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Integrating Newcomers

A comparison of British Columbian and French roofers

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Summary

A category pulls together many phenomena in a manner that benefits the creature in whose mind it resides. It allows invisible aspects of objects, actions, and situations to be "seen". Categorization gives one the feeling of understanding a situation one is in by providing a clear perspective on it, allowing hidden items and qualities to be detected … future events anticipated … and the consequences of actions to be foreseen. Categorization thus helps one draw conclusions and to guess about how a situation is likely to evolve.

Hofstadter and Sander[1]

Introduction

The British Columbia Construction Association (BCCA), through its *Integrating Newcomers* initiative, is interested in establishing equivalencies and identifying gaps between French credentials and Canadian (specifically BC) credentials.

This paper compares the training and certification of British Columbia (BC) and French roofers. Where possible 6 kinds of programs were compared, namely:

- British Columbia apprenticeship program
- British Columbia "Challenger" program
- French BM (Brevet de Maîtrise - III), CMA[2]-based
- French Bac pro[3] (IV), lycée (school-based)
- French BP (Brevet Professionnel - IV), CFA (apprenticeship)
- French CAP (Certificat d'Aptitude Professionnelle - V), CFA (apprenticeship)

These programs lead to a limited number of credentials. The BC programs lead to the Red Seal endorsement. The French programs lead to either a level IV or level V education ministry credential, regardless of route. The French BM, level III, is an industry-created and administered credential, available, under different set of pre-requisites, to graduates of the roofer program level IV. The difference in routes to lower level credentials is important when laddering into further studies in the French system.

Methodology

We conducted the comparisons using documents from three sets sources: BC's Industry Training Authority and Ottawa's Red Seal websites for Canadian content - Program Overview and Challenge

[1] Douglas Hofstadter and Emmanuel Sander (2013); *Surfaces and Essences*, Basic Books, p.14,

[2] Where CMA stands for Chambres de Métiers et de l'Artisanat, a French industry association that runs a network of training programs, facilities, and credentials.

3 The Bac pro for this trade is called "Bac pro Interventions sur le patrimoine bâti option couverture" and focusses on restoration work for buildings pre-1945. We chose the BP as a better "hands-on" equivalent for our comparisons.

process and requirements, and the NOA, Essential Skills, and Ellis Chart, respectively. And for French materials, we consulted the Éducation Nationale, Legifrance, éduscol, es&st, inrs, CMA, and CFAs websites – these cover education, labor law and education law, teaching resources, health and safety, industry bodies, and private apprentice training, respectively.

The comparison is in four parts: First Impressions, Essential Skills, Comparing Program Levels, and Examinations and Certification. In First Impressions we used the documents to conduct a meta-analysis: we wanted to know about similarities and differences in philosophies, program delivery, length, organization, emphasis and high level content. In Essential Skills, neglecting native tongue, we rated each program against each essential skill to represent the likelihood that a graduated roofer had mastered the skill. In Program Levels we rated each program against the BC/ITA's Program Overview elements, rating first the general areas of competence then the competencies. And in Examinations and Certification we compared the formal requirements for certification, examinations, and the certification granted. We discuss briefly the structure of examinations, problems associated with the examinations, and the validity and reliability of these examinations.

We created two tools to help us with these tasks. We developed a 10-point rating system color-coded to indicate rough safety and training implications, and cross-referenced to the French ratings. And we developed a glossary of terms to reflect how we understood training, testing, and certification terms in English and French.

Findings

The following are among the more striking differences and similarities (more details under the separate parts):

A French roofer can build and insulate all manners of roof structure, he is a superior installer of all types of roofing materials including sheet metal details and he has excellent shop skills – he can move from the shop – where he might spend 10% of his time - to the field easily. A French just- graduated roofer, will have more time in the trade (or equivalent) than a BC roofer. French roofers holding the BP credential will have more both hands-on and in-school hours than a BC roofer. French roofers holding a Bac pro, overseen by the Ministry of Culture and pretty rarely taken, will have fewer hands-on hours and more in-school hours – for more equivalent hours - than a BC roofer but their field of expertise is limited to heritage buildings, hence is of no interest to us in this analysis.

In all things scholastic, the French roofer is better equipped. The BC graduate of the apprenticeship system is next, followed by the Challenger. That is because in France, the roofer-in-training is completing (usually) secondary school and must take general math, physics, French, socials, and a foreign language in addition to trade-specific courses and shop and field work. By contrast, BC apprentices enter the block release training system usually after they exit the K-12 system, and the Challengers do not take any formal training that we know of.

The French roofing programs strongly emphasizes designing, planning, manufacturing, and assembling components. And all of these activities are conducted using both traditional - "paper-and-pencil" – and computer-assisted means - software packages.

The French programs are extremely detailed and very prescriptive; they are thoroughly thought out and articulated and meticulous programs. In a few words, you know what you get.

In both BC and France, there is a tacit "exchange rate" between hours on the job and hours at school. While in BC the schooling for apprentices is short, the hours are costly, more so than in France. Whereas in BC one can exchange work hours for school hours – it is the basis of the challenge process, in France, essential schooling must be taken regardless of work hours; the difference is in the type of diploma and how it bridges to more advanced credentials. In all cases, BC apprentices' and Challengers' most onerous program component is hours on tools.

In both BC and France, certification is granted on the strength of one or several examinations. In BC, it is a single paper and pencil exam, in France a comprehensive, challenging battery of written, practical, and oral tests.

The Bac pro

The Bac pro germane to the Roofer trade is called "Bac pro Interventions sur le patrimoine bâti option couverture". Graduates of this Bac pro work with architects and builders on restoration work for buildings pre-1945. Graduates of this program cannot be compared to Roofers (*Couvreur / Couvreuse*) as the program does not cover modern materials and techniques. For the purpose of this analysis, we chose the BP as a better "hands-on" equivalent.

The BM

The *Brevet de Maîtrise*, a level III credential, is the next step up the French credentialing ladder when travelling the CMA stream in the roofing trade. But, as our French colleagues have pointed out, there are few enrollees in this program at the time, even though about 380 roofers complete the BP each year.

To be eligible a candidate must have at least a level IV roofer credential – BP or BTM, or a level V roofer credential and 5 years' field experience, or a level IV carpenter credential with 3 years' experience as a roofer.

It remains that, since the French Level III is geared for owners, managers, or project managers, the competencies covered are more managerial / supervisory rather than practical[4]. Using the summary document for the BM roofer as a basis, it seems that the closest British Columbian equivalent program is, e.g., BCIT's 2-year Construction Management program, leading to a bachelor level credential. But candidates applying to BCIT must have completed 2 years of relevant post-secondary education, not be holders of a trade credential. Unlike French Level IV graduates, BC Red Seal graduates have no direct, laddered access to further, advanced studies in their trade.

[4] This is a broad generalization as the program devotes 40% (approx.) of the training time to "professional modules", most of which are devoted to advanced hand and CAD drawing, planning and executing complex fabrication tasks, planning and supplying the worksite, and (usually) organizing crews to execute the planned work. The exam battery also has a practical component mirroring these (somewhat) activities. Nevertheless, the emphasis is more on the planning and executing than on the doing.

Therefore, we did not think it illuminating to compare level III (bac + 2) graduates' competencies with those of British Columbian trade Red Seal holders. This is because, differences in trade practices notwithstanding, French Level IV graduates are already better and more broadly trained theoretically than Red Seal holders. Moreover, the level III competencies generally belong to another domain than the Level IV and Red Seal competencies, even in the same trade.

Clearly roofing BM holders are more qualified than graduates of the BC apprenticeship program. But it might be interesting to see what combination of BC roofing and construction credentials might be comparable – but this would have to be another analysis.

Gaps

The gaps we flag below are those for a French roofer coming to BC. Throughout the analysis, we make the trivial point that, for some of the gaps like language, a BC roofer moving to France would show the same gap. Notwithstanding this fact, the gap analysis would have yielded substantially different results if we had conducted using either the NOA or the French program as a reference rather than the BC apprenticeship program overview. But these differences could be attributed, in part, to structural differences in the documentary sources used.

Language

Despite the foreign language requirement in the French program, a French roofer, while possibly competent in basic English, would entirely lack the technical language skills of the trade in BC.

Our French colleagues pointed out that even though one would expect gaps resulting from being in a foreign language environment, there would still be, for CAP graduates, language problems in French. This is because "the CAP is aimed for students coming out of SEGPA (adapted schooling), hence having learning difficulties, especially in core topics. And when they are in an apprenticeship program, the language component of the training is very limited. This continues if they move on to the BP program. This is why the soon-to-be-offered Bac pro would take an additional year to complete."

Health and safety

Health and Safety legislation, regulations, and their implementation are very strict in France. While there are similarities at the personal level (e.g., Personal Protective Equipment (PPE), Fall Arrest, etc.), at the worksite level (e.g., dust, asbestos, noise, etc.), and at the application of the regulations, a French roofer might miss the differences between the French approach and the BC approach, probably on account of those similarities.

Codes

Like Health and Safety, building codes are jurisdiction-specific in Canada. A French roofer coming to BC would be fully aware that there are building codes, would know how to look things up, would know how to apply code requirements to his or her work, but would not know the specifics of the codes that pertain in BC.

Measurement system

France is a MKS or metric country. French roofers do not know the FPS or imperial system (save for the "S" of second). BC roofers (and most construction workers) usually work in imperial, and even the Red Seal exam provides all dimensions in both metric and imperial systems. And BC roofers use lifting and

hoisting equipment that is tested and tagged in imperial (if it is from the United States), use imperial load charts, and calculate their load limits using pounds.

Waterproofing and damp-proofing

Briefly said, French roofers don't do routinely water- and damp-proof. While they will install roof waterproofing membranes and heat and sound insulation, and will design, fabricate, and install water evacuation systems, they do not install water- and damp-proofing materials on walls, floors, kitchens, showers, or decks. And they do not do any work below grade. These tasks are done by the holder of a credential in water- and damp-proofing ("CAP / BP Étancheur / Étanchétité bu bâtiment et des travaux publics").

But this can be put in perspective when we notice that BC roofing apprentices only get 1 day of training in this topic over their three-year apprenticeship.

Flat roofs

Contrary to BC, In France, flat roofs account for only 20% of work volume[5] and the training programs (whether leading to a level V CAP or level IV BP) reflect this industry feature.

Note that flat roofs in France are defined in two linked manners: (i) the size of roofing "elements" (materials), and (ii) the type of building. Large roofing elements such as metal panels, cement fiber boards, etc. are compared to small roofing elements such as tiles, asphalt shingle, slate, etc. Small elements are predominantly used on residential structures and exhibit strong regional variations, whereas large elements are used for non-residential structures and are pretty standard throughout the country.

Torch-on materials

Torch-on is not as common in France as it is in BC, regardless of building type.

[5] http://www2.cndp.fr/archivage/valid/brochadmin/bouton/e051/e051ca.pdf accessed 13 January 2016

First impressions

In this section, we conduct gross comparisons between the French and BC programs. We compare the programs' stated conceptions or philosophies, trade descriptions, credential worth, and program lengths and mixes. Throughout, we consider "just graduated" BP roofers as our subjects. We realize that all graduated roofers have had different learning trajectories most likely leading to different abilities, but, given the lack of profiling data – and the scope of this analysis – we have used published program content and standards as normative tools: all graduates of a program are the same.

Using the saw "a roofer is a roofer is a roofer" or even "if it looks like a roofer, talks like a roofer, acts like a roofer, then it must be a roofer" to circumscribe what the trade is – for our purpose to be able to compare French and British Columbian roofer – would be naïve at best, dissembling at worst.

But it allowed us to be in a position to conduct an analysis of the similarities and differences between the two programs / certifications. And we will be able to use this analysis to develop a set of recommendations to make the equivalencies (and differences) pertinent to roofers when they switch jurisdictions.

As mentioned above we have conducted the analysis using a level IV credential usually – but not necessarily – accessed in two steps. First the level V CAP over 2 years, then the level IV BP over another 2 years.

Program conceptions

Here we compare how the Canadian and French education and training and governmental institutions apprehend their trade learners and, ultimately, grant them a credential. Beyond the face value of, say, a CAP or a CofQ, the credentials carry a social worth that is a direct legatee of the philosophy and pathway that led to the credential. Expressions such as "book learning" or "academic", especially when used as a qualifier adduced to a credential, have currency in the world of trades, where it is not valued as highly as "on-the-job" – and this credential social depreciation is levelled from both in-school and on-the-job perspectives.

The fact that there is a social value attached to credentials is based on the assumption that different paths taken to a credential, job, or career yield a different, in our case, roofer. And to the extent that this difference goes beyond presence or absence of skills, it makes for a different tradesperson notwithstanding personality traits.

A stated goal of education in France, and apprenticeships are no exception, is to form a "citizen". By contrast, in BC, "citizenship" is left out of trades programs. It is possible that since the French programs are targeted at younger learners (between 16 and 25), schools have this additional mission. In Canada, the median age of apprentices is 25, and, arguably, older learners understand their role as citizens.

The French system is based / focused on education and training, labs and structured, sustained industry experience are meant to both reinforce the school elements and expose the trainee to new and challenging tasks. By contrast, the BC system (and we assume, by association, other Canadian jurisdictions) is based on workplace skills obtained through the job, and training, when taken, is meant to elucidate these practical, workplace skills. As a result, French graduates might show what could be called an *epsitêmê* or theoretical slant, whereas the BC graduates would show a *technê* or praxis slant.

The French system deals with plain students – those of lycée age in general - or students who are under a rigid work contract - apprentices. By contrast, the BC system deals with workers who happen to be released from work for in-school training at variable intervals.

Table 1. Rough comparison of the some of the conceptions of French and BC programs

Component	French program	BC Program
Program aim	Citizenship	Skilled worker
Training approach	Theory (and practice)	Practice (and theory)
Training emphasis	Mental skills (and hand skills)	Hand skills (and theoretical skills)
Training regimen	Lock-step, fixed time	Open
Training delivery	En alternance (apprenticeship)	Block release (apprenticeship)
	Full time school + placement	
Training duration	2 (CAP) or 4 (BP) years	3 – 5 years[6]
Main training vector	Classroom + labs	Work / jobs
Learner status	Employee under contract (apprenticeship)	Employee (apprenticeship)
	Secondary (lycée) student	
Credential	National	Provincial + national endorsement
	Industry-based (BM Couvreur)	
Completion rates	85%	45%

What is a roofer?

Taking for granted that not all roofers are absolutely equal when they graduate, we can nevertheless "pretend" that they are and that they are thus solely due to the different training pathway they've taken. This approach will allow us to conduct rough and more detailed analyses of the similarities and differences between the programs and certifications.

To illustrate this point, here are (excerpt of) definitions of "roofer" which we found in the four (+) major sources of information we've used in this report:

- Industry Training Authority (ITA) - British Columbia
    - Roofers build and repair flat roofs - using hot asphalt, gravel and waterproof sheet materials. They may also build and repair sloped roofs - using asphalt and wood shingles, shakes and masonry or baked clay roofing tiles and metal materials - although this type of work is typically done by a Residential Steep Roofer. Their work also involves setting up scaffolding to provide safe access to roofs. Roofer is a nationally designated trade under the Inter-provincial Red Seal program. Many Roofers work in the construction industry or for home renovation firms. They may need to estimate the materials needed and the cost of installation, in some cases from plans or project specifications. They may determine what costs and materials can be saved and what structures need to be replaced. Roofers work in high and potentially dangerous places,

[6] http://www.statcan.gc.ca/pub/81-004-x/2010002/article/11253-eng.htm accessed 3 December 2015

making safety considerations vital. ... Opportunities for Roofers are closely tied with levels of construction and renovation activity, and weather can have a significant bearing on work scheduling. (Industry Training Authority, "ITA", Roofer trade description, ITA website[7])

- "Roofer" means a person who builds or lays insulation, vapour retarders, built-up or flat-deck roofs, covering roof frames with unitized materials such as tile, slate, composite, wood, shakes and shingles and metal shingles; application of roof deck waterproofing with modern plastic and rubberized coating materials and, the damp and waterproofing of floors, foundations and below-grade pipes and tanks with such materials as pitch, tar, asphalt, plastic, bitumen and rubberized materials, in any building other than residential premises. (Industry Training Authority, "ITA", Roofer Program Outline, 2011[8])

- National Occupational Analysis (NOA) - (Canadian / federal)
  - Roofers install, repair and replace flat and sloped roofs. They work with membrane roofing systems that consist of a variety of materials with different application methods. They also install, replace and repair shingles, slate, shakes, roofing tiles, sheet metal and other preformed sheeting on sloped roofs.
    Before the work begins, roofers may inspect existing roof systems and determine the extent and procedure for repair of the substrate or removal and replacement of roofing materials. Some roofers may be involved in the estimating of material and installation costs.
    As part of the job preparation, roofers may set up scaffolding to provide safe access to the work area and may install fall protection systems. They also weatherproof, waterproof and dampproof roofing surfaces, foundation walls, floor slabs and bridge decks. They install roofing accessories such as sheet metal flashings, roof vent flashings, anchor bolt flashings, drain inserts and clamps. ... (Employment and Social Development Canada, National Occupational Analysis - Roofer, "NOA", 2012)
- Office National d'Information Sur les Enseignements et les Professions (ONISEP) - France
  - A roofer installs scaffolding and safety systems. In preparation to installing the roof itself, the roofer attaches batten boards on the roof frame. Then he prepares plaster, cement, sand, and lime required to build joints.
    Using the blueprints, roofers install materials such as slate, tiles, glass, plastic, sheet metal, aluminum, copper, lead, etc. each of which require specific tools and techniques. And to make sure the roof does not leak, these must be installed with a tolerance within a millimeter.
    A roofer will then install systems that will ensure rain water evacuation such as gutters and downspouts, ornamental works such as wind vanes or church spire roosters, as well as skylights and dormers. He also waterproofs chimney bases and insulates the roof.
    A roofer also maintains and repairs roofs, for example replacing tiles ripped out by a storm, thatch rood replacement, water leaks … In some cases, repairs may be conducted

[7] http://www.itabc.ca/program/roofer accessed 09 January 2016
[8] Interestingly, this 2011 document states that it has been aligned to the 2012 National Occupational Analysis, "NOA", the federal document that is the basis for the Red Seal examination.

on classified historical buildings. (our translation, ONISEP.FR, accessed 10 January 2016)[9]

- BTPCFA-Vienne[10] - France (Centre de Formation des Apprentis)
    - The holder of a Roofer-Sheet Metal CAP is responsible for building, fixing and restoring roofs on new, existing, or historical buildings. He is also responsible for systems that catch and evacuate rain water. He may work with a variety of materials such as tiles, slate, shingles, stone, thatch, zinc, lead, copper, etc. Using a plan he makes the worksite safe and prepares the roof structure. He also installs ancillary structures and systems such as frames, perforated tiles, etc. (our translation, BTPCFA-Vienne.com, accessed 10 January 2016[11])

Rough comparisons – Trade description

Using the trade descriptions, we've tried to identify large qualitative differences between the Canadian, BC, and French trade practices. The large differences can point to gaps that might be filled by upgrade training programs when roofers move from one jurisdiction to another.

Not all roofers are the same as we noted above. Regardless of jurisdiction, training and certification attest that a certain level has been reached at some time. But each roofer's extant skill set will be a function of (i) his/her job experience(s) after the training, and (ii) the length of time since certification. We are calling this latter effect "skills erosion": a state of affairs due to the differential worker exposure to specific work practices over time.

Further, it is interesting to see that the ITA offers two different descriptions. The first cited above is located on its website and places great importance on flat roofs whereas the second is somewhat more balanced and underlines the water- and damp-proofing aspect of the trade. Perhaps this is reflective of a change in how the trade is practiced, it appears to be a slow split between roofing proper – a change already visible in the "Steep Roofer" trade designation as an ITA (dormant) program – and below-grade water- and damp-proofing, work quite often done - after inspection and before backfilling excavations - by the same workers who did the foundation work, carpenters, for example.

[9] Le couvreur met en place les échafaudages et les dispositifs de sécurité. Avant de s'attaquer à la toiture, il fixe les liteaux (lattes de bois supportant la couverture) sur la charpente. Puis il prépare le plâtre, le ciment, le sable et la chaux nécessaires pour les raccords et les scellés. Conformément aux indications du plan, le couvreur pose les matériaux (ardoises, tuiles, verre, plastique, zinc, tôle, aluminium, cuivre, plomb...) auxquels correspondent une technique de pose, un outillage. Pour assurer l'étanchéité du toit, ils doivent être ajustés au millimètre près.
Le couvreur installe ensuite les accessoires qui permettront d'assurer l'évacuation des eaux de pluie (chéneaux, gouttières), les éléments ornementaux (girouette, coq d'église) ainsi que les lucarnes. Il assure également le raccord de base des cheminées et l'isolation thermique. Le couvreur assure également l'entretien et les réparations. Des tuiles arrachées par la tempête, un chaume qu'il faut remplacer, des infiltrations... c'est lui qu'on appelle à la rescousse dans ces cas-là. Certaines réparations peuvent relever de la restauration d'art, notamment sur les édifices classés monuments historiques.

[10] Note that the description (and the delivery mode) for roofer varies from CFA to CFA.

[11] Le titulaire du CAP Couverture-Zinguerie a en charge la réalisation des toitures des constructions neuves ou en réfection et la restauration d'ouvrages anciens. Il assure également le recueil et l'évacuation des eaux de pluies. Il peut travailler sur différents matériaux : tuiles, ardoises, bardeaux, lauzes, chaume, zinc, plomb, cuivre, etc. A partir d'un plan, il prépare et sécurise le chantier et prépare le support sur lesquels reposera la couverture. Il pose également les accessoires (châssis, chatières, etc.).

It remains that there are clearly identifiable areas in the Canadian programs such as flat roofs, asphalt, tar, pitch, and gravel, and below-grade water- and damp-proofing that are not part of the French program.

Similarity – Work sites

All descriptions make it clear that roofers work on all types of edifices – from single family dwellings to apartments blocks and small and large commercial and industrial structures - and that the work may be new, remedial, restorative, or ameliorative. Let's nevertheless note that, unlike in BC, the majority (80%) of the work of French roofers takes place in the residential sector. That sector in BC is both less important and less visible officially.

Similarity – Work drivers

Both Canadian and French definitions state that roofers make use of blueprints, schematics, and drawings to conduct their work. French roofers usually, unlike Canadian roofers, use powerful software packages to plan their work.

Similarity – Work Scope

All descriptions indicate that roofers are expected to be able to carry out all aspects of a roofing construction project.

Difference – Worker safety; general

Canadian documents emphasize site and personal safety, not in the trade description itself except in passing, saying that working at heights is dangerous. There are no specific references to safety practices, codes, or regulations.

In contrast, the French descriptions do not mention safety as such. This might be due, in part, to the fact that the Code du Travail – backed by the Code de la securité sociale (article L. 461-4) and on-site medical services - stipulates both structure and process when it comes to Occupational Health & Safety (Titre II : Principes généraux de prevention)[12].

An in-depth examination of the differences between the Canadian and French approaches to safety at work from a training or certification perspective is beyond the scope of this analysis. However, given the large difference between the approaches, it is fair to say that French workers starting to practice in a Canadian environment would require substantial training in safety regulations and processes and on-the-job practices. Canadian workers moving into a French environment would also require training mainly in the procedural aspects of at-work safety practices, and in the structural and legal aspects of worker safety.

Difference – Worker safety; chemicals

The NOA, under occupational observations, states "Roofers are increasingly using mechanically fastened and peel-and-stick membranes. There is an increase in concern about chemical fumes entering buildings." (Employment and Social Development Canada, National Occupational Analysis - Roofer, "NOA", 2012). These materials are not as prevalent in France, and personal and public environmental

[12] For additional information on OH&S training for "trainees" see http://www.esst-inrs.fr/synergie/

prevention practices related to all materials are part of the general training in controlling these types of threats.

Difference – Worker and public safety; Fire Safety

Both the NOA and the Program Outline emphasize fire safety on account of the important and increasing use of torch-on systems in Canada. In France, however, torch-on is not as prevalent and building structures are different (less wood frame) and, consequently, fire safety falls into the general safe work practices.

Difference - Building materials

Both Canadian definitions clearly emphasize flat roof and below-grade materials: membranes, tar, pitch, bitumen, and gravel are given a prominent place. And while the NOA – and to a lesser extent the BC Program Outline - mention unitized materials (e.g. shingles, shakes, etc.), these are preceded by the word "and" after a lengthy description of flat roof and below-grade materials. The ONISEP and CMA definitions, on the other hand, emphasize unitized materials, probably a reflection of the industry itself. In addition, these materials are more varied – think of thatch and slate, for example – than what is listed in the Canadian documents.

Difference – Sheet metal practices

Both the NOA and the Program Outline list installing flashings, vents, and metallic roofing materials. But they do not, like the French program list designing, fabricating and installing sheet metal flashings, vents, chimneys, and ornamental works. Nor do the Canadian documents list manufacturing and installing gutters and downpipes made of metals other than sheet metal (for example, copper and stainless steel) or aluminum.

Difference – Skills overlap with other trades

Unlike the French roofers, Canadian and BC roofers do not build the roof structures themselves – they might replace sheathing or substrate materials on sloped roofs. It is not surprising, then, that a holder of a French Carpentry Level IV credential with 3 years' experience in roofing is eligible for the Level IV Roofing training and credential (BP). There is no such cross-trade opportunities in Canada.

Also, in France it is possible for a roofer to specialize – most likely as a function of the region in which he practices his trade – in the type of unitized materials such as slate ("*couvreur ardoisier*"), stone ("*couvreur lauzier*"), zinc ("*couvreur zingueur*"), etc. However, as our French colleagues have remarked, these specialties are marginal to the common practices in the trade.

Difference – Green technologies

French roofers are expected to install photovoltaic and photothermic panels as part of their day-to-day practice. In contrast, the BC program makes no mention of these and the NOA restricts the practice to detail work around the already installed equipment: "Increasing numbers of roof projections such as cell towers and photo-voltaics mean that roofers spend more time detailing and accommodating these features." (Employment and Social Development Canada, National Occupational Analysis - Roofer, "NOA", 2012)

Rough Comparison – The credential's worth

The worth of a "ticket" is dual: that of having one in the first place, and that of the mean by which it was attained – what we could call an "acquisition value". Usually just having a ticket suffices. However, if any argument arises at as to the worth of the ticket, disagreements hinge on the acquisition value, usually to decrease the ticket's social value. The same holds for the experiential path taken to get the ticket; the reputational value of the employer or the projects worked on weigh heavily on the overall worth attached to the ticket.

As the "Program Conception" section above indicates, credentials appear to be more important societally in France than in BC where what a worker can do, based on his/her experience, usually trumps a "ticket". But the BC experience might not be the same as that in Canadian jurisdictions that have "compulsory trades" like Québec or Alberta; there, having a ticket – or being a registered apprentice - is necessary to practice.

Both in BC and in France the credential is held for life. French credentials, however, are better articulated to further studies than in BC and Canada. This is true for both French pathways, the "trade" route (Filière CMA), and the technical studies route (Parcours EN, but excluding the Bac pro for roofing as indicated earlier) - leading to Levels III, BTMS / BM and BTS, respectively, and II BMS and Licence, respectively.

Finally, French credentials are issued by the national government – excepting the roofing Level III BM which is an industry credential issued by the CMA - and have currency everywhere in France – and arguably can be used in the entire European Union as a means to get a job[13]. By contrast, a BC roofer may face different fees and processes depending on the Canadian jurisdiction he/she wants to have the BC credential recognized.

Rough Comparisons – Program mix and length

In British Columbia[14], there are 2 main paths to get certified as a roofer: a formal course of study (apprenticeship), and an informal, workplace-based route (challenge). The main differences between the two pathways are (i) the open-endedness of the workplace-based route, and (ii) the exchange of schooling for additional experiential hours. The exchange rate[15], as it were, is 5 hours of work for each hour of school (see Table 2 and Figure 1 below).

[13] Free movement of workers is a fundamental principle of the Treaty enshrined in Article 45 of the Treaty on the Functioning of the European Union and developed by EU secondary legislation and the Case law of the Court of Justice.

[14] We specify British Columbia because the requirements differ from jurisdiction to jurisdiction for apprenticeship from 1 year and 2000 hours in Québec to 3 years and 6000 hours in Nova Scotia (see Ellis Chart at http://www.ellischart.ca/home.jsp?lang=en); or even compulsory as in Alberta; and for the challenge with undefined years and 5400 work hours in BC vs. 6 years and 8270 hours in Alberta.

[15] The exchange rate, normed to the BC requirements, is a rough temporal measure we used to equate on-job experience and in-school training. The exchange rate is calculated as $(H_A-H_C)/H_{IS}$, where H_A are on-job apprenticeship hours, H_C are minimum required hours for a challenge (i.e. without attending school), and H_{IS} are total in-school hours during the apprenticeship. There is no French exchange rate as we have used the CFA-based, articulated BP for the analysis as the Bac pro is unsuitable as indicated earlier. The BP is most easily accessible via the CAP → BP route.

In France credentials are granted upon completion of a state-sanctioned program. The length of the program is directly related to the credential attached: a Level V credential is awarded after 2 years, a Level IV after a further 2 years (the 3 year Level IV Bac pro specializes in historic buildings' roof remediation and is not germane to our analysis). The total number of years to reach the Level IV roofing credential is 4 years and can be done through apprenticeships, but not necessarily so. There is no exchange rate as the in-school hours are mandatory. It is possible, for older workers to access the credential via the continuous learning ("en formation continue") route, and that route requires fewer hours in school – especially is the student already has some advanced credential. But this route does not appear to be common.

Briefly, it seems like in British Columbia, school-based training is disesteemed - can be replaced wholly by workplace experience - but worth a lot, whether in France school-based training is a must, and workplace experience is highly structured and monitored.

Comparing the programs and using the British Columbia exchange rate – comparing a French credential for BC, and norming to the minimum BC requirement for hours in the trade, all French programs match or exceed the BC requirements. The closest match, at this gross analytical level, is with a CAP (Level V) credential acquired through an apprenticeship: a 0.05-year[16] BC workplace shortfall equivalent. The BP shows 1.8-year BC workplace excess equivalent.

Comparing a BC credential for France, and norming to the BP, and since the French programs comprise much more school and time than BC programs, any graduated BC roofer has a 5.15 BC roofer year shortfall (i.e. 1200 hours). Counting only the hands-on hours, a BC apprentice has a 0.95 BC roofer year shortfall, a challenger a 0.53-year excess equivalent. And both the BC apprentice and the BC challenger show a deficit in in-school hours: 0.84-year equivalent and 1.14-year equivalent respectively.

Given the (generous) school-centric nature of French programs, it seems that a structured workplace-based "make-up" program for incoming French workers is the best approach. The converse would be true for BC workers moving to France.

Table 2. Program comparison in weeks, hours (adjusted for statutory holidays, BC workweek at 40 hrs; French work and school weeks at 35 hrs) - with an exchange mechanism for workplace hours – Note that Red Seal CofQ stands for the challenge credential access.

[16] "Year" is defined loosely as 50 weeks (accounting for 2 weeks of annual vacation) each at 24 hours for a total hours of 1200 hours (the figure used for calculations in this part of the analysis) – hours at work are undefined / unregulated, in the sense of minima or maxima, save for obligations under the BC Labor Code and/or Collective Agreements for unionized workplaces. In-school for BC apprentices is nominally set at 30 hours/week but contact time may vary from institution to institution depending on Collective Agreement

	Jurisdiction				
	British Columbia		France		
	Red Seal CofA + CofQ	Red Seal CofQ	BAC Pro (IV)[17]	CFA BP (IV)[18]	CFA CAP (V) EREA LP
Program Elements				En alternance[19]	
Duration (years)	3	5	3	4	2
Duration (weeks)	156	225	156[20]	183	92
In-school (weeks/year)	4	0	36	13	13
In-school (total weeks)	12	0	108	39	26
In-school (total hours)	360	0	2700	1365	910
At Work (hours/year)	1200	1200	257	1190	1190
At Work (total weeks)	90	135	22	136	68
At Work (total hours)	3600	5400	770	4760	2380
Extra work hours		1800		3990	
"Exchange rate"		5			
Extra school hours Bac pro / **BP**-CofA			2340	1005	550
Extra school hours Bac pro-CFA Bac pro					
Extra school hours Bac pro / BP - CFA Level V				455	
BC Exchange rate value Bac pro / BP				5025	2750
BC Exchange rate value CFA Bac pro					
BC Exchange rate value CFA Level V					
Net BC workplace "value"	5400	5400		11585	6930
Difference (normed to BC)	0	0		6185	1530

[17] We have based the roofer analysis on the BP CFA route as the Bac pro (as note before) is not a trade as such. But we have kept the same format and comparison basis as we used for the carpenter analysis, supplemented with figures using the BP as anchor, in order to make comparisons with other reports easier.

[18] The BP (IV) numbers are cumulative (CAP+BP). In order to get into a CFA-based BP, one must hold a CAP (V), then take the BP training. Since the CAP takes 2 years to obtain and the BP another 2 years, we have added the training periods to yield the numbers shown.

[19] "En alternance" means that the learner spends two weeks on the job followed by two weeks at school for the duration of each of the school years of the program (BTPCFA-Vienne). But this may vary from CFA to CFA.

[20] School week in France is 24-28 hours set by the Ministère de l'Éducation Nationale; holidays roughly 16 weeks/year (regardless of zone), set by provision of the Code du Travail. The CFA we consulted listed annual vacations at 5 weeks/year for apprentices as per minima set by provision of the Code du Travail.

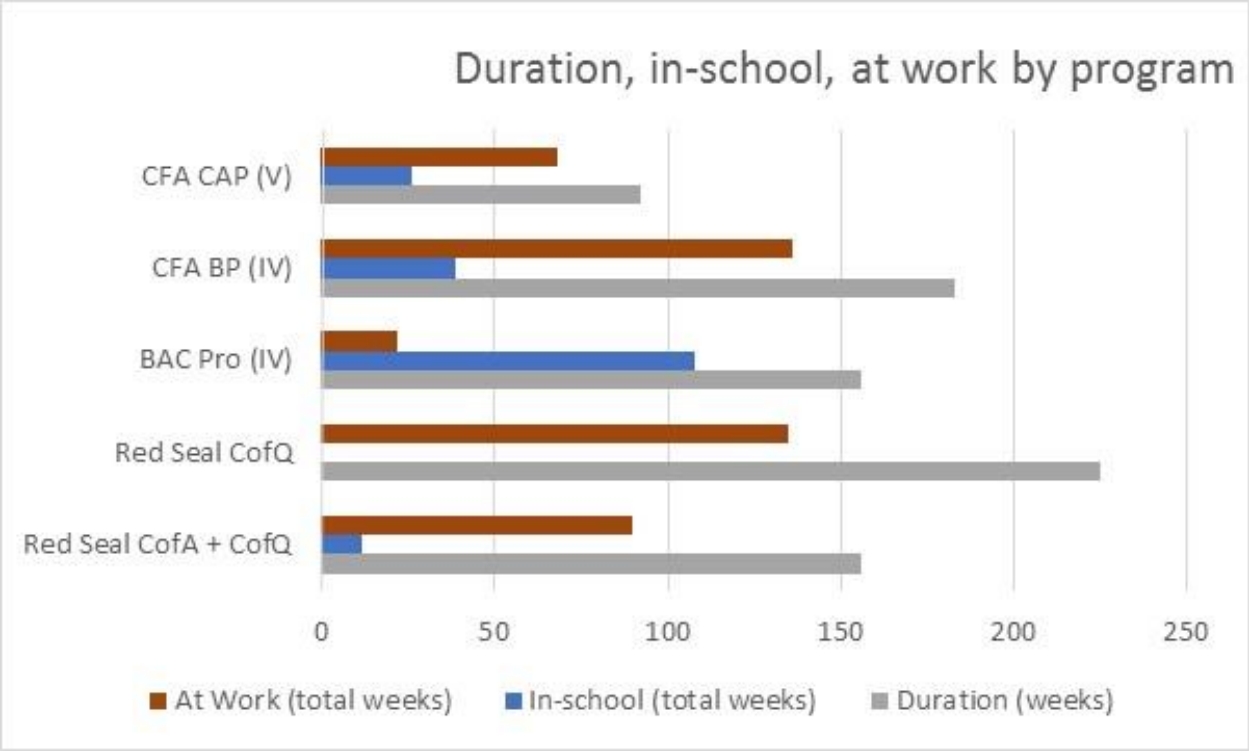

Figure 1. Comparison of program duration, in-school, and on-the-job length in weeks

Essential skills

What are "Essential Skills"?[21]

"Essential skills are the skills needed for work, learning and life. They are used in nearly every job and at different levels of complexity. There are nine essential skills" (see Table 3):

Table 3. Essential skills defined at the Federal level as listed in the NOA – there is no Essential Skills profile specific to Roofers

Essential Skill	Competency / Description
Reading	Read project specifications to understand what is required for a project.
	Read specification books and notes on blueprints.
	Read installation manuals.
Document use	Interpret labels such as the Workplace Hazardous Materials Information System (WHMIS) to follow safety guidelines.
	Reference documents such as work orders, plans and specifications.
	Reference site specific safety plans that are required for construction, alteration and repairs.
	Identify the location and orientation of parts in assembly drawings of equipment.
Numeracy	Measure the length, width and height of roof surfaces so they can order the correct amount of materials to complete a roofing job.
	Calculate material requirements using drawings.
	Determine the layout of shingles.
	May use thermometers to measure the temperature of roofing materials and working environments to ensure conditions are appropriate for application of the materials.
Writing	May write in logbooks and on contract forms and work orders to describe the work that needs to be done.
	May fill out maintenance and inspection reports.
	Complete safety documents according to jurisdictional regulations.
Oral communication	Communicate with colleagues, other trade workers, manufacturers and supervisors to discuss and review job and safety requirements.
	Speak to customers to explain procedures used for application and disposal of roofing material.
	May use specialized communication such as hand signals to communicate with crane or hoist operators when moving material and equipment.
Working with others	Work collaboratively on teams to complete roofing projects.
	Discuss safety, work processes, installation improvements and quality control.
Thinking	Address oversights and discrepancies on the job site.

[21] http://www.red-seal.ca/trades/roof/2012n.4.1_.4v.2rv.3.2w-eng.html accessed 15 January 2015. We have used this reference rather than the one found at http://www.jobbank.gc.ca/es_search-eng.do?titleKeyword=roofer&source=2&modify=Go!&noc=7291 as it appeared more directly linked to the trade itself and had been (in all likelihood) approved by the industry representatives at the NOA creation workshop and subsequent jurisdictional validation exercises.

Essential Skill	Competency / Description
	Assess roof conditions and consult with supervisors and clients to adjust the scope of a roofing job.
	Anticipate changes in weather to prevent damage to an existing roofing structure and to roofing material.
	Decide the start and end of work considering factors such as weather and the availability of supplies and labour.
	Judge the quality of finished roofing jobs.
	Test to make sure roofing materials are sealed and have adhered properly.
Computer use	May use email to communicate with others in the industry.
	May use the internet to look up product and safety information.
Continuous learning	Keep abreast of new roofing products, application procedures and safety precautions.
	Take WHMIS and provincial construction safety courses, as well as other safety-related courses to stay current.
	Manufacturers sometimes provide training on their products.
	May learn from manuals and newsletters.

The Essential Skills have trade-specific wording and emphases. The list put together for roofers in the NOA – there is no trade-specific Essential Skills List for Roofers - will be rated here, and the same rating applied for the trade-specific knowledge skills analysis will be used (See Appendix 1 for details).

Rating essential skills

We used the following assumptions and protocols to rate the essential skills:

- Ratings are applied to holders of the credential, i.e., CofQ with Red Seal endorsement, BP, or CAP
- The rating and color coding used is that shown in Appendix 1 Tables 6 and 7
- Assign a rating of 7 / 70%[22] for a skill that has been delivered during the (formal) training
- Assign a rating of 7 / 70% for a skill that is listed in the NOA – and possibly tested in the Red Seal examination - for BC challengers
- Assign a rating of 8 / 80% for a skill for which there is evidence of advanced training or that the skill must be practiced in complete autonomy
- Assign a rating of 1 for those skills that do not appear in the documents but is likely mastered
- Assign a rating of 0 if the skill is clearly out of scope
- Use Grade 9[23] + technical training to rate BC apprentices
- Maximum rating is 9 / 90% indicating that the roofer could teach others the skill being rated

[22] We used 7 / 70% to mimic the cut score required for certification on Red Seal examinations; we also defined 7 / 70% as a roofer's the putative ability to do the task on his/her own.

[23] The ITA website states: Recommended Education The following education is recommended for apprentices entering this occupation. These are not prerequisites, but rather a desired level of skill or knowledge that will contribute to success in the industry … "Grade 9 in general Math and English; Preferred: Grade 10".

- Ratings were assigned regardless of language, only for presence and level – it stands to reason that a French roofer may not master English well enough to apply his skills in BC. The converse holds for BC roofers wanting to work in a French environment.

Essential skills ratings results

The results are presented by skills and competency in Table 4, and summarized by skill category in Figure 2 below.

Table 4. Comparison of BC apprentice, BC challenge, and French programs against Essential Skills for Roofers

Essential Skill	Competency	Max rating	Red Seal CofA + CofQ	Red Seal CofQ	BP (IV)
Reading	Read project specifications to understand what is required for a project.	9	7	7	8
	Read specification books and notes on blueprints.	9	7	7	8
	Read installation manuals.	9	7	7	8
	Total score	27	21	21	24
	% score	100%	78%	78%	89%
Document use	Interpret labels such as the Workplace Hazardous Materials Information System (WHMIS) to follow safety guidelines.	9	7	7	8
	Reference documents such as work orders, plans and specifications.	9	7	7	8
	Reference site specific safety plans that are required for construction, alteration and repairs.	9	7	7	8
	Identify the location and orientation of parts in assembly drawings of equipment.	9	7	7	8
	Total score	36	28	28	32
	% score	100%	78%	78%	89%
Numeracy	Measure the length, width and height of roof surfaces so they can order the correct amount of materials to complete a roofing job.	9	7	6	8
	Calculate material requirements using drawings.	9	7	6	8
	Determine the layout of shingles.	9	7	7	8
	May use thermometers to measure the temperature of roofing materials and working environments to ensure conditions are appropriate for application of the materials.	9	0	6	0
	Total score	36	21	25	24
	% score	100%	58%	69%	67%
Writing	May write in logbooks and on contract forms and work orders to describe the work that needs to be done.	9	1	6	8

Essential Skill	Competency	Max rating	Red Seal CofA + CofQ	Red Seal CofQ	BP (IV)
	May fill out maintenance and inspection reports.	9	7	6	8
	Complete safety documents according to jurisdictional regulations.	9	1	6	8
	Total score	27	9	18	24
	% score	100%	33%	67%	89%
Oral communication	Communicate with colleagues, other trade workers, manufacturers and supervisors to discuss and review job and safety requirements.	9	5	7	8
	Speak to customers to explain procedures used for application and disposal of roofing material.	9	1	7	8
	May use specialized communication such as hand signals to communicate with crane or hoist operators when moving material and equipment.	9	7	6	8
	Total score	27	13	20	24
	% score	100%	48%	74%	89%
Working with others	Work collaboratively on teams to complete roofing projects.	9	5	7	8
	Discuss safety, work processes, installation improvements and quality control.	9	5	7	8
	Total score	18	10	14	16
	% score	100%	56%	78%	89%
Thinking skills	Address oversights and discrepancies on the job site.	9	7	7	8
	Assess roof conditions and consult with supervisors and clients to adjust the scope of a roofing job.	9	7	7	8
	Anticipate changes in weather to prevent damage to an existing roofing structure and to roofing material.	9	1	7	8
	Decide the start and end of work considering factors such as weather and the availability of supplies and labour.	9	1	7	8
	Judge the quality of finished roofing jobs.	9	7	7	8
	Test to make sure roofing materials are sealed and have adhered properly.	9	7	7	8
	Total score	54	30	42	48
	% score	100%	56%	78%	89%
Computer use	May use email to communicate with others in the industry.	9	1	6	8

Essential Skill	Competency	Max rating	Red Seal CofA + CofQ	Red Seal CofQ	BP (IV)
	May use the internet to look up product and safety information.	9	1	6	8
	Total score	18	2	12	16
	% score	100%	11%	67%	89%
Continuous learning	Keep abreast of new roofing products, application procedures and safety precautions.	9	5	6	8
	Take WHMIS and provincial construction safety courses, as well as other safety-related courses to stay current.	9	7	7	8
	Manufacturers sometimes provide training on their products.	9	5	5	8
	May learn from manuals and newsletters.	9	6	5	8
	Total score	36	23	23	32
	% score	100%	64%	64%	89%
	Grand Total score	279	157	203	226
	Grand % score	100%	56%	73%	81%

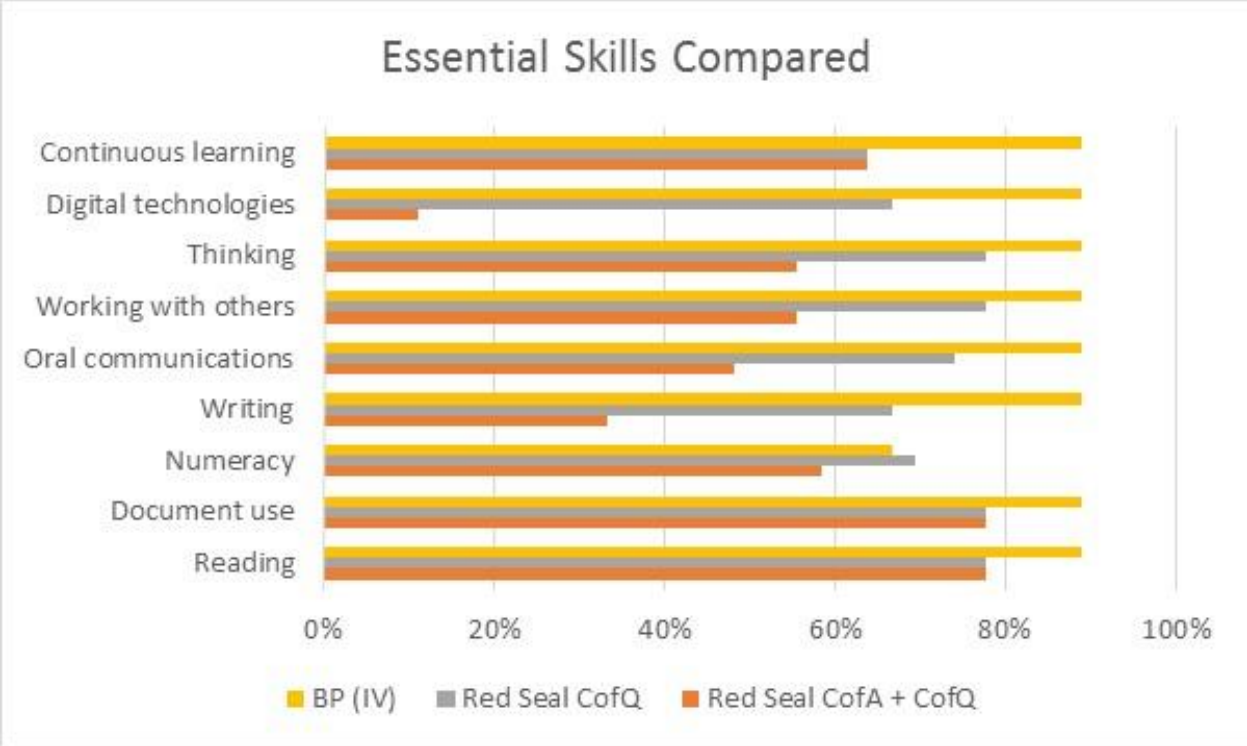

Figure 2. Essential skills compared as a match percentage by skill; BC Apprenticeship, BC Challenge, and French roofer BP

Essential skills ratings interpretation – general remarks

Essential skills for roofers reflect what they would need to be able to work safely, effectively and efficiently. These skills also reflect those cognitive abilities that would be required to have a career in roofing. Many of those skills are those developed through compulsory education. One thinks of formal skills such as reading, writing, counting, manipulating symbols and formulae, distilling data from diverse sources and media, developing relationship skills, and making sense of complex situations as must-haves. But we have to recognize that many of these skills are further refined or broadened when young students navigate the sea of digital data, form, develop, and maintain friendships … spend their money of technological toys.

Yet the formal, cognitive skills, are acquired at school. Further, in general, we expect that once a student leaves the K-12 system they have been internalized. It is somewhat concerning that the ITA recommends Grade 9 (second year of high school) as a recommended educational level, even though they state that the preferred level is Grade 10.

Essential skills ratings interpretation – specific remarks

The 3Rs

Both the BC Program Outline (PO) and the NOA reflect that assumption – unadjusted for the potentially low entrance "requirements". Granted, the BC PO sets aside some time to review (or learn for the first time) basic mathematical concepts through an estimating competency (28 hours or 8% of the total training time), and, through interpretive exercises of documents develops reading – and perhaps writing – skills. The NOA simply lists the skills / knowledge as a presumed ability.

In contrast, the French programs, being part of the secondary education system makes no such assumption. The breadth and depth of the courses French would-be roofers take either at the CFA far exceeds what the BC applied programs offer.

This is reflected in the higher ratings given the French program elements.

Language skills

It stands to reason that a French graduate who had not taken English as his/her language requirement (*langue vivante*) would be unable to function in an English-speaking environment, even if he/she had the roofing skills. And, at any rate, as our French colleagues remarked, the language skills would be very rudimentary. Likewise, a BC roofer who had not graduated from French Immersion or Programme Cadre, or whose parents were not francophone would have difficulty working in a French-speaking environment.

Measurement system

BC roofers used both imperial and metric systems. In France only the metric system is used.

Digital technology

There is to be more emphasis on computers in general, and Computer Numerical Aided Design (CAD) in the French programs. And, in general, technology in France; electronic tools are taken for granted. There is no such emphasis in either the BC Program Outline or the NOA.

Safety – Working at heights / environment

As noted earlier, the safety approach in France is more structured and more formal than in BC. The French programs focus on identifying and mitigating hazardous situations in general rather than focusing on specific high risk situations as it is with the BC program.
Environmental safety is covered rigorously in France but lightly touched upon in BC and the NOA.

Working with Others – Teamwork

The French programs, especially at the BP level, emphasize teamwork skills. In fact, they expect graduates to be able to lead a small team. There is no such expectation in the Canadian program, just one that people should be able to work with others.

Thinking skills

Under that heading, the NOA lists some fairly obvious, if not trite, skills, for example the ability to use weather information to decide whether to start a job or not. In contrast the French programs require the students to be able to generate their own solutions to roofing problems, whether in new construction or remediation work. Most of the activities ("*Activités*") and tasks ("*Tâches*") listed at the BN level require the student to master the staff, means, and materials on the job.

Discrepancies

The NOA uses the term "May" in several of the essential skills. We were confused by the disconnect between the term "May" and the fact that it prefaced what was supposed to be an "essential" skill. In our minds, if a skill is essential, it is absolutely necessary, whether it gets used regularly or not.

Comparing program levels – Trade skills

Here we compare the program elements to identify commonalities, differences, and gaps between the BC apprenticeship, the BC challenge (relying on the NOA), and the French BN. While all programs are structured hierarchically, the nomenclature and number of levels vary from program to program. Table 5 below summarizes the levels and how we compared them. Blanks in the table indicate that there was no direct comparison possible, or that the comparison would yield over-complicated results. For example, we decided that the "Block" level at the NOA, which arguably better corresponds to General Areas of Competence (GACs), was better left out of the comparative analysis.

An additional level of difficulty is that the BC, federal, and French documents are structurally – where structure is most likely reflective of the "philosophy" of the documents' authors – quite different. For example, the BC PO, called variously, depending on the section, "Program Outline", and "Program Overview", and "Program Content" lists, under the overview section, "suggested time allocations", and it is tailored to the delivery of technical training for BC apprentices – and is, most probably the results of some sort of ITA-channelled consensus between industry and the only industry association-run training institution that delivers the training. Like the BC PO, the NOA is also a jurisdictionally-mediated consensual product but limits itself to a Task Analysis depicting the "average" Canadian roofer; and the NOA makes no pretense to link up with the world of training. And the French "Référentiels" are a combination of both these approaches: they describe the trade and then translate the trade requirements in a rigorous training (and assessment) program[24].

Moreover, the French documents are made up of 3 extremely detailed and cross-referenced parts: Activities and Tasks (*Activités et Tâches*), Abilities and Competences (*Capacités et Competences*), and Associated Technological knowledge (*Savoirs Technologiques Associés*). While the NOA also lists key competencies and knowledge, it does so using a cursory list of statements, none of which are cross-referenced to each other or specific knowledge. Finally, the BC PO mixes things in a random fashion: "Estimate quantities of materials", "Describe roof types", and "Install asphalt shingles" are structurally equivalent in the PO – all competencies - when they should be, using the French structure, General Unit – Math & Science (Unités Générales – Étude mathématiques et scientifique), Associated Technological knowledge (*Savoirs Technologiques Associés*), and Abilities and Competences (*Capacités et Competences*) respectively.

We conducted the analysis using the BC PO as the reference document. That is, we looked in the NOA and the French program documents for similarities to the BC GACs and Competencies and listed those. From the French program, we limited the comparison to Abilities and Competences (*Capacités et Competences*), using the other two levels only to verify that what appeared to be a similarity actually was one. For example, to equate the BC PO "A1 – Describe workplace hazards", we consulted all three levels (*Activité – Mettre en Oeuvre; Tâche 6 – Mettre en place et réceptionner les dispositifs de sécurité*

[24] Our French colleagues also note that their programs are as precise as possible in order to accommodate regional roofing styles and practices. The program is a base which allows for these regional differences to be included. ("[N]ous nous efforçons d'avoir un cadre précis car la couverture est faite suivant les matériaux des régions. C'est pour cela qu'il y a un cadre qui est un socle permettant de pouvoir s'adapter aux particularités spécifiques locales, régionales voir transfrontalières. »)

et de protection collective) **and** (*C3 – Traiter, Décider, Préparer; C2.3 – Choisir une mesure de prévention adaptée aux dangers identifiés*) **and** (*S6 – Santé et sécurité au travail*). And it is only by putting all of these together that we gained an overall picture of the knowledge, skills, and abilities a French BN roofer brings to the table. In contrast, these are listed as competencies (in the aggregate and only partially equivalent) in the BC PO (Line / GAC A), and the NOA (1.01 and 1.02).

The numerical ratings, as previously, was taken from Table 15 (Appendix 1). Also, as before, when rating safety competencies, we rated them according to the training/credentialing jurisdiction. Clearly, a French roofer coming to BC would require an orientation to "the way BC does business" such as regulations, but not in the basics like working at heights, wearing PPE, preventing accidents, etc. The same would apply to a BC roofer moving to France.

As we used the BC PO as the reference, we have assigned a value of 7 – using the same rationale as above - to all of the competencies there, and assigned estimated ratings to the NOA and French program elements with reference to the BC rating or, when possible, absolutely.

Table 5. Comparative program structure elements by name – highlighted cells indicate elements used in the analysis

	Jurisdiction		
Program elements	British Columbia - BCPO	Red Seal/Federal - NOA	Référentiel Charpentier Bois
		Block	Capacités
	GAC - "Line"	Task	Activités
			Compétences
	Competency	Sub-task	Compétences détaillées
			Tâches
	Learning tasks	Key competencies	
	Content	Knowledge	Données techniques
			Savoirs
	Objective		Résultats attendus
			Limites de connaissance

Comparing General Areas of Competence (GAC) – Knowledge & Abilities

Using the BC Program Overview (BC PO) as the reference, we searched the NOA and BP and CAP Référentiels (combined if necessary) for equivalent entries. The rationale to assign ratings to the NOA and French equivalents was a follows:

- Use 9 if they appear to be much superior in "breadth and depth" (total autonomy; innovative).
- Use 8 if they appear to be superior in "breadth and depth" (more content; more activities; greater difficulty).
- Use 7 if they appear to be the same in "breadth and depth".
- Use 6 if they appear to be inferior in "breadth and depth" (less content; fewer activities; simpler).
- Use 0 if there is no direct reference to the GAC or competency.

It is important to keep in mind that the ratings are here to help summarize complex, ill-matched documents in a single indicator. The numbers are not indicative of the trade as a whole or individual

roofers, nor are they suitable to establish some sort of pecking order in either the jurisdictions, programs, credentials, or people.

As the scale is ordinal, we have steered away from mathematical manipulations except to normalize counts – using the categorical number of entries over the largest number of entries as a reverse factor - in order to get a clearer picture. Reporting counts and the attached ratings provides an overall picture of the differences and might help in making decisions about remedial interventions.

However, we have added an "average rating" calculated value to provide a very rough – and mathematically unjustifiable; see Appendix 2 under "quantitative" for details – measure of comparison between the 3 programs.

Results

By definition, the BC PO has the largest number of "7" (9 normed to 19). The French program has a large number of "9" (15 normed to 15), the NOA a substantial number of "8" (7 normed to 10). Also, the NOA has some "7" (3 normed to 4). The French program and the NOA have some "6" (3 normed to 3 and 1 normed to 1, respectively) and both the NOA and French programs show "0" entries (both 1 normed). The detailed entries are provided in Table 6, the summary count in Table 7, and the normed counts in Figure 3.

Table 6. Rated comparisons at the GAC level - BC PO is the reference; colors and ratings as above, expounded in Appendix 1

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Line		Rating	Task		Rating	Compétence		Rating
A	Use safe work practices	7	1	Performs safety related functions	6	C2.3	Choose prevention methods commensurate with identified hazards	9
						C3.1	Organize and secure workplace/site	9
B	Use tools and Equipment	7	2	Maintains and uses tools and equipment	7	C3.4	Install structural elements supporting roof	9
						C3.5	Install metallic roofing elements	9
						C3.6	Install roofing materials on all types of structures	9
						C4.1	Maintain materials, equipment, and tools	9

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Line		Rating	Task		Rating	Compétence		Rating
C	Use documentation	7			0	C1.2	Collect and analyze information required for the project	9
						C1.3	Decode and analyze technical documentation	9
D	Organize work	7	3	Performs common work practices and procedures	6	C2.5	Organize work in the shop and on the worksite	9
						C3.7	Close down the worksite at the completion of the project	9
E	Prepare roofs	7	4	Prepares roofs for replacement	7	C3.4	Install structural elements supporting roof	9
			5	Prepares decks for replacement	7			
F	Install low slope and flat roofing	7	6	Applies roofing components	8	C3.4	Install structural elements supporting roof	6
			7	Applies membranes	8	C3.5	Install metallic roofing elements	6
						C3.6	Install roofing materials on all types of structures	6
G	Install steep roofing	7	8	Performs common steep slope practices	8	C3.4	Install structural elements supporting roof	9
						C3.5	Install metallic roofing elements	9
						C3.6	Install roofing materials on all types of structures	9
H	Assess and maintain roofs, damp and waterproofing	7	14	Assesses roof conditions	8	C4.2	Identify the problem and apply corrective solutions	9

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Line		Rating	Task		Rating	Compétence		Rating
			15	Maintains and repairs roof	8			
I	Apply waterproofing and damp-proofing	7	12	Waterproofs surfaces	8			0
			13	Damp-proofs surfaces	8			

Table 7. Summary count of comparison ratings at the GAC level – BC PO is the reference

	British Columbia – BC PO	Red Seal / Federal - NOA	Référentiel Couvreur (BP)
Total number ratings	9	13	19
Total rating	63	89	153
Ratings of 9	0	0	15
Ratings of 8	0	7	0
Ratings of 7	9	3	0
Ratings of 6	0	1	3
Ratings of 0	0	1	1
Average rating	7	6.8	8.1

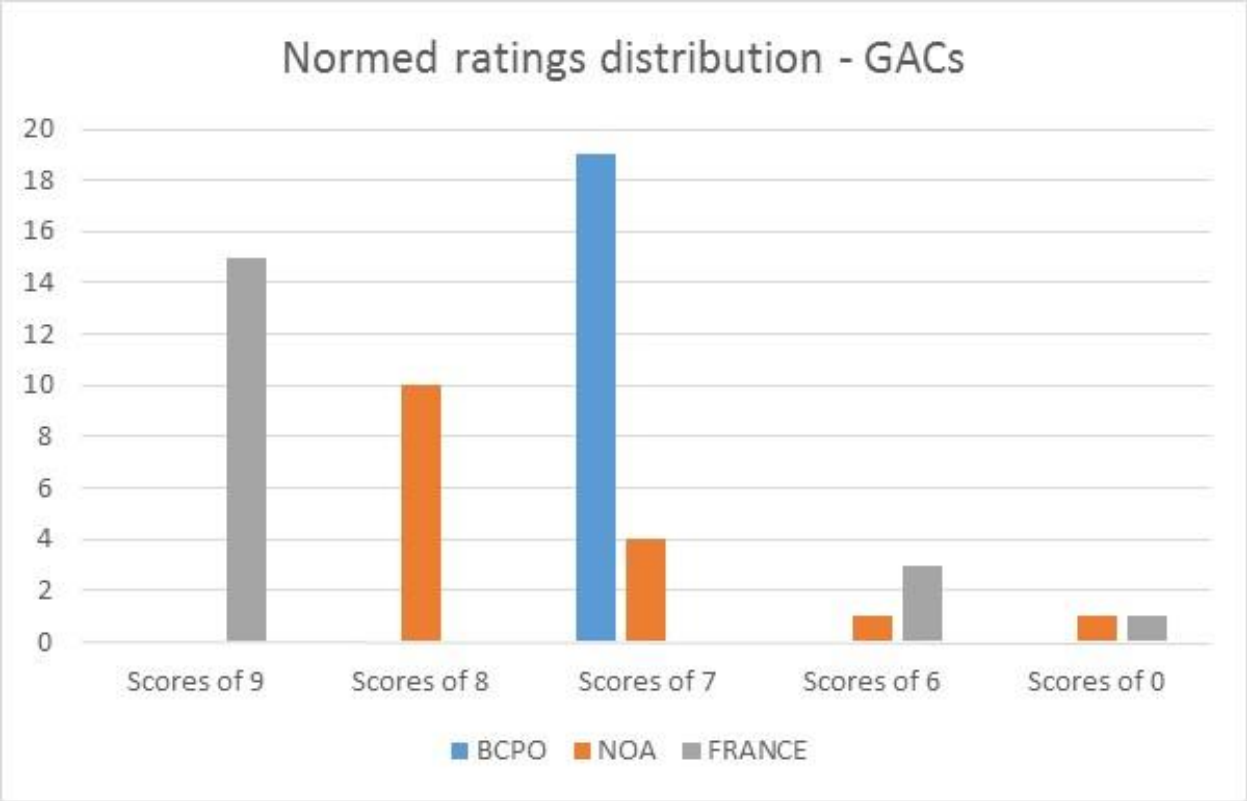

Figure 3. Normed ratings distribution for BC's apprentice program (BCPO), the BC Challenger program (NOA), and the French roofer BP – at the GAC / Task / Compétences level

Comparing competencies – Hands-on skills & knowledge

Using the BC Program Overview (BC PO) as the reference, we searched the NOA and Réferentiels for equivalent entries. The rationale to assign ratings to the NOA and French equivalents was a follows:

- Use 9 if they appear to be much superior in "breadth and depth" (total autonomy; innovative).
- Use 8 if they appear to be superior in "breadth and depth" (more content; more activities; greater difficulty).
- Use 7 if they appear to be the same in "breadth and depth".
- Use 6 if they appear to be inferior in "breadth and depth" (less content; fewer activities; simpler).
- Use 0 if there is no direct reference to the GAC or competency.

It is important to keep in mind that the ratings are here to help summarize complex, ill-matched documents in a single indicator. The numbers are not indicative of the trade as a whole or individual roofers, nor are they suitable to establish some sort of pecking order in either the jurisdictions, programs, credentials, or people.

As the scale is ordinal, we have steered away from mathematical manipulations except to normalize counts – using the categorical number of entries over the largest number of entries as a reverse factor - in order to get a clearer picture. Reporting counts and the attached ratings provides an overall picture of the differences and might help in making decisions about remedial interventions.

However, we have added an "average rating" calculated value to provide a very rough – and mathematically unjustifiable; see Appendix 1 for details – measure of comparison between the 3 programs.

Results

By definition, the BC PO has the largest number of "7" (35 normed to 66). The French program has a large number of "9" ratings (32 normed to 32) reflecting the fact that the BP is an advanced credential. Both the NOA and the French program have a substantial number of "8" (21 normed to 23 and 17 normed to 17, respectively). Also, the NOA has a substantial number of "7", and the French program has just 1 (25 normed to 28 and 1 normed to 1, respectively). And the NOA and the French program both have some "6" (8 normed to 9 and 9 normed to 9, respectively) and some "0" entries (7 normed to 8 and 9 normed to 9, respectively). The detailed entries are provided in Table 8, the summary count in Table 9, and the normed counts in Figure 4.

Table 8. Rated comparisons at the competency level - BC PO is the reference; colors and ratings as above, expounded in Appendix 1

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
A1	Describe workplace hazards	7	1.02	Maintains safe work environment.	6	C2.3.1	Identify all prevention measures to mitigate hazards linked to a professional or worksite situation	9
						C2.3.2	Analyze pros and cons of prevention measures	9
						C2.3.3	Choose and justify a prevention measure	9
						C3.1.2	Implement team-wide prevention measures and delimit work zones	9
						C4.1.3	Check worker collective protection equipment	9
						C4.1.4	Check workers' PPE	9
A2	Interpret the Occupational Health and Safety Regulation and WCB Standards	7			0	C3.1.4	Apply prevention measure and ensure that they are followed on the worksite	9

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
A3	Use WHMIS	7	Safety	It is imperative to apply and be familiar with the Occupational Health and Safety Acts (OH&S) and Workplace Hazardous Materials Information System (WHMIS) regulations.	6			0
A4	Use Personal Protective Equipment	7	1.01	Uses personal protective equipment (PPE) and safety equipment.	7	C3.1.4	Apply prevention measure and ensure that they are followed on the worksite (part of the evaluation criteria)	9
A5	Use Fire Safety Procedures	7			0	S 3.3	Fire protection	7
B1	Use Hand Tools	7	2.01	Maintains tools and equipment.	7	C3.4.2	Install roofing components (with or without integral insulations)	9
						C3.4.4	Install and secure roof underlayments	9
						C3.5.1	Cut up manufactured roofing components or materials to be used for manufacture roofing components	9
						C3.5.2	Manufacture metallic roofing components manually or with power tools and equipment	9
						C3.6.1	Cut roofing materials	9
B2	Use Portable Power Tools	7	2.01	Maintains tools and equipment.	6	C4.1.1	Check that tools and equipment that require Regular General Verifications have been checked	9
						C4.1.2	Maintain electrical tools	8
B3	Use Propane Fuelled Equipment	7			0			0
B4	Use Hot Process Equipment	7			0			0
B5	Use Hoisting, Lifting and Rigging Equipment	7	2.02	Uses hoisting, lifting and rigging equipment.	7	C3.4.2	Install roofing components (with or without integral insulations)	9

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
						C3.4.3	Straighten out roof structures	9
B6	Use Motorized Equipment	7	2.03	Uses motorized equipment.	7	C3.4.2	Install roofing components (with or without integral insulations)	9
B7	Use Ladders and Platforms	7	3.05	Accesses work area	7	C3.1.3	Erect, disassemble, accept, and use scaffolding	9
			3.06	Positions equipment and material on the ground and on the roof.	7			
C1	Read Drawings and Specifications	7	3.01	Interprets blueprints and drawings	7	C1.3.1	Decode technical elements of a project	8
						C1.3.2	Analyze documents	8
C2	Use Building Codes and RCABC Standards	7			0	S 0.1	International and national trends on energy and the environment	6
						S 0.2	Action realms for sustainable development	6
						S 1.2	Qualifications, warranties, and responsibilities	6
C3	Read Manufacturers' Information	7	3.01	Interprets blueprints and drawings	6	C1.3.2	Analyze documents	8
D1	Describe Roof Types	7			0			0
D2	Communicate with Others	7	3.04	Communicates with others	0	C5.1.4	Participate in safety and quality discussions	8
						C5.1.5	Participate in the mentoring of a new employee	8
						C5.2.1	Identify the stakeholders in building projects	8
						C5.2.2	Use communication tools appropriate to the situation	8
						C5.2.4	Conduct a conversation or participate in a meeting	8
D3	Prepare The Worksite	7	3.05	Accesses work area	7	C2.5.2	Define worksite zones	8

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
			3.07	Prepares material disposal systems	7	C3.7.1	Uninstall worksite zones and collective safety systems	8
						C3.7.2	Close down the worksite	8
D4	Estimate Quantities of Materials	7	3.02	Estimates material.		C2.4.1	List equipment, materials, and accessories required for the work	8
						C2.4.2	Quantify equipment, materials, and accessories required for the work	8
						C2.4.3	Estimate cost of equipment, materials, and accessories required for the work	8
E1	Prepare Roofs for Replacement	7	4.01	Protects surrounding area	7	C3.4.1	Receive the roof frame	6
			4.02	Removes loose debris	7			
			4.03	Removes roofing and flashings	7			
E2	Prepare Roofs for New Installation	7	4.04	Prepares roof substrate	7	C3.4.1	Receive the roof frame	6
			4.05	Performs minor adjustments to penetrations, curbs and parapets	7			
			4.06	Installs water cut-off, temporary seals and temporary drains	7			
			5.03	Verifies placement of roof penetrations, curbs and parapets				
F1	Install Gypsum Board and Insulation	7	6.04	Installs insulation	7	C3.4.5	Apply insulating materials	9
			6.05	Installs cover board	7			

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
F2	Install Overlay Board	7	6.05	Installs cover board	7	C3.4.2	Install roofing components (with or without integral insulations)	9
F3	Install Vapour Retarders and Air Barriers	7	6.03	Applies vapour retarder, vapour barrier and air barrier	7	C3.4.5	Apply insulating materials	9
F4	Install Flashing Materials	7	6.06	Installs drains, vents, curbs and penetrations	8	C3.5.3	Weld, staple, rivet, etc. manufactured flashings	9
			6.08	Installs metal flashings	7	C3.5.4	Install flashings	9
F5	Install Built-Up Roofing Systems	7	6.07	Applies ballast, walkways and protective surfaces	7			0
F6	Install Flexible Membrane Roof Systems	7	7.03	Applies membranes using hot-liquid process	8			0
			7.04	Applies membranes using torched-on method	8			
			7.05	Applies membranes using hot-air welding	8			
			7.06	Applies membranes using cold process	8			
			7.07	Applies membranes using mechanical fasteners	8			
			7.08	Applies loose-laid membranes	8			
G1	Install Asphalt Shingles	7	9.01	Determines layout of shingles	8	C3.6.1	Cut materials	6
			9.02	Installs starter strips	8	C3.6.2	Install roofing materials	6
			9.03	Fastens shingles	8	C3.6.3	Secure roofing materials mechanically or with adhesives	6
			9.04	Cuts shingles	8	C3.6.4	Install roofing transition zones around openings	6
			9.05	Tabs shingles	8			
G2	Install Wood Shingles and Shakes	7		Shingles OK - No shakes	6			0
G3	Install Concrete and Composite Materials	7	10.01	Installs strapping	8	C3.6.1	Cut materials	9
			10.02	Fastens roof tiles	8	C3.6.2	Install roofing materials	9

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
			10.03	Cuts roof tiles	8	C3.6.3	Secure roofing materials mechanically or with adhesives	9
			10.04	Installs closure strips	8	C3.6.4	Install roofing transition zones around openings	9
			10.05	Seals ridge and hip caps	8			
G4	Install Metallic Materials	7	11.01	Installs strapping for pre-formed metal roofing	8	C3.6.1	Cut materials	9
			11.02	Fastens pre-formed metal roofing	8	C3.6.2	Install roofing materials	9
			11.03	Cuts sheet metal	8	C3.6.3	Secure roofing materials mechanically or with adhesives	9
			11.04	Installs closure strips for pre-formed metal roofing	8	C3.6.4	Install roofing transition zones around openings	9
H1	Assess Roof Conditions	7	14.01	Performs roof inspections	7	C4.2.1	Locate and identify roof defect	9
H2	Maintain and Repair Roofs, Damp and Waterproofing	7	15.04	Repairs membrane defects	6	C4.2.2	Propose a safe and effective fix to roof problems	8
			15.06	Repairs steep roofing defects	6	C4.2.3	Repair or replace a defective roofing element	8
I1	Waterproof Surfaces	7	12.02	Applies waterproofing membrane	7			0
I2	Damp-Proof Surfaces	7	13.01	Applies coatings	7			0
			13.02	Applies protection layer	7			

Table 9. Summary count of comparison ratings at the competency level – BC PO is the reference

	British Columbia – BC PO	Red Seal / Federal - NOA	Référentiel Couvreur (BP)
Total number ratings	35	60	66
Total rating	245	385	485
Ratings of 9	0	0	32
Ratings of 8	0	21	17
Ratings of 7	35	25	1
Ratings of 6	0	8	9
Ratings of 0	0	6	9

	British Columbia – BC PO	Red Seal / Federal - NOA	Référentiel Couvreur (BP)
Average rating	7.0	6.5	7.1

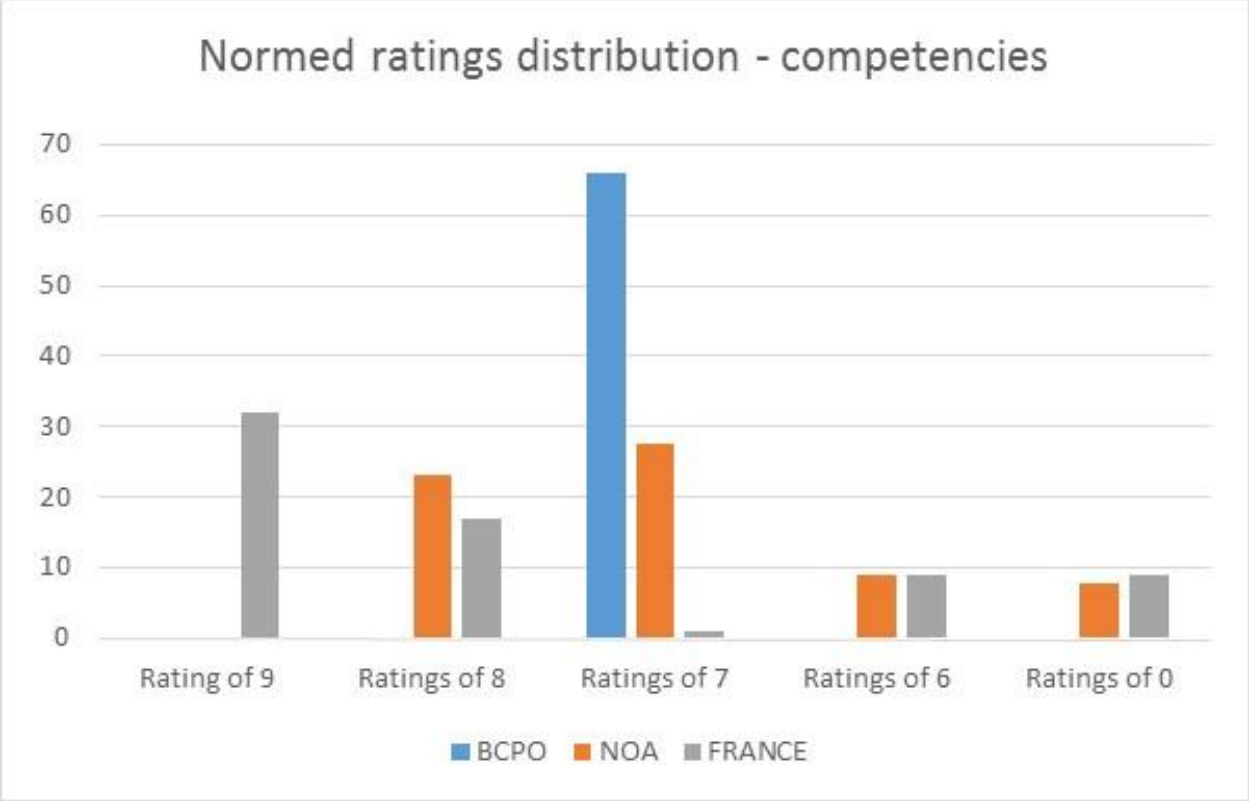

Figure 4. Normed ratings distribution for BC's apprentice program (BCPO), the BC Challenger program (NOA), and the French roofer BP – at the competency / sub-task / Compétences intermédiaires level

Gaps - Competencies

When compared to the BC PO, and using the rating protocol explained above, both the NOA and French programs show gaps. For the purpose of this classification, we have defined as gap any competency that did not match the equivalent BC competency standard rating, i.e. rating<7, or that was not listed or readily surmised from those listed.

Clearly a gap indicated by a rating of 6 ought to be seen as less absolute as one showing a rating of 0. This is because a 0 indicates that the competency is entirely absent the document or program. Table 10 shows the three-way comparison and gap. Tables 11 and 12 show the NOA and French gaps respectively.

Table 10. Rated gap competencies - BC PO is the reference; colors and ratings as above, expounded in Appendix 1

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
A1	Describe workplace hazards	7	1.02	Maintains safe work environment.	6	C2.3.1	Identify all prevention measures to mitigate hazards linked to a professional or worksite situation	9
A2	Interpret the Occupational Health and Safety Regulation and WCB Standards	7			0	C3.1.4	Apply prevention measure and ensure that they are followed on the worksite	9
A3	Use WHMIS	7	Safety	It is imperative to apply and be familiar with the Occupational Health and Safety Acts (OH&S) and Workplace Hazardous Materials Information System (WHMIS) regulations.	6			0
A5	Use Fire Safety Procedures	7			0	S 3.3	Fire protection	7
B2	Use Portable Power Tools	7	2.01	Maintains tools and equipment.	6	C4.1.1	Check that tools and equipment that require Regular General Verifications have been checked	9
B3	Use Propane Fuelled Equipment	7			0			0
B4	Use Hot Process Equipment	7			0			0
C2	Use Building Codes and RCABC Standards	7			0	S 0.1	International and national trends on energy and the environment	6
						S 0.2	Action realms for sustainable development	6
						S 1.2	Qualifications, warranties, and responsibilities	6
C3	Read Manufacturers' Information	7	3.01	Interprets blueprints and drawings	6	C1.3.2	Analyze documents	8
D1	Describe Roof Types	7			0			0
D2	Communicate with Others	7	3.04	Communicates with others	6	C5.1.4	Participate in safety and quality discussions	8
E1	Prepare Roofs for Replacement	7	4.01	Protects surrounding area	7	C3.4.1	Receive the roof frame	6

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
			4.02	Removes loose debris	7			
			4.03	Removes roofing and flashings	7			
E2	Prepare Roofs for New Installation	7	4.04	Prepares roof substrate	7	C3.4.1	Receive the roof frame	6
F5	Install Built-Up Roofing Systems	7	6.07	Applies ballast, walkways and protective surfaces	7			0
F6	Install Flexible Membrane Roof Systems	7	7.03	Applies membranes using hot-liquid process	8			0
G1	Install Asphalt Shingles	7	9.01	Determines layout of shingles	8	C3.6.1	Cut materials	6
			9.02	Installs starter strips	8	C3.6.2	Install roofing materials	6
			9.03	Fastens shingles	8	C3.6.3	Secure roofing materials mechanically or with adhesives	6
			9.04	Cuts shingles	8	C3.6.4	Install roofing transition zones around openings	6
			9.05	Tabs shingles	8			
G2	Install Wood Shingles and Shakes	7		Shingles OK - No shakes	6			0
G3	Install Concrete and Composite Materials	7	10.01	Installs strapping	8	C3.6.1	Cut materials	9
			10.02	Fastens roof tiles	8	C3.6.2	Install roofing materials	9
			10.03	Cuts roof tiles	8	C3.6.3	Secure roofing materials mechanically or with adhesives	9
			10.04	Installs closure strips	8	C3.6.4	Install roofing transition zones around openings	9
			10.05	Seals ridge and hip caps	8			
G4	Install Metallic Materials	7	11.01	Installs strapping for pre-formed metal roofing	8	C3.6.1	Cut materials	9
			11.02	Fastens pre-formed metal roofing	8	C3.6.2	Install roofing materials	9
			11.03	Cuts sheet metal	8	C3.6.3	Secure roofing materials	9

British Columbia – BC PO			Red Seal / Federal - NOA			Référentiel Couvreur (BP)		
Competency		Rating	Sub-Task		Rating	Compétences intermédiaires		Rating
							mechanically or with adhesives	
			11.04	Installs closure strips for pre-formed metal roofing	8	C3.6.4	Install roofing transition zones around openings	9
H1	Assess Roof Conditions	7	14.01	Performs roof inspections	7	C4.2.1	Locate and identify roof defect	9
H2	Maintain and Repair Roofs, Damp and Waterproofing	7	15.04	Repairs membrane defects	6	C4.2.2	Propose a safe and effective fix to roof problems	8
			15.06	Repairs steep roofing defects	6	C4.2.3	Repair or replace a defective roofing element	8
I1	Waterproof Surfaces	7	12.02	Applies waterproofing membrane	7			0
I2	Damp-Proof Surfaces	7	13.01	Applies coatings	7			0

Table 11. Gaps between BC PO and BC Challenger (NOA)

British Columbia – BC PO			Red Seal / Federal - NOA		
Competency		Rating	Sub-Task		Rating
A2	Interpret the Occupational Health and Safety Regulation and WCB Standards	7			0
A3	Use WHMIS	7	Safety	It is imperative to apply and be familiar with the Occupational Health and Safety Acts (OH&S) and Workplace Hazardous Materials Information System (WHMIS) regulations.	6
A5	Use Fire Safety Procedures	7			0
B2	Use Portable Power Tools	7	2.01	Maintains tools and equipment.	6
B3	Use Propane Fuelled Equipment	7			0
B4	Use Hot Process Equipment	7			0
C2	Use Building Codes and RCABC Standards	7			0
C3	Read Manufacturers' Information	7	3.01	Interprets blueprints and drawings	6
D1	Describe Roof Types	7			0
D2	Communicate with Others	7	3.04	Communicates with others	6
G2	Install Wood Shingles and Shakes	7		Shingles OK - No shakes	6
H2	Maintain and Repair Roofs, Damp and Waterproofing	7	15.04	Repairs membrane defects	6
			15.06	Repairs steep roofing defects	6

Table 12. Gaps between the BC PO and the French BP

British Columbia – BC PO			Référentiel Couvreur (BP)		
Competency		Rating	Compétences intermédiaires		Rating
A3	Use WHMIS	7			0
B3	Use Propane Fuelled Equipment	7			0
B4	Use Hot Process Equipment	7			0
C2	Use Building Codes and RCABC Standards	7	S 0.1	International and national trends on energy and the environment	6
			S 0.2	Action realms for sustainable development	6
			S 1.2	Qualifications, warranties, and responsibilities	6
D1	Describe Roof Types	7			0
E1	Prepare Roofs for Replacement	7	C3.4.1	Receive the roof frame	6
E2	Prepare Roofs for New Installation	7	C3.4.1	Receive the roof frame	6
F5	Install Built-Up Roofing Systems	7			0
F6	Install Flexible Membrane Roof Systems	7			0
G1	Install Asphalt Shingles	7	C3.6.1	Cut materials	6
			C3.6.2	Install roofing materials	6
			C3.6.3	Secure roofing materials mechanically or with adhesives	6
			C3.6.4	Install roofing transition zones around openings	6
G2	Install Wood Shingles and Shakes	7			0
I1	Waterproof Surfaces	7			0
I2	Damp-Proof Surfaces	7			0

Conclusions

BC PO and NOA

The gaps we identified, especially those between the BC PO and the NOA could be due to structural or practical or "jargon" differences between the two documents. Indeed, the BC PO states that it is aligned to the NOA.

But we should nevertheless examine these gaps because challengers to the certification in BC have, in general, no trade schooling, and the NOA is the only training proxy we can use.

For example, we know that safety regulations and codes vary from jurisdiction to jurisdiction, and that only those Pan-Canadian regulations and codes might be tested on the Red Seal examination, for example WHMIS. A BC-specific gap is possible for those challengers who have worked mostly out of BC.

BC PO and BP

The gaps identified here are reflective of the differences in the training programs, language notwithstanding. In effect, we are saying that someone who has been trained in a domain has the ability to recognize and adapt to changes to and in that domain. On the other hand, someone who was never

exposed to the domain would be oblivious to its elements, hence would be insensitive to its subtleties, let alone to any change. We are also saying that it is easier to train someone familiar with a domain than someone with no acquaintance to that domain at all. And this is true regardless of the myth of having to "un-learn" things: there is no need to wipe the slate clean to learn new things.

The differences between safety legislation and regulations and building codes, let alone RCABC standards, are significant, as are the language differences – even if a French student took English as his or her "langue vivante". But the French BP roofer has been well-trained in interpreting and applying standards, indeed to ensure compliance with them – probably more so, since European countries tend to be more process-heavy than Canada. Bridging gaps due to jurisdictional and language differences is a trivial finding, even if it is one that needs to be addressed.

The real gaps, those representing missing curriculum bits in France, are, in decreasing order of importance: water- and damp-proofing (we noted earlier that this is a different trade in France), flat roofing (we also noted earlier that flat roofs are the exception rather than the rule for French roofers), and (cedar) shingles and shakes (which is a very regionalized specialty trade practice).

These gaps are more than made up with advanced architectural sheet metal abilities, the wider variety of unitized products used, the familiarity with copper, zinc, and lead components, and, for some, the ability to restore historical roofs and sheet metal details and decorations (steeple roosters ("*coqs*") and gargoyles!). Further, French BP roofers are well-versed in environmental (LEEDS) building practices, environmental conservation (heat losses), and environmental disposal – all this with stricter regulations than are in effect in Canada and BC. Last, a French BP roofer is a safety practices and systems decision-maker on the worksite, an ability far beyond that of BC roofers in general.

Examination and Certification

Credentialing in BC

Apprentices

Apprentices are required to pass each of 3 levels (blocks) of in-school training. At the time of this writing, the practical and theory tests are institution-specific – there is only one institution delivering the technical training for roofing apprentices in BC. The Industry Training Authority (ITA) intends to impose standardized level theory tests for all trades, including roofing, but these have not been developed yet. There is no standardized practical test at the completion of training: instructors assign cumulative marks for in-school projects.

Successful completion of the Level 3 in-school final exam gives access to the Red Seal examination, the only certification mechanism for roofers in BC.

The Red Seal - Apprentices and challengers

Introduction

Apprentices and approved challengers are required to write the Red Seal examination in order to get a BC "Roofer, Damp and Waterproofer" credential. There is no partial credit, no part credential.

The Red Seal examination is a timed "paper and pencil" test. All questions on the examination are machine-scorable 4-choices multiple choice (4MC).

The Red Seal Certification examination is based on the National Occupational Analysis (NOA). The NOA is broken down into a numbers of blocks, tasks, and sub-tasks. Examination questions are based on the sub-tasks, the number of questions on each sub-task is based on a national mathematical average of estimated time spent on task by the roofers in each jurisdiction, curved to the total number of question on the examination.

There is no weighting of any section of the Red Seal examination based on either heightened safety implications or criticality of task. There is no jurisdictional examination overlay for the Red Seal examination.

Red Seal examinations are prepared cooperatively between all Canadian jurisdictions but are hosted by a designated jurisdiction (designate status for any Red Seal examination is assigned through the CCDA[25]'s Product Committee's ISEC[26]). Red Seal examinations are item bank-generated; that is for each examinable sub-task of the NOA a number of items are developed and then randomly assigned to an instrument based on a ToS[27] that mirrors the NOA percentages. For "smaller" trades, i.e. those with fewer registered apprentices nationally, rather than using a bank a set of 2 or 3 unique examinations are developed – this to allow rapid national replacement of a compromised examination.

Bank-generated and ToS-driven examinations are more comprehensive and more "difficult[28]" than many of the "before-bank" examinations: items address more areas of the trade at more varied/complex levels than in one-off, instructor-developed examinations.

Problems

It is generally assumed that the ability to pass the examination[29] can be directly attributed to a candidate's work experience: that there is a direct proportional relationship between the level, scope, and quality of on-the-job training (OJT) and experience, and performance on the examination. It is also assumed that the instructional content (and activities) delivered by the institutions reflect the National Occupational Analysis (NOA) - our analysis shows this to be a dubious assumption, at best.

There are a number of problems with these assumptions. First, it is questionable if a pencil and paper test can stand as a proxy for practical ability. Second, it is unclear whether the candidates are able, for the purpose of the test only, to conceptualize what they do on the job in order to answer a "word" problem. Third, domain hierarchy is neither considered nor established. And fourth, the NOA sub-tasks are not worded clearly enough to permit domain definition (e.g. "E 13.01- Applies coatings").

The third and fourth problems are of interest to the roofer Red Seal examination because they are borne out of examination development design and practice. As a pencil and paper test, the roofer IP assumes that all candidates can read, thus making the examination a test of literacy. As well, many items require candidates to apply mathematical concepts in order to identify (not necessarily generate as they would

[25] Canadian Council of Directors of Apprenticeship
[26] The *Interprovincial Standards Examination Committee* is made up of provincial/territorial government representatives
[27] A *Table of Specifications* is developed by the host jurisdiction and assigns weights and taxonomic item levels to sub-tasks
[28] Where "difficulty" is a perceptual measure from the candidates' perspective rather than statistically derived through Item Response or Classical theories
[29] 70% aggregate cut score for all Red Seal examinations

on the job) the correct answer, as such, the Red Seal is a test of numeracy. These two domains are listed in the Essential Skills, albeit at a fairly low achievement level, but they are not tested for, nor are they part of the application requirements for challengers. Nevertheless, they are tested in conjunction with the job skills. All Red Seal examinations are made up of items that test an indeterminate number of domains in an indeterminate fashion.

Success on the Red Seal examination means the candidate scored >70%. All Red Seal examinations have this unique cut score. The cut score is not adjusted to the compounded psychometric profile of the items used for the examination – items are not differentially weighted. And, while results are available at the task level, the score obtained is the unweighted ratio of the total correct answers over the total number of questions aligned to the sub-tasks.

Validity

Validity is a measure of confidence in the inferences made based on a test score. With high stakes tests (like the Red Seal), it is crucial that test developers and administrators ensure inferences drawn from test scores are accurate. In the case of roofers, a score <70% means that the candidate is not a competent roofer, a serious professional issue.

Validation studies are recommended prior to the introduction of any test and should be mandatory for high stakes tests like the roofer Red Seal. Usually three types of validation studies are conducted: content, criterion-related, and construct. With Red Seal examinations in general, only a cursory content validation is conducted when local experts review items.

Some may argue that the use of subject matter experts (SMEs) during item development is a validation exercise. This is a spurious argument, as content validation exercises ought to be conducted by independent judges, not the people who developed the items. Moreover, there is no indication that the SMEs are fully cognizant of all domains tested, are representative of the population of roofers, or are able to precisely determine what is being tested.

Reliability

If a test is an accurate measure of an individual's ability[30], then any candidate's observed scores should be consistent over a number of tries on the same test or parallel, equated tests. Reliability indices are numerical values that provide a statistical measure of the consistency of test scores; one would expect z-scores of a given individual to remain relatively consistent over repeated tries.

Score consistency is affected both by random and systematic errors. Random errors are chance happening and cannot be controlled (but they can be accounted for). Systematic errors are due to either examination flaws or candidates' characteristics (e.g. visual impairment). Red Seal examinations are developed, produced, and implemented without any reliability studies. In fact, some jurisdictions do not track reliability indices, even rudimentary αs or z-scores distributions in or for test-re-test situations.

[30] i.e. that E (the error unrelated to the domain(s) being tested – see footnote 2) is minimized in T=X+E so that the test score (X) is a stable, true reflection of the true score (T),

Credentialing in France

Whether an apprentice, a challenger, or a continuing (adult) education student, all candidates to the roofer BP face the same summative tests. Access to these summative tests, their content, duration, and scoring are backstopped by the *Code de l'éducation*, the central French legislation in educational matters. These summative tests are clearly differentiated in law from formative tests, i.e. tests required of learners for progress at school.

There are two "delivery" mechanisms for these summative tests: fixed time and place (*ponctuel*), and interspersed during the second half of the training program (*Contrôle en cours de formation - CCF*). French regulations fix the methodological equivalencies between the two delivery systems.

For roofers, there is a minimum of six tests – additional testing may be asked for by educational authorities. Three of these tests cover scholastic skills: mathematics and physics, French and social studies, and foreign language (choice of English, German, Spanish, or Italian). The other three tests cover trade skills. The first is the design, drawing, supplying, and worksite intervention project planning portfolio. The second test is running the worksite for the intervention, including safety planning, running a small team, and interfacing with stakeholders. And the third test is following up on the erection of the designed project, accounting for tools, equipment, and materials and conducting a diagnostic and repair intervention.

All of these tests are cross-referenced to "end state" competences, and have a prescribed set of givens (e.g. computer, software, drawings, technical specifications, etc.), conditions (e.g. time allotted, fixed number of pages, types of drawings, take-offs, etc.), and, for practical trade tests, at least one industry practitioner in addition to the examiner.

The products of each test are gathered in a portfolio and the mark assigned by the examiners is attached to each portfolio. Before granting the certification, the marks (and portfolios) are reviewed and approved by a jury.

The BP credentials are issued by the French national ministry of education.

Validity

The French summative tests are "constructed response" tests. That is, and unlike the Red Seal, the candidate must generate his own answer or solution to a given problem. In addition, a French candidate has to demonstrate both cognitive and hands-on abilities. Marks are issued by examiner teams, as opposed to being machine graded, and each examiner team's assessments build an overall picture of the candidate across all terminal competences. The terminal competences are those the training program and the trade require as minimum proof of competence.

Our French colleagues pointed out that their goal is to focus summative examinations on the ability to solve problems rather than answer pointed questions that are on the examination in order to satisfy an exam plan requirement.

Reliability

Having many tests increase challenges to reliability if we added a reliability index for each test and summed those. One of the mechanisms the French are relying on to increase individual tests' reliability is using multiple raters (and being able to provide an inter-rater reliability index) supplemented by a (at

a minimum) two-tiered marking structure – in effect getting two inter-rater values. In addition, marginal candidates can be asked to sit another test or (especially in CCF) re-sit an exam, and there is an "appeal" process to a higher educational authority.

The French picture is a composite one spread over six tests and it is unlikely that a candidate in a test-re-test situation would do much differently overall.

BC vs. France

Table 13 compare the major elements of the testing and credentialing systems for roofers in BC and in France. Both systems reflect general beliefs and philosophy about education and training.

Briefly, BC, like most North American jurisdictions, consistent with a greater reliance on technology and quantitative, large scale standardized testing uses a machine scorable test. The Red Seal examinations are designed and produced by a broad-based Canadian consensus, and are managed by a local arms-length government agency, ITA, an institution removed from the training institution and the field. The Red Seal endorsement is meant to qualify the worker.

By contrast, the French approach is holistic, reflects ideas of citizenship, is imbued with traditional educational values, and is reliant on expert educators and subject matter experts. The BP is meant to qualify the student.

Table 13. Comparison of BC and France examination and credentialing

Examination and certification		
Element	BC	France
Exam	Single	Multiple
	Pencil & paper	Pencil & paper
		Hands-on
Domains tested	Multiple unspecified	Multiple specified
	Proxy	Direct
Domain inclusion	Negotiated norm	Criterion
Item type	Selected response	Constructed response
Scoring	Machine	Rubric-based
		Examiner teams
		Jury
Scores	One correct	Gradated
Results	Unique fixed cut score	Compounded
Validity	Medium	Strong
Reliability	Unknown	Strong
Credential	Endorsement	National

APPENDIX 1 - Evaluative framework

The following is a detailed rationale describing the process and product of the evaluative exercise.

What is a rating scale?

A rating scale is a tool that allows an assessor to translate a candidate's achievement into a series of pre-set, defined values.

There are 4 major types of scales, arranged in the following fashion (Bond and Fox, 2007):

- Nominal scales– separate the data of interest in defined, recognizable classes, for example, there is an" A", a "B", a "C", … a "n"
- Ordinal scales – separate nominal data along a quantitative axis, for example A>B>C>…n, therefore, e.g. A>n
- Interval scales – separate ordinal data along a regular quantitative axis, for example A>B>C>…n, such that (A-z)=B, (B-z)=C, (C-z)=D, …, (m-z)=n, and z is invariant or constant but specific to the data (and scale) at hand (e.g. millimeters, cents, seconds, etc.)
- Ratio scales – separate interval data along a quantitative axis, for example A>B>C>…n, such that (A-z)=B, (B-z)=C, (C-z)=D, …, (m-z)=n, and z is invariant or constant across all possible scales

For the purpose of analysis, the scale used is an interval numerical scale based on percentages. While the use of a percentage numerical scale is arbitrary, it is familiar to most people because it is closely aligned with scales used in the public education system. Unlike the public education in North America, we did not use a letter grades scale (i.e. A-F) with a percent range equivalency table (e.g. A = 85-100%). Using the percent scale will allow for both translation to any base 10 numerical scale (say a test based on 20 or 40 marks) and for uncertainty.

In addition, the number of ranks (10) provides evaluators some measure of sensitivity around mid-range performance (5-7).

What is in a rating scale?

Rating scales are comprised of the following 3 elements:

- An ordinal rating value (e.g., 1, 2, 3, … n); omitted here for the sake of simplicity
- A label defining the ordinal points (e.g., 1=10%, 2=20%, 3=40%, … , 10=100%), i.e. an interval of 10% between each point
- One (or a set of) statement(s), or criterion/a, that describe(s) the behavior commensurate with the rating (e.g., 1=10%= "Candidate attempts to bluff through the task; or 'I have never done this type of task, but let me show you how it's done'"

For this exercise we have added another 2 sets of criteria or scales: safety and training. These 2 additional sets are more generic (have fewer details), and allow for evaluation as opposed to assessment. These scales are meant to be used simultaneously and conjunctively. There are 3 reasons for using additional rating criteria:

- Enable the assessor to classify the performance from a (gross) safety perspective (e.g., "Unacceptable", "High", etc.)

- Enable the assessor to classify the performance at a more general level (e.g., "Needs in-school training", "Needs on-the-job training", etc.).
- "Triangulate" the performance rating. For example, we would not accept (and expect) that a candidate be rated competent and an unacceptable safety risk in the workplace simultaneously.

In addition, the 10-point scale is meant to assist users of the evaluation grid in better targeting their intervention(s), for example, on-the-job coaching vs. in-school training (or both).

What rating scales did we use?

For this exercise, we used 3 rating scales and 1 set of statements or criteria. The rating scale elements are as follows:

- Safety
- Training required
- Percent scale (11 anchor points: N/A, 1-10)
- Criteria – description in the vernacular, from a certified tradesworker's perspective of the expected level of comfort and/or familiarity and/or capabilities based on the training and testing attached to each competency.

Safety & Training scales

The "Safety" scale is a 5-point scale risk qualitative estimate, color-coded for ease of reference (where risk is assumed to be linearly, inversely proportional to ability as reflected in the competency-based evaluation). The risk labels, while open to interpretation, are roughly aligned to investigators' ratings when an accident involving a tradesworker occurs.

The Training Scale addresses 6 potential responses for each competency assessed, where 2 responses are hiring-based, 2 responses are training-based, and 2 responses are punctual (commensurate with mandated or legislated training):

Table 14. Color-coded safety and training scales

Risk	Training
Restriction	No training required at this time, restrictions are in place
Unacceptable	Training required is too extensive to justify hiring or restrictions are required
High	Training required is best delivered in a formal, in-school format (followed on-the-job training)
Medium	Training required is best delivered on-the-job (followed by training mandated for the job)

Low	No immediate training is required (except that mandated for the job)
Improbable	No training is required (except that mandated for the job)

Note:

- "Restriction" refers to a job task limits imposed on the tradesworker by the hiring entity and kept in place until the tradesworker is deemed competent.

How did we integrate French scales?

The French program consists of three articulated domains (using our translation): Activities and Tasks, Competences and competencies, and Technological knowledge. Only the first and the last of these levels have expected performance scales. Neither of these 2 scales are identical, although they are related – the same is true of the three levels listed just above.

The first scale is binary and separates the performance expectations between someone completing a task under supervision and using an assigned methodology, and someone completing a task independently using the methodology they have selected.

The second scale is a four-point scale that maps out fairly easily to the Interprovincial Standard Examination (IPSE, a.k.a. Red Seal) taxonomy or question classification, itself is a modified/compressed Bloom taxonomy. Roughly, the French level 1 would correspond to the ability to name, member, recognize, or understand things and concepts. Level 2, in addition to Level 1, would correspond to the ability to apply concepts, perhaps mainly cognitively. Level 3 would correspond to the ability to analyze and apply the things and concepts cognitively and physically. And Level 4 would correspond to the ability to analyze complex tasks and create means to resolve them. These correspondences are captured in Table 7 below.

Combined numerical rating scale

The numerical rating scale has 4 elements:

- Percent (%) rating (estimated) (10%, 20%, … , 100%)
- Descriptors/criteria/vernacular
- Risk
- Training
- And, in addition, is cross-referenced to the French performance levels

These elements are as follows:

Table 15. Combined scales

Score	Descriptor/vernacular	Risk	Training	French cross-reference / IPSE/Bloom
N/A	Task is not required for the occupation or job position or headquarter	Restriction if task is part of the trade but location-specific	No training required at this time, restrictions are in place	

Score	Descriptor/vernacular	Risk	Training	French cross-reference / IPSE/Bloom
0 / 0%	Task is not part of profile; or "I have never done this type of work"	Unacceptable	Training required is too extensive to justify hiring or restrictions are required	
1 / 10%	Task is marginally part of profile; or "I have never done this type of task, but I think I can make it"	Unacceptable	Training required is too extensive to justify hiring or restrictions are required	
2 / 20%	Task is not part of profile but bears some resemblance to some profile task; "I don't know this; show me and talk me through it step by step"	High	Training required is best delivered in a formal, in-school format (followed on-the-job training)	
3 / 30%	Task is not part of profile but is a composite of other tasks; "I've done this quite a while back, you just need talk me through it one step at a time"	High	Training required is best delivered in a formal, in-school format (followed on-the-job training)	
4 / 40%	Task is part of profile but uncommon / rare; or "Here's how the whole procedure is done, is that correct?"	High	Training required is best delivered in a formal, in-school format (followed on-the-job training)	• Niveau d'implication 1[31] – Limited knowledge and know-how; method assigned • IPSE Tax 1 • Bloom 1-2
5 / 50%	Task is part of profile but usually left to specialists; or "I can do this, but I'll probably get stumped and may need help at some point"	Medium	Training required is best delivered on-the-job (followed by training mandated for the job)	• Niveau d'implication 1 – Limited knowledge and know-how; method assigned • IPSE Tax 1→2 • Bloom 2→3

[31] Our translation – A des connaissances et savoir-faire minimaux ; exécute la tâche sous la responsabilité d'un supérieur hiérarchique et selon une méthode imposée.

Score	Descriptor/vernacular	Risk	Training	French cross-reference / IPSE/Bloom
6 / 60%	Task is part of profile but usually left to specialists; or "I can do it on my own, you just need to check when I'm done – I'll probably make a forgivable mistake"	Medium	Training required is best delivered on-the-job (followed by training mandated for the job)	• Niveau d'implication 2 – Partial knowledge and know-how; may choose method[32] • IPSE Tax 2 • Bloom 3-4
7 / 70%	Task is part of profile but frequency of practice varies a lot; or "I can do it on my own, you just need to check when I'm done – I won't make any mistake"	Low	No immediate training is required (except that mandated for the job)	• Niveau d'implication 2 – Partial knowledge and know-how; may choose method • IPSE Tax 2 • Bloom 3-4
8 / 80%	Task is part of profile and is very common; or "I can do it on my own, you won't have to check my work"	Low	No immediate training is required (except that mandated for the job)	• Niveau d'implication 3 – Deep knowledge and know-how; responsible for the work, materials, and people[33] • IPSE Tax 3 • Bloom 5-6
9 / 90%	Task is part of profile and tested rigorously; or "I can teach others how to do it"	Improbable	No training is required (except that mandated for the job)	• Niveau d'implication 3 – Deep knowledge and know-how; responsible for the work, materials, and people • IPSE Tax 3 • Bloom 5-6
10 / 100%	Task is part of profile and subject to re-certification; or "I developed and	Improbable	No training is required (except that mandated for the job)	

[32] Our translation – A des connaissances et savoir-faire partiels ; maîtrise l'exécution de la tâche et peut choisir la méthode.

[33] Our translation – A des connaissances et savoir-faire approfondis ; exerce durant la tâche une responsabilité des personnels, des moyens, des produits.

Score	Descriptor/vernacular	Risk	Training	French cross-reference / IPSE/Bloom
	implemented this procedure"			

Notes:

- The numerical standard for an estimated "competent" performance rating is 70%, or the ability to perform safely independently. An estimated "proficient" performance rating is 90% or 100% or that exhibited by a higher level of certification or tenure as a trades instructor.
- Where "forgivable" in the 60% rating vernacular means a procedural misstep or omission; an error that would not have led to or resulted in injury to self, co-workers, or the public and/or damage to equipment or plant.

Further refinements

The analysis conducted herein could be further refined by adding analytical levels, say including learning tasks, or "saviors", or "limites de connaissance". Using these levels, it might be possible to move from an ordinal rating to an absolute rating and then conduct mathematical operations on the ratings and add weightings to calculate gaps to a higher – albeit artificial - level. This is explained below

The numerical indicators above can be handled via arithmetic mean calculations – if they are used in an absolute fashion rather than a comparative or ordinal fashion - and would have the following assumptions embedded:

- All ranks are equally spaced, i.e. it is as difficult to go from a "20%" to a "30%" as it is from a "60%" to a "70%".
- Competence and risk can be represented linearly (in the form of $y=ax+b$)
- All competencies are equally important
- All competencies are equally risky
- There is no measurable skills erosion due to jobsite conditions or time elapsed since certification

Clearly, all of these assumptions might lead to (i) overestimation of competence and, (ii) underestimation of risk. For example, in a worst case scenario, a tradesworker may "score" very high on low risk/low impact competencies, hence "make up" for weaknesses in high risk/high impact competencies.

There are 2 non-mutually exclusive palliatives to address the assumptions' potential impact on gaps/scores:

1. Gating items/competencies
   Simply put, gating items or competencies are "must-haves". For example, a roofer who lacks, e.g., NOA Bock E Task 12 "Waterproofs surfaces", would be considered "incompetent" altogether as mastery of that Task is deemed absolutely necessary to function in a Canadian construction environment.
2. Weighting
   Weighting consist in assigning a multiplier to the assessed raw score based on competency criticality and/or risk level (expressed as a "safety score"). At the individual competency level

achievement described as a percentage remains the same, but at the aggregate level, the weighting affects the results. Weighting values could be based, say, on percent of instructional time listed in the BCPO, or the Tasks national averages in the NOA.

Table 16. Example of profile results using the all of the ratings to determine a risk factor on a 3-point scale (weighted risk factors were not considered)

Summary of ratings against competencies	Score/Max.	Percent	Risk/Training	Value (=v)	Average Risk (=Σv/n)
3 greens (all at 7/70%)	21/30	70%	Low	3*1=3	2.17
4 yellows (3 at 6/60%, 1 at 5/50%	23/40	58%	Medium	4*2=8	
5 oranges (4 at 4/40%, 1 at 3/30%)	17/50	34%	High	5*3=15	
Overall	61/120	51%	Medium-High	26/12	Medium-High

Comparing 2 "candidates" with similar rating profiles but in a weighted situation:

Table 17. Example of weighted program comparison

GAC	(K) Raw Score		(K) No weight %		Weight (1-5)	(K) Weighted score		(K) Weighted %		(S) Raw Score (SRS)		(S) No weight		Weight (1-5) (W)	(S) Weighted score		(S) Weighted %	
Candidate	A	B	A	B		A	B	A	B	A	B	A	B		A	B	A	B
A	P	P	P	P	∞	P	P	P	P	P	P	P	P	∞	P	P	P	P
B	6	7	60%	70%	4	24	28	60%	70%	2	1	55%	75%	4	8	4	.50	.25
C	4	6	40%	60%	4	16	24	40%	60%	3	2	30%	55%	4	12	8	.75	.50
D	6	5	60%	50%	2	12	10	60%	50%	2	3	55%	30%	2	4	6	.25	.38
E	9	7	90%	70%	1	9	7	90%	70%	0	1	95%	75%	1	0	1	0	.06
Overall	25	25	63%	63%		61	69	55%	63%	7	7	59%	59%		24	19	1.50 67%	1.19 83%

Note: (S) Weighted % is calculated as: $\left\{100\left(\frac{1}{(SRS*W)/(W*SRS_{max})}\right)\right\}$

APPENDIX 2 - Glossary of Terms

Below is a list of terms used throughout the report, cross-referenced to their French term(s).

Table 18. Glossary of terms

Element	French	Explanation
Assessment	Évaluation scolaire	• The term assessment is generally used to refer to all activities teachers use to help students learn and to gauge student progress.
Certified/Certification	Qualifié ou diplômé / Certification en tant que …	• Certification refers to the confirmation of certain characteristics of an object, person, or organization. This confirmation is often, but not always, provided by some form of external review, education, assessment, or audit. • One of the most common types of certification in modern society is professional certification, where a person is certified as being able to competently complete a job or task, usually by the passing of an examination. • There are two general types of professional certification: some are valid for a lifetime, once the exam is passed. Others have to be recertified again after a certain period of time. Also, certifications can differ within a profession by the level or specific area of expertise they refer to.
Competence	Aptitude	• Competence is a generic term used to describe an acceptable performance in the appropriate context; it is the ability to do a particular activity to a prescribed standard. • Competence is measured against (a set of) documented criteria • Competence usually regroups a number of activities or behaviors typical of a job but may not include all job tasks
Competence (General Area of)	Activité(s)	• General Area of Competence (GAC) are made up of competencies following this rough classification: ○ Competencies related to specific divisions in work assignment or job activities. ○ Competencies that comprise knowledge, skills, and abilities (KSAs) used extensively as part of one or more job activities. ○ Competencies that relate to a generic set of learning activities.

Competency	Tâche / Savoir-faire / Compétence	• Competency and competencies are concepts used to label particular abilities and refer to activities.
		• Competency statements always contain a verb that describes what the person does.
		• For operational purposes, competencies:
		  ○ Taken together, fully describe the general area of competence (GAC) they are a part of.
		  ○ Are constituent parts of general areas of competence.
		  ○ Fully describe an independent job unit.
		  ○ Describe what the individual is able to do.
		  ○ Include each and every job skill; fully describe the job in behavioral terms

Competency (Profile Chart)	Activités et taches professionnelles	• A Competency Profile Chart outlines all competencies that a worker, tradesperson, and (therefore) an apprentice, is expected to perform on the job. It forms the basis for developing a training program.
Content - Program outline	Abrégé du programme pédagogique	• A list of topics required for each learning task
Content - Materials	Ressources pédagogiques / Matériel didactique	• A comprehensive package (in any medium) of information required to support the delivery of learning tasks
Course	Cours	• [Is} a short, pithy statement which informs a student about the subject matter, approach, breadth, and applicability of the course [material] • focuses on content ... we are looking for a list of topics[34]. • There is no standard definition of the word course in UK higher education … the definition of a course is usually driven by the academic regulations and structures of a provider • A course [is] a coherent academic engagement with a defined set of learning outcomes • [A] course [is] something you can apply to • A course [is] the thing that lead to the student's qualification[35]
Curriculum (also see syllabus, program)	Programme scolaire / de formation	• In formal education, a curriculum is the set of courses, and their content, offered at a school or university. A curriculum is prescriptive, and is based on a more general syllabus which merely specifies what topics

[34] Stanford University the Office of the Registrar
[35] Higher Education Statistics Agency (UK)

		must be understood and to what level to achieve a particular grade or standard. • May also refer to a defined and prescribed course of studies, which students must fulfill in order to pass a certain level of education.
Delivery - Instructor	Enseignement – Instructeur / Formateur	• Individual tasked with teaching apprentices or aspiring workers.
Evaluation	Évaluation	• Evaluation is making a judgement (or set of judgements) on how well a (training) program has reached its stated objectives. Summative evaluation (hereinafter referred to as "evaluation") is the last and concluding step in the DACUM process and the ADDIE training and instructional development models. • The results of evaluation exercises allow us to determine: o The type of contribution the (training) program made to the organization. o Participants' reaction to elements of the (training) program. o Participants' grasp of the (training) program contents. o Participants' success in applying newly learned concepts and behaviors on the job. o The (training) program's cost-effectiveness. o How the (training) program might be improved. o Whether or not the (training) program should be repeated or modified before repeat deliveries.
Exam – Competence evaluation	Évaluation des aptitudes / du savoir-faire	• Competence evaluation is a test of practical competence. Competence is defined as 'the ability to do a particular activity to a prescribed standard'. Competence is based on the belief that what people do rather than what they know is most important in terms of job safety, (training) outcomes, and productivity. Competence is measured against specific job competencies. • A Competence evaluation is trade / occupation-specific. Competence evaluations focus on "core competencies" for the trade / occupation. Those core competencies are identified by subject matter experts (SMEs); core competencies are defined as work activities that are critical to safety and / or extremely common.
Exam - Exam	Examen	• An exam(ination) or test is an assessment intended to measure a candidate's

		knowledge, skill, aptitude, physical fitness, or ability. An exam or test may be administered orally, on paper, on a computer, or in a confined area that requires a test taker to physically perform a set of skills. Formal examinations or tests often yield grades or test scores.
Exam - Quiz	Test	• A quiz is a brief assessment used in education and similar fields to measure growth in knowledge, abilities, and/or skills. • Quizzes are usually scored in points.
Exam – Skills Check	Examen des savoir-faire	• See "Competence Evaluation" above • The results of a Competence evaluation allow us to determine: o The skills level of the candidate against core job competencies. o The training required to fill the skills gaps, if any. o The most appropriate training mode to fill the skills gaps.
KASA - Ability	Capacité	• The power or capacity to perform an activity or task[36] • An internal / self- (or external) evaluation of an individual's affective, cognitive, and psycho-motor domains' capacities (sometimes partially captured via qualifications) that allow for the placement of that individual on an idiosyncratic ordinal scale
KASA - Attitude	Attitude	• A state of mind or feeling with regard to some matter • Affective domain activities such as training or end-of-course-evaluations, and so on, would tap "attitudes"
KASA - Knowledge	Connaissance(s) - Savoir(s)	• An organized body of information, usually factual or procedural in nature • Cognitive domain activities such as training, end-of-course-evaluations, and so on would tap "knowledge" • As opposed to competencies, knowledge statements do not contain "action" verbs. Rather they state what the content or facts might be.
KASA - Skill	Habileté	• "Skill" is taken to be primarily to be "the ability to carry out [a] particular task" or "the proficient manual, verbal, or mental manipulation of data or things" • Rather than "ability based on some permutation of dexterity, practical

[36] http://www.va.gov/jobs/hiring/apply/ksa.asp

		knowledge, theoretical knowledge and social ability", or "the ability or potential ability to fulfill all the tasks associated with or negotiated for an occupation"[37]
Learning outcome	Aboutissement de l'apprentissage	• A statement of what a learner will be able to do as a consequence of attending a course, studying materials, using a job aid, etc. • Also referred to as "Learning Objective"
Learning task	Attente(s) d'apprentissage	• One of a set of instructional activities which, collectively, are required in order to reach one of a competency's enabling objective, or the competency's learning or performance outcome
Needs Assessment	Évaluation des besoins	• A needs assessment is a systematic effort to gather data, ideas, and opinions from a variety of sources about performance problems, or new systems/procedures, or new technologies' impact on workers. • A need is a gap between the current situation (actuals) and a more desirable future situation (optimals). A need only exists when there is a discrepancy or gap between actuals and optimals. A training need is training required to fill that gap. • **Note** that training may not be that appropriate response to any given gap.
Performance outcome	Résultat(s) prévus	• A statement describing the learner's observable, measurable behavior resulting from attending a course, studying materials, using a job aid, etc. • Also referred to as "Instructional/Performance Objective"
Qualification	Qualification	• Qualification refers to documentary evidence (in the form of certificates, guild membership, proof of training, on-the-job experience, etc.) that shows the bearer is recognized as a practitioner in the field for which the qualification has been issued. • "Certification" is often used as a synonym
Qualified	Qualifié	• A bearer of (a) qualification(s) is said to be qualified • Some will argue that one may be certified (i.e. be the bearer of a qualification or certificate) but not qualified. In that instance, "qualified" refers to the (evaluated) ability to "do the job" regardless of documentary evidence in hand

[37] Winch C, and Clarke, L (2003); "Front-loaded" Vocational Education versus Lifelong Learning. A Critique of Current UK Government Policy, Oxford Review of Education, 29:2, 239-252

Qualitative (e.g. assessment, evaluation, research, etc.)	Approche qualitative	• Reported outcomes of investigations in the physical or social realms that eschew any numerical representation (or, at most, report rudimentary frequencies/counts) or mathematical (usually statistical) manipulation. Often used as a counterpoint to "quantitative" (aka "hard"), "qualitative" outcomes report on attributes of interest using the vernacular (although with post-moderns, there has been a marked increase in the use of obscure language). • There is a connection between the qualitative and the quantitative via the theory of measurement: "The objects measured, their properties and the relationships between them are described as *qualitative*, to distinguish them from numbers and numerical relationships, which are described as *quantitative* … Such qualitative structure, however, may be similar (i.e. isomorphic or homomorphic) to quantitative (numerical) structures. It is in virtue of this structural similarity that numerical systems may be used to *represent* qualitative empirical systems.[38]"
Quantitative (e.g. assessment, evaluation, research, etc.)	Approche quantitative	• Commonly thought to be the assignment of numbers (real, rational, and irrational) to a process, product, result, or any outcome of an investigation in physical or social realms. This assignment of numbers to outcomes is taken as a confirmation that some sort of attribute has been measured. While commonly understood to follow Steven's (1946) nominalist-representational formulation: "a measurement is the assignment of numerals to objects or events according to a rule[39]", the concept of measurement as an arbitrary, investigator-based assignment of a scale is erroneous. • "Put as succinctly as possible, *measurement* is **the numerical estimation of the ratio of a magnitude of a quantitative attribute to a unit of the same attribute**." • "*Quantitative attribute*. A quantitative attribute (or quantity) is an attribute the instances of which are related to one another

[38] Michell, J (1993): The Origins of the Representational Theory of Measurement: Helmholtz, Hölder, and Russell, *Studies in History and Philosophy of Science* 24 (2), 185-206 (emphasis in original)

[39] Stevens, S.S. (1946): On the theory of the scales of measurement. *Science*, 103, 667-680

		both ordinally and additively. One version of (continuous) quantitative structure is given by Hölder's (1901) axioms[i] … Not all attributes are quantitative. E.g. length is quantitative, but neither sex nor nationality is.[40]"
Training	Formation	• A planned, systematic set of mediated activities which results in a predicted, (mainly) permanent behavior change in the participants and is (i) a response to a documented knowledge or skill-based performance gap, and (ii) job-specific, location-specific, or firm-specific

[40] Both quotes from Michell, J (1997): Quantitative science and the definition of *measurement* in psychology. *British Journal of Psychology*, 88, 355-383 (emphasis in original)

APPENDIX 3 – Select Web References

ONISEP.FR – Fiche formation; Bac pro Technicien du bâtiment
http://www.onisep.fr/Ressources/Univers-Formation/Formations/Lycees/BP-Etancheite-du-batiment-et-des-travaux-publics
Accessed 09 January 2016
ONISEP.FR – Fiche formation
http://www.onisep.fr/Ressources/Univers-Metier/Metiers/couvreur-couvreuse
Accessed 09 January 2016
BTPCFA-Vienne
http://www.btpcfa-vienne.fr/content/uploads/sites/2/2015/02/CAP-Couvreur.pdf
Accessed 10 January 2016
Ministère de l'Éducation Nationale – Les niveaux et les établissement d'enseignement
http://www.education.gouv.fr/cid216/le-centre-de-formation-d-apprentis-c.f.a.html
Accessed 24 November 2015
Ministère de l'Éducation Nationale – Voies de formation et diplômes
http://www.education.gouv.fr/cid155/apprentissage.html
Accessed 24 November 2015
Statistics Canada
http://www.statcan.gc.ca/pub/81-004-x/2010002/article/11253-eng.htm
Accessed 26 November 2015
Statistics Canada
http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3154&lang=en&db=imdb&adm=8&dis=2
Accessed 26 November 2015
http://charpente-total-bricoleurs.wifeo.com/dictionnaire-des-termes-de-charpentes.php
Accessed December 2015 (throughout)
http://eduscol.education.fr/cid47717/definition-et-caracteristiques-du-ccf.html
Accessed 13 December 2015

[i] Hölder's axioms (1901) are as follows (from Michell, J (1993): The Origins of the Representational Theory of Measurement: Helmholtz, Hölder, and Russell, *Studies in History and Philosophy of Science* 24 (2), 185-206:

1. Given any two magnitudes, *a* and *b*, of the same kind, *one* and *only one* of the following is true
   (i) *a* is identical with *b* (i.e. *a=b* and *b=a*).
   (ii) *a* is greater than *b* and *b* is less than *a* (i.e. *a>b* and *b<a*).
   (iii) *b* is greater than *a* and *a* is less than *b* (i.e. *b>a* and *a<b*).
2. For every magnitude there exists one that is less.
3. Any two magnitudes of the same kind, *a* and *b*, when added in a definite order give a well determined sum, *a+b*
4. For any two magnitudes of the same kind, *a* and *b*, *a+b>a* and *a+b>b*.
5. If for any two magnitudes, *a* and *b*, of the same kind, *a<b* then there exists magnitudes *x* and *y* also of that kind such that *a+x=b* and *y+a=b*.
6. For any three magnitudes, *a*, *b*, and *c*, of the same kind *a+(b+c)=(a+b)+c*.
7. If all magnitudes of the same kind are divided into two classes such that
   (i) each magnitude belongs exactly to one class, and

(ii) each magnitude of the first class is smaller than any magnitude of the second class, then there exists a magnitude, *m*, such that every magnitude *m'*<*m* belongs to the first class and every magnitude *m"*>*m* belongs to the second class (*m* may belong to either, depending upon the case)