	10-1



- Appendix A:** Study Committee Members
Appendix B: Survey Methodology and Returns Analysis

Executive Summary

1. Introduction

New materials, information and technology are changing patterns of work in the construction industry. Computers control highly customized work tasks previously executed by both unskilled and skilled workers. Information technology allows better and faster design, retooling, inventory control and product delivery. Flexible and customized manufacturing processes in capital-intensive factories produce both standardized and one-off goods, replacing the mass production of identical products.

These changes are directly affecting the roofing industry. New materials and technologies are replacing some traditional craft methods of work. New tools, materials and processes appear, disappear and reappear. Regulations initially impede and then facilitate change. The risks involved in decision making related to new systems, products and partners are significant: the right choice can present tremendous business opportunities, the wrong choice can be disastrous.

Compounding these challenges, a serious decline in labour demand began in 1990 and a dramatic shift in demographics is increasing the average age of the work force. Government policy is also creating difficulties as cuts to capital budgets reduce work and smaller training budgets discourage new entrants to the trade. As a result, extensive structural unemployment is placing considerable pressure on public social programs, while at the same time, ironically, employers cannot find workers with the skills needed for the new era of construction.

In this context, Human Resources Development Canada (HRDC) has offered assistance to the industry through sectoral councils and National Sector Adjustment Services (NSAS) committees. The Sheet Metal and Roofing Trades National Sector Study Committee was created with representation from all provinces and trades, and includes the Sheet Metal Workers International Association, the Canadian Roofing Contractors Association (CRCA) and the Sheet Metal Association of Contractors in North America (SMACNA). This Committee approached HRDC with a request to undertake a labour market analysis for their trades, in 1996. This report, prepared by The ARA Consulting Group Inc., and its associates, represents the results of that analysis.

The objective of the work is:

“...to provide a guide for training and labour force development and adjustment over the next decade for the sheet metal and roofing trades in Canada. The study will determine the requirements from the trades for put in place construction and maintenance and the new skills that are expected to come into demand over the period as a result of technological change. These estimates will be compared to the size of the existing trades work force and its skills attributes to determine the training needs of the sheet metal and roofing sector over the period.”

This report presents conclusions and recommendations for consideration by the Sheet Metal and Roofing Trades National Sector Study Committee. Further reviews and validation discussions are planned so that a broad cross-section of the industry will have an opportunity to comment on these ideas. However, certain highlights and recommendations are apparent and are presented in this Executive Summary.

The ARA Consulting Group Inc. would like to acknowledge the assistance of the members of the National Sector Study Committee, the Steering Committee and the many survey respondents and participants in provincial advisory groups, focus groups and related interviews. This report is essentially a summary of their views and contributions.

2. Industry Overview

There are two distinct segments in the roofing industry. Low slope roofing systems are used chiefly in high rise residential and Industrial, Commercial and Institutional (ICI) construction. Steep slope roofing (i.e., asphalt or cedar shingling) predominates in low-rise residential construction. In both segments of the industry, demand is driven by new construction and the need to replace existing roofs.

The roofing industry comprises approximately 18,000 persons, employed as journeypersons, supervisors, owner-operators, apprentices and helpers. Of these, in 1996, approximately 11,000-12,000 workers worked exclusively or chiefly in the installation of various low slope roofing systems. Another 6,000-8,000 workers worked as asphalt or cedar shinglers in the steep slope sector. Approximately 40% of workers in the low slope sector also work in shingling.

The scale of work tends to be small — workers spend short periods on a job and contractors/installers operate with very small staff and limited resources. There are many players in this complex industry — roofing material suppliers, unions, owner/clients, general contractors, government regulators and inspectors — experience is essential and the competition is unforgiving.

There is evidence of specialization by contractors and an associated consolidation especially in larger markets. Contractor/installers develop strategic alliances with material suppliers and the combined operation grows to a critical size; serving a large market area. This shift in industry structure seems to be focused in single ply systems. If this process of specialization and consolidation continues and spreads to other types of roofing, workers may become more specialized with fewer opportunities for training and work experience involving a variety of roofing materials.

Another harsh reality that challenges both contractors and workers is the underground economy in construction that consists of many illegal and improper practices undermining the entire construction industry and the roofing trade. These practices include: accepting cash, “straight cheque” or any other payments that escapes the taxes and charges that are normally applied to construction compensation. Other practices seek to reduce the cost of construction by cutting corners or avoiding regulations.

Contractors can be categorized along lines similar to the work force — between residential shinglers and industrial, commercial and institutional (ICI) roofers. The industry is made up of small firms — but the average size of the shinglers is well

below four workers. This suggests an entire industry of owner/operators that have a limited management structure, financial backing or capacity for training.

The roofing industry is subject to marked seasonal fluctuations. Overall, seasonal fluctuations in employment are greater in the roofing industry than in construction as a whole. There is, however, somewhat less fluctuation in roofing work over the economic cycle than in construction as a whole. This is largely attributable to the demand for re-roofing and for repair work which is less volatile than the demand for new construction.

Except in periods of a severe industry downturn, the roofing industry operates at virtually full employment capacity during the summer months. During the winter, unemployment typically exceeds 50%. Cyclical unemployment doubled from under 20% to nearly 40% during the boom-bust in the late 1980s. These conditions have a major impact on human resource management and labour market conditions. Individual employers have limited incentive or resources for training or long term human resource development. Mobility of the workforce and training needs have created a natural role for unions and construction relies on the unionized industry that has recruited, trained and mobilized the workforce for decades. In spite of this natural advantage, unionized firms have been losing share in recent years. Industry conditions also act to discourage new entrants and often “push” workers out of the trades or construction altogether. Overall construction is a unique and challenging environment for human resource development.

An important finding of the study is the high degree of both short-term and long-term inter-provincial mobility of labour. A key conclusion, therefore, is that a continuation of uncoordinated and disparate provincial regulation will weaken the industry by impeding the development of a mobile, skilled labour force. Almost one quarter of the workforce move among provinces seeking work and more would likely benefit if barriers were reduced. Everyone benefits if workers can increase their utilization by increased mobility — incomes rise, productivity increases and skills are used more effectively. Finally, a national or continental job market would encourage shared training facilities, equipment, teachers, curriculum and certification. Training costs are rising as available resources are declining. Sharing training costs across a larger workforce will save needed resources.

3. Technological Change

Currently evolving technology brings better weatherability, installation, improved membrane materials and aesthetics to roofing systems. The increasing efficiency of roofing systems also reduces maintenance costs. There are many large and small examples of new products and applications, but for the most part these changes are not major leaps forward. Rather, they are incremental to existing approaches and unfold over extended periods of time. Roofing manufacturers are responding to the needs of end-users with increasingly durable and efficient roofing products. With diligent planning and an understanding of specific systems, facilities professionals can realize long-term performance for their roofs.

The increasing emphasis on the durability, life-cycle costs, and energy savings of roofing systems is causing the industry to review existing approaches, in the context of the efficient use of natural resources. In some instances, industry is adopting completely new techniques or reintroducing “old” techniques which may have been too

expensive in the past, but, have recently become viable because of total cost considerations over the service life of the roof.

Roofing materials and systems may not change “dramatically” in the future, but, there will be significant efforts to improve performance, reduce costs and mitigate environmental impact. There will also be a movement to the development of “high performance roof systems” — roofs with increased wind and fire resistance, longer service life, lower life cycle costs and improved energy efficiency. Most industry sources indicate that it is in the warranty-related areas that technological improvements and innovation are likely. Technology change will also include new products and methods, improved specification manuals, and more rigorous specification of products. Perhaps the most important trend on the horizon is the emergence of sustainable roofing and green buildings which will force, albeit in a subtle manner, innovative ways of installing new roofs and repairing/recovering old ones. It is in this latter activity that workforce changes, in demand and skills, are most likely.

Technological change, while slow, has the potential to exacerbate the problems of an already unstable diverse and fragmented roofing industry. The industry has a poor image due to litigation, premature roof replacements, and poor installation practices. The current roofing industry is largely driven by marketing and sales; product is marketed using “data” (raw numbers regarding material properties) rather than “information” (which leads to a decision). It is also an industry that relies heavily on specifications and awards projects based on “lowest-cost” because it is assumed that all contractors can perform to the same level of performance. This means that manufacturers “push” the advancement of technology by developing new products which can be promoted as having better properties in order to gain a marketing edge over competitors. There is some “pull” from builders and owners but, they are not motivated by technology change per se, rather they are primarily interested in roof systems which: do not leak, have an extended performance period, involve minimal maintenance and repair, perform in adverse environmental conditions (weather, number of penetrations, traffic, and chemical exposure) and involve the lowest installation cost.

The net effect of technological advancements and the developing structure of the industry on labour specific skill requirements is gradual over time, but significant. There will likely be a two or three tier workforce. At one level, the general roofing contractor segment will be characterized by a stable, relatively well-rounded and reasonably skilled workers. The diversity of jobs and work sites, in addition to the complexities of renovation work which involves many unforeseen circumstances, requires that workers be steeped in traditional skills, experienced with many different types of materials and capable of solving problems as they arise. At the second level, the specialty and large commercial contractors will have fewer fixed employees, but a large group of workers who have been trained to perform one or two relatively simple, repetitive tasks (such as welding seams, spraying a foam mixture or mechanically fastening the roof down give it more structural integrity), but lack understanding of the underlying roofing system principles. The activities of these workers will be directed by a few skilled/trained supervisors.

4. Contractors

In order to investigate the state of contractor related issues, six focus groups were organized in British Columbia, Alberta, Manitoba, Ontario, Quebec and with the National Board of Directors of Canadian Roofing Contractors Association. Fifty contractors, representing both the organized and unorganized sectors of the industry participated in the process.

In the larger markets (B.C., Ontario, and Quebec) there is a growing trend for manufacturers of roofing materials to play a larger role in the industry. Manufacturers certify certain contractors (by training their workers) as installers for their product/systems. The manufacturer in some cases works closely with the contractor in bidding jobs, and carries out some of the sales functions. Firms which are not certified are blocked out of the market, although in some cases if they win a large job, the manufacturer will give them a “quickie certification”.

According to contractors, the key trends in the roofing industry that will have ongoing impact on demand for skills and training are:

- ❑ *Innovation in Materials and Applications*: ongoing change requires a workforce that is constantly being upgraded in the latest materials and procedures. This puts much greater emphasis on journeyman training than apprenticeship;
- ❑ *Strategic Relationships Between Manufacturers of Roofing Materials and Contractors*: this trend gives manufacturers control over market entry. This limits some contractors as to the work that they can bid. It also results in more specialized contractors which, subsequently, narrows the range of skills that workers require;
- ❑ *Increasing Specialization of Contractors in Larger Markets*: in some markets contractors choose to specialize in one or two roofing materials. Workers with one or two materials cannot easily transfer those skills to another type of material; and
- ❑ *Manufacturers Play a Role in Training and Certification of Contractors*: this impacts on the structure of the market. However, there is disagreement about whether manufacturers offer the best training or if it should be a supplement to a regular apprenticeship program.

5. The Workforce

As part of this study, a survey was undertaken of the demographic characteristics, employment patterns and skills of the roofing industry work force. Participation in the survey comprised almost entirely workers who are employed by companies that operate either primarily or solely in the low-slope sector. The Worker Survey does not provide, therefore, information on the demographics and skills of individuals who work only in the asphalt shingle segment of the market.

The results of the survey are summarized as follows:

Demographics

- ❑ Average Age: Total Industry – 33; Low-Scope Roofing Only – 38.

- ❑ Steep-slope roofing is a young worker's industry. There is a high rate of exit from this industry after age 35. In low-slope roofing, this high exit rate occurs after age 45.
- ❑ The industry is challenged by exceptionally high exit rate, compared to construction as a whole. The industry requires a human resource strategy that will both reduce this exit rate and also allocate scarce training resources in a manner which is most efficient in light of exit patterns within the industry.

Education

- ❑ Low levels of formal schooling are common. Basic skills weaknesses (reading, communications, trade math) are likely to be widespread.

Apprenticeship and Certification

- ❑ The incidence of trade certification varies radically across provinces. This is attributable to differences among provinces in the regulation of the trade. In Ontario, 60% of the industry work force are not certified.

Occupational Structure

- ❑ In provinces where certification is voluntary, the industry's occupational requirements are for: journeypersons to function as crew leaders and assistant crew leaders (30%), apprentices (10%), non-certified, material handlers (50%) and trainee/helpers (10%).
- ❑ This model will provide an occupational ladder that may reduce industry turnover. More important, this model will assist the industry in allocating its scarce training resources in the most efficient manner.
- ❑ Structuring occupations along these lines will maximize the industry's return to training investments by allocating training resources roughly in proportion to propensity to remain working in the roofing industry.
- ❑ In provinces where certification is mandatory, the key issues are the appropriate ratio between journeypersons and apprentices and managing apprentice entry and training so as to keep attrition within construction industry norms.

Employer-Based/Sponsored Training

- ❑ The roofing industry is distinctive in the importance of proprietary materials, methods and systems. It is essential to bring manufacturers of roofing systems to the training table and to track, certify and monitor training in proprietary roofing systems.

Employment Trends

- ❑ In the medium term, increases in the demand for labour can be met without increasing the absolute size of the industry work force. New entrant intake should be approximately 6% in relation to an estimated annual exit rate of 7%.
- ❑ 2/3 to 3/4 of industry members worked for only one contractor during the past twelve months. This is consistent with the prevalence of proprietary roofing systems in localized markets.
- ❑ 16% of apprentices reported working in only one roofing system in the past year. This raises an important issue of skill breadth in the administration of apprenticeship.
- ❑ Interprovincial Mobility is significant in both the short-run and the long-run:
- ❑ 10% of industry members worked in more than one province in the past twelve months.
- ❑ 33% of industry members worked in more than one province in the past ten years.
- ❑ 12.5% of certified industry members are currently resident in a province other than the province in which they obtained their certification. This points to the importance of red seal certification and the maintenance of national standards.

Basic Skills (Reading, Writing, Trade Math)

- ❑ Reading and math skill requirements for non-supervisory jobs are moderate and compare approximately with grade 11.
- ❑ Basic computer literacy is not widely required at present.

The key recommendations resulting from the survey are presented by category as follows:

Trades Training and Certification

1. Increase resources committed to basic skills upgrading (reading, math, communications). This will be needed for both journeypersons and apprentices. In some provinces — especially in Ontario — English as a second language should be part of basic skills upgrading.
2. Designation of roofing as an apprenticeship trade should be the norm in all provinces. In particular, this implies that steps should be taken to have roofing designated as a trade in Ontario.
3. In provinces in which certification is voluntary, introduce certification and training that reflects the tiering of the workforce among journeypersons, semi-skilled roofers and helpers/trainees. Journeypersons would continue to receive traditional apprenticeship training based on employment time and trades school instruction. Semi-skilled roofers would receive training in at least one type of roofing. Helpers/trainees would receive training in basic construction procedures and safe working practices. The helper/trainee level would be the standard entry point into the industry for persons with no prior experience.

Persons wishing to move from the helper/trainee level to semi-skilled roofers or to an apprenticeship should receive credit for their experience and prior training.

4. In provinces in which certification is mandatory and in which there is also a high rate of attrition from apprenticeships, greater use should be made of pre-apprentice training. If recommendation No. 3 is adopted, the training proposed for semi-skilled crew members would fulfill this role.
5. Establish a training council in which manufacturers of roofing systems are brought in as critical stakeholders in the industry. Introduce a system of tracking, certifying and recording training in proprietary roofing systems. Develop standards applicable to such training.
6. Expand upgrade training opportunities in: estimation, membrane welding and basic supervision skills.
7. Take steps to ensure the breadth of the trade by designing and administering apprenticeships that counter-balance specialization in only one type of roofing system. These steps might include increasing the trades school component. In light of the tendency of tradespersons and apprentices to work with one employer and the prevalence of employer specific training on proprietary roofing systems, rotation of apprentices across employers will not be practical in most cases.
8. Until approximately 2000/2001, new entrants should not exceed exits. A new entrant rate of approximately 6% in relation to an estimated exit rate of 7% would represent an appropriate re-balancing of supply of demand. After the balance between supply and demand is improved, average annual hours of employment will return to levels that prevailed in the 1980's. With lower turnover rates, the average level of proficiency in the industry will increase. This, in turn, will enable the industry to realize a greater return on its investments in training.
9. Make the red seal standard the operative standard in each province. Consideration should also be given to seeking mandatory status for the roofing trade in those provinces which currently make certification voluntary.

Basic Skills Training

1. Promote the adoption of a national occupational standard which specifies a reasonable degree of both skill breadth and skill depth.
2. Develop a system of recording, monitoring and certifying training in proprietary roofing systems and adopt standards applicable to this type of training.
3. Consider strategies for undertaking training in proprietary roofing systems on a multi-employer basis or using colleges to augment the generic and portable content of such training.
4. Make upgrade training available to supervisors in basic computer literacy with particular emphasis on retrieval and manipulation of computer-based drawings (i.e., CAD).

5. Ensure adequate math, reading and communications upgrading opportunities for apprentices entering the trade with less than grade 11.

6. Training Opportunities

The inventory of training opportunities was compiled by contacting the Canadian Labour Force Development Board, all the provincial roofing contractor associations and associate members of the Canadian Roofing Contractors Association by means of a simple questionnaire and telephone follow-up. A similar inquiry was sent to all SMWIA locals with training centers.

The inquiry identified six distinct training deliverers:

- ❑ Community Colleges and CEGEPS;
- ❑ Industry Associations;
- ❑ CCQ (Quebec);
- ❑ Union-Affiliated Training Centers;
- ❑ Non-Profit Non union Training Center; and
- ❑ Private (for profit) Training Centers.

Generally, apprenticeship programs are similar in structure but vary in distinct details across the provinces. Completing an apprenticeship and/or obtaining a Certificate of Qualification is only required to work in Quebec and British Columbia, in all other provinces the training and certification is voluntary. There are ongoing changes in some aspects of the system with Ontario now considering the regulation of roofing and Manitoba acquiring the training system now in place in Saskatchewan. Overall, the quality and quantity of roofing training programs is improving.

In provinces such as Alberta and Ontario, the industry wishes to create their own training school to meet its needs, as the industry finds that the programs currently available are not effective. In Quebec, there is a recently opened training facility which is well received by the industry. In Manitoba, a roofing apprenticeship program was recently put in place. While in Nova Scotia and New Brunswick there are no training facilities. In Nova Scotia workers are trained solely on the job, New Brunswick has no curriculum, and any training materials are out of date. Saskatchewan has a mobile training delivery system which goes to where the workers are; relying on employers to become involved in training. In British Columbia, an industry association operated school supplies workers to both the union and non-union sectors.

In addition to the formal in-class training for roofing apprentices, many of the roofing trade associations provide in-class instruction related to the application of various roofing materials. These are primarily focused on the health and safety related to the installation of products.

Due to the complexity and unique characteristics of various roofing materials, several product manufactures offer worker training. Some manufacturers require training and certification of applicators as part of their licensed applicator agreements with roofing contractor firms. This is particularly prevalent with manufacturers of synthetic single ply, modified bitumen, elastomeric coatings and sprayed polyurethane foam. Training

is conducted at the manufacturer's/supplier's facilities or at the roofing contractor's shops.

Some training is being provided by private (for profit) organizations. However, the primary focus of these providers is the managerial or maintenance personnel of public and private sector organizations. Courses on roofing are generally constructed in seminar and workshop settings.

7. Recommendations

The National Study Committee has prepared draft recommendations that are presented in this section. It is important to recognize that conditions vary across provinces and the need for change is not the same everywhere. Furthermore, the recommendations are intended to balance the needs of both the workers (union, non-union and future entrants) and contractors. In general, the workers are best served by fewer barriers to mobility and access to more work through enhanced personal skills. Contractors require access to skilled workers at competitive rates with the flexibility to manage their business to maximize growth and profit.

It is recommended that the "Sheet Metal and Roofing Trades National Sector Study Committee" work with industry leaders and structure activities that will:

- ❑ *A National Roofing Human Resources Committee* — structure a national roofing committee to implement the recommendations of this report;
- ❑ *National Standards* — encourage the further development of national occupational standards for roofing industry journeypersons and apprentices based on the established work in this area. Work with the provinces to gain their support for these standards;
- ❑ *Basic Skills Upgrading* — increase resources committed to basic skills upgrading (reading, math and communications) for journeymen and apprentices;
- ❑ *Certification and Training for a Tiered Workforce* — introduce trade certification and training for a tiered workforce structure that includes: journeyperson roofers (skilled); apprentices (journeypersons – skilled); material handlers (task-skilled) and roofer trainees (semi-skilled);
- ❑ *Tracking Certification of Proprietary Systems* — devise a system for certifying employer-based training in proprietary roofing systems. This system might include the adoption of a "training passport";
- ❑ *Specialized Upgrade Training* — expand upgrade training opportunities in estimation, computer operation, membrane welding and blueprint reading;
- ❑ *Broaden Apprentice Scope* — take steps to ensure the breadth of the trade by designing and administering apprenticeship so as to counter-balance the specialization in only one type of roofing system. These steps might include increasing the trades school component;

- ❑ *Balance Entry and Exit to the Trade* — over the next five years the industry should be careful to limit the number of new entrants into the workforce to equal the number of exits. This should be accomplished by limiting new entry to roughly equal 6% of the workforce. Once a more satisfactory balance of supply and demand for labour is established the level of utilization will rise for workers;
- ❑ *Open Access for Equity Groups* — encourage an openness to proposals and requests from designated groups (women, aboriginal groups, handicapped people, visible minorities and others) that fit with the other recommendations noted here; and
- ❑ *Improved Human Resource Records* — develop a national, computerized standard system for keeping human resource records including hours of work, work experience, educational attainment, employment records (construction and non-construction), upgrade training, and certification and exit/retirement age. Records should track the certifications of workers on proprietary roofing systems.

These recommendations are based on the understanding that all roofing workers, regardless of their employment level, career aspirations, organizations of the crew, or the type of roofing (steep or low slope) require a basic and quantifiable set of skills in order to work efficiently and productively as members of a roofing crew.

The basis training will, therefore, be the minimum required by all individuals working in roofing, and should include instruction in such areas as safety, work organization, basic roofing technology and materials, equipment handling, math, communication, etc.

Upon completion of the basic roofer training, individuals who aspire to become journeyperson roofers may apply for apprenticeship training which would consist of the more structured and formal training currently in place.

This structure would most effectively meet the current and anticipated future demand for workers given a tiered workforce.

1. Introduction and Key Findings

1.1 Introduction

The industrialization of construction is bringing fundamental change to all trades including the roofing trade. Construction workers are being forced through an accelerated workplace adjustment process that spanned over fifty years for the rest of the labour force. Other industries passed through a craft phase into a mass production phase and are now entering the information phase of work organization. The first industrial revolution, in the nineteenth century, saw a wave of new technology that allowed skilled craftsmen to build customized manufactures on a “one off” basis. This type of goods production combined specialized tools and materials with work place techniques that had been used in building for centuries. This was the high point of small scale, home based manufactures. Earlier in this century, a second industrial revolution introduced mass production and forced massive dislocation of industrial workers — but these techniques (and the associated impact on work practices) never reached construction.

By its core nature construction remained focused on individual crafts bringing their skills to build a customized structure on a unique site. Mass production techniques did not apply to construction and the workforce was spared the wrenching deskilling and job loss that hit the manufacturing workforce. The third industrial revolution, however, is not sparing construction.

New materials, information and other technologies are again changing work patterns. Computers can now automate and control highly customized work tasks that were previously done by both unskilled and skilled workers. The potential for information technology to speed up design, retooling, inventory and delivery systems is, perhaps, even more important. These changes permit flexible manufacturing and customized production. Mass production of identical products is now being replaced by capital intensive factories that produce unique, customized goods. And these changes are directly useful in construction.

New materials and technologies are sweeping through the industry and pushing aside the traditional craft methods of work. This is not a neat and orderly process. The pace of change is sometimes rapid and often random. New tools, materials and processes appear, disappear and reappear. Regulations first impede and then facilitate change. Business risks are huge with opportunities to embrace systems, products and partners constantly appearing. The wrong choice can be fatal.

In addition to these challenges, a devastating decline in demand began in 1990 and a dramatic shift in demographics is raising the average age of the workforce. Government policy is now compounding these difficulties as cuts to capital budgets reduce work and lower spending on training discourages new entrants. A major implication of all this change is massive structural unemployment that is placing a huge cost on public social programs. Employers cannot find needed skills while thousands of workers are unemployed.

1.2 Statement of Objectives and Mandate

Human Resources Development Canada (HRDC) has offered assistance through sectoral councils and industrial adjustment service (IAS), now National Sector Adjustment Services (NSAS), committees. These initiatives are joint efforts, by industry and the department, that target labour force adjustment. The construction industry was invited to take advantage of this system in the early 1990s. The result has been the creation of a series of construction NSAS committees.

The Sheet Metal Workers International Association, the Canadian Roofing Contractors Association (CRCA) and Sheet Metal and Air Conditioning Contractors National Association (SMACNA) approached HRDC with a plan in 1996 and this report represents the results of this effort. The Sheet Metal and Roofing Trades National Sector Study Committee was created with representation from all provinces and trades. A Request for Proposals for a labour market analysis for these trades and occupations was circulated and a contract was awarded to ARA Consulting and its associates. The objective of the work is.

“ . . . to provide a guide for training and labour force development and adjustment over the next decade for the sheet metal and roofing trades in Canada. The study will determine the requirements from the trades for put in place construction and maintenance and the new skills that are expected to come into demand over the period as a result of technological change. These estimates will be compared to the size of the existing trades workforce and its skills attributes to determine the training needs of the sheet metal and roofing sector over the period.”¹

The following activities were proposed to achieve these objectives:

- ❑ interviews with the National Study Committee and regional/trade subcommittees;
- ❑ projections of hours worked by the trades for the period 1995 — 2005 and a discussion of factors driving this demand;
- ❑ projections of the workforce for the sheet metal and roofing trades for the same period based on analysis of the age structure of the workforce, apprenticeship, exit rates and other factors;
- ❑ assessment of the skills attributes of the workforce based on a survey of union members and the non-union workers;
- ❑ a review of the pattern of technological change in the trades and an assessment of its impact on skills, training, hours worked and employment;
- ❑ a review of regional and equity issues related to entry into the trades by designated groups who are now under-represented in construction;

¹ See “Industrial Adjustment Committee request for Proposals for Labour Market Analysis for the Sheet Metal and Roofing Industry Trades and Occupations” Sheet Metal and Roofing National Sectoral Study, April 1995.

- ❑ an inventory of training resources available to the trades;
- ❑ analysis of the apprenticeship entry process; and
- ❑ a series of workshops to validate all of the above analysis.

During the early stages of the study it was agreed that the circumstances of the sheet metal and roofing trades were sufficiently different that it would be best to prepare two separate studies. This, then is the second of two reports — covering the roofing trade.

1.3 Key Findings and Recommendations

This report is not intended to finalize the conclusions and recommendations of the Steering Committee. Further discussions and validation are planned so that a broad cross-section of the industry will have an opportunity to offer their ideas. However, certain highlights are apparent and can be summarized here:

- ❑ National demand for roofers will expand slowly through the period from 1997 to 2005 while moderate economic growth and productivity gains restrain the extent of hours required. Seasonal incidences of skill shortages may occur in some areas. Demand will be strongest for “team leaders” or supervisors who have expertise or certification in several types of roofing.
- ❑ The workforce has a higher concentration of young people than other trades but the general demographics trends are reducing the population of recruits. This might lead to a modest decline in the number of workers available in 2005. Initiatives are needed to attract new and retain aging workers. A sharper drop will follow in the period 2006 — 2015.
- ❑ The supply of available labour will exceed requirements until at least the year 2000. Low utilization and high unemployment will remain key issues.
- ❑ Technological change in roofing is not as urgent an issue as in other trades. While many new types of roofing are available, the large installed base and steady demand for repairs and re-roofing reduce the pace of change.
- ❑ The roofing workforce has a limited base of communication and math skills with little familiarity with computers. While these skills are not extensively needed for many in the trade, there is a growing need for skilled team leaders and supervisors who are able to learn new techniques, provide leadership and manage quality control on the site.
- ❑ Training needs will grow steadily throughout the next ten years. There is a significant need to rebuild the ranks of younger workers with modern skills to avoid limited shortages in the next ten to fifteen years.
- ❑ A difficult situation is emerging. Manufacturers are providing more of the upgrade training for their own roofing systems. Ad hoc and proprietary certification systems are growing and these fragment the skill base of the trade. National standards for training would break down barriers to employment in the trade.
- ❑ Traditional methods of delivering training (long apprenticeship programs with extended classroom periods) may not meet these challenges. Shorter, more flexible systems and computer/multi-media based instruction may be essential to meet the training demands with the limited resources.

- ❑ Unnecessary differences in apprenticeship programs, welding certification, collective agreements, travel arrangements and other conditions limit the mobility of workers across provinces and among jobs. These restrictions compound the labour market imbalances noted in the study.

1.4 Methodology

In order to successfully undertake a study of this scope it is crucial to have broad based involvement of the industry. Many individuals from the roofing industry contributed their time and effort to provide the necessary guidance, information and feedback. Initiatives undertaken during this project, are outlined in the following discussion.

Working Groups

In early discussions with the Study Committee it was decided to set up working groups in each province. These groups were organized to represent a local perspective, union and non-union sectors; labour and management. The key role for the working groups was to provide direction to the consulting team and facilitate contact with other industry representatives. Specific functions of the Working Groups included:

- ❑ identifying issues and any provincial factors which may have impact;
- ❑ helping design questionnaires so that questions relating to skills attributes address key issues and are posed in a language that workers understand;
- ❑ helping select a sample from union membership and solicit the help of union members to help administer the survey;
- ❑ helping select a sample of non-union firms and their workers to participate in the survey;
- ❑ helping select a sample of firms for the contractor focus groups and enlist support of local associations to encourage response;
- ❑ recommending local actuaries or other professional advisors who could access, organize and deliver data on workers from pension or health funds; and
- ❑ providing guidance in the selection of “experts” in the validation process.

Worker Survey

The Worker Survey was the largest single undertaking in the course of this study. The objective was to obtain a statistically significant response to assess skill levels and training needs.

A questionnaire outline was developed by the consulting team and, in partnership with the Steering Committee and Working Groups it was finalized in June, 1997. It is a comprehensive document which requested information on workers’ background, certification, industry experience, basic reading and math skills, as well as a detailed profile of trade skills.

Technology Study

The technology study used both an interview process and a literature review to gather the necessary information. Forty interviews were carried out with manufacturers, contractors and trainers from across the country. The literature review focused on technological change in the industry.

Focus Groups	<p>Between February and March, 1997 focus groups were held with management representatives across the country. The focus groups were organized by the provincial working groups — targeting a representative sample of eight to ten union and non-union participants. The focus groups considered market conditions, new technology, training needs, adequacy of available training, and viable solutions to the issues raised.</p> <p>Apprentice focus groups were organized in four provinces. These groups were structured to include a balanced sample of apprentices from each year. Participants were asked to fill in a brief survey and then discussed a series of questions about entry, classes, on-the job training, costs and administration during their apprenticeship.</p>
Forecasts	<p>Under the direction of HRDC, Informetrica Limited prepared national and provincial forecasts of construction activity. The projections were then broken down into hours worked by building trades.</p>
Recommendations	<p>The findings of the report suggest a series of recommendations to improve the skills and mobility of the roofing work force. Ten recommendations, summarized here, are set out in detail in Section 10. The Sheet Metal and Roofing National Sector Study Committee recommends that:</p> <ol style="list-style-type: none"> 1. A national roofing committee be created to implement the recommendations of this report. In particular the committee would: 2. Encourage the further development of national occupational standards for journeymen roofers based on work already completed in this area. 3. Increase resources committed to basic skills upgrading. 4. Introduce trade certification and training for a tiered work force that includes four categories of workers. This system would not be needed in provinces where compulsory certification exists now. 5. Devise a system of “training passports” for certifying employer based training in proprietary roofing systems. 6. Expand upgrade training opportunities in estimation, computer operation, membrane welding and blueprint reading. 7. Ensure an appropriate breadth of training in apprenticeship. 8. Limit the number of new entrants into the work force to reflect utilization levels, unemployment and the rate of exit. 9. Encourage open access to the trade by designated groups (women, aboriginals, handicapped, visible minorities and others). 10. Develop a standard, national, computerized system for keeping human resource records.

Outline of Report

This report is organized into ten sections. This introduction is followed by a brief description of the industry. This is followed by a review of existing and emerging technology and Section 4 covers the perspective of the contractors. Section 5 reviews projections for demand and supply in the workplace and Section 6 then presents work experience and training of the workforce. Section 7 presents a review of skills in the workforce. Section 8 previews circumstances in apprenticeship programs and then Section 9 presents an inventory of training now available for roofers. Section 10 summarizes our findings and presents preliminary conclusions.

2. Overview of the Industry

This section of the report presents a broad overview of the business environment for roofing contractors and their workforce in Canada. The focus is on business structure, competition and risks. These fundamentals determine the environment where working conditions, skill requirements, technology and training plans are determined.

In 1996 between 11,000 and 12,000 workers were employed as low slope roofers across Canada. This workforce includes both union and non-union employees working on high-rise residential, institutional, commercial and industrial buildings. There are another 6,000 to 8,000 steep slope workers employed primarily as shinglers on low rise residential houses. This division between low slope roofers and shinglers is quite distinct — with little evidence of workers moving from one type of work to the other.

Both shinglers and low slope roofers are shifting and variable groups — hard to identify and measure. Section 5 adds much detail and needed precision to our current description — based on the survey conducted for this study. In both cases these groups have many distinct features that are not common to other construction trades.

For some measures it is difficult to isolate the tradespeople and contractors from industry statistics. Contractors in particular sometimes work in several related trades perhaps offering sheet metal, or other mechanical services like plumbing, heating and air conditioning. Wherever possible we are focusing only on the conditions surrounding the demand for work and the employers supplying products and services related to roofing and related systems.

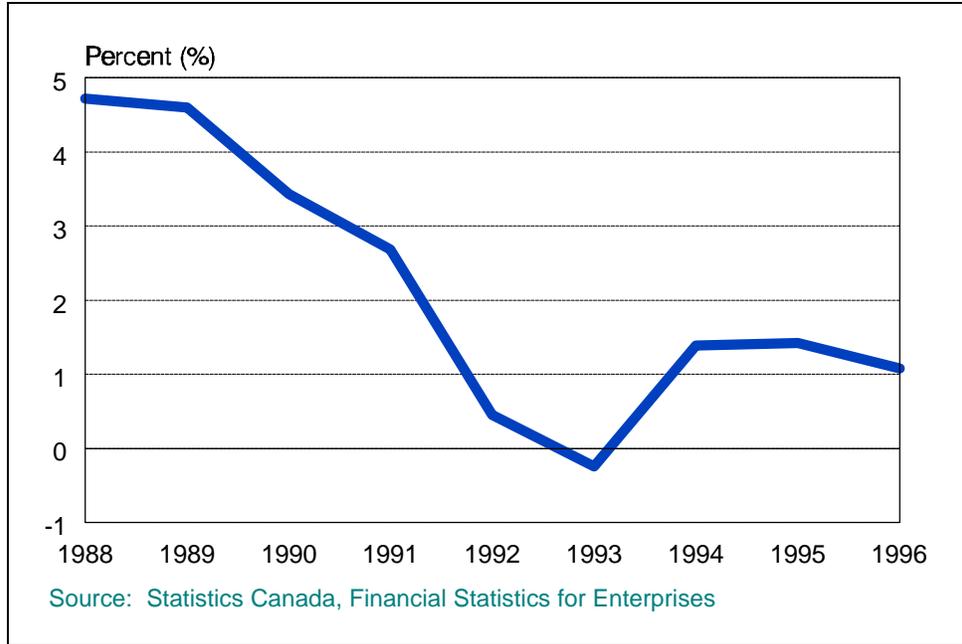
Several themes are repeated in the working conditions for employers and employees in all these areas. Work is risky with unpredictable cyclical and seasonal changes always interfering.

The scale of work tends to be small — workers having short periods on a job and contractors/installers operating with very small staff and limited resources. There are many players in the business — roofing material suppliers, unions, owner/clients, general contractors, government regulators and inspectors. It is thus a complex business where experience is essential and the competition is unforgiving.

2.1 Contractors

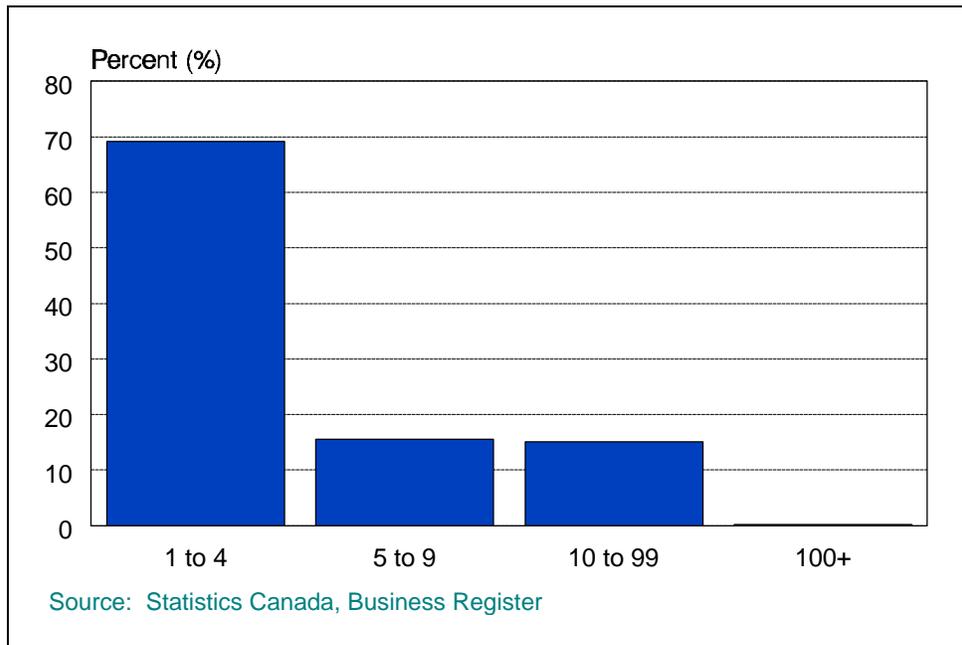
Construction markets are more volatile than the overall economy and the recession since 1990 has been devastating. Construction sub-contractors in general reveal very low profit margins — especially since the recessions began in 1990 (see Exhibit 2.1). Bankruptcy is common with construction firms leading other industry groups in the economy.

*Exhibit 2.1
Profit Margins Special
Trade Contracting,
1988-1996*



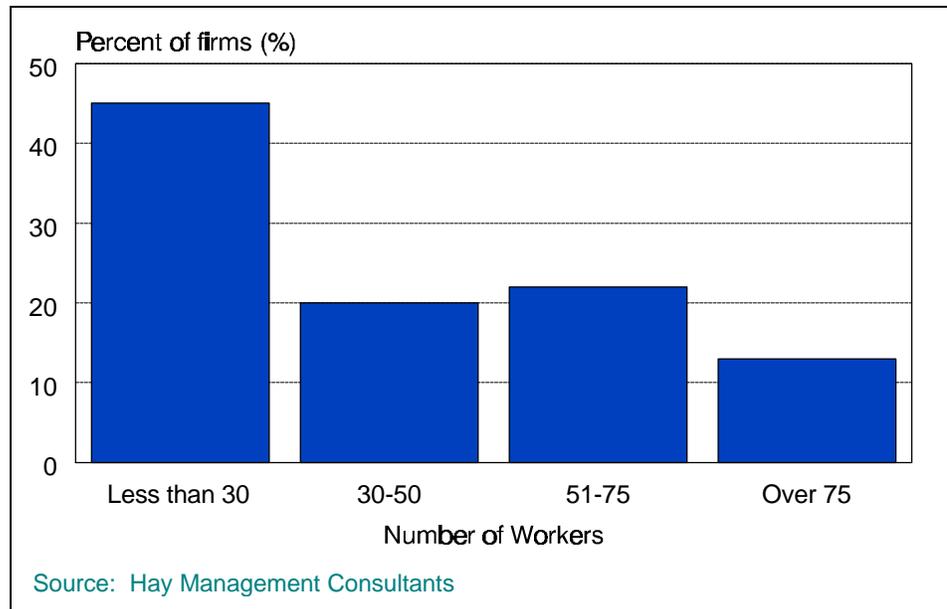
Contractors are divided along the same lines as the work force — between residential shinglers and industrial, commercial and institutional (ICI) roofers. In both cases the industry is made up of small firms — but the average size of the shinglers (shown in Exhibit 2.2) is well below four workers. This suggests an entire industry of owner/operators. For these businesses there would be no management structure, financial backing or capacity for training.

*Exhibit 2.2
Number of Contractors
Roof Shingling —
Canada, 1996*



The low slope roofers were studied in a 1991 report by Hay Management for the Canadian Roofing Contractors Association (CRCA) and that research revealed a slightly larger firm size (shown in Exhibit 2.3).² These larger firms would have a greater investment in machinery and equipment, more depth of management and greater financial backing. Human resources issues are a priority for owners. The 1991 study was arranged for by the industry and it revealed concerns about turnover and the availability of skilled workers. These average size estimates are highly seasonal with the CRCA study reporting that employment doubles during the peak season. We return to this theme in the next section on workers.

*Exhibit 2.3
Distribution of Roofing
Companies, 1990*



There is also evidence of specialization by contractors and an associated consolidation especially in larger markets. Contractor/installers develop strategic alliances with material suppliers and the combined operation grows to a critical size; serving a large market area. This shift in industry structure seems to be focused in single ply systems. If this process of specialization and consolidation continues and spreads to other types of roofing it could alter working conditions and the labour market in important ways. In particular, workers will become more specialized with fewer opportunities for training and work experience with a variety of roofing materials.

Another harsh reality that challenges both contractors and workers is the underground economy in construction. This, rather vague, concept refers to a long list of illegal and improper practices that undermine the functioning of the entire construction industry and the roofing trade. These practices include the accepting cash, “straight cheque” or any other payments that escapes the taxes and charges that are normally applied to

² See report by Hay Management Consultants to the Canadian Roofing Contractors Association. This report compiled data from a sample of 81 CRCA members and 274 of their workers.

construction compensation. Other practices seek to reduce the cost of construction by cutting corners or avoiding regulations. Additional apprentices can be brought onto a job site, workers without proper certification can be used, employees can be obliged to claim “independent operator” status to relieve the employer of tax or WCB responsibilities. There are many more, elaborate schemes that conceal construction activity from authorities.

Everyone loses as these practices grow. Important health, safety, training and retirement programs are weakened; leaving the entire workforce vulnerable to injury and financial risk. Owners are getting poor quality roofs and face unknown liabilities in the event of accidents. Huge costs get built into the systems in the form of unfunded liabilities in pension, health and welfare and WCB funds. A growing shortfall in training is reflected in the lagging and aging skills in the work force. Perhaps the worst part of all this is the pressure on honest contractors and workers who realize that they must compete with underground practices or lose needed jobs.

The roofing trade is likely vulnerable to these practices. While there is little documentation, it seems likely that reroof and repair work in the residential sector is susceptible to underground economy practices. Low slope roofing in high-rise residential and the ICI sector is less vulnerable.

2.2 Workers

Workers also face severe risks — Exhibits 2.4 and 2.5 offers further evidence. Cyclical and seasonal swings in unemployment are huge; creating uncertainty about work opportunities.

The Exhibit 2.4 shows the annual and monthly unadjusted pattern of unemployment for all construction. Annual swings portray the overall cyclical impact with unemployment rising from a low near 11% to a high near 20%. Seasonal variations roughly double the annual levels — with summer rates dropping by about a third. Thus, annual unemployment of 15% in 1995 meant a summer rate near 10% and a winter rate near 24%. In roofing (shown in Exhibit 2.5) these fluctuations are much more dramatic. Cyclical unemployment doubled from under 20% to nearly 40% during the boom-bust in the late 1980s. Seasonal fluctuations are huge with unemployment virtually disappearing in the summer and rising above 50% during the winter.

Exhibit 2.4
 Monthly Unemployment
 Rate for Total
 Construction: Canada,
 1986-1997

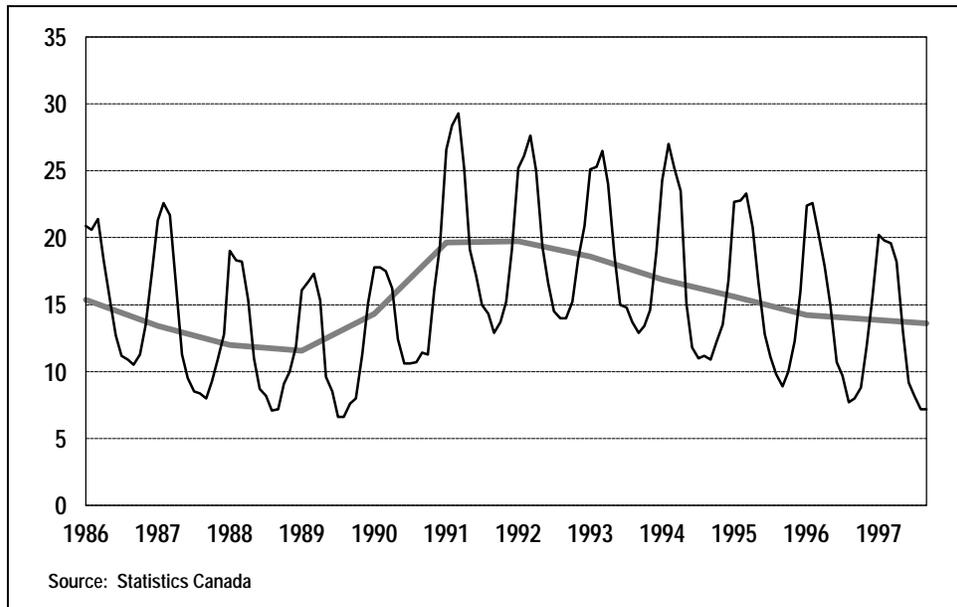
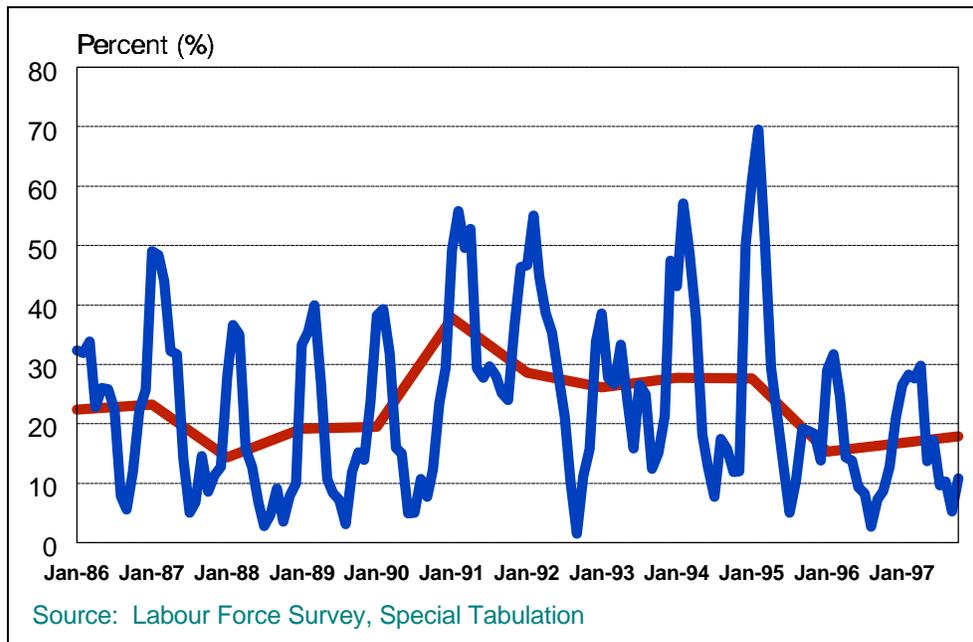


Exhibit 2.5
 Monthly Unemployment
 Rate for Roofers: Canada,
 1986-1997



Unemployment is only part of the story. Workers get fewer hours during a recession. Safety has improved, but there remains a risk of injury. While hourly wages are high, annual incomes are reduced by low utilization. Competition for work is intense and opportunities often require extensive travel.

These conditions have a major impact on human resource management and labour market conditions. Individual employers have limited incentive or resources for training or long term human resource development. Mobility of the workforce and training needs have created a natural role for unions and construction relies on craft unions that have recruited, trained and mobilized the workforce for decades. In spite of this natural

advantage, non-union firms have been gaining share in recent years. For example, data for British Columbia indicates a union share of 45% for the roofing trade.³ Industry conditions also act to discourage new entrants and often “push” workers out of the trades or construction altogether. Overall construction is a unique and challenging environment for human resource development.

Contractors and their workforce usually operate in local markets and activity is distributed across Canada in rough proportion to the population. There is a distinct, regional distribution of roofing systems with specific types and manufacturers having dominant position in certain markets.

While labour markets are often local in orientation it would be a serious error to limit the industry’s vision in this way. To fully develop the opportunities available to both the workforce and employers it is crucial to have a national or continental perspective. This vision of the industry is essential and it must overcome the threat of narrower, provincial interests in Canada.

It may often seem that the industry could develop on a provincial basis. This is especially true for larger provinces where regulations, markets and institutions are self contained and offer opportunities for much of the industry. For smaller provinces this limitation clearly restricts the earnings and choices of contractors and workers. Our report will document several reasons why provincial interests threaten the viability of the industry. For example, almost one quarter of the workforce move among provinces seeking work and more would likely benefit if barriers were reduced. Everyone benefits if workers can increase their utilization by increased mobility — incomes rise, productivity increases and skills are used more effectively. Finally, a national or continental job market would encourage shared training facilities, equipment, teachers, curriculum and certification. Training costs are rising as available resources are declining. Sharing training costs across a larger workforce will save needed resources.

This last theme and the more general characterization of the industry presented in this section will be developed in the rest of the report.

³ See Construction Labour Relations Association of B.C., “Construction Industry Human Resources Project”.

3. Technology

3.1 Introduction

This section presents a review of new and emerging technology in the roofing trade. While the first priority is on emerging innovations in materials, processes and applications, the work also includes analysis of environmental issues, including requirements imposed on structures and health and safety implications of traditional and emerging materials and processes. One key objective of the study is to achieve an understanding of the impact of technology on labour requirements, over the next ten years. For the purposes of this section, new technology is defined as:

“A new innovation in roofing with respect to: system design, materials, methods in the application of materials, system performance, tools, and maintenance, which could affect the quantity and/or the skill content, and/or the time-input component of labour required for a given job.”

Over the last two decades, new construction techniques, in a variety of trades, have had an uneven impact on trade-specific skill demands. Advance knowledge of the impacts of emerging technological change can assist employers, trades people and government in planning programs and other activities. Maintaining currency in training and upgrading programs requires that new skills be incorporated before or as they are needed on the job site.

The emerging trends will not only affect the supply and demand for skills and workers, but significantly influence the type of training required and the apprenticeship selection criteria as well. This section describes technological change implications for the workforce. Some key questions answered are:

What are the primary technology changes (construction processes, costs, productivity, profitability, etc.) affecting the roofing industry; currently and in the future? How quickly will these changes become common practice? How is technology information disseminated through the industry? What are the main factors and motivations causing the adoption of new technology? At what point in the project cycle are the changes originating? Is change more prevalent in material manufacturing as opposed to the techniques used by contractors/installers, and what impact does this have on industry structure. And, finally, has the adoption of new technology resulted in a reduction in the overall demand for labour; an increase or decrease of existing skills, or created a need for a new set of skills?

3.2 Background

The study of roofing technology can be a complicated one. Substantial changes have occurred in the industry over the past decades with the result that there currently exists a large variety of materials, systems and assemblies available for a roofing project. For example, in the United States, there are over 75 single-ply manufacturers which market some 400 products (RS Means, 1997). Research continues in materials science, product chemistry and building envelope physics.

In general, the roofing construction market is traditionally divided into two segments: commercial and residential; which are in turn subdivided into categories of new construction and reroofing. These are by no means definitive terms, but commercial roofing comprises installation of low-slope roofs based on materials such as built-up asphalt/tar systems, modified bitumen and single-ply membranes. Residential roofing comprises installation on steep-slope structures and uses materials such as asphalt shingles, wood shakes/shingles, tile slate and architectural metal systems. However, due to changes in building technology and design, many products are used in all types of roofing and it is increasingly difficult to differentiate the commercial and residential sectors by product type. Reroofing can refer to tear-off and replacement or recover.

The diversity of roofing products and materials and the related options for application, fasteners, adhesives and detailing render the design, construction and repair of roofing systems a complex undertaking. For the purposes of presenting a review of roofing innovation, this section presents a brief explanation of different roofing systems and an overview of roofing industry activity.

Roofing Industry Activity

Activity in the roofing trade generally consists of four different types: new construction, reroofing, recovering and repair. As a national average, 73% of the total roofing business in Canada (value: about \$1.8 billion/year) comprises activity related to reroofing, recovering and repair; new construction represents about 27%. This distribution varies across the country; in British Columbia and the western provinces new construction comprises 36%, while in Ontario and to the east it is 23% (CRCA, Project Pinpoint, Roof Survey, 1994). In the United States, the distribution is quite similar; for the year 1996, replacement and recover represents 74.8% of the commercial roofing market (value: \$13.9 billion) and 82.5% of the residential roofing market (value \$5.7 billion), (NRCA, Market Survey, 1996).

Roofing is also categorized by end use, the characteristics of which vary considerably by region. In Canada, in 1994, the vast majority of projects was in the industrial, commercial and institutional sector (ICI) which represented 86% of total projects (the largest portion of which is in the public sector at 34%) across the country. There is much variance by region, for example, in British Columbia residential activity accounts for 36% of all work whereas in Quebec, it was reported at 4%, no doubt reflecting the high levels of immigration into the former province and the stagnant population in the latter. Quebec, Ontario and the western provinces account for 92% of total industrial roofing in Canada (CRCA, 1994). By way of comparison, in the United States, the commercial market has represented about 71% of the total roofing market for the three years 1994-1996 (no further breakdown of the data is available). However, over the period in question, the dollar value of commercial activity increased by \$2.4 billion (NRCA, 1996).

Generally, roofing system materials can be broken down into four categories: conventional built-up membranes (BUR), single-ply membranes, modified bituminous membranes (Mod-Bit), and other (metal, tile, asphalt shingles, etc.). These categories can be briefly described as follows.

Built-up roofing systems, which have been used for almost 150 years, make use of multiple plies of reinforcing felts laid shingle fashion into continuous moppings of hot asphalt. The system is then covered with aggregate set in an asphalt flood coat or surface coatings. The plies can consist of organic membranes, glass fiber membranes or a combination of both. There are two basic types of BUR: asphalt built-up membranes, and coal tar built-up membranes. In Canada, the most popular BUR are four-ply organic, the national average being 73%, however, its application varies across the country from 47% of projects in the western provinces to 15% in Atlantic Canada. (CRCA, 1994).

Single-ply is primarily synthetic single-layer sheets based on polymers such as polyvinyl chloride (PVC), ethylene propylene diene terpolymer (EPDM), chlorosulfonated polyethylene (CSM) and thermoplastic olefins (TPO); other thermoplastics such as PIB, CSPE, and TRA are also in use. Single-ply can be installed using a variety of means, for example: loose laid and ballasted, fully adhered, mechanically attached, partially adhered. In Canada, 71 percent of single-ply roofs use EPDM, followed by PVC at 24 percent (CRCA, 1994).

Mod-Bit membranes are a factory-rolled product with a rubberized or polymeric asphalt applied to one side at the factory. It can be installed by mopping on hot asphalt to adhere the membrane to the roof or more commonly by using a propane torch to heat the underside of the coating. This turns it into a near-liquid and the membrane is then rolled onto the roof in a continuous operation. As the asphalt cools, it sets and adheres to the substrate. The product is popular in Canada because of its versatility and it is easy to buy and use. Mod-Bit systems combine the capabilities of BUR with the physical characteristics of single-ply roofing, and can be installed on roofs with complicated geometry. Mod-Bit systems developed from traditional asphalt technology; rising petroleum prices in the 1970s caused roofing manufacturers to introduce these systems to remain competitive. Membrane assembly in a controlled-environment factory allows uniformity in thickness, surfacing, etc. and the polymer modifiers result in better weathering and flexibility properties. Mod-Bit are mostly two-ply and, in Canada, 98 percent of the products used on projects contain Styrene-Butadiene-Styrene (SBS); the remainder contain APP (Atactic Polypropylene); other modifiers such as POA (Polyalphaolephine) are in limited use (CRCA, 1994). The properties of the product, which depend on the polymer modifier, vary considerably and appropriate installation methods must be used; the skill of the application of these products is crucial.

Protected membrane roof systems (PMR) are similar to BUR but, involve a rearrangement of the components, with the thermal insulation positioned above the weather-proofing membrane. PMRs are viable due to the availability of polystyrene

foam. PMRs exhibit excellent performance in cold climates and are most common in Canada and the Northern United States. In the PMR configuration, thermal insulation is placed on top of the water-proof membrane. Ballast (large stones, pavers, etc.) holds the insulation in place. Filter fabric (porous non-woven mats of synthetic fiber) placed between the ballast and insulation helps raft the boards together and prevents fine materials from getting between or under the insulation boards.

Roofing System Distribution

In Canada, BUR is the dominant roofing system representing 41.5% of the total market, followed by modified bituminous at 32.5% and single-ply at 24% (CRCA, 1994). In the United States, these data are separated for the new construction and reroofing markets. In the new construction market, single-ply dominates with 37%, followed by BUR at 24.6% and Mod-Bit at 21.2%. “Other” roofing systems (metal, tile, SPF, liquid applied, asphalt shingles) account for 17.4%, in contrast to Canada where this category represents only 2%, primarily reflecting climatic differences between the two countries. In the reroofing market, single-ply again dominates at 31.2%, BUR represents 29%, Mod-Bit represents 23% and the other category accounts for 16.8%. (NRCA, 1996).

The Canadian data and discussions with roofers indicate that materials used and the type of work performed by contractors differs by area; in Ontario and the western provinces an installer is likely to be in a very competitive market oriented to large-surface-area projects which require the cost effective application of large membranes sheets, while the orientation in Atlantic Canada is on relatively small projects and the dominant application is two-ply Mod-Bit.

3.3 Ongoing Incremental Advancements

Due to continuing research in materials science, product chemistry and building envelope physics, etc., there has been (and will continue to be) a steady advancement in the art and science of building roofs. Designers, manufacturers and contractors are all making gradual improvements in system mechanics, product performance, and installation techniques, respectively.

The majority of roofing activity is reroofing, the primary cause for which is a leaking roof. Moisture dynamics is considered to be the number one problem in the roofing industry and considerable effort is being expended to resolve this issue. (For example, the Oak Ridge National Laboratory devotes about 25% of its annual roofing research budget addressing the physical principles of moisture.) The other Achilles heel of roofing systems is wind, which, in the United States at least, is considered to be the cause of most roofing damage.

In this context, the work of several roofing organizations and research institutes, such as the CRCA and the NRCC in Canada, the Oak Ridge National Laboratory and the Department of Energy in the United States, and the CIB/Rilem Joint Committee is valuable and important. These organizations are continually developing and disseminating information on roofing system improvements, testing and standards

development, through seminars (“Building Better Roofs”), workshops (“Sustainable Low-Slope Roofing”), technical bulletins, symposiums and specification manuals.

Currently evolving technology brings better weatherability, installation, improved membrane materials and aesthetics to roofing systems. The increasing efficiency of roofing systems also reduces maintenance costs. Some important examples are presented in the following paragraphs.

In asphalt-based roofing systems, advancements are being made in cold process applications using cold adhesives to install modified bitumens (a component of flexible membrane systems) and in some cases, the underlying base plies. Cold process applications have been around for a long period of time (past fifteen 15 years), however, interest has grown over the past three or four years. As previously discussed, modified bitumens can be segmented into Atactic polypropylene (APP) and styrene butadiene styrene (SBS) modified products. APPs have usually been applied by torch, but no longer in all cases. It is now possible to achieve a good chemical bond through the use of cold adhesives. Either cold adhesives or torch-applied methods can be used to install APPs. Cold adhesives can be beneficial when hot asphalt is difficult to get to a building site or when an owner does not want an open flame on the roof. Many roofers are also combining modified bitumens with built-up systems, where the system consists of two or three layers of base plies with a modified bitumen cap. This permits the redundancy of a built-up roof with the performance of a modified capsheet. This combination roof system (which may add about 5 to 10 percent to the cost) appeals to owners who regard their roof as a capital investment and therefore value long-term performance where the benefits (40 to 60 percent increase to the service life of the roof) can outweigh the costs.

The Copper Development Association is working to bring copper, a 400-year-old technology, into the 21st century, by matching pre-engineered copper systems (manufactured and designed to specific standards to perform under specific conditions) with large architectural projects across the United States. Copper has been utilized in traditional applications in restoration and renovation projects rather than in contemporary, tested systems. By promoting pre-engineered systems, copper roofing has won the confidence of building owners by virtue of its longevity. New advances include portable equipment that mechanically locks seams together at the job site, thereby lowering costs and giving a more uniform and tight installation. New chemical applications speed the patination of copper, so building owners need not wait ten years for the copper to turn its greenish, bluish color, an aesthetically appealing element of this material.

For flexible membrane roofing systems, formerly known as single ply, a popular new technology is thermoplastic polyolefins (TPOs). This heat-weldable, ethylene-based membrane is probably the latest technological breakthrough in the industry. A lesser expensive polymer, TPOs are tough and have strong welds. The three types of flexible sheet membranes are: thermosets, including ethylene propylene diene terpolymer (EPDM) and chlorosulfonated polyethylene (CSPE) or “Hypalon”; thermoplastics, including TPOs and polyvinyl chloride (PVC); and modified bitumens, including APPs and SBSs. A benefit of the heat welding capability of TPOs is that it makes the seam as strong as the material. It also allows for versatility. TPOs and PVCs, both

thermoplastic materials, can be heated and rewelded — an advantage if many penetrations in the roof are necessary.

Many of the metal roofing manufacturers now have clip-down systems rather than through-the-roof fasteners. This improves appearance as fasteners (screws, nails) are not visible and it also virtually eliminates the possibility of leaking. Clip-down systems can be installed on low-slope, 3-inch-high structural standing seams and on architectural standing seams that work in the same types of applications as conventional steep roofing. Another advancement with metal systems is the introduction of better paints that last longer — installers are able to guarantee the original color finish for twenty years with improved paint systems.

Advancements in the spray polyurethane foam (SPF) industry make it more efficient to apply. Better electronic circuitry [on equipment] maintains heat and pressure controls more reliably than in the past. Higher pressure units provide a better mix of material. Robotic equipment is also being used for increased production and for a smoother profile. In addition, new, faster-drying coatings are making SPF systems easier to apply. Manufacturers have also developed the technology to custom-design different systems for a variety of performance demands. For example, systems can be designed to provide more impact- and abrasion-resistance in hail-prone areas or where excessive foot traffic is expected, without using traffic pads. SPF is also more environmentally friendly; in 1992/3, the blowing agents that produce the foam were changed from a CFC-11 to a much less ozone-depleting chemical, HCFC-141b.

Tension fabric roof systems have been around for more than twenty years, but are receiving increased interest. The fabric, a woven fiberglass cloth, is coated with a chemical such as Teflon®. These roof systems are highly translucent, so the building interior has a glowing light appearance and the occupants literally “feel” like they're outdoors. Because of its translucence, the fabric allows more natural light into a building, thus reducing the need for interior lighting and air-conditioning, thereby providing additional energy savings. The material is also durable, designed to carry the same loads that a conventional roof would carry, including substantial wind and snow loads.

There are many other large and small examples of new products and applications (see Table 1), but, for the most part these changes are not major leaps forward. Rather, they are incremental to existing approaches and unfold over extended periods of time. Roofing manufacturers are responding to the needs of end-users with increasingly durable and efficient roofing products. With diligent planning and an understanding of specific systems, facilities professionals can realize long-term performance for their roofs.

Exhibit 3.1: Selected Sample of Trends In Roofing Innovations and/or Products

					Potential Impact	
Item/Manufacturer		Description	Application	Benefit	Hours Worked	Skills Needed
Styrofoam Recovermate	DOW	Lightweight extruded polystyrene insulation	Recover	Resist moisture Withstand high temp without distortion	No Change	No Change
Cool Black HiTuff/EP	Stevens Roofing Systems	Thermoplastic polyolefin membrane (TPO)	All	Absorbs less heat Lower roof top temperatures Heat weldable Can be reheated	No Change	No Change
Quick Apply products	Versico Inc.	Roof accessories with pre-applied adhesive	All	Better detailing Speed	Decrease	Quickly Learned
FRS Workstation	NTE	Self-contained heating and pumping unit, computer controlled bitumen processing	BUR	Filters fumes, odours and pollutants	Decrease	Quickly Learned
Pre-Kleened EPDM	Carisle SynTec Inc.	Talc-free membrane	Single-Ply	Eliminates splice cleaning Primers can be applied with rollers	Decrease	No Change
CD-ROM Data Banks and Websites	various	Computerized technical data on products, design, specifications, estimating, etc.	All	Quick access to consistent information	Marginal Decrease (applies primarily to design, consulting tasks)	Quickly Learned
Sticky Tapes, Peel and Stick Tapes	various	Self-adhesive tape systems for seaming membranes	Membrane Seams	Uniform thickness Better shear resistance under strain	Decrease	Quickly Learned
SPF Improvements	various	Faster-drying coatings, better application equipment, better material mix, blowing agents changes to CFC content	New	Increased production Smoother profile Energy savings	Decrease	Quickly Learned
Hybrid Membranes	various	Combination of BUR and Mod-Bit; 3 plies glass fiber felt with Mod-Bit cap sheet	BUR	Tougher Predictable performance Easier to inspect	No Change	No Change
Metal roofing systems	various	Recent improvements to clip-down fastening and support systems	New and recover	Better appearance Better paints offer 20 year finish guarantee	No Change	Not Done by Roofers
Tension fabrics	various	New Teflon-coated flexible materials	New	Translucent so allows in natural light Durable Energy saving	Unknown	Unknown
Fasteners	various	Improved fastener patterns, mechanics and installation methods	Mechanically Attached Systems	Cleaner More attractive Lower-cost installation	Decrease	Quickly Learned
Stone-Coated Steel-Based Panel	Gerard Roofing Technologies	Lightweight interlocking metal roof system	New or Recover	Superior performance Attractive appearance	No Change	Quickly Learned
Met-Tile	Met-Tile Inc.	Clay tile replacement at lower cost	New	Durability Low cost maintenance Wind resistant	Unknown	Unknown

3.4 Sustainable Roofing

Sustainable roofing has been defined as “a roofing system that addresses the issues of energy efficiency, use of materials with a lower environmental impact and embodied energy, durability and less maintenance, and reduced waste generation throughout the life-cycle from design, through construction and reroofing, to reuse and final disposal” (Oak Ridge National Laboratory). Sustainable roofing is not a material-oriented approach, rather it is a philosophy that considers the use of materials consistent with environmental and economic sustainability.

The increasing emphasis on the durability, life-cycle costs, and energy savings of roofing systems is causing the industry to review existing approaches, in the context of the efficient use of natural resources. In some instances, industry is adopting completely new techniques or reintroducing “old” techniques which may have been too expensive in the past, but, have recently become viable because of total cost considerations over the service life of the roof. An example of the former might include high-performance elastomeric roof coatings. An example of the latter could include spray polyurethane foam (SPF) which has witnessed dramatic growth in the United States in the past five years. However, there are conflicting views on many issues, prevalent in the industry; some would argue that SPFs have a long life, save energy, add durability and contribute little to the waste stream. Others argue that SPFs are not renewable or reusable (a sprayed-on “goop”) and hence are not sustainable.

A relatively new sustainable product is the high-albedo elastomeric coating which exhibits high solar reflectance (achieved through a white colour or embedded aluminum flakes) thus, lowering building energy costs. Additionally, if used in mass applications in large urban areas, computer simulations have indicated that micro-climates can be moderated, thus achieving greater societal benefits (temperature reduction, smog abatement, etc.).

Most of the “sustainable technologies” have existed for some time so the basic design/materials/installation spectrum will not change significantly and the consequent impact on labour and skills will be minimal. However, if these developments progress far enough, low-slope roofing could be designed and constructed to provide a minimum thirty year service life — a fifty percent improvement over historical expectations for built-up roofing.

3.5 Environmental Standards and Ecological Conscience

The emergence of “green buildings” is being given impetus by a combination of new and/or more stringent environmental regulations and general concern for the quality of the environment. The former generates a “push” to adopt new techniques in order that the industry be in compliance with legislation; examples include the VOC and CFC standards which affect product manufacturing processes, as well as on-site membrane seam welding and chemical adhesives use. In the United States, the National Ambient Air Quality Standards, scheduled to come into effect in 1997, are expected to affect job-site emissions, as well as contractor vehicles and equipment. Inevitably, these requirements will migrate north to Canada.

Concern for environmental quality has both an altruistic thrust — the desire to do things correctly and engage the principles of reuse and recycle, and an economic thrust — landfill disposal costs are so high (in some jurisdictions) that they must be factored into total job cost and/or means to avoid used material disposal costs must be determined. The latter may cause an increase in the recover without tear-off type of

project, for example the metal recover systems which, although in existence for the last fifteen years, seem to be enjoying a resurgence, at about 150 million square feet installed (in the United States) per annum. Another product which lends itself to recover projects is the liquid membrane coating which has received marketing hype, but remains relatively unproved in the field. With respect to recycling considerations, it will be important to address the question of how much of the roof can be reused. For a roofing system to be reused, its various components must be able to be taken apart — a process which is almost impossible with bitumen-based systems. Thus, there may be increased emphasis on the way roofs are designed and put together in the future, which may lead to more mechanically fastened systems.

3.6 Miscellaneous Product Development

Manufacturers continually bring “radically” new products to the market place some of which catch the imagination of designers and contractors. A recent survey determined that for reroofing, contractors make the decision on the roofing system for 61.5% of projects, and on the manufacturers product for 86.3% of projects; for new construction, designers and specifiers make the decisions for 81.4% of projects (NRCA, 1996). However, in the context of Canadian climate conditions and economic realities, it is unlikely, in the foreseeable future at least, that radically new products/methods will make significant inroads on tradition, to the extent that labour and skills will be noticeably affected.

3.7 Conclusion

Roofing materials and systems may not change “dramatically” in the future, but, there will be significant efforts to improve performance, reduce costs and mitigate environmental impact. There will also be a movement to the development of “high performance roof systems” — roofs with increased wind and fire resistance, longer service life, lower life cycle costs and improved energy efficiency. Most industry sources indicate that it is in the warranty-related areas that technological improvements and innovation are likely. Technology change will also include new products and methods, improved specification manuals, and more rigorous specification of products. Perhaps the most important trend on the horizon is the emergence of sustainable roofing and green buildings which will force, albeit in a subtle manner, innovative ways of installing new roofs and repairing/recovering old ones. It is in this latter activity that workforce changes, in demand and skills, are most likely.

Many in the roofing industry say there is nothing new. However, this is not entirely true; new technology and improvements to existing methods are continually happening. But, adaptation to, and adoption of, change is slow and thus, labour force and skill-needs repercussions are secondary to overall roofing market demand.

If a long-life and minimum maintenance roof were to become a wide-ranging reality, it could be construed to imply a substantial reduction in reroofing (which currently represents almost 70 percent of industry activity) and hence the demand for labour. Alternatively, this could be offset by more intensive labour requirements to build better roofs and buildings with greater structural integrity.

It would seem that significant activity in recover without existing roof removal and/or a strong move to mechanically fastened systems would decrease workforce demand and create the need for more metal roofing skills. On the other hand, many of the reuse and reclaim procedures (such as ballast vacuuming, membrane reprocessing, polystyrene

insulation recycling, etc.) are labour intensive, both in the way used material is removed from the actual job-site and in the (off-site) reclamation process (although this would not necessarily involve roofers). Thus, on balance, it is difficult to predict the net effect on total labour demand, but it seems reasonable to conclude that while some new skills will be required, the demand for labour will decrease.

3.8 Effects on the Trade

Technological change, while slow, has the potential to exacerbate the problems of an already unstable (poor image due to litigation, premature roof replacements, and poor installation practices), diverse and fragmented roofing industry. The current roofing industry is largely driven by marketing and sales; product is marketed using “data” (raw numbers regarding material properties) rather than “information” (which leads to a decision). It is also an industry that relies heavily on specifications and awards projects based on “lowest-cost” because it is assumed that all contractors can perform to the same level of performance. This means that manufacturers “push” the advancement of technology by developing new products which can be promoted as having better properties in order to gain a marketing edge over competitors. There is some “pull” from builders and owners but, they are not motivated by technology change per se, rather they are primarily interested in roof systems which: do not leak, have an extended performance period, involve minimal maintenance and repair, perform in adverse environmental conditions (weather, number of penetrations, traffic, and chemical exposure) and involve the lowest installation cost.

Technological change is a double edged sword. On the one hand, roofing contractors have a difficult task in differentiating the performance of their roof systems, and earning a fair profit. On the other, technology offers the possibility of improving roofing industry stability as it allows (assuming all participants have equal access to technology): differentiation by performance, total competition (no prequalification or limited competition) and entry barriers to prevent unskilled/untrained contractors from quickly entering the industry.

Technology may also exacerbate the fragmentation in the industry. For example, EPDM membranes can be manufactured in sheets of 50 feet by 200 feet (e.g., Firestone RubberGard) which can be laid much like carpet, particularly on large low-slope surfaces such as warehouse and box-store roofs. This phenomenon, in markets where large surface projects are common, is causing new and/or existing firms to operate in “niche” markets, offering exclusive installation of one or two products/materials/roofing systems. Contractor specialization in specific materials and/or applications results in more specialized and narrower experience and, hence, also affects future skills development and requirements. It also means contractors must expand their geographic range in search of similar projects. For example, Design Roofing Contractors services the entire Northern Ontario region offering two classes of single-ply roofing systems.

Specialization has been both the cause and effect of the emergence of strategic alliances between manufacturers and contractors acquiring exclusive rights to service a specific region with a particular product. In other industrial sectors these alliances have led to industry-consolidation, through mergers and acquisitions, and to the growth of larger firms offering essentially a commodity product; competition is waged primarily on the basis of price. (For example, Allied-Signal Commercial Roofing Systems, has become the largest roofing manufacturer in the United States, with billion dollar sales

which, for this one firm, exceed the value of the total Canadian roofing market.) Consequently, the smaller contractors gradually fall by the wayside. The development of strategic alliances is slowly diffusing through the roofing industry, and the end result will be decreased labour demand and a narrower range of individual skills — roof installation becomes essentially an “assembly line” operation. However, this probably only holds true for the larger population basins of Canada. The emergence and strengthening of the market position of large surface area specialty shops will likely exert significant pressures on the overall structure of the roofing trade, which is described below.

One model to consider is that roofing contractors are dividing into three major types: low-slope commercial contractors, specialty shops, and general contractors. Each of these three segments play a distinct role in the trade and exhibits specific characteristics (although some overlap occurs). Low-slope commercial contractors focus on large surface areas, use primarily large sheet membranes and a select few types of products to service a wide range of end-users; specialty contractors are generally involved in the installation of custom fabric and metal roof systems for a small range of ICI clients; general roofing contractors may range in size from large to small but, they generally perform an all-round trade-function. These trade segments have limited areas of commonality but also differ in their use and adoption rate of technology (see Exhibit 3.2).

Exhibit 3.2: Developing Structure of the Roofing Trade

Contractor Segment	Current Use of Technology	Adoption Rate of Technology	Relation to Manufacturer	Characteristics						
				Project Scope	Roof Slope	Dominant Sector	Geographic Market	Product Variety	Installation Technique	Trends
Low-Slope Commercial	Medium to High	Increasing	Strategic alliance very likely Provides extensive training Provides design and bid preparation assistance	Large Mostly new construction	Low	Major ICI projects	Large, but contained	Very limited	Few	Expanding geographic market, increasing in size and throughput volume
Specialty	Medium to High	Rapidly Increasing	Strategic alliance possible Provides highly specialized training Works closely on design, material and installation solutions	Medium to large Mostly new construction or technical retrofit	Various	ICI	Very wide ranging	Limited or one-off designs	Likely to be specific to each job	Increasing in complexity, barriers to entry developing
General Roofing	Low	Stagnant to Slow	No strategic alliances but probable close relation with several suppliers Provides some general training Little design and bid assistance	Small to medium Mostly reroof but also new construction	Steep and Low	Small ICI and Residential projects	Mostly local	Highly varied	Several	Becoming restricted to residential work and/or small markets

In the future, given current economic conditions and construction sector dynamics, the “specificity” of each segment will probably intensify with (potentially) significant effects on management and labour force skills, which are summarized in the next sections.

3.9 Effects on Management

Accurate and rapid response to large or complex surface area work orders requires computer controlled design, estimating and drawing equipment and thus, there is a need for managers and supervisors to be computer and software literate as well as adept with business technologies and information technologies. Generally, only contractors which have developed strategic alliances with manufacturers will have the capital and time (away from the job-site) to engage in the requisite training. Many small enterprise managers simply cannot afford the required equipment and training.

To remain competitive, firms must continually upgrade existing and acquire new capital equipment. This implies greater need for working capital, and knowledge of cash flow management and financial risk in purchasing new equipment in cases where the market for the end-product is unproved.

It will become increasingly difficult for small enterprises to be able to devote the financial capital and time necessary to remain abreast of new developments in technology and in the field and yet, supervise staff and control all aspects of business. Dealing with the above issues tends to be time-consuming for management, making it increasingly difficult to be a “jack of all trades”. These conditions will likely force more and more consolidation within the industry.

3.10 Effect on Skills

The net effect of technological advancements and the developing structure of the industry on labour specific skill requirements is gradual over time, but significant. The primary technology related skill issues are as follows.

There will likely be a two or three tier workforce. At one level, the general roofing contractor segment will be characterized by a stable, relatively well-rounded and reasonably skilled workers. The diversity of jobs and work sites, in addition to the complexities of renovation work which involves many unforeseen circumstances, requires that workers be steeped in traditional skills, experienced with many different types of materials and capable of solving problems as they arise. At the second level, the specialty and large commercial contractors will have fewer fixed employees, but a large group of workers who have been trained to perform one or two relatively simple, repetitive tasks (such as welding seams, spraying a foam mixture or mechanically fastening the roof down give it more structural integrity), but lack understanding of the underlying roofing system principles. The activities of these workers will be directed by a few skilled/trained supervisors.

With increased roof service life, there should be a declining need for repair work; however, according to industry reports, during the period 1950 to 1975, as many as 50 percent of all roofing systems failed halfway through their predicted design life — these roofs never functioned as intended because of: initial roof design; installation of the roofing system; and lack of maintenance. Thus, it is difficult to predict what the implications of the large inventory of (mostly) built-up roofing will imply for future skills and demand.

Some roof-top machinery and on-the-ground equipment executes work operations faster and easier, requires less physical strength (to operate) and allows workers to be more productive with less “traditional” skills. The introduction of this equipment is increasing because machines provide a productivity edge, albeit at present somewhat limited, necessary for competitive bidding — which is very important in a lowest-cost contract award environment typical of the roofing sector.

For large low-slope, box store jobs, design and cost estimating is increasingly geared to the application of CAD and various types of estimating and construction software. This aspect of technology is moving the labour force to younger entrants and opening opportunities for women where none has existed to date.

4. Contractors' Perspective and Industry Trends

Key Points

- ❑ Innovation in materials and applications is being driven by material suppliers. This has a number of impacts on the industry:
 - manufacturers control which firms are certified to install their material by forming strategic alliances with contractors. This results in the contractors specializing in specific roofing materials; and
 - specialization by contractors leads to specialized and more narrowly defining skills in their workers.
- ❑ Ongoing technological change makes journeyman training very important to maintain marketable skills.
- ❑ Changes in materials are resulting in a two-tier workforce, with demand for fewer, highly skilled workers, and proportionately more lower skilled or unskilled workers.
- ❑ Industry in most provinces feels that it should be directly involved in training to assure timely changes to curriculum. Some of the current institutional systems are not responsive to industry's needs.

4.1 Introduction and Methodology

The Study Committee determined that discussions with contractors would yield valuable insight into the expected needs and preferences for skills and training for the roofing workforce. A series of focus groups were held across the country to provide a formal, systemic way for contractors to present their views on the labour market and overall industry conditions.

A discussion outline was prepared with the input of the Steering Committee covering key topics:

- ❑ market/industry trends;
- ❑ impact of technology;
- ❑ supply and demand for skills; and
- ❑ apprenticeship training and journeyman training/upgrading.

Methodology

Throughout February and March six focus groups were organized in British Columbia, Alberta, Manitoba, Ontario, Quebec and with the National Board of Directors of Canadian Roofing Contractors Association. Fifty contractors, representing both the organized and unorganized sectors of the industry participated in the process. The groups were organized through provincial associations, where they are active, or through members of the Provincial Advisory Groups and the Study Committee. As illustrated in Exhibit 4.1, attendance varied by province, but in each case there was a knowledgeable representation of the industry.

*Exhibit 4.1
Breakdown of
Contractor Focus
Groups*

Province	Roofing Contractors No. Attending
British Columbia	8
Alberta	15
Manitoba	4
Ontario	5
Quebec	8
National	10

The focus groups provided vital information on industry trends and perspectives on how those trends impact on human resource needs. The results gives a clear picture of the demand for labour, skills and training. This section presents these results.

4.2 Trends in the Business Environment

This section presents the contractors' view of the business environment in which they are operating, as well as a discussion of key trends which are changing industry structures in some regions. These trends have a direct impact on training and the skills required from the labour force, and on the actions the industry can undertake at a given point in the business cycle.

Business Conditions Business conditions across the country have been depressed for the last few years, although there is a general optimism regarding business conditions especially in Western Canada. At the time the groups were conducted contractors in Central and Eastern Canada still perceived a relatively slow market.

Much of the industry's work is re-roofing and maintenance. In Quebec re-roofing and maintenance accounts for about 70 per cent of activity. As economic conditions improve it is expected that more major retrofit work will be underway. "There are a lot of 15 to 20 year old roofs out there" giving the industry a positive outlook in the near term. The re-roofing work is generally more labour intensive than installation of new roofs.

Industry Trends and the Role of Manufacturers

In the larger markets (B.C., Ontario, and Quebec) there is a growing trend toward manufacturers of roofing materials, such as EPDM, playing a larger role in the industry. Manufacturers certify certain contractors (by training their workers) as installers for their product/systems. The manufacturer in some cases works closely with the contractor in bidding jobs, and carries out some of the sales functions. Firms which are not certified are blocked out of the market, although in some cases if they win a big job, the manufacturer will give them a "quickie certification".

A brief summary of key activity across the country shows considerable regional variation:

- ❑ in Nova Scotia there is little specialization in roofing materials as the market is too small;
- ❑ in New Brunswick there are various roofing systems on the market, and companies do tend to specialize. Workers develop specific skills and remain with one employer for a longer period of time;
- ❑ in Quebec contractors tend to specialize in one or at most two roof types. Almost 70% of new roofs are newer materials (membrane roofs) while the remainder are the old style asphalt roofs. Regional markets tend to be dominated by local material suppliers and contractors act as their installers;
- ❑ in Ontario the majority of the market has been in re-roofing. The market is divided into EPDM contractors and those that work with other material. Employees working with materials warranted by manufacturer have to be more highly skilled;
- ❑ Manitoba has undergone a restructuring, as two large firms recently shut down spinning off six new firms. Most firms are able to install a range of products, but most of the projects still using more traditional materials;
- ❑ in Saskatchewan the roofing market has been stable, with contractors doing all types of work. Contractors have specialized crews, which may only work in one or two types of material. Material suppliers are also active in certifying installers and in that way controlling access to the market;

- ❑ in Alberta, there is the full gamut of companies, some general and some specialized. It is difficult to find young people to work in the industry that are able to deal with the new technology; and
- ❑ in British Columbia there is a lot of activity in new membrane roofs. The main issue is retaining people in the industry that have the skills to work with the new materials. Manufactures are also very active in this market with some contractors feeling they have too much control over access to certain materials.

The key trends in the roofing industry that will have ongoing impact on demand for skills and training are:

- ❑ innovation in materials and applications: Ongoing change requires a workforce that is constantly being upgraded in the latest materials and procedures. This puts much greater emphasis on journeyman training than apprenticeship;
- ❑ strategic relationships between manufacturers of roofing materials and contractors: This trend gives manufacturers control over market entry. This becomes an issue to some contractors as it limits the work that they can bid for. It also results in more specialized contractors which subsequently narrows the range of skills that workers require;
- ❑ increasing specialization of contractors in larger markets: Not all contractors who specialize are in a strategic relationship with a manufacturer. In some markets contractors choose to specialize in one or two roofing materials. Workers with one or two materials cannot easily transfer those skills to another material type; and
- ❑ manufacturers play a role in training and certification of contractors: By providing training and certification in the market manufacturers impact on the structure of the market. However, there is disagreement about whether manufacturers offer the best training. At best it should be a supplement to a regular apprenticeship program.

4.3 Impact of Technology on the Roofing Industry

This section briefly discusses how technology has affected roofing industry from the perspective of the contractors. A more detailed discussion of technology is found in Section 3 of this report.

Technology Changes

Most of the technology changes in roofing are in materials and application procedures. Although some of the materials have been around for quite some time, the pace of innovation is increasing as architects and engineers become familiar with new materials. Most of these newer materials require different skills as compared to traditional flat roof materials.

Modular roof systems, polyurethane foam installation, metal roofing, BUR combined with other products, are all examples of innovation in roofing materials and/or applications.

4.4 Impact of Market Trends, Industry Structure and Technology on the Demand for Labour/Skills

The major impact of technology (material changes) is on the specialization of contractors by roofing materials. This forces workers into more specialized experience and a narrower range of skills. The issue arises when a worker is laid off from one contractor and does not have the necessary skills to work with another material type.

The change in materials and applications in roofing is also resulting in a two-tier labour force, in respect to skills. Each crew requires one or two workers (foreman, lead hand) that have to be more highly skilled while the remainder of the crew do not require extensive knowledge. They are more likely to require a strong back.

Overall it was difficult for the groups to decide whether more or less labour is required given these changes. In some cases the technology makes the work go faster and easier and requires fewer people. On the other hand because so much of the work is in retrofit, there is still a large labour component required to get the old roof off. The key change is that there will be likely fewer, yet more highly skilled workers in proportion to general unskilled workers.

4.5 Supply and Demand for Skills

The contractors' perspective of the major strengths and weakness of their workforce provides a qualitative indication of where skill gaps exist.

There was consensus among the groups that the most significant weaknesses were the basic skills of reading, writing and math. The new roofing system require a higher degree of literacy in some cases. Also communication skills are poor, with a significant proportion of the workforce not even speaking English. The age of the workforce is a concern but not an overriding one as yet.

In markets, such as B.C., where a larger proportion of the market uses newer materials there is a shortage of workers skilled in those applications. To address this issue the Roofing Contractors of British Columbia established their own school. By training workers to meet the industry's needs any imbalances in the supply and demand for skills will even out in a few years. However, the existing oversupply of tar and kettle workers that are unemployed do not seem to be interested in any type of upgrading or re-training.

Overall, the demand is moving in the direction of specialized skills, as some contractors work with a limited number of materials and in some companies crews are specialized by the type of material being installed. However, for their key staff, contractors still want someone with both the depth and the breadth of industry skills.

Trade Status

Most groups would like to see roofing as a compulsory trade in all provinces, although changes would have to be made to the training system to make it more effective. Enforcement is an issue that few provinces are dealing with effectively. Certification is difficult to enforce in roofing because of the proliferation of small firms, particularly in the residential market. Two suggestions to counteract this were to convince insurance companies to only insure roofs installed by certified roofers, or establish certain licensing arrangement with municipalities.

4.6 Apprenticeship Training

Traditional apprenticeship training programs do not exist in every province. Some provinces that do not have formal programs are working toward that goal. In provinces such as Alberta and Ontario, the industry wishes to create their own training school to meet its needs, as the industry finds that the programs currently available are not effective. In Quebec, there is a recently opened training facility which is well received by the industry. In Manitoba, a roofing apprenticeship program was recently put in place. While in Nova Scotia and New Brunswick there are no training facilities. In Nova Scotia workers are trained solely on the job, New Brunswick has no curriculum, and any training materials are out of date. Saskatchewan has a mobile training delivery system which goes to where the workers are; relying on employers to become involved in training. As mentioned earlier in British Columbia there is an industry run school that is operated by the association and supplies workers to both the union and non-union sectors.

In some provinces contractors felt all of their training needs were being met in-house or by the manufacturers and did not see a need for additional courses. In the provinces where colleges delivered the training, access (only one or two locations in the province) and out-dated curriculum were identified as issues.

Most groups agreed that industry has to play a bigger role in providing training, preferably through setting up their own schools, developing curriculum and investigating other delivery systems. In order to encourage contractors to participate in training there should also be some economic “carrot” or benefit such as a training tax credit.

Contractors were asked their opinion on the role of Provincial/Trade Advisory Committees (PAC/TAC’s). In some provinces PAC/TAC’s were seen to be quite effective, but the industry would still like to see them have more clout. In other provinces, the PAC/TAC’s were seen as virtually useless, as they met too infrequently, and did not accomplish anything.

4.7 Journeyman Training/Upgrading

The existing labour pool of journeymen currently provide a large part of the required skills to the roofing industry. With the rapid changes and innovations to materials and applications journeyman upgrading is of key consideration to the roofing trade.

Trend in Employer Based Training

Most of the journeyman upgrading is carried out by the contractors and material manufacturers. As more new products come onto the market, more training is being handled this way. In many cases the training is comprised of a one or two day workshop. Contractors like this as it conforms to their work schedules and they can ensure that the workers get the training they need. However, this method does have certain drawbacks. It does not allow all contractors and their employees equal access to certain types of training.

In British Columbia the training school offers some journeyman courses, but it is difficult to get the workers to attend. Contractors who have identified skill shortages and are paying a premium for certain skills, state that traditional tar and kettle roofers, even if they are unemployed, will not come in for re-training.

5. Profile of Workforce and Scope for New Apprentice Intake

Key Points

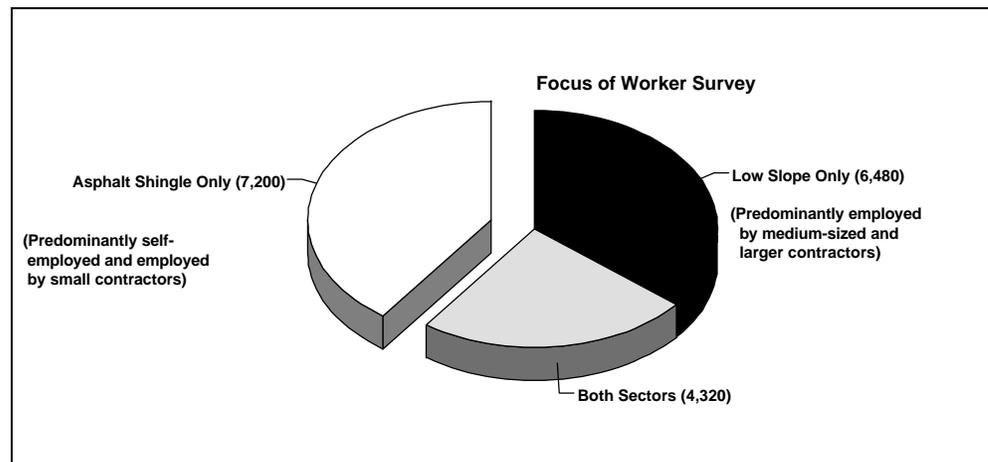
Demographics	<ul style="list-style-type: none"> ❑ Average Age: Total Industry — 33 Low-Slope Roofing Only — 38 ❑ Steep-slope roofing is a young worker's industry with a high exit rate after age 35. In low and flat-slope roofing the high exit rate occurs after age 45. ❑ The industry has a high exit rate compared to the overall construction industry. Patterns of exit must be a factor in determining how occupations and skills needs are defined and how scarce training resources are allocated.
Education	<ul style="list-style-type: none"> ❑ Low levels of formal schooling are common. Basic skills weaknesses (reading, communications, trade math) are likely to be widespread.
Apprenticeship and Certification	<ul style="list-style-type: none"> ❑ The incidence of trade certification varies radically across provinces. This is attributable to differences among provinces in the regulation of the trade. In Ontario, 60% of the industry work force are not certified.
Occupational Structure	<ul style="list-style-type: none"> ❑ In provinces where certification is voluntary, the industry's occupational requirements are for: journeypersons to function as crew leaders and assistant crew leaders, apprentices, semi-skilled roofers and helpers. ❑ Structuring occupations along these lines will maximize the industry's return to training investments by allocating training resources in a manner that will retain workers in the industry. ❑ In provinces where certification is mandatory, the key issues are the appropriate ratio between journeypersons and apprentices and managing apprentice entry and training so as to keep attrition within construction industry norms.
Employer-Based/ Sponsored Training	<ul style="list-style-type: none"> ❑ The roofing industry is distinctive in the importance of proprietary materials, methods and systems. It is essential to bring manufacturers of roofing systems to the training table and to track, certify and monitor training in proprietary roofing systems.

5.1 Industry Structure and Employment

As noted in Section 3 the major division in the roofing industry is between steep-slope roofing, which is chiefly asphalt shingle roofing, and low-slope roofing. Steep-slope roofing is used principally in the low-rise, residential sector. Low-slope roofing systems are found in the high-rise residential sector and in the ICI sector. The principal low-slope roofing systems are: built-up roofing, single-ply roofing and modified bitumen roofing. Specialty roofing, such as copper roofing and tile roofing, accounts for only a small share of the total market. Roughly 75% of the roofing market involves re-roofing existing structures. Consequently, the longevity of roofing systems is a major factor in determining long-run demand.

The roofing industry comprises approximately 17,000-18,000 persons employed as tradespersons, supervisors, owner-operators, apprentices, and helpers.⁴ Of these, approximately 40% work solely in the low-rise, residential sector, that is to say, in the installation, repair and replacement of asphalt shingle roofing. The remainder — roughly 10,000 to 11,000 workers — are employed in low-slope roofing. Approximately 40% of these individuals also work in the steep-slope sector. In some cases, this work is done through their principal employer. In other cases, work in the steep-slope market is done as a secondary source income, either on own account or through a small employer. Exhibit 5.1 summarizes the approximate structure of the roofing industry labour force.

*Exhibit 5.1
Approximate Distribution
of Roofing Industry Work
Force by Sector*



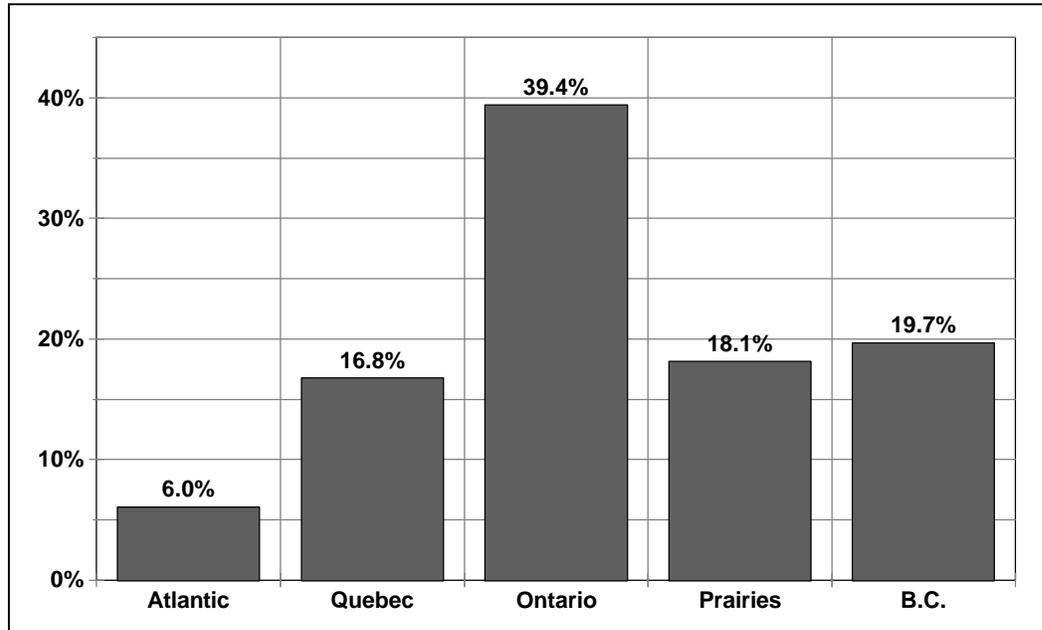
In 1990, 16.8% of the labour force in the overall construction industry was self-employed.⁵ In the asphalt shingle sector, crews of 1-3 persons are the norm. In this environment, the self-employed proportion of the work force is probably greater than the industry average. However, in the low-slope segment of the roofing industry, larger crews are the norm and equipment costs are substantially higher. As a result, self-employment is uncommon.

⁴ Estimate based on a special tabulation of 1991 Census data.

⁵ OECD, Employment Outlook, 1992, p 187 Table 4.A.2 (1990 data).

The regional distribution of the roofing industry labour force is broadly commensurate with the overall distribution of the construction industry work force. Exhibit 5.2 summarizes this distribution, based on the 1991 Census.

*Exhibit 5.2
Distribution of Roofing
Workforce by Region
— (1991 Census)*



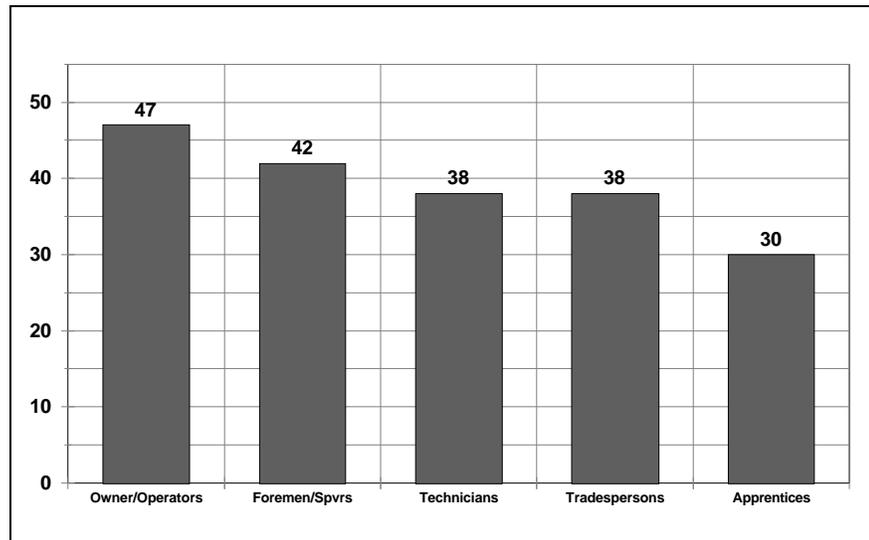
5.2 Worker Survey

As part of this study, a survey was undertaken of the demographic characteristics, employment patterns and skills of the roofing industry work force. The Worker Survey was administered with the co-operation of the Sheet Metal Workers International Association and the national and provincial associations representing roofing contractors. Participation in the survey comprised almost entirely workers who are employed by companies that operate either primarily or solely in the low-slope sector. The Worker Survey does not provide, therefore, information on the demographics and skills of individuals who work only in the asphalt shingle segment of the market. Additional details on the survey are discussed in Appendix A.

5.3 Demographics

Exhibit 5.3 summarizes the average age by occupation of the respondents to the Worker Survey. For all survey respondents, the average was approximately 38. This compares with an estimated average age of 33 in the 1991 Census. The higher age in the Worker Survey can be explained by two factors. First, being skewed to the low-slope segment of the industry, the Worker Survey covered persons who, on average, are better paid, more experienced and significantly more likely to have completed an apprenticeship. Second, the representation of union members in the Worker Survey is greater than in the industry as a whole. On average, union members who participated in the Worker Survey are two years older than non-union workers.

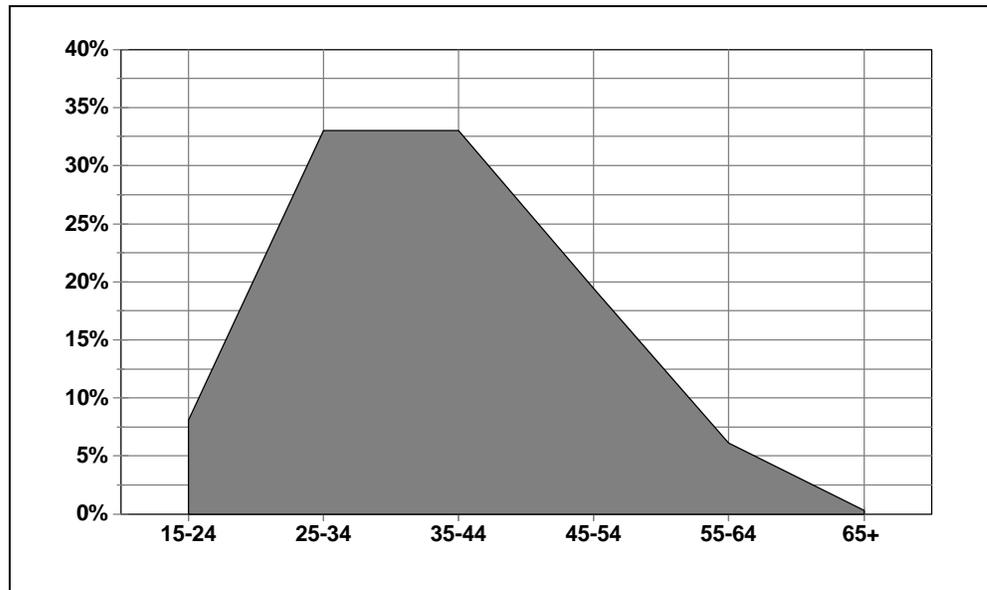
*Exhibit 5.3
Average Age by
Occupation in The
Roofing Industry —
(Worker Survey)*



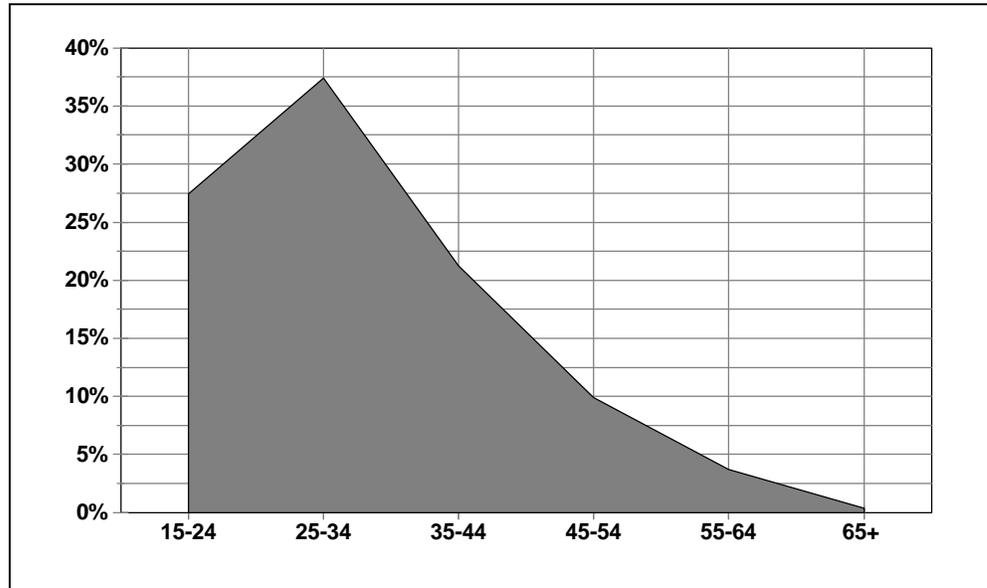
The age of apprentices is close to construction industry norms. Data from the recent National Apprenticeship Survey indicate that the median age of entry into an apprenticeship was 27. It should be noted that, at this age, many apprentices are supporting families. In the long run, changes to the financing of apprenticeship training, which rely on tuition and administrative charges, may prove to be a significant deterrent to entry into the roofing trade.

The age structure of the work force in the low-slope sector is significantly different from that of the work force in the steep slope sector. Exhibits 5.4 illustrates the age structure of the steep slope roofing work force, based on the Worker Survey. Exhibit 5.5 shows the age composition for the roofing industry, as a whole, including workers in both sectors. These data are taken from the 1991 census. As can be seen, in the industry as a whole — which comprises approximately 40% steep-slope roofing workers — there is an extremely high exit rate after age 35. Only 33% of the total roofing industry work force is over the age of 35. By contrast, in the low-slope sector, almost 60% of the work force is over the of 35. The impression that emerges is that steep-slope roofing is a young worker's industry; low-slope roofing has an age structure closer to that of the construction industry norm, though still somewhat younger owing to a higher exit rate after age 45.

*Exhibit 5.4
Age Structure of Low-
Slope Roofing
Industry (Worker
Survey)*



*Exhibit 5.5
Age Structure of Roofing
Industry Overall
(1991 Census)*



5.4 Country of Origin and Language

Seventeen percent of survey respondents were born outside of Canada; virtually all of these (85%) were born in non-English/French speaking countries. However, the proportion of survey respondents born outside of Canada varies sharply by province. As Exhibit 5.6 indicates, more than half of the low-slope roofing work force in Ontario is drawn from immigrant workers. For Ontario, this implies that English-as-a-second-language is a basic skills issue of much greater than in other regions.

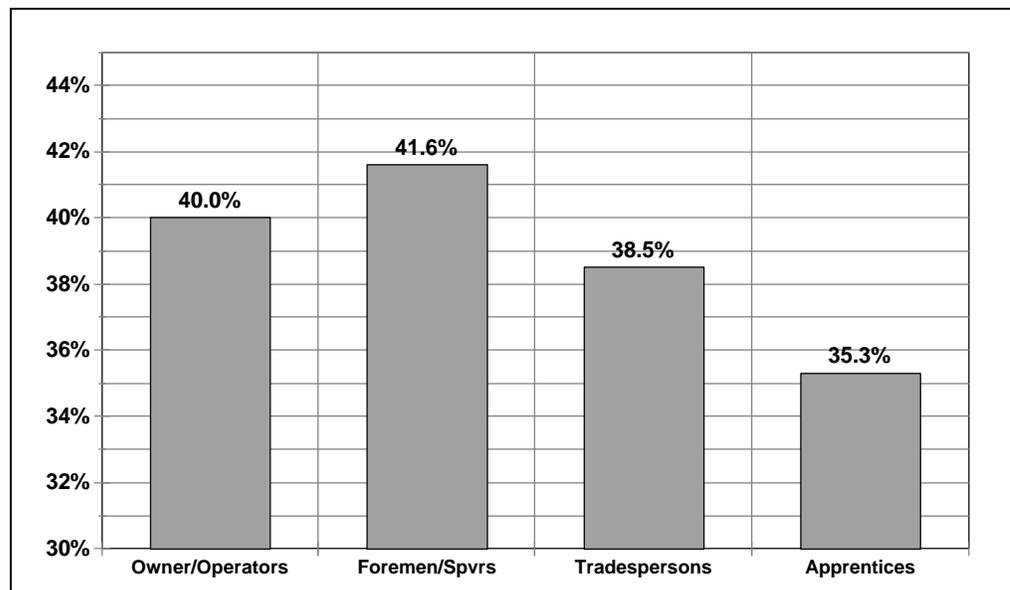
*Exhibit 5.6
Worker Survey:
Non-Canadian Country
of Origin*

	Non-Canadian Country of Origin
Newfoundland	n/a
Nova Scotia	0.0%
New Brunswick	0.0%
P.E.I.	n/a
Quebec	5.3%
Ontario	53.4%
Manitoba	16.0%
Saskatchewan	0.0%
Alberta	13.9%
B.C.	9.0%
Total	17.4%

5.5 Formal Education

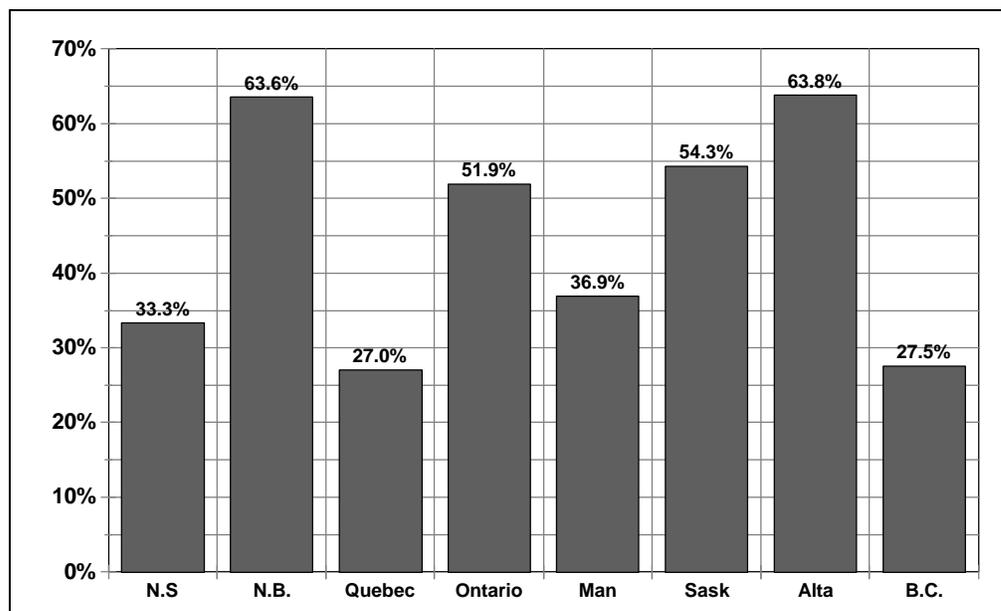
Exhibit 5.7 summarizes the proportion of each occupation in low and flat-slope roofing that has ten years or fewer of formal education. Among trades persons, the average is approximately 10½ years of formal school. Approximately 10% of tradespersons has no high school education. There is no difference in formal schooling between union members and non-union members of the industry.

*Exhibit 5.7
Percent of Each
Occupation in Low and
Flat-Slope Roofing with
10 or Fewer Years of
Formal Schooling*



While survey results were not sufficiently numerous to permit strong conclusions to be drawn at the provincial level, it is significant that the pattern of low formal schooling varied considerably across regions.

*Exhibit 5.8
Percent of Low and
Flat-Slope Roofing
Industry With 10 or
Fewer Years of Formal
Schooling by Province
of Current Residence*



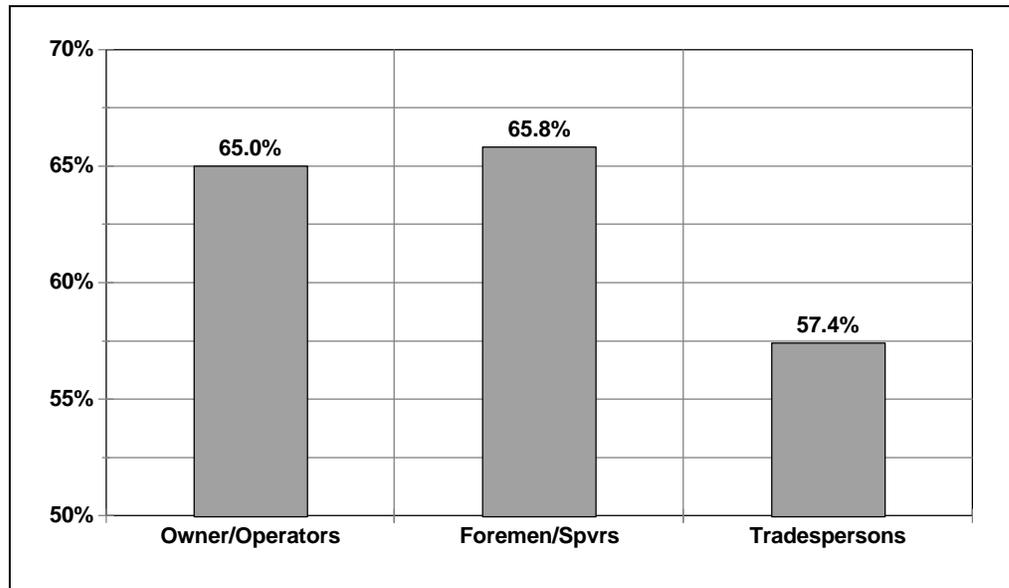
In Ontario, the large immigrant proportion of the work force contributes to the high percentage with a low level of formal schooling. On average 55.5% of immigrant members of the industry have 10 or fewer years of formal schooling compared to 40.5% of Canadian-born members of the industry. Indeed, one quarter of immigrant members of the industry have 8 or fewer years of formal schooling.

The high proportion of the industry workforce with a low level of formal schooling reinforces the importance of linking basic skills upgrading (reading, communications and trade math) to any general training strategy for the industry. In Ontario, basic skills upgrading must include English as a second language. It should also be noted that the problem of widespread weakness in basic skills is unlikely to correct itself over time. A significant number of apprentices — approximately one third — enter the trade with only ten years of formal schooling.

5.6 Trade Certification

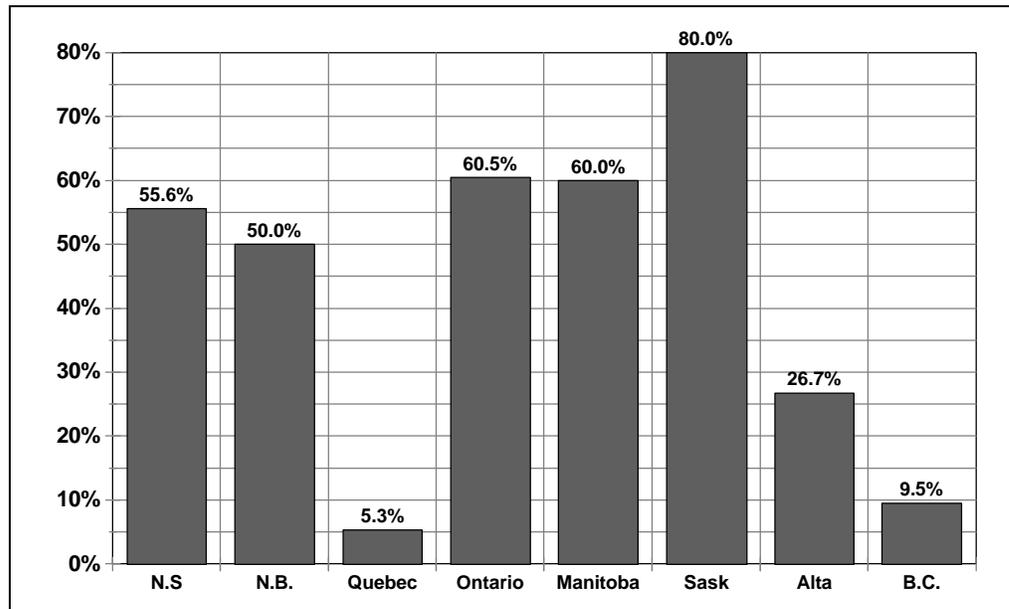
In the low-slope roofing industry approximately 60% of non-apprentices hold a certificate of trade qualification. Roofing is a designated trade in all provinces, except Ontario. In B.C., Nova Scotia and Quebec, certification is mandatory. Roofing is apprenticeship in all provinces except Newfoundland, PEI and Ontario. Roofing is a designated red seal trade. The absence of a formal trade designation and apprenticeship programme in Ontario is a major weakness in the industry, undermining both national standards and inter-provincial mobility. It should be a matter of high priority to address this problem. As will be discussed later in this section, the distinction between voluntary and mandatory certification is especially important in determining the occupational structure of the workforce. In provinces which have adopted mandatory certification, the key issue in managing and maintaining the skill base is the ratio between journeymen and apprentices. In provinces where certification is voluntary, there is a more complex set of ratios involving journeymen, apprentices and semi-skilled helpers. Exhibit 5.9 summarizes the proportion of owner/operators, supervisors and tradespersons who reported in the Worker Survey that they hold a formal trade certification.

*Exhibit 5.9
Percent of Occupations
in Low and Flat-Slope
Roofing who Hold
Certificate of Trade
Qualification*



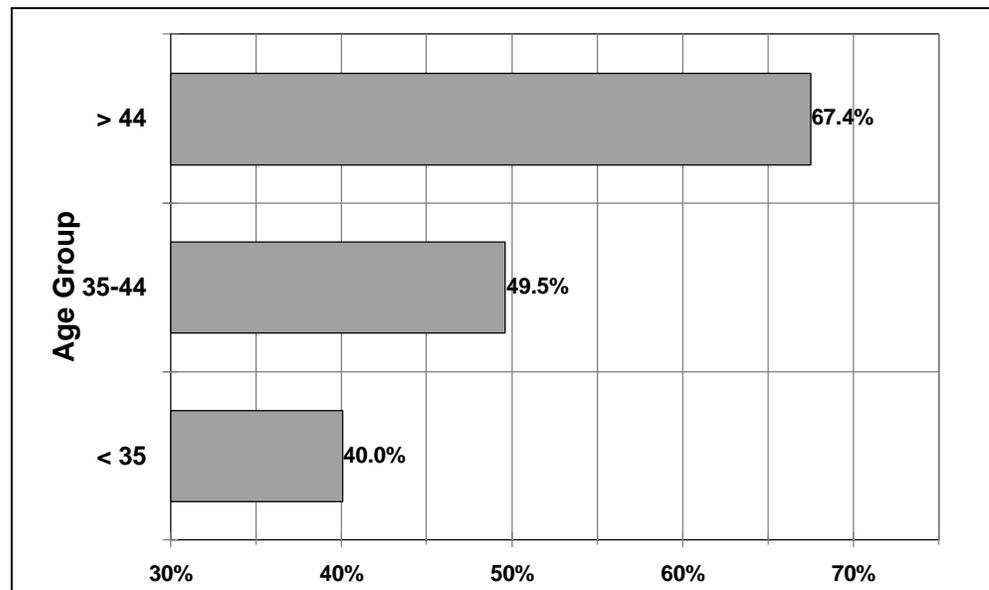
The incidence of trade certification differs sharply across provinces. In Ontario, where roofing is not certifiable, two thirds of industry members are not certified. In Saskatchewan, where the trade is certifiable, non-certification is still the norm. In Quebec mandatory certification applies and certification is universal. Exhibit 5.10 summarizes the proportion of each province’s work force that are not certified.

*Exhibit 5.10
Uncertified
Tradespersons by
Province*



The propensity to remain in the roofing industry is strongly influenced by certification. As Exhibit 5.11 illustrate, two-thirds of workers over the age of 45 are certified. By contrast, only 40% of those under the age of 35 are certified. Clearly, those who make a decision to stay in the industry are influenced in that decision by having completed an apprenticeship and obtained a formal trade certification.

*Exhibit 5.11
Trade Qualification
Certification in the Low
and Flat-Slope Roofing
Industry: Age Group 35-
44 vs. Age Group >45
(Apprentices Excluded)*



An important inference to be drawn from this pattern is that adopting formal trade certification and apprenticeship will assist the industry both by raising average levels of proficiency and reducing the turnover in its skilled labour supply. This is particularly important in Ontario, owing to its size in the national economy.

Only 70% those workers who indicated that they hold a trade certification, reported that they had also completed an apprenticeship. This may mean that there is some over-reporting of certification by survey respondents. Some tradespersons may be receiving a journeyman wage and interpreting this as “certification” of their trade qualification. Alternatively, some respondents may have obtained their trade certification by taking a provincial examination without having completed an apprenticeship.

Virtually all respondents who indicated that they completed an apprenticeship, reported that they had done this apprenticeship in Canada. While the industry in Ontario may rely on immigration as a source of labour supply, the roofing skill is learned in Canada.

Approximately one industry member in eight reported that they held a certification in a trade other than roofing. This is comparatively high. Sheet metal certification and carpentry certification were the most frequent trade qualifications other than roofing.

Sixty percent of tradespersons reported that they did membrane welding as part of their job. Metal welding is an infrequent skill. Approximately 7% of tradespersons indicated that they held a CWB certification. Most of these workers were also qualified sheet metal workers.

5.7 Occupational and Skill Requirements

The industry needs a human resources strategy that will meet three goals:

- reduce worker turnover;
- improve employability; and
- maximize the return to scarce training resources.

In framing its human resources strategy, the industry needs to recognize differences across provinces. Among the most important difference is the way in which the roofing trade is regulated. Provinces which have a history of compulsory certification have a different occupational structure from provinces in which certification is voluntary. In Ontario, where there is no trade certification, the occupational structure is less clearly defined.

Certain themes cut across provinces.

In all provinces, the industry must deal with the seasonal nature of roofing work. Consequently, the industry needs a core workforce of relatively permanent employees and an auxiliary workforce of persons who will be available during the peak months of activity. Evidence from a study carried out in 1991 by the Hay Group suggests that the core workforce and the auxiliary workforce are approximately equal in size.⁶

While individuals who work in low-slope roofing often derive a secondary income from asphalt shingle roofing, there is relatively little movement by workers whose primary occupation is in asphalt shingle roofing into the low-slope sector. Individuals who exit from asphalt shingling after age 35 generally do not move into low-slope roofing. This represents a loss to the industry since there are clearly skills and aptitudes in asphalt shingle roofing that are applicable in low-slope roofing. It is in the industry's interests to facilitate the movement of asphalt shingling roofers into the low-slope roofing workforce. At a minimum, this will require crediting hours and training as a steep-slope roofer towards certification as a fully qualified roofer.

The auxiliary workforce that the industry relies on during peak months of activity needs to support itself through a combination of "off-season" employment in other types of work and income maintenance benefits derived from the UI/EI system. At present, the auxiliary workforce comprises two types of individuals. The first are "regular workers" who return to roofing each season. The second are workers who are employed in roofing for only one or two seasons, but who leave the industry in search of more permanent employment. Recent changes to the UI/EI system reduce the attractiveness of seasonal work. As a result, some of the "regular workers" in the auxiliary workforce will be pushed out of seasonal employment. In the absence of any specific measures, the industry will be forced to hire a greater number of auxiliary workers with little or no experience in roofing. The importance of a seasonal employment pattern is evident across Canada, although it is less pronounced in parts in B.C.

⁶ Report to the Canadian Roofing Contractors' Association Industrial Adjustment Committee, Hay Group (September 1991).

Provinces in Which
Certification is
Voluntary

In provinces in which certification is non-compulsory, crews comprise a mix of journeypersons, apprentices and non-certified crew members. Non-certified crew members have received no formal training in the roofing trade. Their skills are learned entirely through on the job experience. While a small minority of non-certified crew members may have skills that approximate those of a journeyperson, by far the larger proportion are semi-skilled or unskilled. Most are classed as “helpers.” Roughly two-thirds of non-certified crew members are employed only during peak months of activity. For these workers, the most important skills are an understanding of safe working procedures and knowledge of basic construction practices. Training and other human resource practices should reflect this situation.

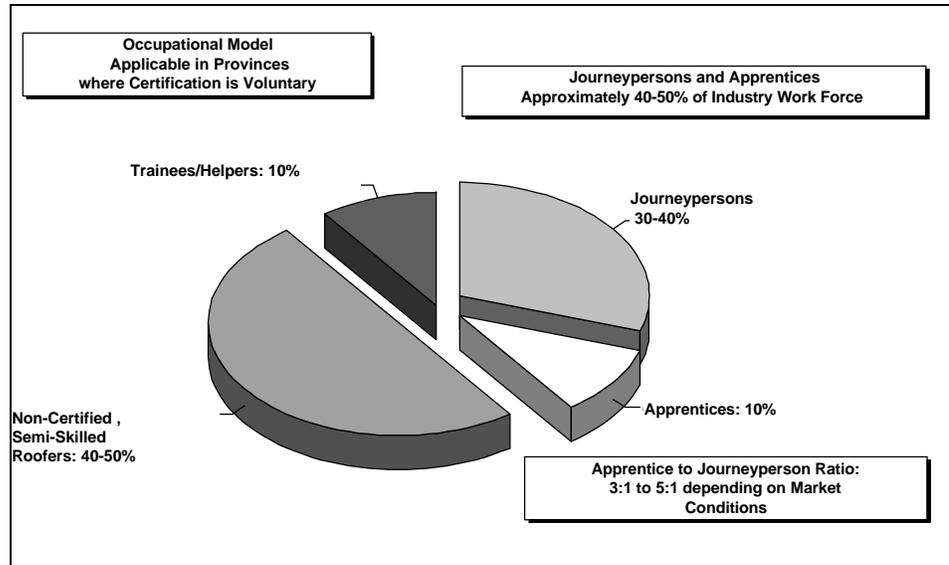
In provinces where certification is voluntary, the industry’s occupations, training and certification should be configured along the following approximate lines:

- ❑ Journeypersons (Crew Leaders and Assistant Crew Leaders):
(approximately 30-40% of workforce)
 - skilled tradespersons who have completed an apprenticeship
 - able to install and repair all major roofing systems
 - good basic skills (including trade math and communications)
 - able to function as crew leaders
- ❑ Apprentices:
(approximately 10% of workforce)
 - registered in a formal apprenticeship
 - good health and safety skills
 - knowledge of basic construction practices
 - elementary knowledge of at least one roofing system and ongoing training in other roofing systems and trade skills
 - normal ratio of apprentices to journeypersons: 1:3, varying as required by market conditions
- ❑ Material Handlers (Non-Apprenticed Roofers):
(approximately 40-50% of workforce)
 - good health and safety skills
 - knowledge of basic construction practices
 - basic training in at least one roofing system
 - may choose to enter an apprenticeship
 - likely to be characterized by high rates of turnover
- ❑ Trainees/Helpers:
(approximately 10% of workforce)
 - entry level job for persons with no prior experience
 - must be trained in safe working practices and basic construction procedures
 - likely to be characterized by high rates of turnover
 - pre-apprentices

In this model, journeypersons (or their equivalent) and apprentices would comprise roughly 40-50% of the industry workforce. Apprentices would work in the industry in a ratio of approximately 1 apprentice per 3-5 journeypersons. A much shorter, industry-based training programme would be provided to all other crew members. This training

would emphasize health and safety, basic construction procedures and an elementary understanding of at least one roofing system. Workers entering an apprenticeship would be credited with the experience and training already acquired. Approximately 40-50% of the industry's work force will fall into this category. Exhibit 5.12 summarizes this occupational and skill.

*Exhibit 5.12
Recommended
Occupational and Skill
Structure for Low-Slope
Roofing in Provinces where
Certification is Voluntary*



A number of specific exceptions and implications of this model need to be considered:

- ❑ the model does not apply in provinces which require journeyman certification or apprentice registration for crew members; and
- ❑ in provinces, such as Ontario, in which roofing is not yet a designated occupation, allowance would need to be made for experienced roofers whom contractors currently employ as *de facto* journeymen.

An industry-based training programme would need to be developed for all other crew members. This programme would comprise: health and safety, basic construction procedures and elementary introduction to at least one roofing system. Training would probably run approximately four weeks. In light of the seasonal nature of roofing, it may be possible to conduct this training during winter months.

In terms of annual new apprentice intake, the above model implies the following range in those provinces in which certification is voluntary (and in Ontario which has not as yet designated roofing as an apprenticeship trade):

*Exhibit 5.13
Recommended Level of
Annual New Apprentice
Intake in Provinces in
which Certification is
Voluntary*

	Range
Newfoundland	20-25
New Brunswick	20-25
P.E.I.	n/a
Ontario	200-300 Rising to 300-350
Manitoba	50-60
Saskatchewan	20-30
Alberta	60-70

The above levels of new apprentice intake would lead to approximately 120-150 completions per year in the above provinces. This represents roughly a doubling over recent years. The increase arises from introducing certification into Ontario and increasing the proportion of journeypersons in the industry workforce as non-certified workers leave of the industry.

To summarize, the occupational model that is suggested here implies four training tracks:

- ❑ *Journeypersons* — would receive upgrade training (discussed below) in proprietary roofing systems and other skills such as estimation, rigging and hoisting and crew supervision;
- ❑ *Apprentices* — would receive traditional apprentice training based on supervised on-the-job learning and block release for trades school;
- ❑ *Non-apprenticed, Material Handlers* — would receive training in at least one roofing system and refresher training in safe working procedures; and
- ❑ *Trainees/Helpers* — would receive compressed training (approximately two-four weeks) emphasizing safe working procedures and basic construction practices. This would be the normal entry job for persons with no prior experience.

The industry has already put in place a training programme for apprentices. This training is consistent with the current occupational analysis. What remains to be done is to:

- ❑ develop a systematic approach to tracking, certifying and monitoring upgrade training for journeypersons; and
- ❑ develop an entry-level training programme suitable for preparing workers to function as non-apprenticed crew members or helpers. This training programme could also serve as a pre-apprentice training programme to assist in screening apprentice applicants.

Provinces in which
Certification is
Mandatory

In those provinces in which certification is compulsory, the industry workforce comprises only journeypersons and apprentices.

In Quebec, CCQ data indicate approximately 2,200-2,300 persons registered in the roofing trade. This has been relatively stable over the past ten years, with the exception of 1989 and 1990 when a spike in demand pushed the number of registered roofers over 2,800. The exceptional demand of those years was accommodated by increasing the number of apprentices. Over the past five years, on an annual basis, the CCQ has registered an average of 111 apprentices and certified an average of 87 new journeypersons. This implies an annual replacement rate of approximately 4%. The Quebec industry has developed a system which appears to meet the industry's need for a reliable supply of skilled labour.

In B.C., the 1991 Census reported 3,450 roofers and shinglers. Of these, roughly 2,100 work solely or principally low-slope roofing. Over the past five years, B.C. has registered annually an average of 93 new apprentices and certified an average of 29

journeypersons. An average of 60 registered apprentices — approximately one-third of total apprentices — discontinue their apprenticeship each year. In comparison with Quebec, apprentice intake is moderately lower than would be expected. Apprentice completion rates, however, are substantially lower than would be expected. The apprentice completion rate implies a replacement rate in the range of 1.5%. There can be little doubt that this is below the industry’s actual attrition rate. While entrant rates are moderately lower than optimal, the current downturn in the B.C. economy makes addressing this issue less urgent. However, the non-completion rate should be a matter of significant concern. More careful screening of apprenticeship applicants, combined with pre-apprentice training, would contribute to bringing the completion rate closer to the 70-80% range which characterizes most trades. While the institutional mechanisms for managing the skill base are in place in B.C., the industry still needs to devise procedures for using these mechanisms to ensure both a stable supply of skilled labour and an efficient use of training resources.

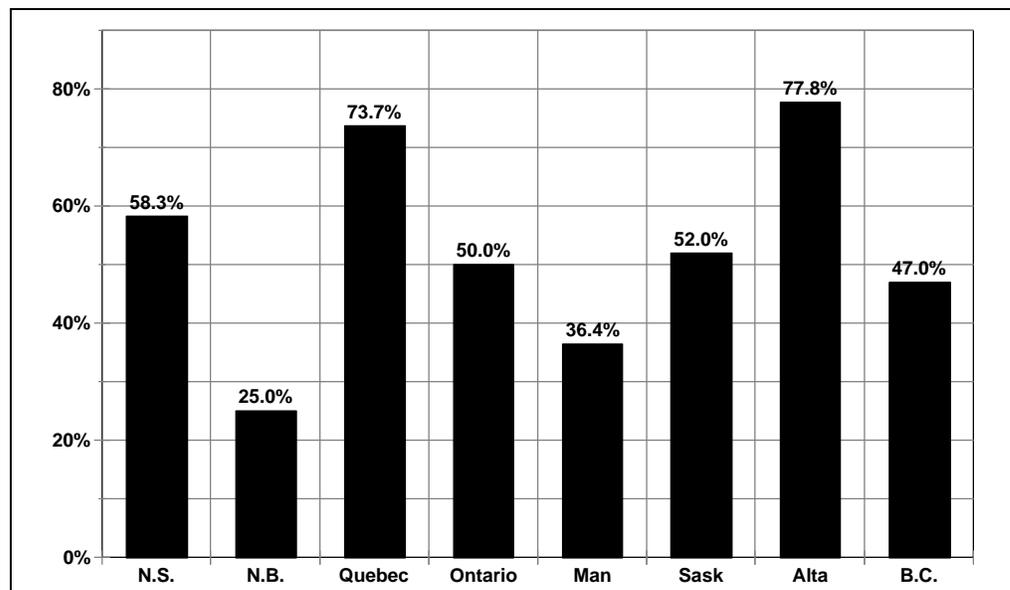
5.8 Upgrade Training: Importance of Training in Proprietary Systems

Approximately 50% of the respondents to the Worker Survey reported having taken at least one upgrade course. Among those members of the industry who hold a trade certification, the proportion who have taken upgrade training increases to 69%. It is clear that among the segment of the work force that has made a career commitment to the roofing industry there is a significant willingness to update skills.

Approximately three-quarters of owner-operators or foremen/supervisors reported having taken upgrade training. Just under 50% of tradespersons also reported having taken such training.

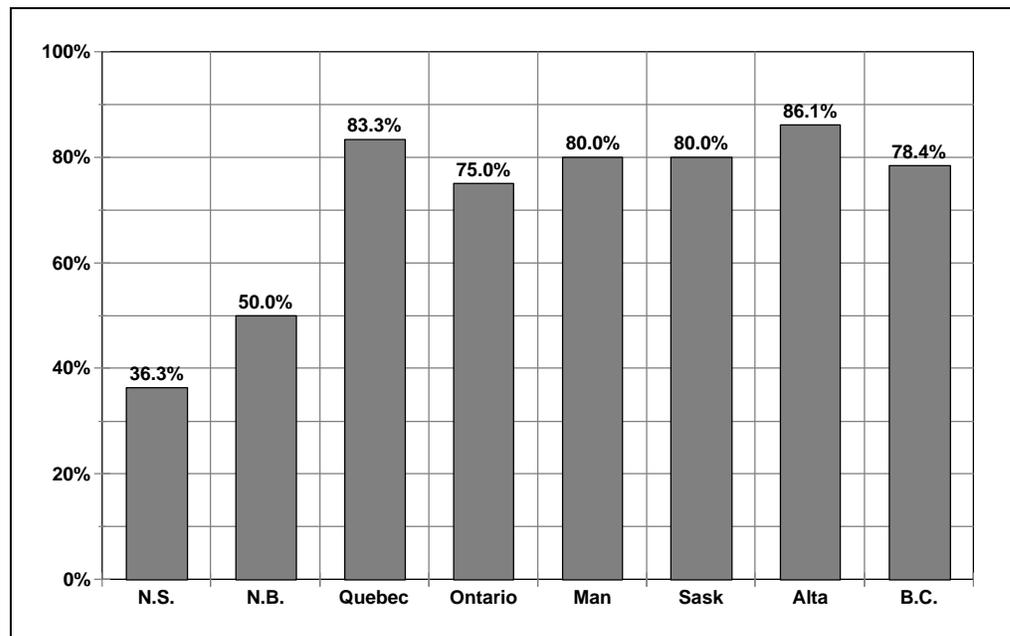
Exhibit 5.14 summarizes the incidence of upgrade training by province.

*Exhibit 5.14
Percent of Worker Survey Respondents who Reported Having Taken Upgrade Training*



In general, with the exception of the Atlantic provinces, survey respondents found the opportunities for upgrade training adequate.

*Exhibit 5.15
Percentage of Worker
Survey Respondents
Reporting Opportunities
for Upgrade Training to
be Adequate or Better*



Of those tradespersons who were able to identify the source of funding for upgrade training, 55% reported that their employer had paid for this training. This finding is consistent with the high proportion (43%) who reported having taken training in new methods, materials or systems. Eighty percent of these upgrade courses were delivered through employers.

In general, employer-based or employer-sponsored training is more evident in the low-slope roofing industry than in other sectors of construction. This arises from the importance of proprietary materials and systems and the importance of the relationship between large manufacturers/distributors and designated installers. Suppliers of roofing systems may sometimes require completion of a training programme as a condition of warranting an installation.

Training in proprietary roofing systems is so significant that a skills management strategy for the industry would be seriously incomplete without putting in place mechanisms for tracking, certifying and monitoring this training. Indeed, unless manufacturers are brought to the training table, the industry will be hampered in its effort to develop a sustainable training strategy. The industry may wish to consider establishing a training council in which manufacturers are a recognized stakeholder.

5.9 Types of Upgrade Training and Priorities

Exhibit 5.16 summarizes the incidence of upgrade training by type of training. Again, the importance of training in new materials, methods and systems is clear. This underlines the importance of recognizing this training.

Exhibit 5.17 ranks the areas of upgrade training that survey respondents identified as personal priorities. Types of training were ranked on a 10-point scale based on the number of respondents who expressed a desire to take this training. Overall, approximately 25% of respondents indicated that they wished to take some type of upgrade training.

Exhibit 5.16
Types of Upgrade
Training Taken by
Members of Low and Flat-
Slope Roofing Industry

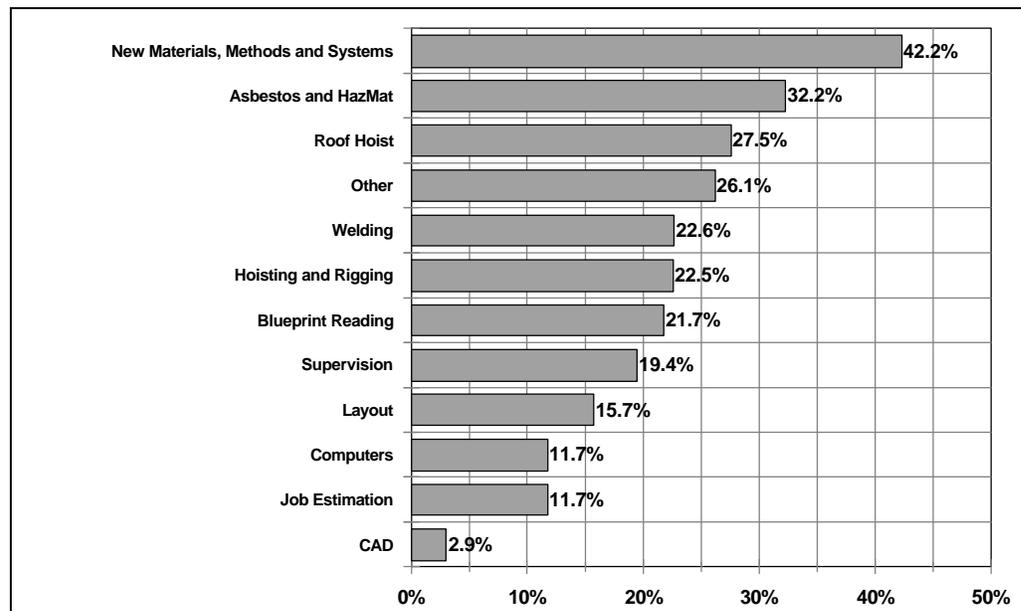
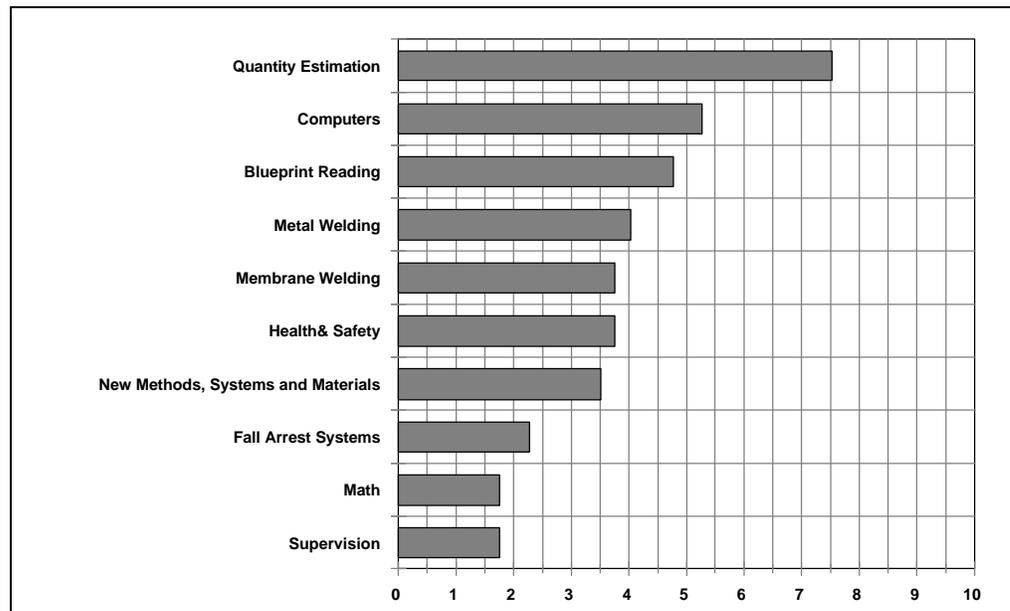


Exhibit 5.17
Upgrade Training
Priorities Members of
Low and Flat-Slope
Roofing Industry (Scale
of 1-10 Ranking Relative
Importance)



Evidence on the use of computers and blueprint reading indicate that these skills are low priorities at this time in the industry. However, rigging and hoisting skills — which were not tracked by the Worker Survey — are felt by many employers to be in short supply. Employers also pointed to the need to improve basic supervision skills. The industry may wish to adapt the *Better SuperVision* programme introduced by the Construction Labour Relations Association in B.C.

Recommendations

1. Increase resources committed to basic skills upgrading (reading, math, communications). This will be needed for both journeypersons and apprentices. In some provinces — especially in Ontario — English as a second language should be part of basic skills upgrading.
2. Designation of roofing as an apprenticable trade should be the norm in all provinces. In particular, this implies that steps should be taken to have roofing designated as a trade in Ontario.
3. In provinces in which certification is voluntary, the industry should introduce certification and training that reflects the tiering of the workforce among journeypersons, semi-skilled roofers and helpers/trainees. Journeypersons would receive upgrade training in proprietary roofing systems. Apprentices would continue to receive traditional apprenticeship training based on employment time and trades school instruction. Material handlers would receive focused training in at least one type of roofing. Helpers/trainees would receive training in basic construction procedures and safe working practices. The helper/trainee level would be the standard entry point into the industry for persons with no prior experience. Persons wishing to move from the helper/trainee level and semi-skilled roofers or to an apprenticeship should receive credit for their experience and prior training.
4. In provinces in which certification is mandatory and in which there is also a high rate of attrition from apprenticeships, greater use should be made of pre-apprentice training. If recommendation No. 3 is adopted, the training proposed for semi-skilled crew members would fulfill this role.
5. Establish a training council in which manufacturers of roofing systems are brought in as critical stakeholders in the industry. Introduce a system of tracking, certifying and recording training in proprietary roofing systems. Develop standards applicable to such training.
6. Expand upgrade training opportunities in: estimation, membrane welding and basic supervision skills.

6. Employment Trends

Key Points

- ❑ In the medium term, increases in the demand for labour can be met without increasing the absolute size of the industry work force. New entrant intake should be approximately 6% in relation to an estimated annual exit rate of 7%.
- ❑ 2/3 to 3/4 of industry members worked for only one contractor during the past twelve months. This is consistent with the prevalence of proprietary roofing systems in localized markets.
- ❑ 16% of apprentices reported working in only one roofing system in the past year. This raises an important issue of skill breadth in the administration of apprenticeship.
- ❑ Interprovincial Mobility is significant in both the short-run and the long-run:
 - 10% of industry members worked in more than one province in the past twelve months
 - 33% of industry members worked in more than one province in the past ten years
 - 12.5% of certified industry members are currently resident in a province other than the province in which they obtained their certification

This points to the importance of red seal certification and the maintenance of national standards.

6.1 Supply/Demand Balance

The roofing industry is strongly seasonal in its labour requirements. Of the 10,000-11,000 workers employed in low-slope roofing, approximately half work in the industry only a seasonal basis. In those provinces in which certification is voluntary (or where there is no certification), seasonal employment is most marked among “helpers.” Roughly two-thirds of these employees do roofing work only during its peak months of activity.

From the perspective of supply/demand balance, there are two issues. The first is the adequacy of the labour supply to meet the industry’s requirements during its peak months. The principal issue here is the supply of seasonal workers with training in safe working procedures, basic construction practices and elementary knowledge of at least one roofing system. The second issue is the supply of fully trained journeypersons, the majority of whom will be part of the industry’s core workforce.

Estimates of Average Annual Hours of Employment:

Average annual hours of employment are an approximate indicator of the overall balance of supply and demand. There are three sources from which estimates can be derived. The first of these is the Worker Survey. Since this survey was skewed towards the core workforce, an adjustment must be made to reflect the under-representation of seasonal workers in the sample. The second approximation of average hours is drawn from the Dalcour Construction Model which uses HRD developed estimates. These estimates are based on the Statistics Canada Survey of Employment Payroll and Hours. The third estimate of average hours is based on administrative data maintained by the Commission de la construction du Québec. These estimates, of course, apply only to Quebec.

Worker Survey Estimate

Among respondents to the Worker Survey, the average annual hours was 1,447 for tradespersons and 1,473 for apprentices. For apprentices, this finding is broadly consistent with the results of the 1990/91 analysis of employment records reported in the Hay Group study. For journeypersons, the Worker Survey results indicate lower annual hours.⁷

Evidence from union administrative data indicate that approximately 20-25% of union members worked 300 or fewer hours under a collective agreement. Many of these members may have worked outside the collective agreement, in shingling, or outside the roofing industry altogether.

Adjusting for unemployed and under-employed workers, we estimate that for the industry, as a whole, average annual hours were in the range of 1,150-1,250 hours in periods of weak demand and 1,400-1,500 hours when demand was strong.

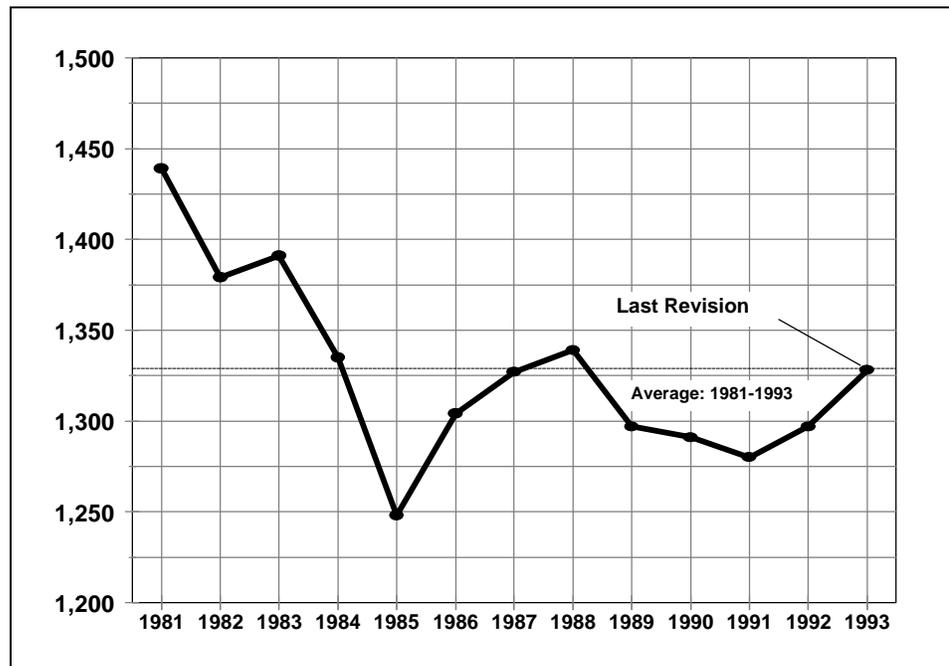
⁷ Report to the Canadian Roofing Contractors’ Association Industrial Adjustment Committee, Hay Group (September 1991). The study reported average annual hours for apprentices as 1,508 and for journeypersons as 1,693.

Dalcor Construction Model Estimate

The estimates we derived from the Worker Survey and from membership data are broadly consistent with the estimates in the Dalcor Construction Model. The Dalcor Model computes employment by trade, sector and region using historical data on construction spending and HRD developed estimates of average annual hours. For roofing workers, the Dalcor Model estimates average annual hours of approximately 1,300. As will be discussed, there is considerable variation across regions and over the course of the business cycle.

An important conclusion from the Dalcor Model is that average annual hours have deteriorated. Exhibit 6.1 illustrates this finding.

*Exhibit 6.1
Estimated Trend in
Average Annual Hours
(National Average) for
Roofing Industry
Workers (Dalcor
Construction Model)*

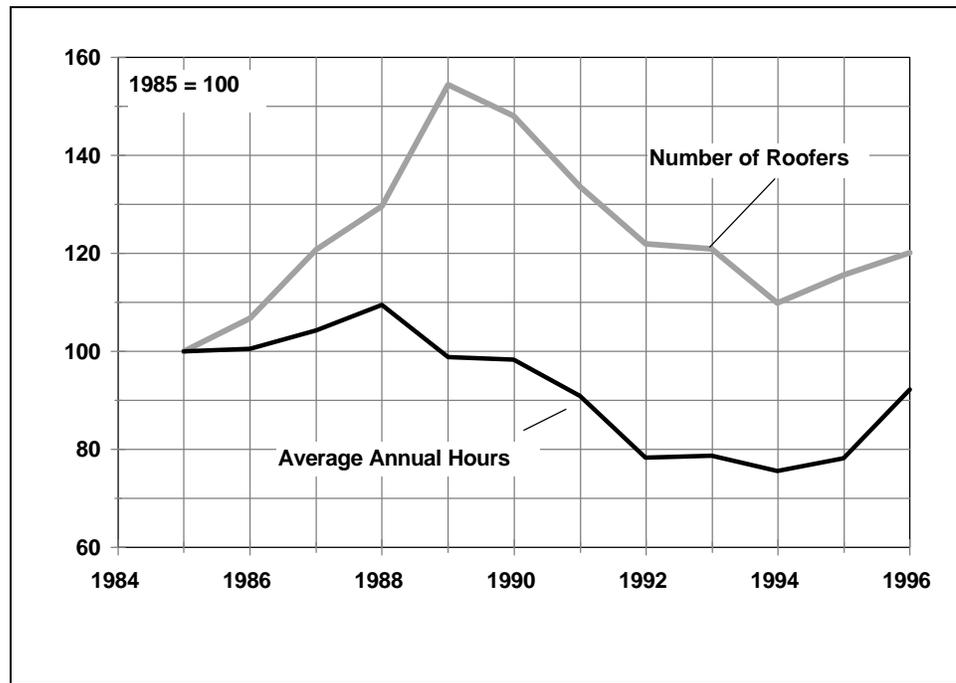


CCQ Administrative Data

CCQ data suggest average annual hours of approximately 749 over the past ten years. The variance around the average is much sharper in the CCQ data than in the Dalcor estimates. From a peak of just under 900 hours in 1988, the average fell to just over 600 hours in 1994.

Exhibit 6.2 compares changes in total employment of roofers in Quebec with changes in average annual hours. To illustrate these trends, the number of roofers and average annual hours were both expressed as an index with 1985 set at 100.

*Exhibit 6.2
Change in Number of
Roofers and Average
Annual Hours in Quebec
(1985=100)*



When the demand for labour increased from 1985 to 1988, the increased labour requirements were met approximately one third by an increase in average annual hours from 813 to 890 and two-thirds by an increase in labour supply from 1,849 to 2,396. Thereafter, labour supply took another sharp jump to 2,856 in 1989. This reduced average annual hours to 804. Thereafter, as labour demand subsided, both the number of roofers and average annual hours declined. In 1996 there were approximately 20% more roofers in the industry than in 1985, although these roofers worked an average of only 750 hours compared to 813 hours in 1985.

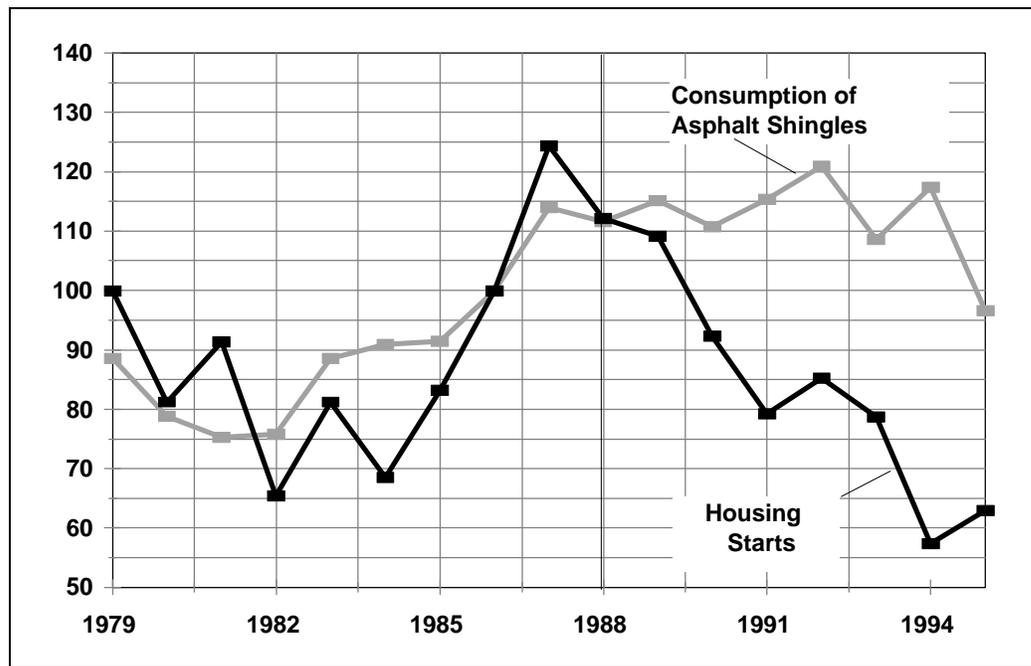
Cyclical Factors

The roofing industry has two distinct sources of demand:

- ❑ new construction; and
- ❑ replacement roofing.

New construction is highly cyclical. Replacement roofing demand is much less cyclical. The principal determinants of replacement roofing are the age of the existing stock of installed roofs and the estimated durability of previous roofing systems. Replacement roofing is deferrable, as is any capital expenditure. However, replacement roofing is not subject to the same degree of cyclical variability as new construction. This is most easily illustrated using data from the steep-slope sector. Exhibit 6.3 shows that after 1988, housing starts (an indicator of new construction demand) fell dramatically. However, the consumption of asphalt shingles — which was determined by both new construction and re-roofing demand — was comparatively stable.

Exhibit 6.3
Consumption of
Asphalt Shingles
compared to Housing
Starts (Chiefly Steep-
Slope Roofing
Industry) Index: 1986
= 100



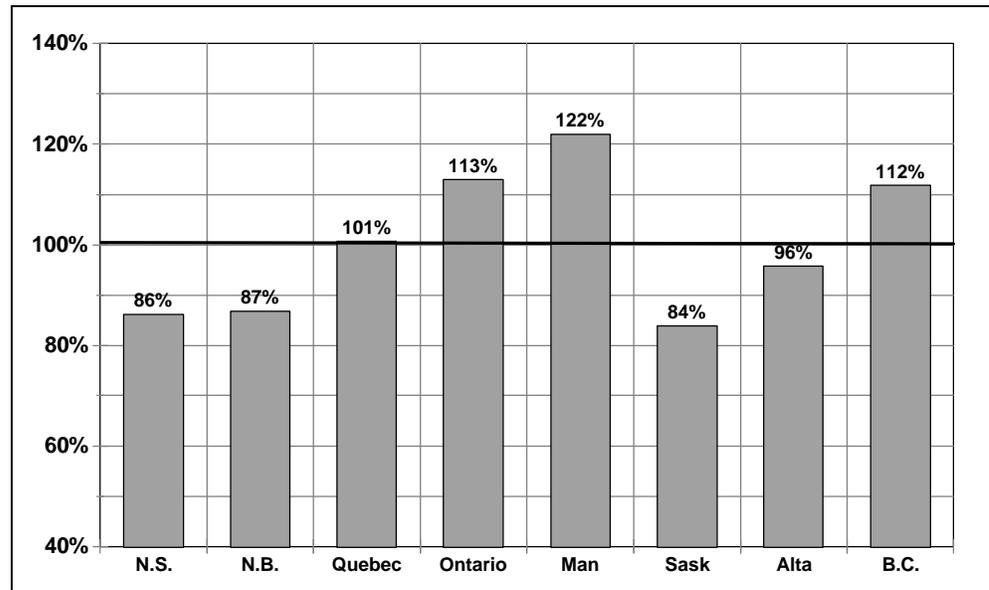
Replacement roofing accounted for approximately 55-60% of the hours worked by the participants in the Worker Survey. Industry estimates sometimes put replacement demand as high as 75%.

Regional Variation
in Annual Hours of
Employment

Exhibit 6.4 compares the Dalcour Model's estimates of average annual hours of employment by province in relation to the national average. As can be seen Manitoba has the highest estimated annual employment in relation to the national average. Saskatchewan and the Atlantic provinces are below the national average. (Newfoundland and P.E.I. were omitted owing to the weakness of data.)

In light of the variations in annual hours of employment among provinces, it should be expected that there will be significant inter-provincial movement of labour, at least in the long-run. Confirmation of this is found in the results of the Worker Survey. This factor needs to be taken into account when planning long-term skill requirements in provinces where demand is generally stronger than the national average. Difference in average annual hours by region would suggest that the likely inter-provincial movement of labour is from the Atlantic provinces to Ontario and from Saskatchewan to the other western provinces. Industry experience generally confirms this expectation.

*Exhibit 6.4
Average Annual Hours
of Employment by
Province in Relation to
National Average*



Working Outside
Roofing Industry

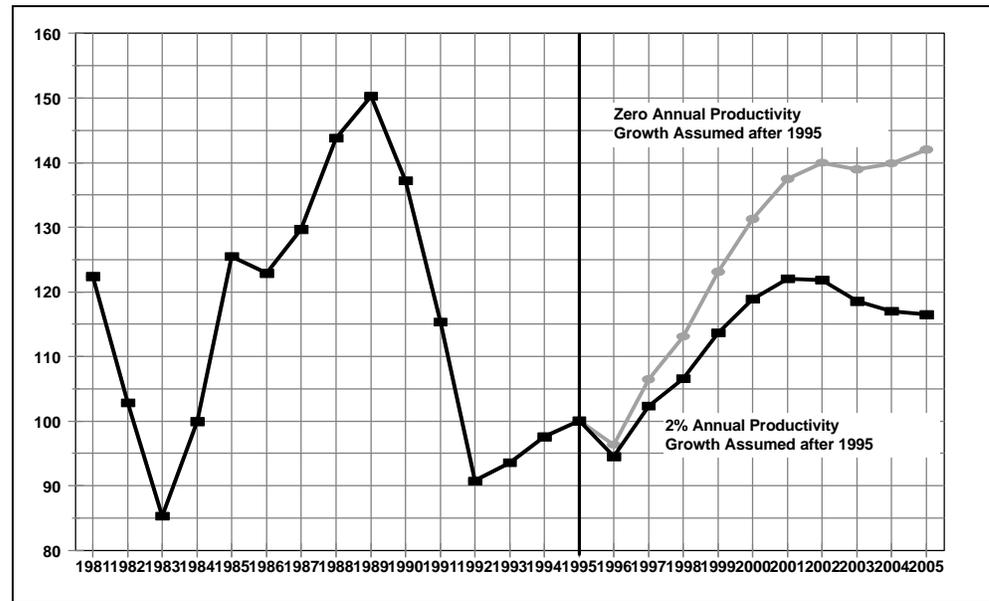
Approximately 10% of Worker Survey respondents indicated that they worked outside of construction in the past two years. A marginally higher proportion reported working in construction but outside of the roofing industry. In general, these results do not point to any widespread pattern of under-utilization. However, it must be noted again that survey responses were biased to regularly employed members of the industry.

Outlook

Exhibit 6.5 illustrates the projected demand for roofing industry workers, on a national basis. The upper line tracks projected demand in the absence of increases in productivity and on the assumption that the broad determinants of economic growth (exports, interest rates, etc.) are positive. The lower line tracks demand on the assumption of either a 2% annual productivity gain or a less positive economic outlook. If productivity gains were to be compounded with a pessimistic economic outlook, the projected demand would be essentially flat.

The discussion on technology in Chapter Three noted that improvements in the expected life-span installed roofs would reduce the long-run demand for replacement roofing. In light of this trend, the most likely scenario is closer to the lower demand line.

*Exhibit 6.5
Projected Demand —
Low and Flat-Slope
Roofing Industry
(Based on Informetrica
Projections and
National Seminar)
Index: 1995 = 100*



Relative to current employment levels, the lower demand scenario projects an overall increase in labour requirements of approximately 15% over the next five years. This demand can, and should, be accommodated by increasing average annual hours of employment, rather than by increasing the absolute size of the roofing industry work force.

From the foregoing discussion of average annual hours of employment a number of observations and conclusions emerge.

1. There has been a deterioration in average annual hours of employment. This is evident, even when allowance is made for the economic cycle.
2. The deterioration in average annual hours of employment has exacerbated the problem of labour turnover.
3. Increases in the demand for labour are accommodated by an increase in average annual hours and additions to the industry labour force. In general one third of the increased demand is met by increasing hour and two-thirds by increasing the industry labour force.
4. The industry labour force adjusts much more slowly to a decline in demand than it does to an increase in demand.
5. Relative to current employment, the demand for labour should increase by approximately 15% over the next five years. Efforts should be made to channel this increase in demand into increased average hours of employment rather than an increased industry labour force. Until approximately 2000/2001, there is no reason for new entrants to exceed exits. A new entrant rate of approximately 6% in relation to an estimated exit rate of 7% would represent an appropriate re-balancing of supply of demand.⁸

⁸ A 6% new entrant rate and a 7-8% exit rate are the assumptions that underlie the recommended apprentice intake levels in Chapter Five.

- There are significant differences across regions in average annual hours of employment. These differences are sufficiently great to encourage an inter-regional flow of labour. The principal flows are from the Atlantic region to Ontario and from Saskatchewan to the other western provinces.

6.2 Sources of Employment and Employment Patterns

The following table summarizes the sources of demand based on response to the Worker Survey. In some regions, industry sources estimate that the re-roofing segment of the market accounts for 75% of demand.

Exhibit 6.6
Estimated Sources of Demand by Major Sector and New Construction Replacement Roofing

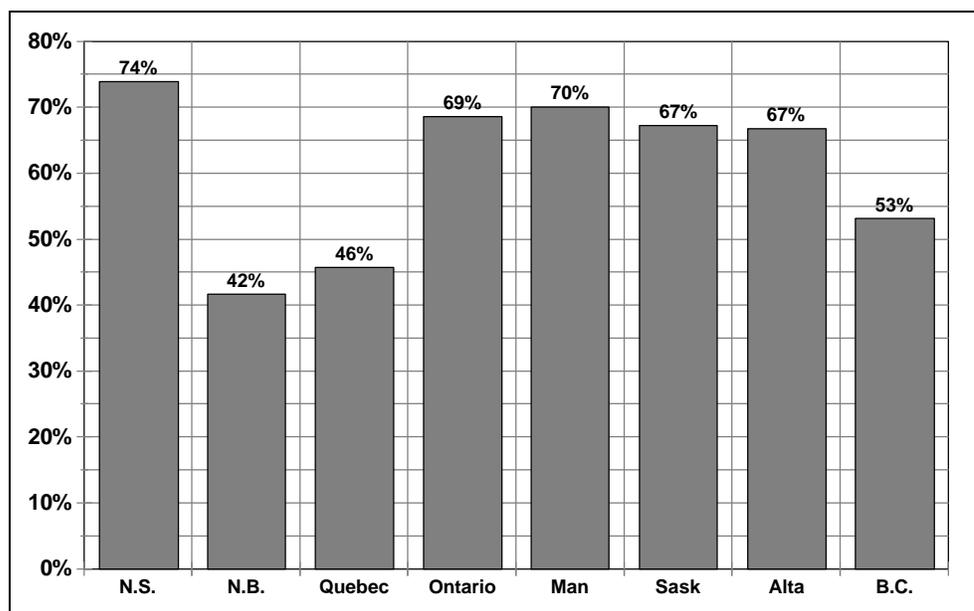
	New Construction	Repair and Replacement Roofing	Total
ICI Sector	30-40%	40-50%	70-80%
High-Rise Residential Sector	8-15%	10-15%	20-30%
Total	40-50%	50-60%	100%

In southern Ontario, Vancouver and greater Montreal, the ICI sector represents a greater source of demand. This is especially the case when there is significant new construction. The average age of the building stock — and by implication, the demand for replacement roofing — differs across regions.

Steep-Slope Roofing and Low-Slope Roofing

Overall, approximately one third of tradespersons in the low-slope roofing industry also work in steep-slope roofing. The remainder work only in low-slope roofing. Among apprentices the proportion working in both sectors is approximately equal. In general, low-slope roofing is better paid. The proportion of tradespersons working in both sectors varies across provinces. This reflects differences in the opportunity to work exclusively in the better paid low-slope sector. Exhibit 6.7 illustrates these regional differences.

Exhibit 6.7
Percent of Industry Members Working only in Low-Slope Roofing



Low/Flat-Slope
Roofing Systems

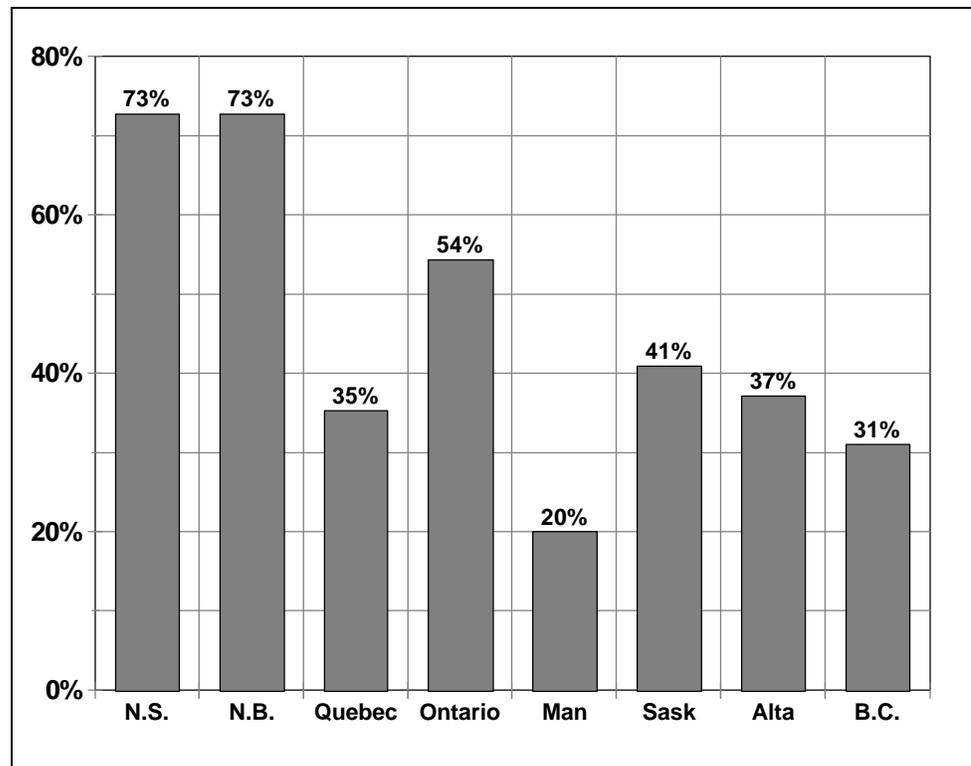
There are three systems used in the low-slope roofing:

- ❑ built-up roofing (approx. 40% market share);
- ❑ modified bitumen roofing (approx. 35% market share); and
- ❑ single-ply roofing (approx. 25% market share).

Most members of the industry work with more than one system. Overall, only 11.8% of survey respondents reported working with just one system in the past two years. The remainder were approximately evenly distributed between those who worked with two systems (42.1%) and those who worked with all three systems (46.1%).

The propensity to work in all three roofing systems varies across provinces. Exhibit 6.8 illustrates the regional pattern of breadth in skill and experience.

*Exhibit 6.8
Percent of
Respondents who
Worked in All Three
Low/Flat-Slope
Roofing Systems in
Past Two Years*



Among apprentices, approximately one in six (16%) reported working in only one system. This ought to be cause for concern since it implies that the on-the-job training of some apprentices is too narrow. Only 35% reported working in all three systems over the past two years.

Number of Contractors

Two-thirds of tradespersons and three-quarters of apprentices reported working for only one contractor over the past twelve months. This degree of stability is a distinctive feature of the roofing industry. In part, the stability arises from the tendency of low-slope roofing contractors to be somewhat larger than contractors in other trades. The tendency to work for one employer also contributes to the willingness of employers to invest in training their employees in installing proprietary roofing systems. At least within a particular region where a contractor is designated as the sole supplier of a particular roofing system, such training is employer-specific. An employee only gains a return from this training by working with the employer that provided the training.

6.3 Mobility Across Regions

Evidence from the Worker Survey points to two general conclusions on the importance of inter-provincial mobility:

- ❑ First: in the short run, inter-provincial mobility is moderately important in dealing local labour market imbalances, though it is unclear if “push” or “pull” factors are more important.
- ❑ Second: in the long run (i.e., ten years) roughly one industry member in three works in more than one province. In some provinces the incidence of inter-provincial mobility is significant higher.

In the past twelve months, 10.7% of Worker Survey respondents reported that they had worked in more than one province. The proportion was higher in all provinces except Ontario and B.C. Over the past ten years, 33% reported having worked in more than one province. This represents a particularly high level of long-run, inter-provincial mobility of labour. Roughly one journeyman in eight is resident today in a province other than the province in which they initially qualified in the roofing trade.

Exhibit 6.8 summarizes the proportion of journeymen resident in province who worked in more than one province during the past ten years:

*Exhibit 6.8
Percent of
Journeymen who
Worked in More than
One Province Over
the Past Ten Years*

	%
Canada	33.0%
Newfoundland	n/a
PEI	n/a
Nova Scotia	62.5%
New Brunswick	50.0%
Quebec	28.9%
Ontario	10.2%
Manitoba	40.0%
Saskatchewan	40.0%
Alberta	61.1%
British Columbia	29.6%

A key conclusion from the evidence on inter-provincial mobility is the importance of mutual recognition and the adoption of a recognized national standard. Only 35.5% of

certified journeypersons reported that they also held an inter-provincial (red seal) certificate. In light of the importance of both short-term and long-term inter-provincial mobility, this is much lower than appropriate. Consideration should be given to making the red seal standard the operative standard in each province.

Recommendations

1. Take steps to ensure the breadth of the trade by designing and administering apprenticeships that counter-balance specialization in only one type of roofing system. These steps might include increasing the trades school component. In light of the tendency of tradespersons and apprentices to work with one employer and the prevalence of employer specific training on proprietary roofing systems, rotation of apprentices across employers will not be practical in most cases.
2. Until approximately 2000/2001, new entrants should not exceed exits. A new entrant rate of approximately 6% in relation to an estimated exit rate of 7% would represent an appropriate re-balancing of supply of demand. After the balance between supply and demand is improved, average annual hours of employment will return to levels that prevailed in the 1980's. With lower turnover rates, the average level of proficiency in the industry will increase. This, in turn, will enable the industry to realize a greater return on its investments in training.
3. Make the red seal standard the minimum standard for certification for certified journeymen in each province. In provinces where roofing is not a mandatory trade, consideration should be given to seeking formal regulation requiring the implementation of the four-tiered system; certifying the training of both journeypersons to at least the red seal standard, and semi-skilled roofers to a lower level of proficiency.

Key Points

- ❑ Two dimensions to analysis of skills:
 - Breadth: experience across four systems: built-up roofing, single ply roofing, modified bitumen roofing and air barriers.
 - Depth: experience within a particular system.
- ❑ Built-Up Roofing:
 - 90% of trades and apprentices work in this roofing system.
 - Skill depth is highly uneven — approximately half of trades and apprentices perform only one or two tasks in this roofing system.
- ❑ Single Ply Roofing:
 - Dominant pattern is to work with only one type of single ply roofing.
 - EPDM dominates market on a national basis. Most workers who work in single ply roofing have had no experience in EP, CPE or Hypalon.
 - Modified Bitumen Roofing:
 - there is a marked skewing of experience to SBS which has a dominant share of the market.
 - Air Barriers:
 - 44% of industry workers report no experience with air barrier systems.
 - General Conclusion:
 - there are moderate gaps in both skill breadth and depth. This is attributable to unevenness of certification and the absence of an industry-based approach to training in proprietary roofing systems.

Basic Skills (Reading, Writing, Trade Math):

- ❑ Reading and math skill requirements for non-supervisory jobs are moderate and compare approximately with grade 11.
- ❑ Basic computer literacy is not widely required at present.

7.1 Skill Breadth

This chapter examines the skills and experience of the current work force in the low and flat-slope roofing industry in relation to the major types of roofing systems. In this chapter, the terms skill breadth and skill depth are used to analyze the industry's effective skill supply:

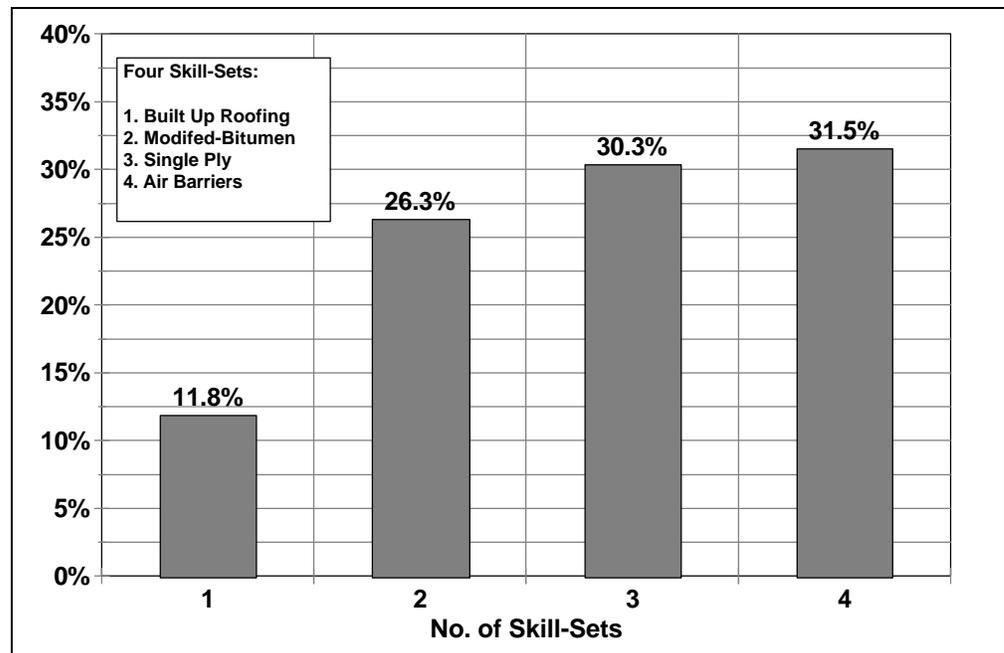
Skill Breadth:	the number of roofing systems in which a worker has significant experience;
Skill Depth:	the number of skills within a roofing system in which a worker has significant experience.

Four skill-sets were examined. These included three roofing systems and installation of air barrier systems:

- installing built-up roofing;
- installing single-ply roofing;
- installing modified bitumen roofing; and
- installing air barriers.

Exhibit 7.1 summarizes the general pattern of skill breadth in the industry's workforce:

*Exhibit 7.1
Skill Breadth: Percent of
Industry with Experience in
Major Skill-Sets*



Approximately 60% of the industry's workforce reported experience in 3 or 4 systems. This represents a satisfactory degree of skill breadth.

As Exhibit 7.2 illustrates, there is little variation across regions in the tendency to work in more than one skill-set. Only in Manitoba, where 1 in 5 respondents reported working in just one skill-set, is there any discernible variation from the national pattern.

*Exhibit 7.2
Percent of Industry
Working in Only One
Skill-Set by Province*

	Percent Working in Only One Skill-Set
Nova Scotia	4.5%
New Brunswick	9.1%
Quebec	14.7%
Ontario	14.8%
Manitoba	21.7%
Saskatchewan	15.9%
Alberta	8.6%
British Columbia	7.5%

- workers over the age of 45 tend to be specialized in only one skill-set;
- workers who were employed by three or more contractors over the past year were more likely to have worked in three or four skill-sets (80%) than workers who were employed by only one contractor (63%); and
- only 6% of survey respondents reported working for only one contractor and in only one skill-set.

7.2 Skill Depth — Built-Up Roofing

Built-up roofing systems account for approximately 40% of the low-slope roofing market.

Built-up roofing and modified bitumen roofing are significantly more common than single-ply roofing. Approximately 85% of industry members reported working in built up roofing over the past two years. Among tradespersons, this proportion rises to 90%. There was no significant variance across provinces.

Five tasks within built-up roofing were surveyed. Asphalt application, which is used almost universally, was not surveyed. This was a design error in the survey. Coal tar pitch is generally not used in western Canada. The specific skills that were tracked by the survey included:

- installing modified asphalt as a waterproofing agent;
- installing non-organic felts, such as fiberglass or polyester;
- surface coating;
- applying coal tar pitch; and
- cold build-up process.

Of these tasks, installing modified asphalt as waterproofing and installing non-organic felts were the most significant in terms of employment hours. (Had applying asphalt been included in the survey, it would have dominated employment hours.) Exhibit 7.3 summarizes the relative importance of each of the five tasks, expressed as an average of total annual hours worked by tradespersons or apprentices. Among survey participants, the total average hours worked by these persons was 1,458.

*Exhibit 7.3
Estimated Average
Annual Hours Worked
on Principal Tasks in
Built-Up Roofing
(Tradespersons and
Apprentices only)*

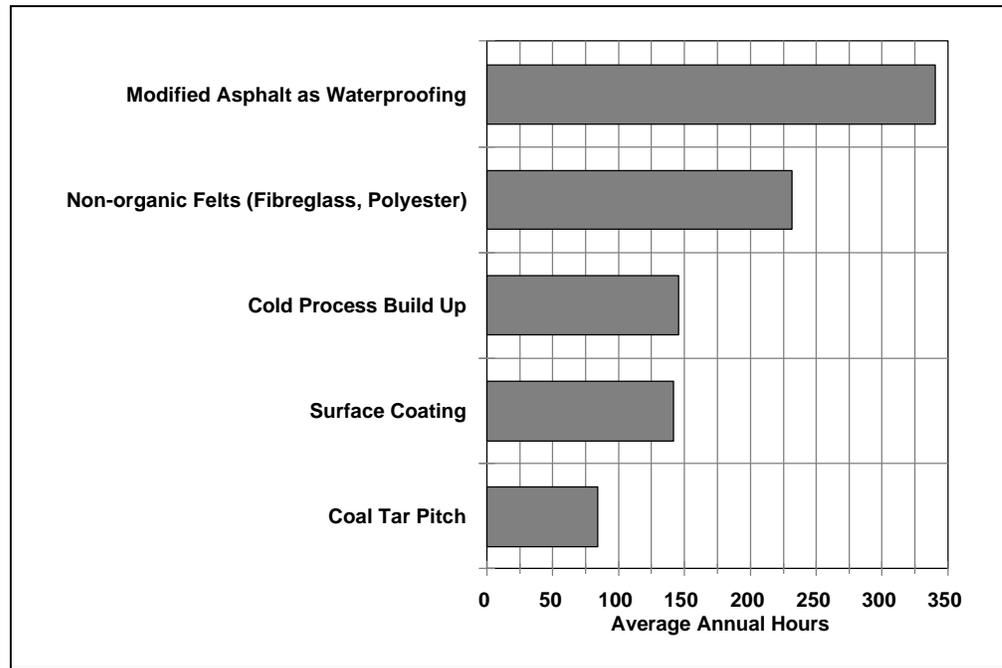
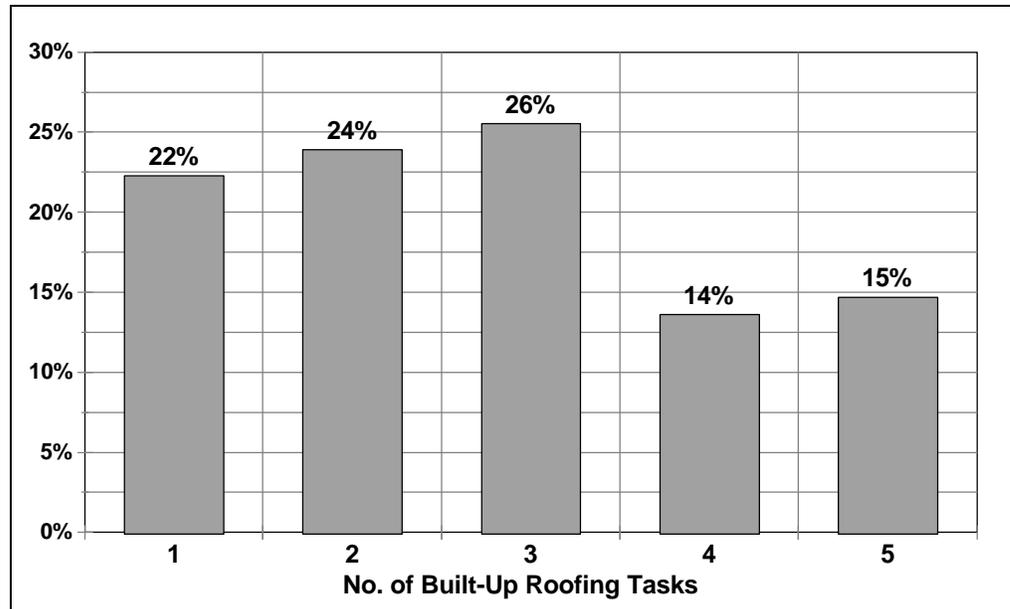


Exhibit 7.4 illustrates the pattern of work across the five tasks. As can be seen, among those apprentices and tradespersons who work in built-up roofing, only 29% report working in all five tasks over the past two years. Almost half — 46% — worked chiefly in one or two tasks, though many would also have reported applying asphalt, had this been tracked.

*Exhibit 7.4
Percent of
Tradespersons and
Apprentices working
on Tasks in Built-Up
Roofing*



Equally important is the pattern of high exposure and no exposure to particular tasks. Exhibit 7.5 contrasts the proportion of trades and apprentices who work in built-up roofing but who had no exposure to a particular task to the proportion who worked more than 500 hours per year over the past two years on that task.

Exhibit 7.5
Percent of Trades and Apprentices with No Exposure or High Exposure to Particular Tasks in Built-Up Roofing (Sample only of Persons working in Built-Up Roofing)

	Percent with No Exposure Over Past Two Years	Percent Reporting >1,000 Hours Over Past Two Years
Installing Modified Asphalt as Waterproofing	5%	32%
Installing Non-organic Felts (fiberglass, polyester)	16%	15%
Surface Coating	37%	6%
Coal Tar Pitch (Not used in Western Canada)	54%	3%
Cold Process Build Up	29%	12%

The survey data indicate that among workers who reported working in built-up roofing, a significant proportion had no exposure over the past two years to some of the key tasks in this type of roofing system. While virtually all trades and apprentices (90%) worked in this type of roofing, skill depth — as evidenced by work experience in the past two years — is somewhat uneven.

7.3 Skill Depth — Single Ply Roofing

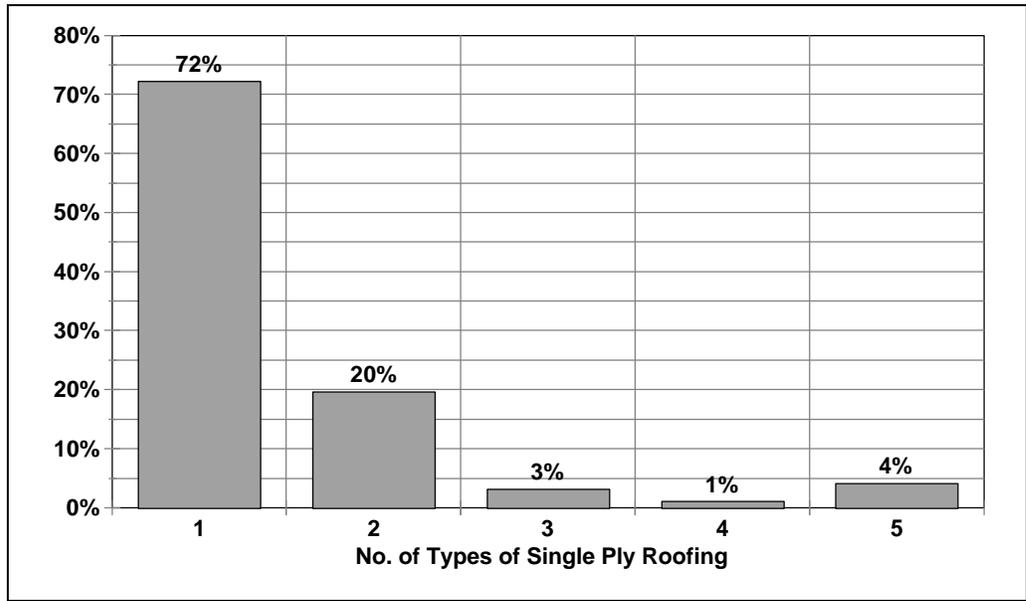
Single ply roofing systems are less common than built-up systems. Single-ply roofing accounts for approximately 25% of the low-slope market. Sixty percent of industry members reported working in built up roofing over the past two years, compared with 85% who reported working in built-up roofing. Among tradespersons, the proportion is comparable. Roughly half of apprentices reported installing or repairing single-ply roofing. Among survey respondents, single ply roofing was more common in the Atlantic provinces.

Five types of single ply roofing were surveyed:

- installing EPDM;
- installing PVC;
- installing EP;
- installing Hypalon; and
- installing CPE.

Exhibit 7.6 shows that, among tradespersons and apprentices who work in single ply roofing, by far the dominant pattern of experience is to work with only one type of single ply roofing system. This is consistent with the earlier patterns identified, i.e., most workers are employed by a single contractor and contractors are designated by manufacturers to install a particular type of roofing in a region.

*Exhibit 7.6
Percent of Tradespersons
and Apprentices working
on Different Types of
Single Ply Roofing*



Among the five types of single ply roofing covered in the Worker Survey, the most prevalent in the market place is EPDM. All trades and apprentices who worked in single ply roofing reported that they had installed EPDM systems in the past two years. Exhibit 7.7 illustrates the relative importance of the five single ply systems using share of average annual hours of work in the past two years as an indicator. Local market conditions will often differ from the national average.

*Exhibit 7.7
Relative Importance of
Different Types of
Single Ply Systems*

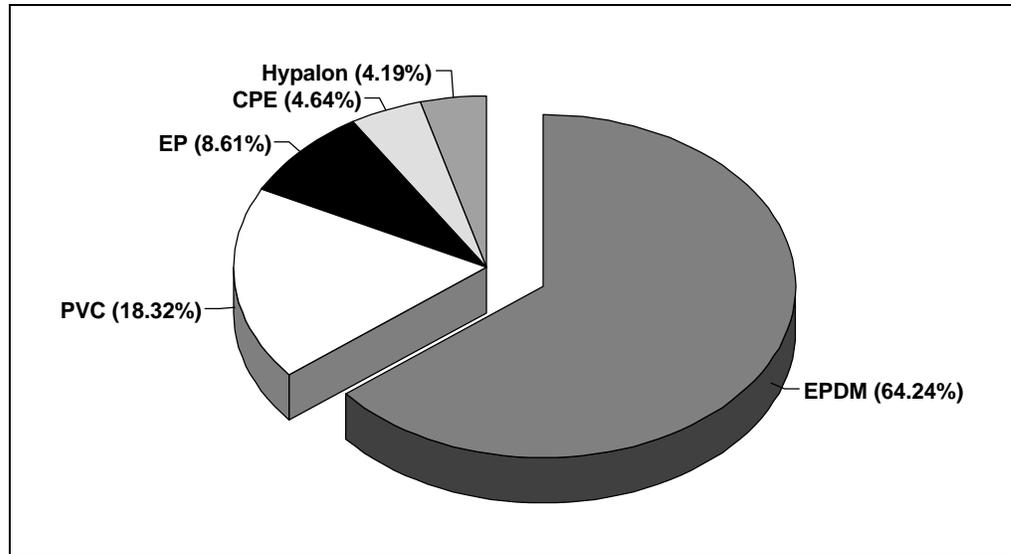


Exhibit 7.8 summarizes high and low exposure to each type of single ply roofing covered in the Worker Survey. For approximately one quarter of those tradespersons and apprentices who work in single ply roofing, EPDM systems generated more than 1,000 hours of employment in the past two years.

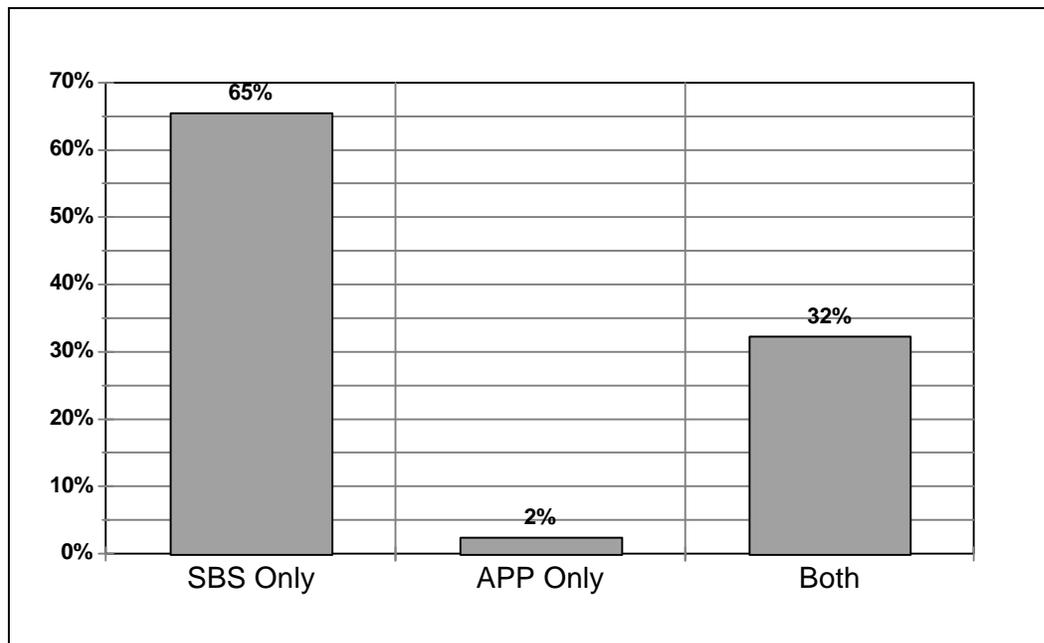
<i>Exhibit 7.8</i>		Percent with No Exposure Over Past Two Years	Percent Reporting >1,000 Hours Over Past Two Years
<i>Percent of Trades and Apprentices with No Exposure or High Exposure to Each Type of Single Ply Roofing (Sample of Persons working in Single Ply Roofing)</i>	<i>EPDM</i>	0%	26%
	<i>PVC</i>	25%	4%
	<i>EP Only</i>	46%	2%
	<i>CPE</i>	56%	0%
	<i>Hypalon</i>	61%	1%

7.4 Skill Depth — Modified Bitumen Roofing

Modified bitumen roofing systems are commonly used in most provinces. These systems have approximately 35% of the low-slope roofing market. Fifty-five percent of tradespersons and apprentices reported installing or repairing modified bitumen roofing systems in the past two years.

Two types of mod-bit roofing were surveyed: SBS and APP. Exhibit 7.9 shows that SBS is dominant with approximately two-thirds of industry members working only in this type of mod-bit roofing and the remainder working in both SBS and APP. Only a small minority reported working solely in APP roofing. SBS roofing accounted for roughly 83% of employment hours in mod-bit roofing among survey participants.

Exhibit 7.9
Percent of Tradespersons and Apprentices with Experience in Various Types of Modified Bitumen Roofing



Both torch applied and hot modified asphalt applied methods are used in both SBS and APP roofing systems. Torch applied methods were somewhat more common among survey respondents. Approximately one quarter of respondents who worked in mod-bit roofing had little or no experience with hot modified asphalt application.

7.5 Skill Depth — Air Barrier Systems

Air barrier systems are widespread across Canada. Among tradespersons and apprentices, 56% reported installing air barrier systems. Three types of air barrier system were surveyed:

- ❑ trowel on;
- ❑ torch on; and
- ❑ self-adhering.

In some provinces, it should be noted, trowel application is carried out by members of another trade.

Exhibit 7.10 illustrates the estimated market share using average employment hours as a proxy. As can be seen, torch-on systems are the most common, while trowel-on systems are less used.

*Exhibit 7.10
Relative Importance
of Different Air
Barrier Systems*

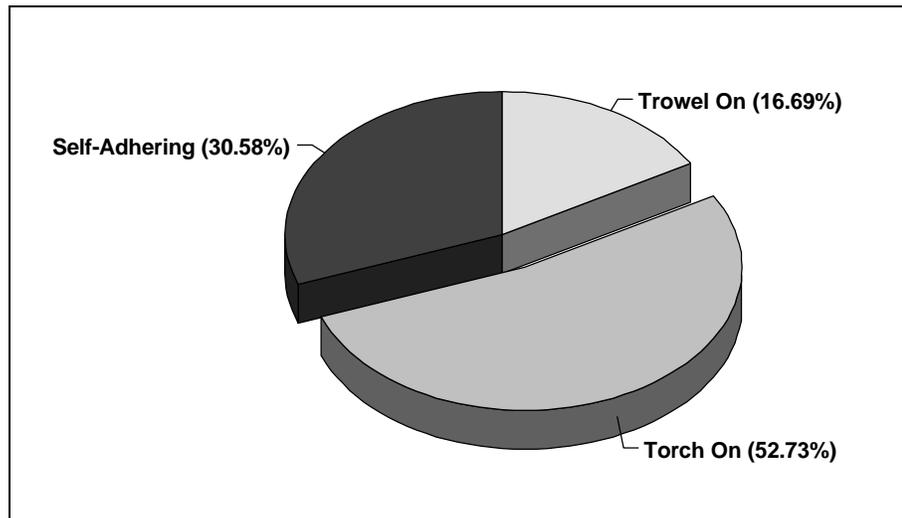


Exhibit 7.11 summarizes high and no exposure to different types of air barrier systems. The significant fraction with no exposure to trowel systems may reflect the declining market share of this type of air barrier or the tendency to assign this work to members of another trade.

<i>Exhibit 7.11 Percent of Trades and Apprentices with No Exposure or High Exposure to Barrier Systems (Sample only of Persons working in Air Barrier Systems)</i>	Percent with No Exposure Over Past Two Years	Percent Reporting >1,000 Hours Over Past Two Years
Trowel On Air Barrier	61%	6%
Torch On Air Barrier	2%	20%
Self-Adhering Air Barrier	19%	7%

7.6 General Conclusions on Skill Breadth and Skill Depth

The picture that emerges from the foregoing analysis is that the industry's work force has reasonable skill breadth and depth, although there are gaps. For example, one would expect a greater proportion of the industry to have experience with air barrier systems. The dominance of EPDM systems in single ply roofing may encourage a narrowing of skills to this type of system.

The gaps in skill breadth and depth arise from two factors. In the first place, certification is uneven across the country. The notable exception to trade designation is Ontario. Given the relatively high degree of inter-provincial mobility, the absence of Ontario from the system of trade regulation represents a serious problem for the industry. A second factor that contributes to a sub-optimal narrowing skills is the prevalence of employer-sponsored training in proprietary roofing systems. When employers are paying directly for training, they understandably limit their training investment to as few workers as practical and then focus the employment of those workers on installing the system for which they have been trained. The result is a skewing of both training and experience. This again points to the need to bring training in proprietary roofing systems under the umbrella of an industry-based training strategy.

7.7 Overview of Basic Skills (Reading, Writing, Trade Math)

The Worker Survey tracked three types of basic skills:

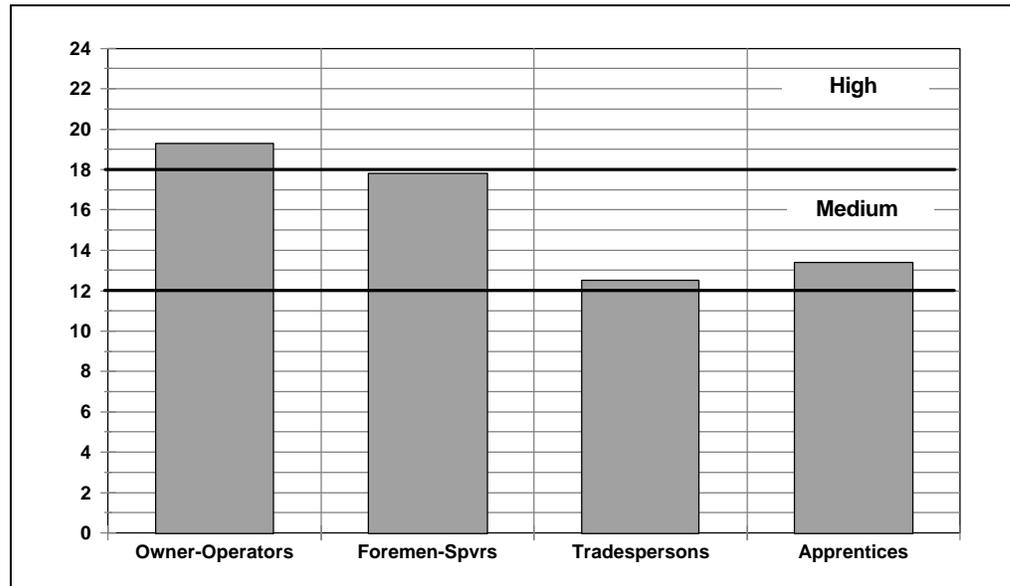
- ❑ six basic reading and writing skills (reading forms or labels, notes or memos, job orders, MDS sheets, books or manuals and writing reports);
- ❑ symbolic reading (drawings and schematics); and
- ❑ 12 basic and trade math skills (preparing invoices, estimating time required, measuring or estimating distance, volume, area, weight, angles, ratios or percentages, estimating strength, using formulae, using a simple calculator, using a scientific calculator).

In the case of reading and math skills a composite index was developed which weighted each of the surveyed skills equally. Usage was based on frequency, i.e., “never,, to “daily,, use of the skill.

7.8 Reading Skills

Exhibit 7.12 shows that median ranking of each occupation on the reading skills usage index. The median ranking is the half-way point in the distribution, i.e., half of the members of the occupation have a higher level of skill requirement and half have a lower level. In general, most tradespersons and apprentices have a usage level in the low to medium range. Broadly, this means that non-supervisory jobs require moderate reading of documents such as forms, labels, job orders, MDS sheets or manuals once or twice per week. This would be a reading level approximately commensurate with around grade 11. Members of the trade whose reading proficiency is below this level are likely to face some difficulty in undertaking more complex tasks that are part of the trade. It will be recalled from the discussion in Chapter Five that a significant proportion of the industry's work force have formal schooling at or below this level. In the absence of systematic testing, the evidence on reading usage and formal schooling points to the likelihood of a significant basic skills deficit among approximately one third of the work force, including apprentices.

*Exhibit 7.12
Relative Importance of
Reading Skills
(Composite Index
based on Worker
Survey)*

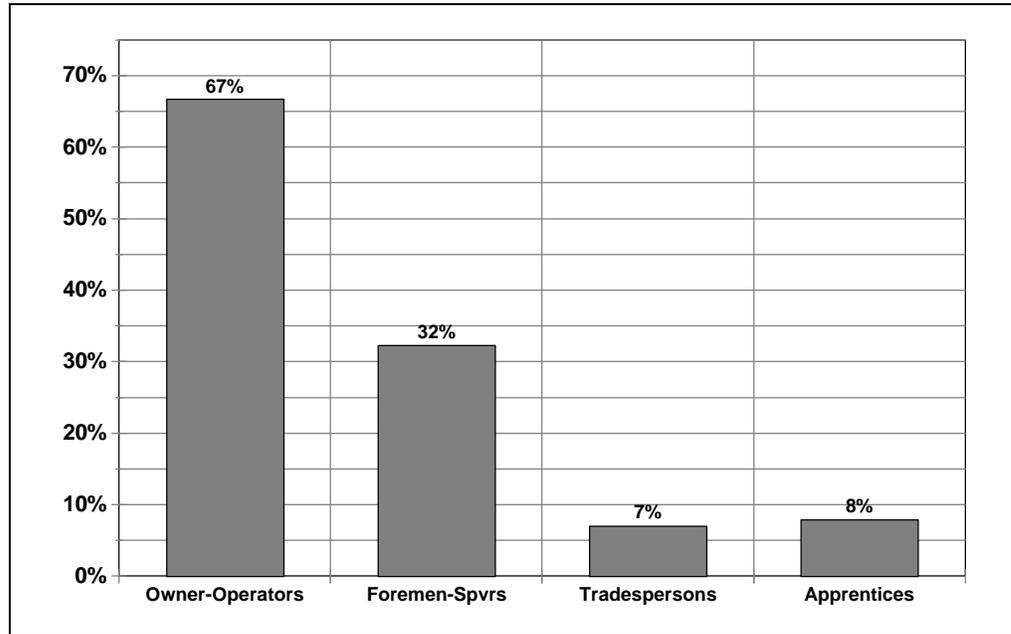


7.9 Schematics and Drawings

Exhibit No. 7.13 shows that the need to read drawings or schematics is largely confined to owner-operators and supervisors. Industry comment indicates that these estimates, in fact, are probably low for these two occupations. If, as the survey suggests, few tradespersons or apprentices need to read drawings and schematics, there will be a considerable time lapse between learning this skill during apprenticeship and relying on this skill when taking on a supervisory role. The knowledge will not only deteriorate but be rendered partially obsolete as computer-based drawings replace traditional drawings.

The industry will need to provide refresher or upgrade training in blueprint reading to workers who are promoted to supervisory or crew leader roles.

*Exhibit 7.13
Percent of Industry
Occupations Reading
Drawings or
Schematics Daily*

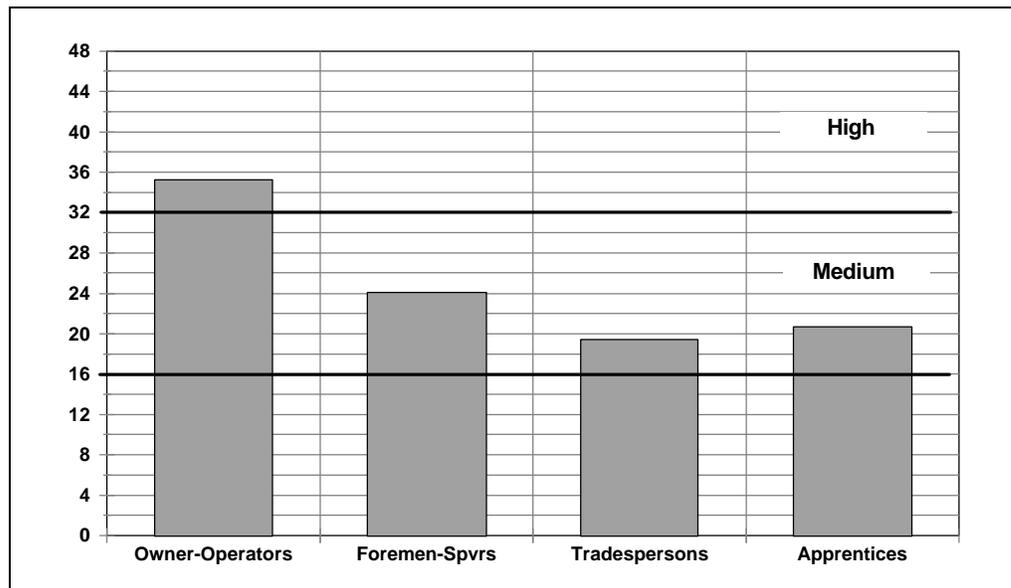


7.10 Trade Math and Basic Math Skills

Exhibit 7.14 summarizes the requirements for basic trade math in terms of the median for each occupation. As in the discussion of reading skill requirements, half of the respondents fall above the median and half fall below. Exhibit 7.14 shows that basic trade math is used moderately in most non-supervisory jobs and routinely in supervisory positions. Members of the trade generally need to be proficient in measuring, basic calculations, ratios and percentages. The approximate level of math skill required would be commensurate with Grade 10.

Again, earlier data on educational attainment suggests that weaknesses in basic trade math are likely to be common.

*Exhibit 7.14
Relative Importance
of Math Skills
(Composite Index
based on Worker
Survey)*



7.11 General Prevalence and Requirements

Exhibit 7.15 summarizes the proportion of respondents by occupation who used computer applications once per week or more often. As can be seen, computer usage is generally low throughout the industry. This may point to the limited relevance of computer technology to the roofing industry. This is unlikely, since other trades have shown a greater affinity for using computer technology in scheduling, estimating and CAD. A more likely explanation for the low usage, is low level of training in computer applications.

*Exhibit 7.15
Percentage using
Computer Applications
Once per Week or
More Often*

	Owner/ Operator	Foreman/ Supervisor	Tradesperson	Apprentice
Scheduling	22%	4%	1%	3%
Word Processing	50%	5%	1%	3%
Estimating	33%	4%	2%	0%
Database	22%	3%	2%	0%
Spreadsheet	22%	3%	0%	0%
CAD	11%	1%	1%	1%
E-mail	11%	2%	1%	0%
Other	0%	0%	0%	3%

Assessing the importance of basic computer skills is a judgment based on whether the current pattern of limited computer is likely to persist. Our expectation is that there will be an expansion of computer technology to drawings and estimating. Basic computer literacy, therefore, is likely to be more commonly required in supervisory jobs over the next five to ten years than is evident at present. Upgrade and apprenticeship training should reflect trend. It is noteworthy that one third of apprentices report using a computer at home.

Recommendations

1. Promote the adoption of a national occupational standard which specifies a reasonable degree of both skill breadth and skill depth.
2. Develop a system of recording, monitoring and certifying training in proprietary roofing systems and adopt standards applicable to this type of training.
3. Consider strategies for undertaking training in proprietary roofing systems on a multi-employer basis or using colleges to augment the generic and portable content of such training.
4. Make upgrade training available to supervisors in basic computer literacy with particular emphasis on retrieval and manipulation of computer-based drawings (i.e., CAD).
5. Ensure adequate math, reading and communications upgrading opportunities for apprentices entering the trade with less than grade 11.

8. Apprenticeship and Access to the Trade Training

8.1 Equity Issues

This section of the report discusses the participation of aboriginals and women in the roofing industry labour force. Historically, only small percentages of either group have ever worked in the industry and a key objective of this analysis was to determine what barriers, if any limited their participation. Canadian demographics reflect that fewer young people are entering the workforce in the 1990's, although youth unemployment remains an issue that plagues labour ministers across the country.

The pool of skilled labour for many occupations is diminishing, and this includes the construction trades. Groups designated under the Employment Equity Act (visible minorities, aboriginal people, women and people with disabilities) are making up an increasing number of new labour force entrants. The integration of this group into well-paying skilled and technical jobs becomes an important issue for both industry and government to address.

At this time the provinces are developing new directions and approaches to apprenticeship training overall, and as each develops its strategy, designated equity groups are being given consideration. British Columbia is one province that has a clearly stated goal of making apprenticeship training more representative and accessible to designated equity groups. Some of the strategies BC plans to undertake include:

- ❑ developing guidelines and policies for addressing barriers to apprenticeship for members of designated equity groups;
- ❑ developing an “Equity in Apprenticeship Plan” and preparing annual reports to assess progress in removing barriers and increasing participation rates in apprenticeship among designated equity groups. The focus of the plan is on shifting attitudes and behaviours so that equity considerations become a basic tenet of BC's apprenticeship training system; and
- ❑ working in conjunction with TAC's (PAC's) develop a training module addressing diversity in the workplace and include it as a training component for apprenticeable trades and journeyperson upgrading.

In Ontario, both industry and government state that the apprenticeship system has to have better linkages to the education system, so that it can be promoted to a younger and more diverse pool of potential entrants.

8.2 Aboriginal People

There is virtually no accurate data to report the number of aboriginal people in roofing or any other trade. The union locals do not gather data by race and therefore any information received was through interviews with the union representatives. Provincial agencies which were contacted also did not have data on this issue. However, provincial governments are aware of the low participation and as the apprenticeship systems in each province are being addressed key target groups such as aboriginals and women are being incorporated into new strategies.

According to the SMWIA representatives they are not aware of a large proportion of aboriginals among their membership, although there are a few. There are no direct barriers which apply specifically to this group, which would prevent them from entering roofing. However, there are some factors which may contribute to the low representation.

Those aboriginals which live away from major centers may find it difficult to access the required training. They may not want to re-locate in order to get the work and education they need to work in the roofing trade. In many cases training is only at one or two locations and they tend to be in larger urban areas. This puts a greater financial burden on anyone who lives outside those areas to receive their training.

In the case of roofing, since it is not a compulsory trade, individuals could apply for work directly with contractors, without seeking formal training. However, the nature of roofing is that the work is done by “crews” of five or six individuals. These crews are tightly knit groups who, in some cases, work together over long periods of time. New crew members, in many cases, are referred by existing workers. Also, in some provinces there is a strong ethnic component to roofing work. For example, in Ontario there is a large proportion of Portuguese, and in Manitoba, roofing has a large Polish component. Although it is not overt discrimination, it is difficult for individuals from other ethnic backgrounds to fit in with the established workers, thereby limiting opportunity to get into the industry, unless they form an entire crew.

Roofing attracts a large number of transient workers in the busy summer months, as in each crew there are low skilled positions available. Aboriginals may be part of that large, marginal workforce associated with roofing, however, there is no confirming data. What is evident is that they do not comprise an equitable proportion of the “core” workforce, which works consistently in roofing. There is no specific encouragement to attract this group to the industry.

There are efforts at HRDC through the Aboriginal NSAS committee to address their role and participation in the construction trades. However, to this date there is little available information about specific initiatives by industry or provincial government to address this issue.

8.3 Women in Construction

In the last few years there has been considerably more attention focus on women in construction. There are national groups which have been working diligently to encourage more women into the trade and to assist them in staying with the trade once they have received their ticket. There is some data available on women in the trades, particularly participation in apprenticeship programs. Further information was gathered through discussions with Locals, provincial apprenticeship branches and representatives from groups that represent women in trades.

The low participation rate of women in trades is further corroborated by data from Alberta Apprenticeship and Training, where female participation by trade is around one percent. Also, in discussions with SMWIA Local representatives there were a few active female members although they do not make up significant numbers. The Roofing Contractors Association of BC, which operates its own training facility, reported that they have had some women complete the program, (one of whom was at the top of the class). However, the number are still minimal.

Traditionally, roofing would not have been considered a possible career choice for many women. The tar and gravel roofs required considerable physical ability, and were not work choice most women would have found attractive. However, with the introduction of new materials, such as the membrane roofs, and new application procedure, such as torch on welding, roofing can provide career opportunities for women. In many cases industry representatives have praised women's skills at the torch on application because of their manual dexterity and attention to detail.

The reasons for the low participation rates for women are not because of direct barriers but more to with the traditional views on women undertaking this type of work. There are no direct barriers created by the industry to prevent women from working. However, there are hidden or systemic reasons why women do not populate this trade. Such as:

- ❑ to date the representation of women in non-traditional jobs is not equitable, although more women are entering these fields. The roofing is simply not a career choice most women would make. The work is at times dirty, uncomfortable and physically demanding, although as mentioned above there are new opportunities available;
- ❑ there are physical demands in some aspects of the trades that most women would find difficult to handle;
- ❑ there is the issue of working in all-male crews where the environment tends to be sexist. This is a particularly important issue in roofing, as the work is carried out by tightly knit crews out in the field. It is extremely difficult for a woman to fit in with the existing crew;
- ❑ women do not have the pre-training and experience/knowledge necessary to be able to even make a choice to go into the trade; and
- ❑ women often do not have the contacts with the industry that men have and therefore are at a disadvantage in getting jobs or even getting accepted as an apprentice.

One of the key reasons for the low rate of participation is that the roofing trade, along with other trades, has not been presented to women as a career opportunity until recently. According to Women in Trades and Technology (WITT), “Apprenticeship has not been given a high priority provincially and equity has been given even less. If provinces were serious, they would mandate their apprenticeship counsellors to go out and sell apprenticeship to employers and unions”.

The Hibernia oil platform construction project has served as a testing ground for several public policy initiatives to promote employment equity for women. To evaluate the effectiveness of these policies a report entitled “Women, Employment and Equity and the Hibernia Construction Project” has written by WITT (Newfoundland and Labrador). The report was based on a number of interviews of women working on the Hibernia oil platform, and drawing on this information examined the involvement of women in employment and training related to the Hibernia project and assessed the extent to which they have been able to participate as equal member of the project’s labour force.

The report indicated that despite some efforts to integrate women into the project workforce, women experienced barrier to full and equal participation that began at the training level and continued through to lay-off decisions. The study found that women were subjected to on going harassment and were not allowed to do the work for which they were trained, with many feeling they had no opportunity for advancement. The report determined that the equity policies in place were insufficient and those that were in place were inadequately monitored and enforced by the government.

A number of recommendations were made in the report regarding equity issues these included:

- ❑ women’s committees should be set up in order to involve women in the process and to inform management and unions of women’s experiences living and working on site;
- ❑ changes should be made to the work camp environment to make it safer and more acceptable to women;
- ❑ any project agreement between management and the unions should contain an employment equity clause requiring that a certain number of women be trained and hired for the project, and should spell out a policy on sexual harassment;
- ❑ governments should enact legislation to require all major project which receive government funds to implement employment equity policies; and
- ❑ HRDC should follow the guidelines in its Designated Groups Policy and make funding dependent upon the implementation of employment equity initiatives.

There are no specific programs to encourage women to apply to work in roofing, although some provinces do have general Women in Trades organization, and, more recently a number of pilot projects have been launched by the WITT National Alliance. These groups promote non-traditional jobs to women, but in most cases they have not been in place long enough to measure long-term effectiveness.

WITT has implemented a three year pilot project a six high schools across Canada to encourage young women between the ages of 16 to 19 to enter the area of construction

technology. WITT also offer exploratory courses and bridging programs to compensate for systemic barriers in formal and informal education. Exploratory course also include a focus on examining labour market trends and employment opportunities in trades and technology. These courses act as “feeders” into the more traditional apprenticeship training.

The hope is that as women undergo career retraining or look for post-secondary school opportunities, construction will be one of their options. It is the position of groups such as WITT that special measures are necessary to overcome the effects of past discrimination, regardless of whether that discrimination was overt or systemic. WITT has espoused a number of recommendations or suggestions to make the trades more accessible to women. These include:

- ❑ make space available in training programs for women coming out of exploratory courses, as sitting on long waiting lists could discourage individuals;
- ❑ there has to be a change in workplace culture to foster a more accepting training environment, this includes employers, unions and other employees;
- ❑ there should be retraining for instructors to help them understand and develop strategies for teaching a greater diversity of learning styles;
- ❑ more accurate information about apprenticeable occupations and how to access them must be made available to junior and senior secondary school counsellors and community based groups working with designated groups; and
- ❑ unions must take seriously their commitment to equity by actively recruiting women and providing support systems.

The roofing industry should keep in mind the position of equity groups as it works to develop new training programs and foster individual in these groups to become skilled and valuable members of the workforce.

9. Training Opportunities

Material presented earlier has covered the demands that are placed on the training systems that support roofers across Canada. These demands are based on a complex set of market, technological, demographic and institutional factors. The last section focused in on the specific demands of apprenticeship and other training programs from the viewpoint of contractors and the apprentices themselves. This is all needed background for a training strategy for the coming decade.

All this analysis leaves one basic question — what training is now available in Canada? There are pressing needs that might be met by existing capabilities — or new courses might be added. This section is devoted to an inventory of training opportunities.

Training comes in many formats. Informal mentoring and demonstrations on the job can be the most effective way to transfer skills. Often brief sessions in the work place — on topics like safety — can communicate efficiently. It is common for building material suppliers and equipment companies to offer training as part of a sales package. In particular, it is becoming more common for building material suppliers to seek out unique arrangements with contractors that certify the firm or its workers as “installers” of their products. Formal, class style, training can be just a few hours in duration or run for many weeks. The newest format is multimedia based training at remote sites using computer graphics, video and other modern tools.

It is intended that our inventory will include all of these “training opportunities” and a systematic search is being done. The consulting team began by contacting the Canadian Labour Force Development Board, all the provincial roofing contractor associations and associate members of the Canadian Roofing Contractors Association. These groups were asked to identify all the groups providing training for roofers. A simple questionnaire and telephone follow-up then led to most of the information in the current inventory. A similar inquiry was sent to all SMWIA locals with training centers. There are a wide range of providers for this type of training.

The inquiry identified six distinct training deliverers:

- Community Colleges and CEGEPS;
- Industry Associations;
- CCQ (Quebec);
- Union-Affiliated Training Centers;
- Non-Profit Non union Training Center; and
- Private (for profit) Training Centers.

There are many “gray” areas that emerge around our search. Much general training is offered by private businesses and public institutions in computers, writing, math, construction skills and management that applies to our workforce but is not included here. Some contractors and apprentices that participated in our study commented that general training was often not immediately relevant to the specific needs of roofing workers and contractors. In general, however, it seems that there are a large number of general training courses — some specific to construction — that would benefit

participants. It is also clear from the survey results reported in Section 4 that many workers do not take advantage of these opportunities.

The distinction between courses and programs is significant. Programs are geared toward training standards and provide training in a broad range of skills. They can run up to 900 hours in duration and are predominantly delivered through community colleges. Courses are directed toward single topics and can take as little as three hours. Courses are frequently delivered through union training centers.

Most of the formal training for roofers is delivered through the apprenticeship programs. These programs are offered in all provinces except Newfoundland, Nova Scotia, Prince Edward Island and Manitoba. Completing an apprenticeship and/or obtaining a Certificate of Qualification is only required to work in Quebec and British Columbia, in all other provinces the training and certification is voluntary. There are ongoing changes in some aspects of the system with Ontario now considering the regulation of roofing and Manitoba acquiring the training system now in place in Saskatchewan.

Where apprenticeship training is offered the formats are similar but not identical. Most systems require apprentices to attend three period of classroom instruction on a “block release” basis. Each block consists of about four to eight weeks (between four and eight hundred hours) in school and curriculums are again similar but not identical. Each period of class room instruction is preceded by between 1000 and 2000 hours of work in the field. The total period of indentureship varies between 2000 and 5400 hours. A companion document to this report includes a comprehensive review of the apprenticeship programs.⁹

The quality and quantity of roofing training programs is improving. Quebec opened a new roofing training facility in Laval in 1997 and is now offering both apprenticeship and journeyperson upgrading. Until last year there was no facilities to train during the crucial winter months when the workforce was able to attend class. Manitoba is preparing to offer training based on the Saskatchewan model.

A traditional roofing apprenticeship is offered in New Brunswick at Saint John Community College. Quebec has now begun offering a traditional apprenticeship program at the new training center in Laval.

Ontario offers roofing apprenticeship training at three community colleges. The format is similar to other provinces but the province does not classify roofing as a regulated trade so that Certificates of Qualification earned in other provinces are of little value in the large Ontario market. The Ontario Industrial Roofing Association is working on its own training system.

Manitoba regulates the roofing trade but has no training. Through the efforts of the SMWIA training developed in Saskatchewan will be offered in Manitoba. The Saskatchewan system follows the usual curriculum and has typical work requirements. However, training is offered in a modular format, organized around specific learning

⁹ Please see “Roofer Training Inventory” prepared for the Study Committee by Peter Kalinge at the CRCA. Copies are available from CRCA or ARA Consulting on request.

activity or competency. As a result, students can enter and exit programs at different times. Students are evaluated upon completion of the required learning activities for each competency and assigned a grade of complete or incomplete on each task. For competency completion, an individual must satisfy the prescribed criteria for the knowledge and skill evaluations. After completing three years of apprenticeship the student can challenge the Red Seal Examination.

Alberta offers apprenticeship training at the Northern Alberta Institute for Technology in the usual format. Training in British Columbia follows the usual apprenticeship format but is offered through a system run by the industry. The Roofing Contractors Association of British Columbia has established its own system — establishing a level of control that would be envied in other provinces. One important advantage is the extension of training to include journeyman upgrading and contractor/managerial courses. The roofer training programs available at the institute are the best and most comprehensive in Canada.

There is thus a similar structure to provincial apprenticeship but quite distinct details. In particular, the presence of dedicated facilities and industry involvement in (for example) Quebec and British Columbia has permitted crucial journeyman upgrading courses. In many other provinces these opportunities are not available. Once a roofer has earned a Red Seal a degree of interprovincial mobility is achieved, but during apprenticeship there is no portability of experience or transfer of credits.

In addition to the formal in-class training for roofing apprentices, many of the roofing trade associations provide in-class instruction related to the application of various roofing materials. These are primarily focused on the health and safety related to the installation of products.

In Alberta, Quebec and British Columbia, training aids provided for safe application of modified bitumen (torched) membranes. These courses are offered in the evenings and usual consist of three to five hours session over a three week period.

Due to the complexity and unique characteristics of various roofing materials, several product manufacturers offer worker training. Some manufacturers require training and certification of applicators as part of their licensed applicator agreements with roofing contractor firms. This is particularly prevalent with manufacturers of synthetic single ply, modified bitumen, elastomeric coatings and sprayed polyurethane foam. Training is conducted at the manufacturer's/supplier's facilities or at the roofing contractor's shops. The duration of training varies between one and five hours. The CRCA report documents thirteen firms in a partial list of supplier based training.

Some training is being provided by private (for profit) organizations. However, the primary focus of these providers is the managerial or maintenance personnel of public and private sector organizations. Courses on roofing are generally constructed in seminar and workshop settings. Such providers include the Technical University of Nova Scotia, the University of Toronto, the Roofing Industry Educational Institute in BC and the Roofing Consultants Institute and Ontario Hydro.

10. Recommendations

Findings and insights in the preceding nine sections are an excellent starting point for human resource planning in the roofing industry across Canada. It is important that these findings lead to specific actions that contribute measurable results. It is also important to recognize that conditions vary across provinces and the need for change is not the same everywhere. The National Study Committee, mindful of the findings and the need for action, have drafted recommendations that are presented in this section.

The recommendations included here are intended to balance the needs of both the workers (union, non-union and future entrants) and contractors. In general, the workers are best served by fewer barriers to mobility and access to more work through enhanced personal skills. Contractors require access to skilled workers at competitive rates with the flexibility to manage their business to maximize growth and profit. The optimum arrangements for labour market support systems (e.g., training, occupational standards and human resource information/planning) must be worked out in consultation with government and educational institutions – but the industry itself has the most relevant experience. Its recommendations, summarized here, have the best chance of success.

Interests of workers and employers are different in these matters. In general, contractors would underfund training and other support systems while workers have an interest in seeking a broader range of skills that contractors might wish to support. The industry requires the right mix of skills, at competitive rates and the flexibility to adjust to cycles and technological change.

10.1 Draft Recommendations

That the “Sheet Metal and Roofing Trades National Sector Study Committee” work with industry leaders and structure activities that will:

A National Roofing Human Resources Committee

Structure a national roofing committee to implement the recommendations of this report.

National Standards

Encourage the further development of national occupational standards for roofing industry journeypersons and apprentices based on the established work in this area. Work with the provinces to gain their support for these standards.

Basic Skills Upgrading

Increase resources committed to basic skills upgrading (reading, math and communications) for journeymen and apprentices.

Certification and Training for a Tiered Workforce

Introduce trade certification and training for a tiered workforce structure that includes:

- journeyperson roofers (skilled);

- ❑ apprentices (journeypersons) (skilled);
- ❑ roofers (semi-skilled); and
- ❑ roofer trainees (semi-skilled).

Tracking
Certification of
Proprietary Systems

Devise a system for certifying employer-based training in proprietary roofing systems. This system might include the adoption of a “training passport”.

Specialized
Upgrade Training

Expand upgrade training opportunities in estimation, computer operation, membrane welding and blueprint reading.

Broaden Apprenticeship
Scope

Take steps to ensure the breadth of the trade by designing and administering apprenticeship so as to counter-balance the specialization in only one type of roofing system. These steps might include increasing the trades school component.

Balance Entry and
Exit to the Trade

Over the next five years the industry should be careful to limit the number of new entrants into the workforce to equal the number of exits. This should be accomplished by limiting new entry to roughly equal 6% of the workforce. Once a more satisfactory balance of supply and demand for labour is established the level of utilization will rise for workers.

Open Access for
Equity Groups

Encourage an openness to proposals and requests from designated groups (women, aboriginal groups, handicapped people, visible minorities and other) that fit with the other recommendations noted here.

Improved Human
Resource Records

Develop a national, computerized standard system for keeping human resource records including hours of work, work experience, educational attainment, employment records (construction and non-construction), upgrade training, and certification and exit/retirement age. Records should track the certifications of workers on proprietary roofing systems.

These recommendations are based on the understanding that all roofing workers, regardless of their employment level, career aspirations, organization of the crew, or the type of roofing (steep or low slope) require a basic and quantifiable set of skills in order to work efficiently and productively as members of a roofing crew.

The basis training will, therefore, be the minimum required by all individuals working in roofing, and should include instruction in such areas as safety, work organization, basic roofing technology and materials, equipment handling, math, communication, etc.

The training provided should be delivered in a manner that best accommodates the needs and circumstances of both the trainee and the employing firm (i.e., modular, delivered at the shop or in a more formal setting). A system of credits leading to the acquisition of the “roofer” status may be the most appropriate. A mechanism should be

put in place to monitor and certify the training programs whether delivered by employers, labour organizations, manufacturers or others.

Upon completion of the basic roofer training, individuals who aspire to become journeyperson roofers may apply for apprenticeship training which would consist of the more structured and formal training currently in place. This occupational and training model would assure that all roofing tasks are performed by workers with certification appropriate to that task. At the same time the four designated occupations are a ladder of progression where time served on one rung of the ladder is recognized in certification on the next rung.

We believe that this structure would most effectively meet the current and anticipated future demand for workers given a tiered workforce. The benefits of this model are as follows:

- ❑ it provides basic training for all but temporary and short-term workers (helpers/material handlers) enhancing the skill set of all roofing workers;
- ❑ it provides a mechanism whereby the training provided meets the requirements of a tiered workforce;
- ❑ it facilitates the mobility of workers between low slope and steep slope, commercial and residential roofing, as well as facilitating intra and inter firm mobility;
- ❑ it allows individuals to acquire training in accordance with their own career aspirations and market conditions;
- ❑ it allows training to be delivered in a flexible and efficient manner; and
- ❑ it is responsive to the needs of the employee, employer and labour markets.

Appendix A

Study Committee Members

Appendix A: Study Committee Members

Jim Bower
Chapter Manager
British Columbia Sheet Metal Association (SMACNA-BC)
156-4664 Lougheed Hwy.
Burnaby, B.C. V5C 5T5

Doug Copithorne
CASMA
2725-12 Street N.E., Suite 210
Calgary, AB T2E 7J2

Claire Gregoire
Formation Professionnelle
Commission de la Construction du Quebec
3530 Jean-Talon Ouest
Montreal, Quebec H3R 2G3

Gary Kot
Business Manager, SMWIA Local 296
#102-1402 Rose Street
Regina, SK S4R 1Z9

Evelyne Lemieux-Nault
Standards, Planning and Analysis Division
Human Resources Partnering Directorate
HRDC
140 Promenade du Portage
Phase IV, 5th Floor
Ottawa/Hull, Ontario K1A 0J9

Wayne Peterson
H.H. Robertson Inc.
1810 Ironstone Drive
Burlington, Ontario L7L 5V3

Bob Porter
HRDC
140 Promenade du Portage, Phase IV, 5th Floor
Ottawa/Hull, Ontario K1A 0J9

Paul Stoll
HRDC
140 Promenade du Portage, Phase IV, 5th Floor
Ottawa/Hull, Ontario K1A 0J9

Bob Colvin
6188 Kingsway Avenue
Burnaby, BC V5J 1H5

Bert Gardner
Suite 310-1110 Sheppard Avenue East
Willowdale, Ontario M2K 2W2

John Hill
Canadian Roofing Contractors Association
1300-155 Queen Street
Ottawa, Ontario K1P 6L1

James Larmour
Suite 105-14 McQuade Lake Crescent
Halifax, NS B3S 1B6

David Martin
Business Manager
SMWIA Local 511
202-1080 Wall Street
Winnipeg, MB R3E 2R9

Owen Pettipas
Business Manager
SWMIA, Local 537
479 Main Street
Hamilton, Ontario L8N 1K1

Jacques Regnier
Business Manager
SMWIA Local 116
260-7851 Jarry Street East
Ville d'Anjou, Quebec H1J 2C3

George Ward
Ontario Sheet Metal and Roofers Conference
1312 Hurontario Street
Mississauga, Ontario L5G 3H3

Ken Whiteside
Whiteside Roofing and Sheet Metal Ltd.
78 Morley Street
Hamilton, Ontario L8H 3R7

Carl Woodley
Brunswick Roofing and Sheet Metal Ltd.
P.O. Box 1223
60 Hubbard Road, Fredericton Industrial Park
Fredericton, NB E3B 6B4

Jim Young
199 Eagle Drive
Winnipeg, MB R2R 1V4

Appendix B

Survey Methodology and Returns Analysis

Appendix B: Survey Methodology and Returns Analysis

Survey Design

The survey was developed through several drafts after extensive consultations with the National Committee and with regional advisory committees. The survey was translated into French. Questions were adapted to special circumstances in Quebec, regarding regulation of apprenticeship and the construction industry. The text of the surveys is reproduced at the end of this appendix.

Survey Implementation

The survey was implemented with the assistance of national and provincial contractor associations and the Sheet Metal Workers International Association. Members of the regional advisory committees provided generous assistance in implementing the survey and reaching regional targets.

Returns

Table 1 summarizes survey returns by province and by occupational status:

*Table 1: Synopsis of Workforce Survey
Province of Current Residence and Current Occupational Status*

	Owner/ Operator	Foreman/ Supervisor	Technician	Trades- person	Apprentice	Not Stated	Total	Percent
Newfoundland	1				1	1	3	0.8%
Nova Scotia	1	8	1	9			24	6.4%
New Brunswick	1	6		3	2		12	3.2%
P.E.I.								0.0%
Quebec	2	11		20	5		38	10.1%
Ontario	1	31	3	43	6	4	88	23.4%
Manitoba		5	1	11	6	2	25	6.6%
Saskatchewan	3	12	2	20	8	5	50	13.3%
Alberta	4	11		15	6		36	9.6%
B.C.	7	17	1	21	53	1	100	26.6%
Yukon								
Not Stated								
Total	20	101	8	142	92	13	376	
Percent	5.3%	26.9%	2.1%	37.8%	24.5%	3.5%		100.0%

Table 2 summarizes returns by province and by union status.

Synopsis of Workforce Survey – All Respondents: Province and Union Status

<i>Table 2</i>	Union Percent	Non-Union Percent	Total Returns
Newfoundland	33.3%	66.7%	3
Nova Scotia	73.9%	26.1%	23
New Brunswick	41.7%	58.3%	12
P.E.I.	0.0%	0.0%	0
Quebec	97.3%	2.7%	37
Ontario	63.6%	36.4%	88
Manitoba	96.0%	4.0%	25
Saskatchewan	14.0%	86.0%	50
Alberta	52.8%	47.2%	36
B.C.	51.5%	48.5%	99
Yukon	0.0%	0.0%	0
Total	216	157	373
Percent	57.9%	48.5%	

Table 3 reviews survey returns by age and compares these returns to the average derived from the 1991 Census. The survey sample — which was predominantly of low and flat-slope industry members — is somewhat skewed to union members and is markedly older than the Census sample. As can be seen, in the Census, 35.2% are age 36 or over while in the survey sample, this proportion rises to 54.2% (excluding those who did not state their age). In the Census sample, the average age is approximately 33; in the survey sample, the average age is 37.6.

Age Distribution of Workforce Survey Participants

<i>Table 3</i>	Returns	Percent	1991 Census
< 25	37	9.8%	27.4%
26-35	132	35.1%	37.4%
36-45	116	30.9%	21.3%
46-55	68	18.1%	9.9%
56-65	15	4.0%	3.7%
66 or over	1	0.3%	0.3%
Not Stated	7	1.9%	n/a

* Census: Age Group 15-24