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Abstract (summary of most significant information, 250 word limit; optional): This work was completed in response to the following contract deliverable: At least two additional significant trade capacity building-related institutional strengthening initiatives effectively formulated and implementation initiated in sectoral areas jointly agreed upon by USAID and the GOC. The report proposes a detailed and precise Action Plan to strengthen the Professional Council's capabilities to oversee, regulate and enforce international standards, specifically US standards, in the licensing of the engineering professionals, aimed to implement a mutual recognition system between Colombian Professional Councils and the relevant US state and territorial licensing boards.	
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From: Arthur E. Schwartz, Consultant to The Services Group (TSG), Incorporated

To: Miguel Camacho, Professional Services Component Leader and Jaime Nino, Chief of Party

Subject: March 24 Consultant Preliminary Report

Introduction

As noted in the Terms of Reference, the current negotiations for the establishment of a Free Trade Area between Colombia and the United States impose numerous challenges and opportunities to the professional services sector in Colombia. There is general agreement that one crucial weakness of professional services providers is the lack of a set of technical standards necessary to acquire the individual professional license that are equivalent to international standards, which would facilitate the establishment of mechanisms to promote mutual recognition of professional licenses and qualifications.

Challenge

In Colombia, as in the case of the United States, the professional licensing process is carried out by public agencies, specifically the Professional Councils for Engineering. These Councils have been working for more than 20 years, but their functions and tasks have been limited to a few activities. There is general agreement that these Councils have not ensured the adequacy and quality of the professional services provided by licensed engineers.

Objectives

This project seeks to define a detailed and precise Action Plan to strengthen the Professional Council's capabilities to oversee, regulate and enforce international standards, specifically US standards, in the licensing of the engineering professionals, aimed to implement a mutual recognition system between Colombian Professional Councils and the relevant US state and territorial licensing boards.

The observations and recommendations contained herein are intended (1) to identify strategic and tactical issues to assist Colombian engineers in becoming licensed within one or more of the US state/territorial jurisdictions; and (2) to assist the Colombian government and the Colombian Engineering Councils in introducing legal and regulatory reforms to establish international standards, specifically US standards, in the licensing of engineering professionals in Colombia.

Actions to Date

1. Consultant has performed pre-visit research and analysis of various current US engineering and related education and licensure standards. This has included a review of materials available from the Accreditation Board for Engineering and Technology (ABET) and the National Council of Examiners for Engineering and Surveying (NCEES). Also reviewed for comparison purposes were the materials available from the National Architectural Accreditation Board (NAAB) and the National Council of Architectural Registration Boards (NCARB) as well as the laws and regulations of the US states and territories.
2. Consultant has met with Paul Davis, USAID (Bogota, Colombia) to discuss the nature of the goals, objectives and work plan for the project.
3. Consultant has undertaken a preliminary review of the research developed and performed by the Colombia Productiva team, including Lilian Urueta and Ana Buritica, on the "Oversight and Licensing of the Engineering and Architecture Professions in Colombia".
4. Consultant has developed a survey questionnaire instrument with the input and assistance of the Colombia Productiva team that was used during the meetings and interviews with the 4 Engineering Professional Councils (COPNIA, Electrical/Mechanical Engineers' Council, Chemical Engineers' Council, Petroleum Engineers' Council) held during the week of March 13, 2006. The survey questionnaire has been helpful in identifying strategic and tactical issues that will be useful in making recommendations for strengthening the Professional Councils' capabilities to oversee, regulate and enforce international standards.
5. Consultant has prepared a table comparing and contrasting the responses received from the 4 Engineering Professional Councils during the meetings and interviews conducted during the week of March 13, 2006 to assist in identifying the strategic and tactical issues that will be useful in making final recommendations.
6. Consultant has met with Gabriel Duque, Services Negotiator of the FTA with the US to discuss preliminary observations, findings and recommendations.
7. Consultant has met with team members Lilian Urueta and Ana Buritica to review and provide detailed comments on the research done by the local team regarding the identification of standards in oversight and control of the engineering professional practice in various states, including but not limited to California, Connecticut, the District of Columbia, Florida, Illinois, Louisiana, New Jersey, New York and Texas.
8. Upon return to the US, Consultant has performed additional research and analysis relating to existing Mutual Recognition Agreements involving US states/territories, state laws and regulations relating to the practice of engineering, and court decisions affecting the cross-border practice of engineering within the US.

Preliminary Observations, Findings and Recommendations:

1. **Overview of the US System.** There are significant difference between the engineering education and licensure standards that exist in Colombia and the engineering education and licensure standards that exist in other nations, and particularly within the United States. For example, in the US, individuals seeking licensure as a Professional Engineer and who wish to practice in most US jurisdictions (e.g., states and territories) generally must (1) obtain an a 4 year engineering degree accredited by the Accreditation Board for Engineering and Technology (ABET) (*note*: there is currently discussion within the US to increase the engineering educational requirements for licensure by an additional 30 credits beyond the 4 year engineering degree accredited by ABET), (2) pass an eight hour discipline-specific national examination prepared by the National Council of Examiners for Engineering and Surveying (NCEES) in the Fundamentals of Engineering, (3) obtain four years of progressive engineering experience approved by the state engineering licensure board in the state licensure is being sought, and (4) pass an eight hour discipline-specific national examination prepared by the National Council of Examiners for Engineering and Surveying (NCEES) in the Principles and Practice of Engineering. In addition, currently each US jurisdiction requires Professional Engineers to renew their engineering license on an annual, biennial, or triennial basis, confirm their practice status and other information and pay an annual, biennial or triennial fee in order to support the various education, examination, licensure, disciplinary and other functions performed by the US state/territorial licensure board(s) in the jurisdiction(s) in which the individual practices. (In the US, individuals must be licensed in each of the states or territories in which the individual seeks to practice engineering). Individuals licensed professional engineers are granted a seal with which to seal engineering drawings, plans, specifications and other engineering documents for clients, and for submission to a public authority for approval. However, it should be noted that in varying degrees, each US state/territorial engineering licensure law contains statutory exemptions for engineers working in industry (e.g., fabrication, manufacturing, processing, production, utilities, etc.), education (the teaching of engineering by faculty at engineering colleges and other educational institutions) and government (e.g., federal, state, local). In other words, engineers working in these exempt areas are not required to be licensed as professional engineers. It is estimated that of the approximately 2 million engineers in the US (e.g., graduates of 4 year accredited engineering programs), 360,000 are licensed professional engineers (approximately 20%).

The privileges granted to state/territorially licensed professional engineers in the US are significant and include:

- a. The right to act as an “engineer in responsible charge” offer engineering services (as defined under state/territorial law) directly to the public (e.g. to individuals, businesses, governmental entities, etc.).

- b. The right to sign and seal engineering drawings, plans, specifications and other engineering documents for clients, and for submission to a public authority for approval. As a general rule, state and local building and code enforcement officials require all engineering documents submitted for approval to be signed and sealed by a licensed professional engineer.
- c. The right to serve as an owner, partner, officer, director or “engineer in responsible charge” in a sole proprietorship, partnership, professional corporation, business corporation or joint venture engaged in the practice of engineering and other design professional services as defined by law.

As a general rule, with a few limited exceptions under state law, each individual who is licensed as a professional engineer in each US state/territorial jurisdiction is legally authorized to practice virtually all branches of professional engineering (e.g., civil, mechanical, electrical, chemical, petroleum, structural, mining, environmental, nuclear, etc.) regardless of the engineering degree the individual obtained or the discipline specific examination(s) the individual successfully completed as part of the engineering licensure qualifications process. This is based upon the notion that the practice of engineering is dynamic and that individual licensed engineers have the ability exercise the professional judgment and discretion to practice solely only in their area(s) of competency. Failure on the part of the licensed professional engineer to appropriately exercise that professional judgment and discretion will result in (1) professional liability/errors and omissions claims and (2) state engineering licensure board disciplinary action brought against the professional engineer. The US state/territorial statutes, laws, rules, and regulations that form the basis for the regulation of the practice of engineering are provided in order to safeguard life, health, and property and to promote the public welfare.

2. **Implications for the Colombian System.** The absence of specific or formal engineering education accreditation requirements, fundamentals and principles and practice examination requirements, post-degree experience requirements, annual, biennial or triennial renewal (which results in a system of “engineering licensure for life” in Colombia), or other rigorous technical engineering regulatory standards in Colombia currently presents major obstacles in developing mutually acceptable standards and criteria for engineering licensure based upon mutual recognition between Colombia and the US. Therefore, significant engineering education, licensure and other related Colombia legal reform may need to be accomplished before Colombian engineers can competitively offer engineering services in the US market. This will require the enactment of legislation and regulation to establish specific and formal engineering education accreditation requirements, implementation of a fundamentals and principles and practice examination requirements, enactment of post-degree experience requirements, annual, biennial or triennial renewal including annual fees or other periodic requirements (e.g., mandatory continuing education/competency requirements for continued licensure, and/or periodic re-certification/re-examination for continued engineering licensure), and implementation of more rigorous technical engineering regulatory standards.

The Colombian government should be aware that an existing reciprocal agreement established under the North America Free Trade Agreement negotiated between the US state of Texas, Canada and Mexico under the NAFTA Mutual Recognition Agreement that permits the Texas Board of Professional Engineers to (1) “waive” the eight hour discipline-specific national examination prepared by the National Council of Examiners for Engineering and Surveying (NCEES) in the Fundamentals of Engineering and (2) waive the eight hour discipline-specific national examination prepared by the National Council of Examiners for Engineering and Surveying (NCEES) in the Principles and Practice of Engineering.

However, two significant comments should be made in connection with the Texas “waiver” provision:

- Since the Texas “waiver” provision was enacted in the 1990s, no other US state/territorial jurisdiction has yet formally enacted a similar provision into law or regulation under the North America Free Trade Agreement. This appears to indicate some resistance on the part of some US state/territorial jurisdictions to permit the “waiver” of the Fundamentals of Engineering or the Principles and Practice of Engineering Examination under any present or future International Mutual Recognition Agreements. This resistance is driven, not by a lack of desire on the part of US state/territorial jurisdictions to implement International Mutual Recognition Agreements, but by a strong commitment by many state and territorial engineering licensure boards to the so called “three-legged stool” ({a}four year ABET accredited engineering degree, {b} four years of acceptable progressive engineering experience and {c} passage of the Fundamentals of Engineering and the Principles and Practice of Engineering Examination) for the protection of the public health and safety. Many US state/territorial jurisdictions are of the firm belief that the protection of the public health and safety can only be adequately protected through a seamless process involving what is commonly referred to as the “Three E’s”: (a) Education, (b) Experience and (c) Examination.
 - As with the Texas waiver provision any state ‘waiver’ provision would only permit the individual licensed under the “waiver” provision to practice engineering solely and exclusively in the jurisdiction in which the engineering license was granted. In contrast, instituting the aforementioned legal reform through formal engineering education accreditation standards, fundamentals and principles and practice examination requirements, post-degree experience requirements and other technical standards in Colombia will both provide a greater likelihood of success in negotiating Mutual Recognition Agreements with US state and territorial engineering licensure boards and will improve the likelihood that Colombian engineers will be permitted to practice in a greater number of US states and territories.
3. **Pacific Northwest Economic Region Partnership.** In contrast with the Texas waiver provision, another cross-border initiative, the Pacific Northwest Economic

Region (PNWER) a public-private partnership consisting of the US states and Canadian provinces of Alaska, Alberta, British Columbia, Idaho, Montana, Oregon, Washington, and the Yukon was established in 1991. PNWER's mission is to foster sustainable economic development throughout the entire Pacific Northwest Economic Region in the US and Canada. Among the ongoing actions within PNWER are initiatives recognizing that the licensure systems applied by the licensing authorities in both Canada and the United States within a PNWER jurisdiction, although different in many respects (e.g., the Canadian provinces require graduation from an engineering program approved by the Canadian Engineering Accreditation Board {CEAB}, four-years of acceptable engineering experience and passage of an engineering law and ethics examination prior to licensure but do not require passage of written technical examinations to be licensed as a professional engineer), appear to provide reasonable assurance that persons so licensed by all these jurisdictions are fully qualified and experienced to practice the profession of engineering, in their jurisdictions. Under PNWER, licensing authorities are encouraged to seek legislative amendments necessary to provide to the Board/Council the authority to issue a license to a person licensed in a PNWER jurisdiction where in the opinion of the Board of Council the licensure requirements of the home jurisdiction of the applicant are substantially equivalent to those required by the host jurisdiction. Legislative representatives of the jurisdictions participating in PNWER have been encouraged to introduce and support legislative or policy amendments that may be required in their home jurisdiction to facilitate such agreements. It is the Consultant's view that the ongoing PNWER discussions indicate a current willingness among some US states and territories to explore Mutual Recognition Agreements based upon the concept of substantial equivalency. On July 14, 2004 a "Resolution Regarding Licensing of Engineers in the Pacific Northwest Economic Region" was signed by the state, provincial and territorial licensure board representatives from Alberta, British Columbia, Idaho and Washington, which to the Consultant, is a current indication that some US state/territorial licensure boards are motivated to enter into International Mutual Recognition Agreements.

4. **A Need for Vigorous and Proactive Efforts.** It is the Consultant's view that no Mutual Recognition Agreements involving Colombian engineers can or will be developed unless the Colombian engineering community initiates a vigorous, proactive and concerted effort to seek out markets beyond Colombia. At the present time, other than those Colombian engineers working in the US for US companies, it appears that as international service providers, Colombian engineers have relatively little visibility or penetration within the US market. Therefore any effort to seek opportunities for Colombian engineers in the US will require careful research, planning, design and development of programs, activities, meetings, discussions and "action plans" by the Colombian Professional Engineering Councils to engage US national and state engineering groups. Colombian engineers and the Professional Councils for Engineering (with the assistance of the Colombian government) must aggressively promote the value of a Mutual Recognition Agreement with US state/territorial licensure boards through an active and aggressive marketing

campaign. Among the points and messages that could form the basis for such a campaign could include the following:

- Colombia engineers have the demonstrated education, experience and qualifications to practice internationally;
 - Colombia has excellent world-class engineering educational institutions that have trained Colombian engineers to practice successfully throughout the hemisphere and the world;
 - Colombia has made a strategic decision to build upon its existing engineering education and qualifications for practice system to embrace international engineering standards of practice.
 - Colombia presents an excellent opportunity for individuals licensed in the US state/territories to expand their practice by providing a growing and stable market with strong and lasting ties to the United States.
 - Colombia provides a “platform” for US engineers and US engineering companies seeking to do business throughout South America.
 - Colombia provides an opportunity for US engineers and US engineering companies unfamiliar with the South American market for engineering services to partner with Colombian engineers in order to successfully penetrate the South American market.
5. **A Need for Greater Centralization and Collaboration.** It is the Consultant’s view that the Colombian Professional Engineering Councils must jointly establish a special “Engineering Directorate” consisting of appropriate representatives from each of the Councils and in coordination with each of the Colombian engineering professional engineering societies. The Engineering Directorate should be delegated full authority by the Councils to immediately initiate the necessary joint research, planning, design and development of programs, activities, meetings, discussions and “action plans” to engage US and other appropriate national and state engineering groups, develop strategies for establishing Mutual Recognition Agreements (MRAs) and to advise the Colombian government on international standards for engineering practice.
6. **International Educational Outreach.** The Colombia government should begin to encourage the engineering Councils to jointly establish formal communications with the Accreditation Board for Engineering and Technology, Incorporated (ABET), located in Baltimore, Maryland to express the collective desire for Colombian engineering programs to be evaluated based upon international engineering accreditation standards, including the current ABET accreditation standards. Opportunities for ongoing exchanges and communication should be explored and

encouraged, including proposals for visits to ABET headquarters, participation in ABET evaluation training programs, participation in ABET engineering program accreditation visits and other ABET activities. Similarly, the Councils should be encouraged to arrange exchange visits by ABET evaluators to Colombian engineering programs to promote trust and transparency regarding the quality of Colombian engineering education programs. (It should be noted that at the present time, ABET does not accredit non-US engineering programs.)

7. **International Licensure Outreach.** The Colombia government should encourage the Engineering Councils to establish formal communications with the National Council of Examiners for Engineering and Surveying (NCEES) located in Clemson, South Carolina to express the collective desire to institute an engineering education and licensure system that is compatible with the engineering education and licensure systems in place in the various US jurisdictions. Opportunities for ongoing exchanges and communication should be explored and encouraged, including visits to NCEES headquarters, discussions and liaison with appropriate NCEES committees and task forces and visits to appropriate state engineering licensure boards. In addition, the Engineering Councils should explore the possibility of establishing a process for NCEES examinations being administered and proctored at locations in Colombia.
8. **A Need for Streamlining.** The results and analysis of the preliminary research and interview survey of the four Engineering Councils confirmed that the functions and the tasks currently being performed by the four Councils are very limited both in scope and effectiveness to sufficiently ensure the adequacy and quality of the professional services provided by the licensed professionals. In addition, for those limited functions and tasks, there appears to be a significant degree of duplication of activities being performed by the four Councils. Introductory findings indicate there exists the potential for greater centralization of processes among the Councils such as consolidation or merger of the Councils into one entity with one “National Council Board” consisting of appropriate numerical representation from each of the Councils (e.g., possibly based upon the number of licensees from the technical discipline). The “National Council Board” through its President, should set strategic direction, establish and appoint appropriate working committees and task forces to make policy recommendations as necessary and appropriate, and assign operational responsibility to National Council Board. Once launched, the National Council Board will need to begin to view itself as the “voice of Colombian engineering”, both domestically and internationally, and assume the dominant, authoritative and responsible role for engineering education, licensure and professional practice (in consultation with the engineering educational institutions and engineering professional societies) in Colombia.
9. **Analysis of Operations and Functions.** The results and analysis of the preliminary research and interview survey of the four Engineering Councils indicate that there is a significant degree of variation in the manner in which each of the four Councils currently operate and function. This variation has a significant impact on the effectiveness of each Councils’ operations and functions. The Councils should

establish a joint task force consisting of the President and the chief staff officer of each Council identifying the “best practices” for each of the various operations and functions performed by the four Councils. Among the most significant operations and functions that are recommended for examination include the following: determining appropriate levels of Council staffing, establishing a process for maintaining and continuously updating the engineering registries, establishing a uniform application for engineering licensure for all Councils, establishing a uniform procedure for processing of applications for foreign engineer temporary permits, establishing a uniform and effective method for addressing the issue of unlawful practice of engineering, and strengthening the process for identifying, investigating, prosecuting and imposing sanctions for ethical violations by licensed engineers. In addition, in order to promote best practices as well as efficiencies and economies, the Councils should establish a separate joint task force consisting of appropriate representatives from each of the Councils to determine more effective and creative methods for promoting licensure and ethics among engineers and engineering students, and relations with engineering academia, industry, professional societies.

10. **Generic Professional Engineer Licensure.** As a long term goal, Colombian Professional Engineer Councils should consider implementing a generic professional engineering licensure system that would permit each individual who is licensed as a professional engineer to legally practice all branches of professional engineering regardless of (a) the engineering degree the individual obtained or, (b) once in place, the discipline specific examination(s) the individual successfully completed as part of a reformed Colombian engineering licensure qualifications process. As noted earlier, such a system is justified based upon the notion that the practice of engineering is dynamic and that individual licensed engineers have the ability exercise the professional judgment and discretion to practice solely only in their area(s) of competency. Rather than precluding a professional engineer from practicing beyond a line of demarcation arbitrarily established between engineering technical disciplines, a professional engineer should be given the professional respect, latitude and autonomy to determine on a case-by-case basis the appropriate scope of practice. Adequate safeguards should be put into place to address lapses or misconduct when it occurs. At the same time, the failure on the part of the licensed professional engineer to exercise an appropriate level of professional judgment and discretion in determining scope of practice should result in meaningful sanctions, including (1) civil professional liability/errors and omissions claims and/or (2) departmental or national engineering licensure board disciplinary action brought against the professional engineer.

11. **Registry Administration and Disciplinary Enforcement Action.** During the Consultant’s face-to-face meetings and discussions with the Colombian Professional Engineers Councils two areas of Council administration raised significant concern: (1) registry administration and (2) ethics and disciplinary enforcement action.

In the case of registry administration, at least one Professional Engineers Council indicated that there has been no effort on the part of the Council to update or revise

information contained in the Council's Registry because the Council does not have the staff or financial resources to perform this updating or revising. Curiously, in a discussion with representatives from one of the Councils, in response to a question about the adequacy of Council resources, Council representatives indicated that it had "sufficient resources to perform its primary functions". It is the Consultant's view that the maintenance of complete, accurate and up-to-date records of all registered professional engineers within the authority of the Council is an essential function for this and for all Colombian Professional Engineer Councils. The failure to establish and maintain complete, accurate and up-to-date records of all registered professional engineers undermines the authority, integrity and credibility of the Council and endangers to public health and safety of the Colombian people. It is the Consultant's recommendation that immediate steps be taken to address this critical problem.

In the case of Ethics and Disciplinary Enforcement Action, while at least one Colombian Professional Engineer Council indicated it has a substantial effort underway to address ethics and disciplinary enforcement action to address ethical or unlawful conduct by registered professional engineers within the authority of the Council, most of the Councils currently appear to have little or no serious efforts underway to investigate and process charges of unethical or unlawful conduct by registered professional engineers. Curiously, during in a discussion with representatives from one of the Councils, in response to a question about the number of investigations of charges of unethical or unlawful conduct by registered professional engineers within the authority of the Council, Council representatives indicated that "absence of investigations of charges of unethical and unlawful conduct indicated that engineers within the authority of the Council were extremely ethical and did not engage in unlawful conduct." Based upon professional experience, it is the Consultant's view that within any professional practice cohort, there are always instances of unethical and unlawful conduct (e.g., fraud, deceit, gross negligence, incompetence, negligence, misconduct, violation of the Code of Ethics, etc.) that require investigation and processing of those charges of unethical or unlawful conduct. The failure by some of the Colombian Professional Engineer Councils to investigate and process charges of unethical or unlawful conduct undermines the authority, integrity and credibility of those Councils and endangers to public health and safety of the Colombian people. It is the Consultant's recommendation that immediate steps be taken to address this critical problem.

Conclusion:

As indicated in this report, there are many challenges and opportunities available for improving the Colombian engineering education and licensure process. The recommendations indicated above are preliminary in nature and are not intended to be exhaustive or exclusive concerning the need for legal and other reforms to improve the engineering education and licensure process in Colombia. Additional research and analysis will be necessary to address many of the issues raised in this preliminary report.

I wish to thank Jaime Nino, Miquel Camacho, Sara Scarbro, Lilian Urueta, Ana Buritica and the staff at Colombia Productiva/TSG for their encouragement and support in connection with this project.

cc: Sara Scarbro, Lilian Urueta, Ana Buritica