International mobility and the licensing of professional engineers

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ABSTRACT: Definitions of licensed professional engineers are as varied as educational systems and degrees in engineering across the world. Equally diverse are varied definitions of licensures, registrations or certifications, and titles of professional engineers. The international recognition of accredited degrees alone is not equal to licensure to practice professional engineering internationally. Other potential concerns for *full mobility* as licensed professional engineers involve differences in national standards, requisite language/communication skills, professional responsibilities and accountability, applicable jurisdictional codes, continuing education requirements, etc. The licensing of engineers must ensure that there is quality, expertise and trust in the engineering services. Internationally, there is a multitude of national licensing bodies with very diverse requirements. To date, because of these complexities, there are no direct universal broad-based reciprocal agreements for the transferability of national licensures for international practice. Some assistance is provided through international registries that present pre-screened qualified candidates for possible licensing beyond their home countries.

INTRODUCTION

With the ever-increasing globalisation (either electronically or in direct human contact) of engineering tasks, there must be an equally increasing need for the international licensing of professional engineers. In this paper, the term *licensing* also includes certifications and registrations as professional engineers accorded by individual countries.

In a sense, licensing indicates the level of high competence, which ensures the quality of professional work with a commitment to environmental aspects, safety standards and other important issues to general populations. It also provides a legal authority for licensed individuals to certify, consult and advise in their expertise areas. At the same time, it must be noted that not all engineering undertakings would require international licensing.

ELEMENTS FOR INTERNATIONAL LICENSING

In general, there are six main elements that are needed for obtaining licensure as a professional engineer beyond the applicant's home country:

0. Accredited degree in engineering;
0. Meaningful and challenging engineering experiences;
0. Licensure in the home country;
0. Commitment to continuing education;
0. Listing in the international registries by the home country's agency as a qualified candidate for possible licensing by other countries;
0. Satisfaction of the jurisdictional requirements of the host countries.

The first element deals with the applicant's academic credentials. Invariably, an engineering degree from an accredited programme or institution is a must for international licensing. The next four elements denote the applicant's professional standing. The sixth element is a jurisdictional requirement to practice in the host country. In addition, some licensures may require specific work experience for a specified number of years, as well as knowledge of the relevant laws and standards of the host country.

INTERNATIONAL ACCREDITATION

It was noted that an accredited degree is an essential part in any licensing process. At this time, there are two major international consortia dealing with accreditation and academic quality issues, and the recognition of degrees. These consortia are the Washington Accord and the Bologna Process/European Higher Education Area [1-3].

The Washington Accord (WA) was signed in 1989 and has eight full members, namely: Australia, Canada, Hong Kong-China, Ireland, South Africa, the UK and the USA. Germany, Japan, Malaysia and Singapore joined the WA as provisional members in 2003. The WA covers only the accredited undergraduate engineering programmes in any WA country for mutual recognition by other WA countries. The WA has been in full operation since 1989.

The Bologna Process/European Higher Education (BP/EHEA) concept was initiated by 29 countries in 1999. The BP/EHEA consortium now covers the entire European continent. Its aim is to have a common degree recognition and quality assurance/ accreditation system in full operation by 2010.

The WA and BP/EHEA consortia are not involved in the licensing of engineers – they deal only with the essential academic side of the licensing. Currently, both consortia operate independently from each other as separate entities. Interestingly, Ireland and the UK hold

full memberships in both consortia and Germany recently became a provisional member of the WA Consortium. Eventually, dual membership may lead to the blending of both consortia.

REASONS FOR INTERNATIONAL LICENSURES

Some of the personal and professional reasons for seeking international licensures, registrations or certifications could be given as follows:

- International recognition of an engineering degree;
- Proof of competence;
- Evidence of high professional accomplishments;
- Moving to another country (short-term or long-term);
- Regulated profession in the host country;
- Hiring requirement;
- Specific job requirement;
- Professional pride.

Certainly, there will be situations where no licensure will be required – then the professional pride should be the impetus for obtaining licensure as professional engineer. Obtaining a national license is a good starting point for international licensing. The much talked about issue of outsourcing will also require equity in the credentials of engineers for international practice.

MODELS OF LICENSING PROCESSES

Loosely defined, there may be at least four generic models for the licensing or certifying of professional engineers. Running the risk of unintentional exclusions, these models illustrate some common licensing characteristics that are exemplified by a few selected countries. The models certainly represent many more countries beyond those listed. In general, the licensing of professional engineers is carried out under governmental mandates by national engineering associations or the government-appointed boards of highly regarded practitioners.

All countries require the completion of accredited or, in some cases, government-approved engineering degrees, plus meaningful engineering experiences ranging from two to seven years. There are a few exceptions where direct licensing is implied at the time that an engineering degree is granted.

For international licensing, even within the illustrated models described below, most, if not all, of the previously listed six elements are needed.

Model 1

Example countries engaging in Model 1 include the USA and Canada with professional licensures designated as PE and PEng., respectively [4][5].

Individual states, territories and provinces have specific licensing laws. Consequently, the applicants must seek licensing in the desired state, territory or province. There are 51 licensing entities in the USA and 12 in Canada. Both countries have very similar engineering education and accreditation systems, are full members of the WA, hold several international trade agreements, and are direct geographical neighbours.

However, at this time, there are practically no reciprocity agreements between the USA and Canada. The candidates have to apply to each country and specific state or province. Two written examinations (fundamentals of engineering and practice) are required in the USA. Canada requires one written examination on ethics and laws pertaining to professional engineering. In addition, both countries require verifiable meaningful engineering experience, as well as proof of continuing education. The licensing process in both countries is conducted by the respective government regulatory agencies or mandated state boards. In Canada, membership in engineering associations is required.

The licensing process and the meaning of the licensed professional engineer in the USA and Canada are probably unique in the world. Taking into account all the formalities, the licensing process in the USA is perhaps the most formal and rigid among all countries.

Model 2

Example countries of Model 2 include Australia, Hong Kong-China, Ireland, New Zealand, the UK, with the CPEng (AU), CE (IE), CPEng (NZ), CE (UK) designations, respectively [6-11]. These countries have some long-standing similar traditions in educational systems that are more conducive to possible broad-based reciprocal licensing agreements.

In Model 2, the assessments for national licensing are primarily undertaken by the national professional engineering associations under various government mandates. Licensing is based on an assessment of education (all countries are full WA members), experience, performance and continuing education. In Model 2, membership in the respective national engineering associations is either required or strongly expected.

There are some mutual recognitions of chartered engineer or equivalent licensures without additional conditions. In most cases, they are limited to bilateral agreements. For example, the CE title from the Institution of Engineers in Ireland is recognised by the respective institutions in Australia, New Zealand, Hong Kong-China, among others [6-9].

Going outside Model 2, full members of the Hong Kong Institution of Engineers, under a Mutual Recognition Agreement with the Canadian Council of Professional Engineers, will be eligible to become licensed engineers in Canada if they pass an examination or interview on local laws and practice, and demonstrate that they have obtained one year of experience equivalent to those obtained in the jurisdiction of Canada [5][7]. Similarly, New Zealand under the new Registration Authority Act may require engineers from other countries in Model 2 to undergo further reviews of their qualifications to practice in New Zealand. In summary, the Model 2 countries have not yet developed broad-based reciprocal agreements.

Model 3

Examples of Model 3 are found in countries of the European Union. As citizens of the European Union (EU), professional engineers if their qualifications or licensures enable them to pursue this profession in their own EU state, and are entitled to the same recognition in other EU states, subject to the local laws and national reviews.

There is also another European recognition of professional competence signified by the European Ingenieur (EUR ING) title. This title is awarded by the European Federation of National Engineering Associations (FEANI). One of the FEANI's main goals is to facilitate the mobility of engineers for professional practice within and outside of Europe through the recognition of the overall professional qualifications.

The EUR ING title denotes professional competence on the European scale and complements the engineering titles and qualifications from the EU home countries. There is no legal requirement for engineers to hold this title – application is entirely on a voluntary basis.

The primary criteria for the EUR ING title are based on verifiable engineering education, length of education and proven engineering experience [12-14]. FEANI expects a combination of at least seven years of engineering education, engineering training and experience. Both of the national monitoring and European monitoring committees assess the above elements. More details are provided in the FEANI Index, FEANI Register, and FEANI Guide [12].

By definition, FEANI is not a true licensing body, as there are several European countries where engineering is a regulated profession by national laws. In those instances, holders of the EUR ING title, just like the holders of national licensures, may be required to submit their qualifications for further reviews subject to the national laws of the host country for the practice of engineering.

FEANI, at this time, is a unique and, perhaps, one of the largest broad-based professional bodies for the assessment of engineering competence. The title of EUR ING can be considered as a valuable input when seeking international licensing outside the EU. With the advent of possible new EU directives to improve the mobility of engineers, the significance and status of the EUR ING may be strengthened. With these directives and somewhat redefined EUR ING, the holders of the EUR ING would not be subject to national reviews or additional qualifications for practice within Europe. With these possible changes, the EUR ING will remain open to qualified European engineers on a voluntary basis.

Model 4

Model 4 covers other nations and independents. Various definitions of academic programmes and degrees and licensures put a significant number of countries outside Models 1, 2, and 3 presented above. In some countries, direct licensure to practice engineering is granted at the time of graduation without acquiring significant professional experience. In a number of countries, the title of Engineer is defined and protected by national laws without requiring any special licensing processes. In some cases, both the accreditation and licensing processes are conducted by individual universities alone. There are at least several countries in Africa, Asia, Latin America and Europe that can be classified in this category.

Review

Regardless of their diverse approaches, countries in each of the four models emphasise a common desire for the recognition of high-level competence and the need for the full mobility of licensed/certified professional engineers. However, to date, there is no universal agreement for the direct unhindered reciprocity of national licensures across the above four models. In many cases, applicants must start the process anew taking into account all of the six elements listed earlier in the paper.

In general, the licensing situations and mandates change rapidly, which may require adjustments of the illustrated models. Therefore, it is strongly advised to check the appropriate international Web sites for up to the minute information on specific licensing requirements. However, in most cases, the finalisation of licensing will rest with the jurisdictional authorities of the host country.

LICENSING COOPERATION VIA INTERNATIONAL TRADE AGREEMENTS

In the absence of universal licensing agreements (for whatever reasons), attempts are being made to work through the international trade agreements to develop registries of nationally pre-screened qualified engineers for international practice. The individuals to be considered for these listings must fully meet the licensing/certification requirements in their home countries.

The registries are advisory – each individual case, when requested by the listee, is reviewed by the appropriate national jurisdictional bodies for possible licensing in that particular country. To date, two registries are available, namely:

- The Asia Pacific Economic Cooperation (APEC) Registry. The APEC was established in 1986 by 12 founding members: Australia, Brunei, Canada, Indonesia, Japan, South Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand and the USA. Since that time, the APEC accepted nine new members: the Peoples Republic of China, Hong Kong-China, Taiwan, Mexico, Papua New Guinea, Chile, Peru, Russia and Vietnam.
- The Engineers Mobility Forum (EMF) established the International Registry of Professional Engineers (IRPE). The EME's membership consists of Australia, Canada, Hong Kong-China, Ireland, Japan, South Korea, Malaysia, New Zealand, South Africa, the UK and the USA. FEANI has observer status.

Only those applicants from the APEC and EMF countries can be listed in the respective registries.

Further discussions continue with two more trade agreement partners, namely:

- The North American Free Trade Agreement (NAFTA): Canada, Mexico and the USA.
- The Transatlantic Economic Partnership (TEP): the European Union and the USA.

It should be noted that some countries have multiple memberships in the APEC, EMF, NAFTA and TEP pacts, which may lead to simplification and more universal reciprocity in licensing. For example, the USA has membership in all four pacts. Canada, Australia and New Zealand have three memberships followed by several countries with two memberships.

Engineers from non-listed countries should apply directly to the desired host countries for licensure. Currently, they would

be subjected to more formalised scrutiny than those listed in the IRPE and the APEC registries.

The process for international licensures is very cumbersome and slow. Consequently, several countries have formed committees for providing needed assistance for their engineers. For example, in the effort to assist US-licensed professional engineers to practice internationally, the United States Council for International Engineering Practice (USCIEP) was formed [15]. The organisations that comprise the USCIEP are as follows:

- The National Council of Examiners for Engineering and Surveyors (NCEES);
- The Accreditation Board for Engineering and Technology (ABET);
- The American Council of Engineering Companies (ACEC);
- The National Society of Professional Engineers (NSPE).

It is interesting to note that the USCIEP is a one-step screening unit consisting of industrial, accreditation, professional and licensing organisations. The USCIEP is responsible for the listing of qualified engineers for international practice and updating the US listings in the IRPE and the APEC registry for licensing consideration by other countries. Each listed applicant must request to initiate the process for a listing in the above international registries; an American engineer must be licensed in one or more jurisdictions in the USA, which includes written examinations.

International applicants seeking licensure in the USA will have to satisfy the outlined six elements at the beginning of this paper for international licensing, including the written tests (Model 1).

More detailed information can be provided by the NCEES [4]. In some US licensing jurisdictions, the fundaments of an engineering test could be waived.

OBSERVATIONS AND CONCLUSIONS

The international licensing process is unnecessarily complex due to economic, political, jurisdictional and possibly *protect-the-turf* issues. Regardless of these issues, there is one common thread: the desire to emphasise the quality, expertise and trust in the services provided by professional engineers. These items, hopefully, will start and accelerate the process for simplifying the steps to international licensure and ease the freedom of mobility for professional engineers.

The process used in forming the Washington Accord and Bologna Process/European Higher Education Area agreements could provide an excellent example to overcome complex problems in international licensing and degree recognitions. Engineering has always prided itself on the ability to provide meaningful solutions to complex problems. To further address the issue of *global quality of engineering professionals*, it is important to develop a universal model for international licensing. Neutral engineering communities, such as the UNESCO International Centre for Engineering Education (UICEE) under the auspices of UNESCO, could play a pivotal role in promoting new concepts to benefit the cause of full engineering mobility in this global environment.

In order to start these efforts, a universal international definition of professional responsibilities and an accompanying International Code of Ethics for Engineers must be developed. These two elements must have no international or political boundaries.

Perhaps this universal code would then prime the subsequent efforts leading to a universal or unifying (there are already too many organisations!) international licensing process of professional engineers.

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